



LM340, A Series

Three-Terminal Positive Fixed Voltage Regulators

This family of fixed voltage regulators are monolithic integrated circuits capable of driving loads in excess of 1.0 A. These three-terminal regulators employ internal current limiting, thermal shutdown, and safe-area compensation. Devices are available with improved specifications, including a 2% output voltage tolerance, on A-suffix 5.0, 12 and 15 V device types.

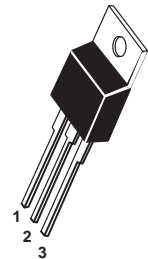
Although designed primarily as a fixed voltage regulator, these devices can be used with external components to obtain adjustable voltages and currents. This series of devices can be used with a series-pass transistor to boost output current capability at the nominal output voltage.

- Output Current in Excess of 1.0 A
- No External Components Required
- Output Voltage Offered in 2% and 4% Tolerance*
- Internal Thermal Overload Protection
- Internal Short Circuit Current Limiting
- Output Transistor Safe-Area Compensation

THREE-TERMINAL POSITIVE FIXED VOLTAGE REGULATORS

SEMICONDUCTOR TECHNICAL DATA

T SUFFIX
PLASTIC PACKAGE
CASE 221A



Pin 1. Input
2. Ground
3. Output

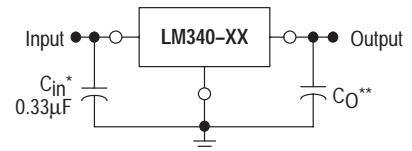
Heatsink surface is connected to Pin 2.

ORDERING INFORMATION

Device	Output Voltage and Tolerance	Operating Temperature Range	Package
LM340T-5.0	5.0 V ± 4%	T _J = 0° to +125°C	Plastic Power
LM340AT-5.0	5.0 V ± 2%		
LM340T-6.0	6.0 V ± 4%		
LM340T-8.0	8.0 V ± 4%		
LM340T-12	12 V ± 4%		
LM340AT-12	12 V ± 2%		
LM340T-15	15 V ± 4%		
LM340AT-15	15 V ± 2%		
LM340T-18	18 V ± 4%		
LM340T-24	24 V ± 4%		

* 2% regulators are available in 5, 12 and 15 V devices.

Simplified Application



A common ground is required between the input and the output voltages. The input voltage must remain typically 1.7 V above the output voltage even during the low point on the input ripple voltage.

XX these two digits of the type number indicate voltage.

* C_{in} is required if regulator is located an appreciable distance from power supply filter.

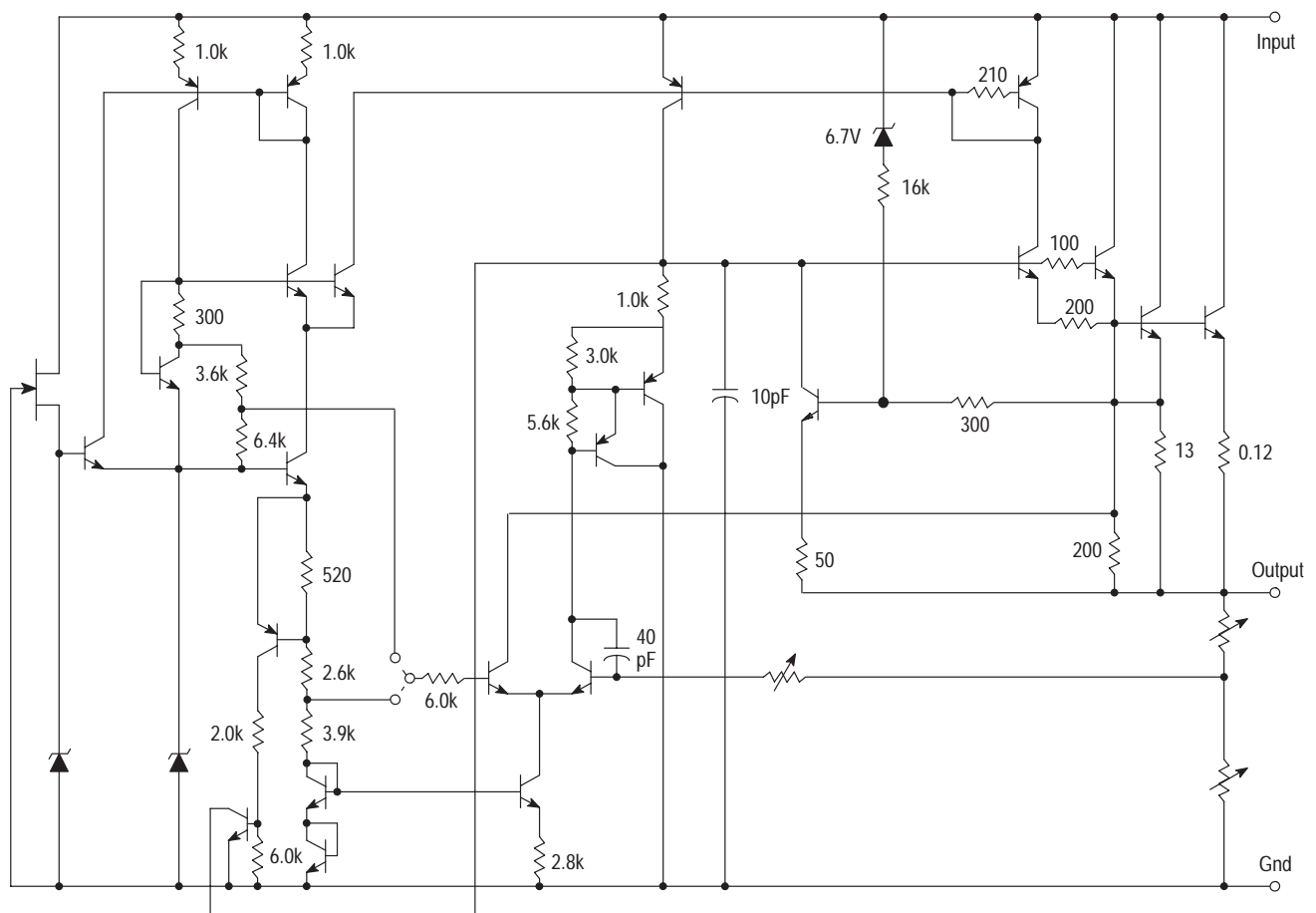
** C_O is not needed for stability; however, it does improve transient response. If needed, use a 0.1 µF ceramic disc.

LM340, A Series

MAXIMUM RATINGS ($T_A = +25^\circ\text{C}$ unless otherwise noted.)

Rating	Symbol	Value	Unit
Input Voltage (5.0 V – 18 V) (24 V)	V_{in}	35 40	Vdc
Power Dissipation and Thermal Characteristics Plastic Package $T_A = +25^\circ\text{C}$ Derate above $T_A = +25^\circ\text{C}$ Thermal Resistance, Junction-to-Air	P_D	Internally Limited	W
	$1/\theta_{JA}$	15.4	mW/ $^\circ\text{C}$
	θ_{JA}	65	$^\circ\text{C}/\text{W}$
	$T_C = +25^\circ\text{C}$ Derate above $T_C = +75^\circ\text{C}$ (See Figure 1) Thermal Resistance, Junction-to-Case	P_D	Internally Limited
	$1/\theta_{JA}$	200	mW/ $^\circ\text{C}$
	θ_{JC}	5.0	$^\circ\text{C}/\text{W}$
Storage Temperature Range	T_{stg}	-65 to +150	$^\circ\text{C}$
Operating Junction Temperature Range	T_J	0 to +150	$^\circ\text{C}$

Representative Schematic Diagram



LM340, A Series

LM340-5.0

ELECTRICAL CHARACTERISTICS ($V_{in} = 10\text{ V}$, $I_O = 500\text{ mA}$, $T_J = T_{low}$ to T_{high} [Note 1], unless otherwise noted.)

Characteristics	Symbol	Min	Typ	Max	Unit
Output Voltage ($T_J = +25^\circ\text{C}$) $I_O = 5.0\text{ mA}$ to 1.0 A	V_O	4.8	5.0	5.2	Vdc
Line Regulation (Note 2) 8.0 Vdc to 20 Vdc 7.0 Vdc to 25 Vdc ($T_J = +25^\circ\text{C}$) 8.0 Vdc to 12 Vdc, $I_O = 1.0\text{ A}$ 7.3 Vdc to 20 Vdc, $I_O = 1.0\text{ A}$ ($T_J = +25^\circ\text{C}$)	Reg _{line}	–	–	50 50 25 50	mV
Load Regulation (Note 2) $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$ ($T_J = +25^\circ\text{C}$) $250\text{ mA} \leq I_O \leq 750\text{ mA}$ ($T_J = +25^\circ\text{C}$)	Reg _{load}	–	–	50 50 25	mV
Output Voltage $7.0 \leq V_{in} \leq 20\text{ Vdc}$, $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_D \leq 15\text{ W}$	V_O	4.75	–	5.25	Vdc
Quiescent Current $I_O = 1.0\text{ A}$ $T_J = +25^\circ\text{C}$	I_B	–	–	8.5 8.0	mA
Quiescent Current Change $7.0 \leq V_{in} \leq 25\text{ Vdc}$, $I_O = 500\text{ mA}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $V_{in} = 10\text{ V}$ $7.5 \leq V_{in} \leq 20\text{ Vdc}$, $I_O = 1.0\text{ A}$	ΔI_B	–	–	1.0 0.5 1.0	mA
Ripple Rejection $I_O = 1.0\text{ A}$ ($T_J = +25^\circ\text{C}$)	RR	62	80	–	dB
Dropout Voltage	$V_I - V_O$	–	1.7	–	Vdc
Output Resistance ($f = 1.0\text{ kHz}$)	r_O	–	2.0	–	$\text{m}\Omega$
Short Circuit Current Limit ($T_J = +25^\circ\text{C}$)	I_{SC}	–	2.0	–	A
Output Noise Voltage ($T_A = +25^\circ\text{C}$) $10\text{ Hz} \leq f \leq 100\text{ kHz}$	V_n	–	40	–	μV
Average Temperature Coefficient of Output Voltage $I_O = 5.0\text{ mA}$	TCV_O	–	± 0.6	–	$\text{mV}/^\circ\text{C}$
Peak Output Current ($T_J = +25^\circ\text{C}$)	I_O	–	2.4	–	A
Input Voltage to Maintain Line Regulation ($T_J = +25^\circ\text{C}$) $I_O = 1.0\text{ A}$		7.3	–	–	Vdc

NOTES: 1. T_{low} to $T_{high} = 0^\circ$ to $+125^\circ\text{C}$

2. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

DEFINITIONS

Line Regulation – The change in output voltage for a change in the input voltage. The measurement is made under conditions of low dissipation or by using pulse techniques such that the average chip temperature is not significantly affected.

Load Regulation – The change in output voltage for a change in load current at constant chip temperature.

Maximum Power Dissipation – The maximum total device dissipation for which the regulator will operate within specifications.

Quiescent Current – That part of the input current that is not delivered to the load.

Output Noise Voltage – The rms AC voltage at the output, with constant load and no input ripple, measured over a specified frequency range.

LM340, A Series

LM340A-5.0

ELECTRICAL CHARACTERISTICS ($V_{in} = 10\text{ V}$, $I_O = 1.0\text{ A}$, $T_J = T_{low}$ to T_{high} [Note 1], unless otherwise noted.)

Characteristics	Symbol	Min	Typ	Max	Unit
Output Voltage ($T_J = +25^\circ\text{C}$) $I_O = 5.0\text{ mA}$ to 1.0 A	V_O	4.9	5.0	5.1	Vdc
Line Regulation 7.5 Vdc to 20 Vdc, $I_O = 500\text{ mA}$ 7.3 Vdc to 25 Vdc ($T_J = +25^\circ\text{C}$) 8.0 Vdc to 12 Vdc 8.0 Vdc to 12 Vdc ($T_J = +25^\circ\text{C}$)	Reg _{line}	–	–	10	mV
Load Regulation $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$ ($T_J = +25^\circ\text{C}$) $250\text{ mA} \leq I_O \leq 750\text{ mA}$ ($T_J = +25^\circ\text{C}$)	Reg _{load}	–	–	25	mV
Output Voltage $7.5 \leq V_{in} \leq 20\text{ Vdc}$, $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_D \leq 15\text{ W}$	V_O	4.8	–	5.2	Vdc
Quiescent Current $T_J = +25^\circ\text{C}$	I_B	–	–	6.5	mA
Quiescent Current Change $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $V_{in} = 10\text{ V}$ $8.0 \leq V_{in} \leq 25\text{ Vdc}$, $I_O = 500\text{ mA}$ $7.5 \leq V_{in} \leq 20\text{ Vdc}$, $I_O = 1.0\text{ A}$ ($T_J = +25^\circ\text{C}$)	ΔI_B	–	–	0.5	mA
Ripple Rejection $8.0 \leq V_{in} \leq 18\text{ Vdc}$, $f = 120\text{ Hz}$ $I_O = 500\text{ mA}$ $I_O = 1.0\text{ A}$ ($T_J = +25^\circ\text{C}$)	RR	68	–	–	dB
Dropout Voltage	$V_I - V_O$	–	1.7	–	Vdc
Output Resistance ($f = 1.0\text{ kHz}$)	r_O	–	2.0	–	$\text{m}\Omega$
Short Circuit Current Limit ($T_J = +25^\circ\text{C}$)	I_{SC}	–	2.0	–	A
Output Noise Voltage ($T_A = +25^\circ\text{C}$) $10\text{ Hz} \leq f \leq 100\text{ kHz}$	V_n	–	40	–	μV
Average Temperature Coefficient of Output Voltage $I_O = 5.0\text{ mA}$	TCV_O	–	± 0.6	–	$\text{mV}/^\circ\text{C}$
Peak Output Current ($T_J = +25^\circ\text{C}$)	I_O	–	2.4	–	A
Input Voltage to Maintain Line Regulation ($T_J = +25^\circ\text{C}$) $I_O = 1.0\text{ A}$		7.3	–	–	Vdc

NOTE: 1. T_{low} to $T_{high} = 0^\circ$ to $+125^\circ\text{C}$

LM340, A Series

LM340-6.0

ELECTRICAL CHARACTERISTICS ($V_{in} = 11\text{ V}$, $I_O = 500\text{ mA}$, $T_J = T_{low}$ to T_{high} [Note 1], unless otherwise noted.)

Characteristics	Symbol	Min	Typ	Max	Unit
Output Voltage ($T_J = +25^\circ\text{C}$) $I_O = 5.0\text{ mA}$ to 1.0 A	V_O	5.75	6.0	6.25	Vdc
Line Regulation 9.0 Vdc to 21 Vdc 8.0 Vdc to 25 Vdc ($T_J = +25^\circ\text{C}$) 9.0 Vdc to 13 Vdc, $I_O = 1.0\text{ A}$ 8.3 Vdc to 21 Vdc, $I_O = 1.0\text{ A}$ ($T_J = +25^\circ\text{C}$)	Reg _{line}	–	–	60 60 30 60	mV
Load Regulation $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$ ($T_J = +25^\circ\text{C}$) $250\text{ mA} \leq I_O \leq 750\text{ mA}$ ($T_J = +25^\circ\text{C}$)	Reg _{load}	–	–	60 60 30	mV
Output Voltage $8.0 \leq V_{in} \leq 21\text{ Vdc}$, $6.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_D \leq 15\text{ W}$	V_O	5.7	–	6.3	Vdc
Quiescent Current $I_O = 1.0\text{ A}$ $T_J = +25^\circ\text{C}$	I_B	–	–	8.5 8.0	mA
Quiescent Current Change $8.0 \leq V_{in} \leq 25\text{ Vdc}$, $I_O = 500\text{ mA}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $V_{in} = 11\text{ V}$ $8.6 \leq V_{in} \leq 21\text{ Vdc}$, $I_O = 1.0\text{ A}$	ΔI_B	–	–	1.0 0.5 1.0	mA
Ripple Rejection $I_O = 1.0\text{ A}$ ($T_J = +25^\circ\text{C}$)	RR	59	78	–	dB
Dropout Voltage	$V_I - V_O$	–	1.7	–	Vdc
Output Resistance ($f = 1.0\text{ kHz}$)	r_O	–	2.0	–	$\text{m}\Omega$
Short Circuit Current Limit ($T_J = +25^\circ\text{C}$)	I_{SC}	–	1.9	–	A
Output Noise Voltage ($T_A = +25^\circ\text{C}$) $10\text{ Hz} \leq f \leq 100\text{ kHz}$	V_n	–	45	–	μV
Average Temperature Coefficient of Output Voltage $I_O = 5.0\text{ mA}$	TCV_O	–	± 0.7	–	$\text{mV}/^\circ\text{C}$
Peak Output Current ($T_J = +25^\circ\text{C}$)	I_O	–	2.4	–	A
Input Voltage to Maintain Line Regulation ($T_J = +25^\circ\text{C}$) $I_O = 1.0\text{ A}$		8.3	–	–	Vdc

NOTE: 1. T_{low} to $T_{high} = 0^\circ$ to $+125^\circ\text{C}$

LM340, A Series

LM340-8.0

ELECTRICAL CHARACTERISTICS ($V_{in} = 14\text{ V}$, $I_O = 500\text{ mA}$, $T_J = T_{low}$ to T_{high} [Note 1], unless otherwise noted.)

Characteristics	Symbol	Min	Typ	Max	Unit
Output Voltage ($T_J = +25^\circ\text{C}$) $I_O = 5.0\text{ mA}$ to 1.0 A	V_O	7.7	8.0	8.3	Vdc
Line Regulation 11 Vdc to 23 Vdc 10.5 Vdc to 25 Vdc ($T_J = +25^\circ\text{C}$) 11 Vdc to 17 Vdc, $I_O = 1.0\text{ A}$ 10.5 Vdc to 23 Vdc, $I_O = 1.0\text{ A}$ ($T_J = +25^\circ\text{C}$)	Reg _{line}	–	–	80	mV
Load Regulation $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$ ($T_J = +25^\circ\text{C}$) $250\text{ mA} \leq I_O \leq 750\text{ mA}$ ($T_J = +25^\circ\text{C}$)	Reg _{load}	–	–	80	mV
Output Voltage $10.5 \leq V_{in} \leq 23\text{ Vdc}$, $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_D \leq 15\text{ W}$	V_O	7.6	–	8.4	Vdc
Quiescent Current $I_O = 1.0\text{ A}$ $T_J = +25^\circ\text{C}$	I_B	–	–	8.5	mA
Quiescent Current Change $10.5 \leq V_{in} \leq 25\text{ Vdc}$, $I_O = 500\text{ mA}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $V_{in} = 14\text{ V}$ $10.6 \leq V_{in} \leq 23\text{ Vdc}$, $I_O = 1.0\text{ A}$	ΔI_B	–	–	1.0	mA
Ripple Rejection $I_O = 1.0\text{ A}$ ($T_J = +25^\circ\text{C}$)	RR	56	76	–	dB
Dropout Voltage	$V_I - V_O$	–	1.7	–	Vdc
Output Resistance ($f = 1.0\text{ kHz}$)	r_O	–	2.0	–	$\text{m}\Omega$
Short Circuit Current Limit ($T_J = +25^\circ\text{C}$)	I_{SC}	–	1.5	–	A
Output Noise Voltage ($T_A = +25^\circ\text{C}$) $10\text{ Hz} \leq f \leq 100\text{ kHz}$	V_n	–	52	–	μV
Average Temperature Coefficient of Output Voltage $I_O = 5.0\text{ mA}$	TCV_O	–	± 1.0	–	$\text{mV}/^\circ\text{C}$
Peak Output Current ($T_J = +25^\circ\text{C}$)	I_O	–	2.4	–	A
Input Voltage to Maintain Line Regulation ($T_J = +25^\circ\text{C}$) $I_O = 1.0\text{ A}$		10.5	–	–	Vdc

NOTE: 1. T_{low} to $T_{high} = 0^\circ$ to $+125^\circ\text{C}$

LM340, A Series

LM340-12

ELECTRICAL CHARACTERISTICS ($V_{in} = 19\text{ V}$, $I_O = 500\text{ mA}$, $T_J = T_{low}$ to T_{high} [Note 1], unless otherwise noted.)

Characteristics	Symbol	Min	Typ	Max	Unit
Output Voltage ($T_J = +25^\circ\text{C}$) $I_O = 5.0\text{ mA}$ to 1.0 A	V_O	11.5	12	12.5	Vdc
Line Regulation (Note 2) 15 Vdc to 27 Vdc 14.6 Vdc to 30 Vdc ($T_J = +25^\circ\text{C}$) 16 Vdc to 22 Vdc, $I_O = 1.0\text{ A}$ 14.6 Vdc to 27 Vdc, $I_O = 1.0\text{ A}$ ($T_J = +25^\circ\text{C}$)	Reg _{line}	–	–	120 120 60 120	mV
Load Regulation (Note 2) $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$ ($T_J = +25^\circ\text{C}$) $250\text{ mA} \leq I_O \leq 750\text{ mA}$ ($T_J = +25^\circ\text{C}$)	Reg _{load}	–	–	120 120 60	mV
Output Voltage $14.5 \leq V_{in} \leq 27\text{ Vdc}$, $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_D \leq 15\text{ W}$	V_O	11.4	–	12.6	Vdc
Quiescent Current $I_O = 1.0\text{ A}$ $T_J = +25^\circ\text{C}$	I_B	–	–	8.5 8.0	mA
Quiescent Current Change $14.5 \leq V_{in} \leq 30\text{ Vdc}$, $I_O = 500\text{ mA}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $V_{in} = 19\text{ V}$ $14.8 \leq V_{in} \leq 27\text{ Vdc}$, $I_O = 1.0\text{ A}$	ΔI_B	–	–	1.0 0.5 1.0	mA
Ripple Rejection $I_O = 1.0\text{ A}$ ($T_J = +25^\circ\text{C}$)	RR	55	72	–	dB
Dropout Voltage	$V_I - V_O$	–	1.7	–	Vdc
Output Resistance ($f = 1.0\text{ kHz}$)	r_O	–	2.0	–	$\text{m}\Omega$
Short Circuit Current Limit ($T_J = +25^\circ\text{C}$)	I_{SC}	–	1.1	–	A
Output Noise Voltage ($T_A = +25^\circ\text{C}$) $10\text{ Hz} \leq f \leq 100\text{ kHz}$	V_n	–	75	–	μV
Average Temperature Coefficient of Output Voltage $I_O = 5.0\text{ mA}$	TCV_O	–	± 1.5	–	$\text{mV}/^\circ\text{C}$
Peak Output Current ($T_J = +25^\circ\text{C}$)	I_O	–	2.4	–	A
Input Voltage to Maintain Line Regulation ($T_J = +25^\circ\text{C}$) $I_O = 1.0\text{ A}$		14.6	–	–	Vdc

NOTES: 1. T_{low} to $T_{high} = 0^\circ$ to $+125^\circ\text{C}$

2. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

LM340, A Series

LM340A-12

ELECTRICAL CHARACTERISTICS ($V_{in} = 19\text{ V}$, $I_O = 1.0\text{ mA}$, $T_J = T_{low}$ to T_{high} [Note 1], unless otherwise noted.)

Characteristics	Symbol	Min	Typ	Max	Unit
Output Voltage ($T_J = +25^\circ\text{C}$) $I_O = 5.0\text{ mA}$ to 1.0 A	V_O	11.75	12	12.25	Vdc
Line Regulation 14.8 Vdc to 27 Vdc, $I_O = 500\text{ mA}$ 14.5 Vdc to 30 Vdc ($T_J = +25^\circ\text{C}$) 16 Vdc to 22 Vdc 16 Vdc to 22 Vdc ($T_J = +25^\circ\text{C}$)	Reg _{line}	–	–	18	mV
		–	4.0	18	
		–	–	30	
		–	–	9.0	
Load Regulation $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$ ($T_J = +25^\circ\text{C}$) $250\text{ mA} \leq I_O \leq 750\text{ mA}$ ($T_J = +25^\circ\text{C}$)	Reg _{load}	–	–	60	mV
		–	–	32	
		–	–	19	
Output Voltage $14.8 \leq V_{in} \leq 27\text{ Vdc}$, $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_D \leq 15\text{ W}$	V_O	11.5	–	12.5	Vdc
Quiescent Current $T_J = +25^\circ\text{C}$	I_B	–	–	6.5	mA
		–	3.5	6.0	
Quiescent Current Change $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $V_{in} = 19\text{ V}$ $15 \leq V_{in} \leq 30\text{ Vdc}$, $I_O = 500\text{ mA}$ $14.8 \leq V_{in} \leq 27\text{ Vdc}$, $I_O = 1.0\text{ A}$ ($T_J = +25^\circ\text{C}$)	ΔI_B	–	–	0.5	mA
		–	–	0.8	
		–	–	0.8	
Ripple Rejection $15 \leq V_{in} \leq 25\text{ Vdc}$, $f = 120\text{ Hz}$ $I_O = 500\text{ mA}$ $I_O = 1.0\text{ A}$ ($T_J = +25^\circ\text{C}$)	RR				dB
		61	–	–	
		61	72	–	
Dropout Voltage	$V_I - V_O$	–	1.7	–	Vdc
Output Resistance ($f = 1.0\text{ kHz}$)	r_O	–	2.0	–	$\text{m}\Omega$
Short Circuit Current Limit ($T_J = +25^\circ\text{C}$)	I_{SC}	–	1.1	–	A
Output Noise Voltage ($T_A = +25^\circ\text{C}$) $10\text{ Hz} \leq f \leq 100\text{ kHz}$	V_n	–	75	–	μV
Average Temperature Coefficient of Output Voltage $I_O = 5.0\text{ mA}$	TCV_O	–	± 1.5	–	$\text{mV}/^\circ\text{C}$
Peak Output Current ($T_J = +25^\circ\text{C}$)	I_O	–	2.4	–	A
Input Voltage to Maintain Line Regulation ($T_J = +25^\circ\text{C}$)		14.5	–	–	Vdc

NOTE: 1. T_{low} to $T_{high} = 0^\circ$ to $+125^\circ\text{C}$

LM340, A Series

LM340-15

ELECTRICAL CHARACTERISTICS ($V_{in} = 23\text{ V}$, $I_O = 500\text{ mA}$, $T_J = T_{low}$ to T_{high} [Note 1], unless otherwise noted.)

Characteristics	Symbol	Min	Typ	Max	Unit
Output Voltage ($T_J = +25^\circ\text{C}$) $I_O = 5.0\text{ mA}$ to 1.0 A	V_O	14.4	15	15.6	Vdc
Line Regulation (Note 2) 18.5 Vdc to 30 Vdc 17.5 Vdc to 30 Vdc ($T_J = +25^\circ\text{C}$) 20 Vdc to 26 Vdc, $I_O = 1.0\text{ A}$ 17.7 Vdc to 30 Vdc, $I_O = 1.0\text{ A}$ ($T_J = +25^\circ\text{C}$)	Reg _{line}	–	–	150 150 75 150	mV
Load Regulation (Note 2) $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$ ($T_J = +25^\circ\text{C}$) $250\text{ mA} \leq I_O \leq 750\text{ mA}$ ($T_J = +25^\circ\text{C}$)	Reg _{load}	–	–	150 150 75	mV
Output Voltage $17.5 \leq V_{in} \leq 30\text{ Vdc}$, $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_D \leq 15\text{ W}$	V_O	14.25	–	15.75	Vdc
Quiescent Current $I_O = 1.0\text{ A}$ $T_J = +25^\circ\text{C}$	I_B	–	– 4.0	8.5 8.0	mA
Quiescent Current Change $17.5 \leq V_{in} \leq 30\text{ Vdc}$, $I_O = 500\text{ mA}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $V_{in} = 23\text{ V}$ $17.9 \leq V_{in} \leq 30\text{ Vdc}$, $I_O = 1.0\text{ A}$	ΔI_B	–	–	1.0 0.5 1.0	mA
Ripple Rejection $I_O = 1.0\text{ mA}$ ($T_J = +25^\circ\text{C}$)	RR	54	70	–	dB
Dropout Voltage	$V_I - V_O$	–	1.7	–	Vdc
Output Resistance ($f = 1.0\text{ kHz}$)	r_O	–	2.0	–	m Ω
Short Circuit Current Limit ($T_J = +25^\circ\text{C}$)	I_{SC}	–	800	–	A
Output Noise Voltage ($T_A = +25^\circ\text{C}$) $10\text{ Hz} \leq f \leq 100\text{ kHz}$	V_n	–	90	–	μV
Average Temperature Coefficient of Output Voltage $I_O = 5.0\text{ mA}$	TCV_O	–	± 1.8	–	mV/ $^\circ\text{C}$
Peak Output Current ($T_J = +25^\circ\text{C}$)	I_O	–	2.4	–	A
Input Voltage to Maintain Line Regulation ($T_J = +25^\circ\text{C}$) $I_O = 1.0\text{ A}$		17.7	–	–	Vdc

NOTES: 1. T_{low} to $T_{high} = 0^\circ$ to $+125^\circ\text{C}$

2. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

LM340, A Series

LM340A-15

ELECTRICAL CHARACTERISTICS ($V_{in} = 23\text{ V}$, $I_O = 1.0\text{ mA}$, $T_J = T_{low}$ to T_{high} [Note 1], unless otherwise noted.)

Characteristics	Symbol	Min	Typ	Max	Unit
Output Voltage ($T_J = +25^\circ\text{C}$) $I_O = 5.0\text{ mA}$ to 1.0 A	V_O	14.7	15	15.3	Vdc
Line Regulation 17.9 Vdc to 30 Vdc, $I_O = 500\text{ mA}$ 17.5 Vdc to 30 Vdc ($T_J = +25^\circ\text{C}$) 20 Vdc to 26 Vdc, $I_O = 1.0\text{ A}$ 20 Vdc to 26 Vdc, $I_O = 1.0\text{ A}$ ($T_J = +25^\circ\text{C}$)	Reg _{line}	–	–	22	mV
Load Regulation $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$ ($T_J = +25^\circ\text{C}$) $250\text{ mA} \leq I_O \leq 750\text{ mA}$ ($T_J = +25^\circ\text{C}$)	Reg _{load}	–	–	75	mV
Output Voltage $17.9 \leq V_{in} \leq 30\text{ Vdc}$, $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_D \leq 15\text{ W}$	V_O	14.4	–	15.6	Vdc
Quiescent Current $T_J = +25^\circ\text{C}$	I_B	–	–	6.5	mA
Quiescent Current Change $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $V_{in} = 23\text{ V}$ $17.9 \leq V_{in} \leq 30\text{ Vdc}$, $I_O = 500\text{ mA}$ $17.9 \leq V_{in} \leq 30\text{ Vdc}$, $I_O = 1.0\text{ A}$ ($T_J = +25^\circ\text{C}$)	ΔI_B	–	–	0.5	mA
Ripple Rejection $18.5 \leq V_{in} \leq 28.5\text{ Vdc}$, $f = 120\text{ Hz}$ $I_O = 500\text{ mA}$ $I_O = 1.0\text{ A}$ ($T_J = +25^\circ\text{C}$)	RR	60	–	–	dB
Dropout Voltage	$V_I - V_O$	–	1.7	–	Vdc
Output Resistance ($f = 1.0\text{ kHz}$)	r_O	–	2.0	–	$\text{m}\Omega$
Short Circuit Current Limit ($T_J = +25^\circ\text{C}$)	I_{SC}	–	800	–	A
Output Noise Voltage ($T_A = +25^\circ\text{C}$) $10\text{ Hz} \leq f \leq 100\text{ kHz}$	V_n	–	90	–	μV
Average Temperature Coefficient of Output Voltage $I_O = 5.0\text{ mA}$	TCV_O	–	± 1.8	–	$\text{mV}/^\circ\text{C}$
Peak Output Current ($T_J = +25^\circ\text{C}$)	I_O	–	2.4	–	A
Input Voltage to Maintain Line Regulation ($T_J = +25^\circ\text{C}$)		17.5	–	–	Vdc

NOTE: 1. T_{low} to $T_{high} = 0^\circ$ to $+125^\circ\text{C}$

LM340, A Series

LM340-18

ELECTRICAL CHARACTERISTICS ($V_{in} = 27\text{ V}$, $I_O = 500\text{ mA}$, $T_J = T_{low}$ to T_{high} [Note 1], unless otherwise noted.)

Characteristics	Symbol	Min	Typ	Max	Unit
Output Voltage ($T_J = +25^\circ\text{C}$) $I_O = 5.0\text{ mA}$ to 1.0 A	V_O	17.3	18	18.7	Vdc
Line Regulation 21.5 Vdc to 33 Vdc 21 Vdc to 33 Vdc ($T_J = +25^\circ\text{C}$) 24 Vdc to 30 Vdc, $I_O = 1.0\text{ A}$ 21 Vdc to 33 Vdc, $I_O = 1.0\text{ A}$ ($T_J = +25^\circ\text{C}$)	Reg _{line}	–	–	180 180 90 180	mV
Load Regulation $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$ ($T_J = +25^\circ\text{C}$) $250\text{ mA} \leq I_O \leq 750\text{ mA}$ ($T_J = +25^\circ\text{C}$)	Reg _{load}	–	–	180 180 90	mV
Output Voltage $21 \leq V_{in} \leq 33\text{ Vdc}$, $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_D \leq 15\text{ W}$	V_O	17.1	–	18.9	Vdc
Quiescent Current $I_O = 1.0\text{ A}$ $T_J = +25^\circ\text{C}$	I_B	–	–	8.5 8.0	mA
Quiescent Current Change $21 \leq V_{in} \leq 33\text{ Vdc}$, $I_O = 500\text{ mA}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $V_{in} = 27\text{ V}$ $21 \leq V_{in} \leq 33\text{ Vdc}$, $I_O = 1.0\text{ A}$	ΔI_B	–	–	1.0 0.5 1.0	mA
Ripple Rejection $I_O = 1.0\text{ mA}$ ($T_J = +25^\circ\text{C}$)	RR	53	69	–	dB
Dropout Voltage	$V_I - V_O$	–	1.7	–	Vdc
Output Resistance ($f = 1.0\text{ kHz}$)	r_O	–	2.0	–	$\text{m}\Omega$
Short Circuit Current Limit ($T_J = +25^\circ\text{C}$)	I_{SC}	–	500	–	A
Output Noise Voltage ($T_A = +25^\circ\text{C}$) $10\text{ Hz} \leq f \leq 100\text{ kHz}$	V_n	–	110	–	μV
Average Temperature Coefficient of Output Voltage $I_O = 5.0\text{ mA}$	TCV_O	–	± 2.3	–	$\text{mV}/^\circ\text{C}$
Peak Output Current ($T_J = +25^\circ\text{C}$)	I_O	–	2.4	–	A
Input Voltage to Maintain Line Regulation ($T_J = +25^\circ\text{C}$) $I_O = 1.0\text{ A}$		21	–	–	Vdc

NOTE: 1. T_{low} to $T_{high} = 0^\circ$ to $+125^\circ\text{C}$

LM340, A Series

LM340-24

ELECTRICAL CHARACTERISTICS ($V_{in} = 33\text{ V}$, $I_O = 500\text{ mA}$, $T_J = T_{low}$ to T_{high} [Note 1], unless otherwise noted.)

Characteristics	Symbol	Min	Typ	Max	Unit
Output Voltage ($T_J = +25^\circ\text{C}$) $I_O = 5.0\text{ mA}$ to 1.0 A	V_O	23	24	25	Vdc
Line Regulation 28 Vdc to 38 Vdc 27 Vdc to 38 Vdc ($T_J = +25^\circ\text{C}$) 30 Vdc to 36 Vdc, $I_O = 1.0\text{ A}$ 27.1 Vdc to 38 Vdc, $I_O = 1.0\text{ A}$ ($T_J = +25^\circ\text{C}$)	Reg _{line}	–	–	240	mV
Load Regulation $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$ ($T_J = +25^\circ\text{C}$) $250\text{ mA} \leq I_O \leq 750\text{ mA}$ ($T_J = +25^\circ\text{C}$)	Reg _{load}	–	–	240	mV
Output Voltage $27 \leq V_{in} \leq 38\text{ Vdc}$, $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_D \leq 15\text{ W}$	V_O	22.8	–	25.2	Vdc
Quiescent Current $I_O = 1.0\text{ A}$ $T_J = +25^\circ\text{C}$	I_B	–	–	8.5	mA
Quiescent Current Change $27 \leq V_{in} \leq 38\text{ Vdc}$, $I_O = 500\text{ mA}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $V_{in} = 33\text{ V}$ $27.3 \leq V_{in} \leq 38\text{ Vdc}$, $I_O = 1.0\text{ A}$	ΔI_B	–	–	1.0	mA
Ripple Rejection $I_O = 1.0\text{ mA}$ ($T_J = +25^\circ\text{C}$)	RR	50	66	–	dB
Dropout Voltage	$V_I - V_O$	–	1.7	–	Vdc
Output Resistance ($f = 1.0\text{ kHz}$)	r_O	–	2.0	–	$\text{m}\Omega$
Short Circuit Current Limit ($T_J = +25^\circ\text{C}$)	I_{SC}	–	200	–	A
Output Noise Voltage ($T_A = +25^\circ\text{C}$) $10\text{ Hz} \leq f \leq 100\text{ kHz}$	V_n	–	170	–	μV
Average Temperature Coefficient of Output Voltage $I_O = 5.0\text{ mA}$	TCV_O	–	± 3.0	–	$\text{mV}/^\circ\text{C}$
Peak Output Current ($T_J = +25^\circ\text{C}$)	I_O	–	2.4	–	A
Input Voltage to Maintain Line Regulation ($T_J = +25^\circ\text{C}$) $I_O = 1.0\text{ A}$		27.1	–	–	Vdc

NOTE: 1. T_{low} to $T_{high} = 0^\circ$ to $+125^\circ\text{C}$

LM340, A Series

VOLTAGE REGULATOR PERFORMANCE

The performance of a voltage regulator is specified by its immunity to changes in load, input voltage, power dissipation, and temperature. Line and load regulation are tested with a pulse of short duration ($< 100 \mu\text{s}$) and are strictly a function of electrical gain. However, pulse widths of longer duration ($> 1.0 \text{ ms}$) are sufficient to affect temperature gradients across the die. These temperature gradients can cause a change in the output voltage, in addition to changes caused by line and load regulation. Longer pulse widths and thermal gradients make it desirable to specify thermal regulation.

Thermal regulation is defined as the change in output voltage caused by a change in dissipated power for a specified time, and is expressed as a percentage output voltage change per watt. The change in dissipated power can

be caused by a change in either input voltage or the load current. Thermal regulation is a function of IC layout and die attach techniques, and usually occurs within 10 ms of a change in power dissipation. After 10 ms, additional changes in the output voltage are due to the temperature coefficient of the device.

Figure 1 shows the line and thermal regulation response of a typical LM340AT-5.0 to a 10 W input pulse. The variation of the output voltage due to line regulation is labeled Δ and the thermal regulation component is labeled Δ . Figure 2 shows the load and thermal regulation response of a typical LM340AT-5.0 to a 15 W load pulse. The output voltage variation due to load regulation is labeled Δ and the thermal regulation component is labeled Δ .

Figure 1. Line and Thermal Regulation

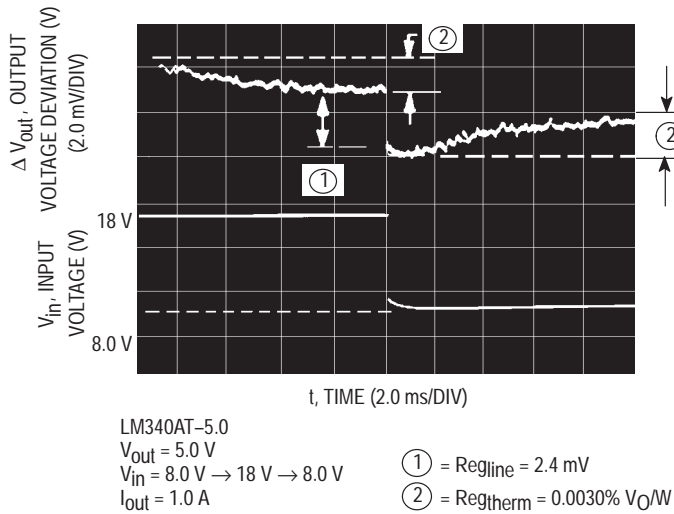


Figure 2. Load and Thermal Regulation

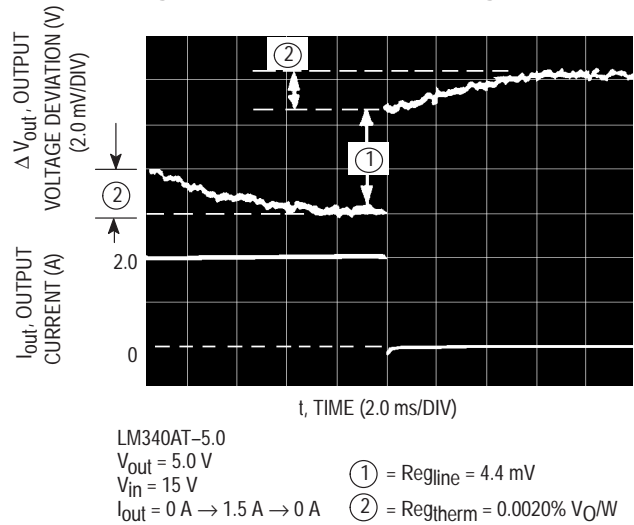


Figure 3. Temperature Stability

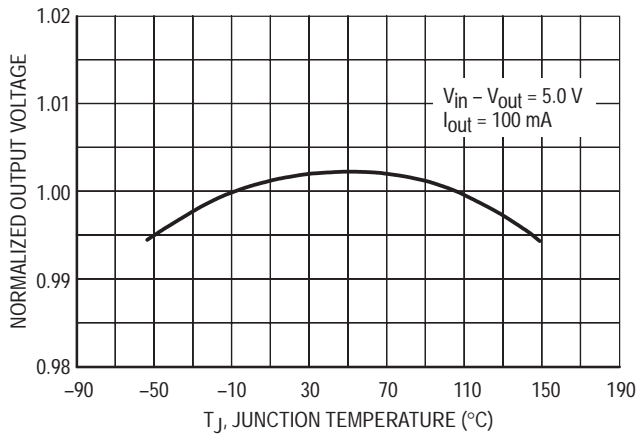


Figure 4. Output Impedance

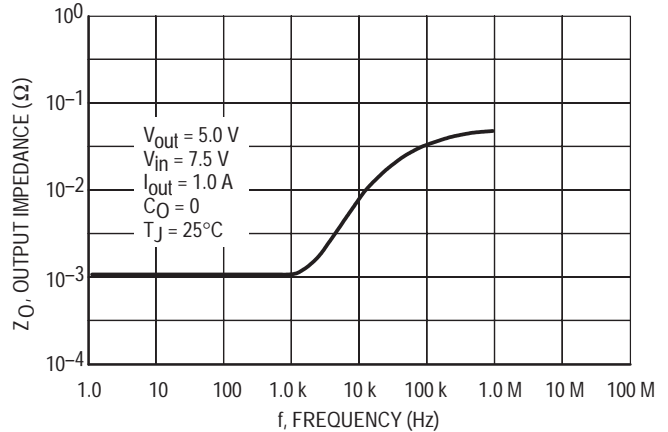


Figure 5. Ripple Rejection versus Frequency

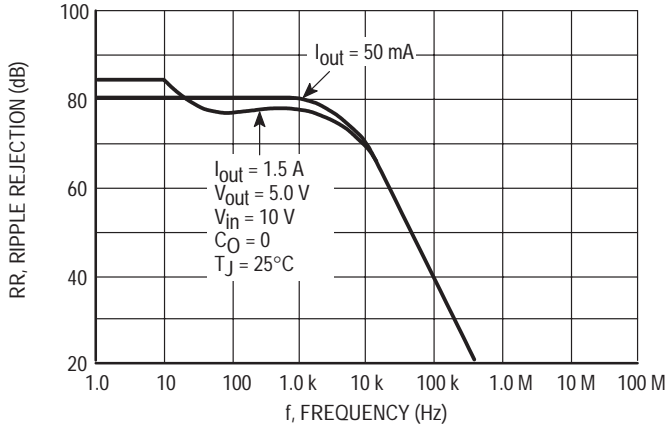


Figure 6. Ripple Rejection versus Output Current

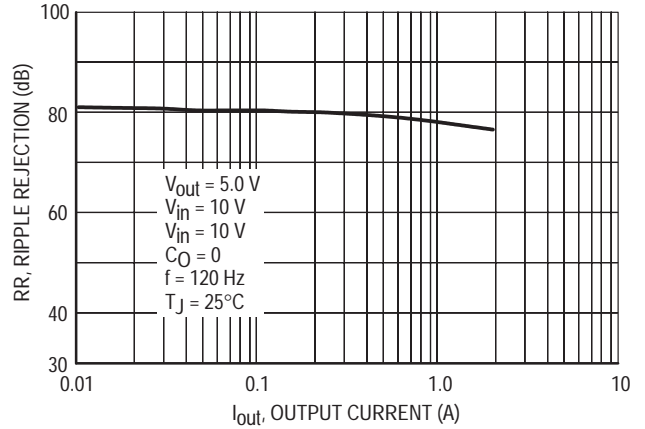


Figure 7. Quiescent Current versus Input Voltage

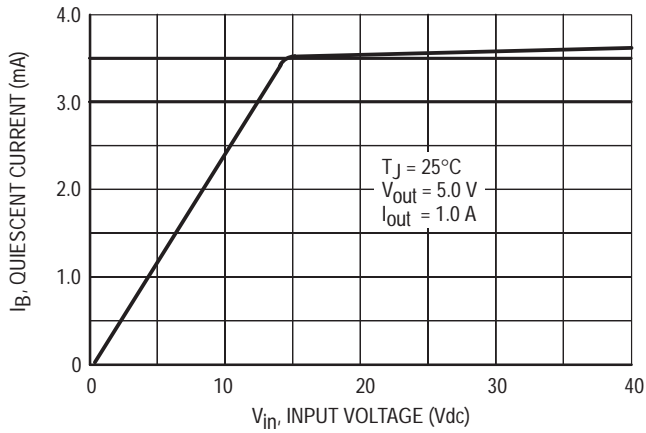


Figure 8. Quiescent Current versus Output Current

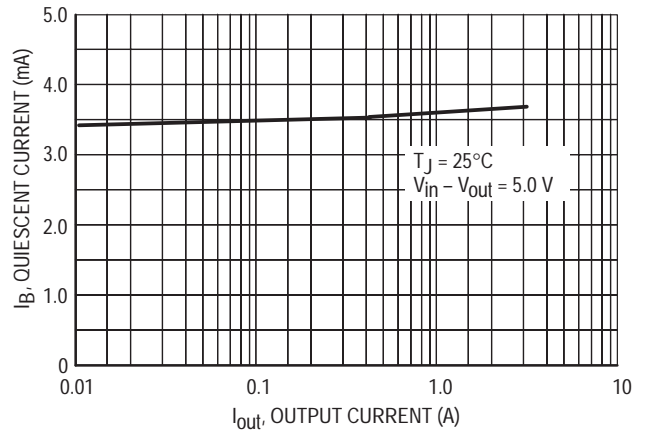


Figure 9. Dropout Voltage

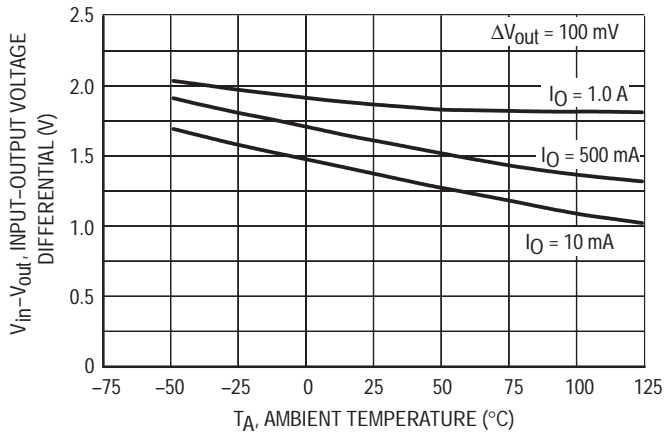
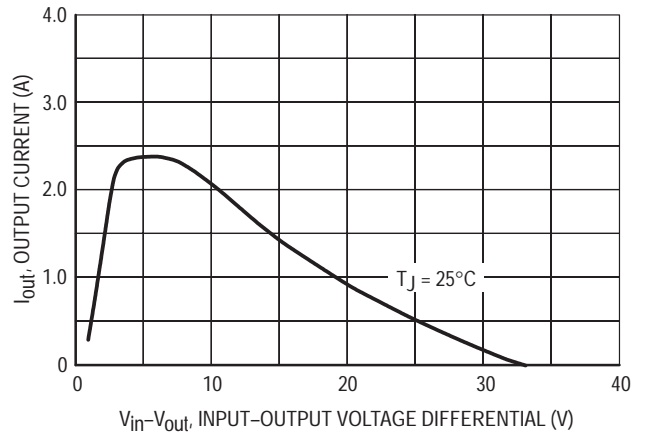


Figure 10. Peak Output Current



LM340, A Series

Figure 11. Line Transient Response

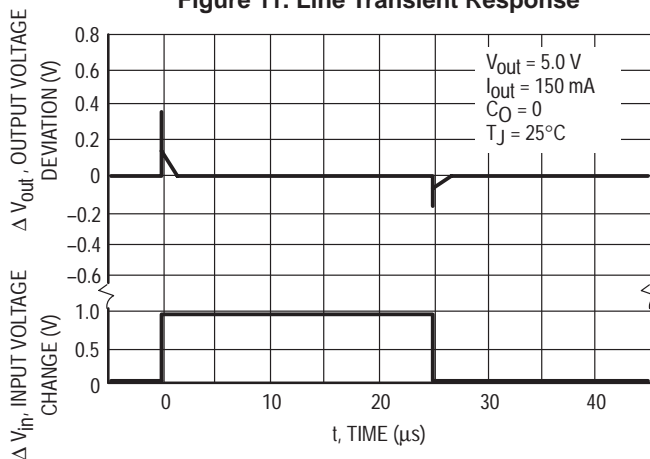


Figure 12. Load Transient Response

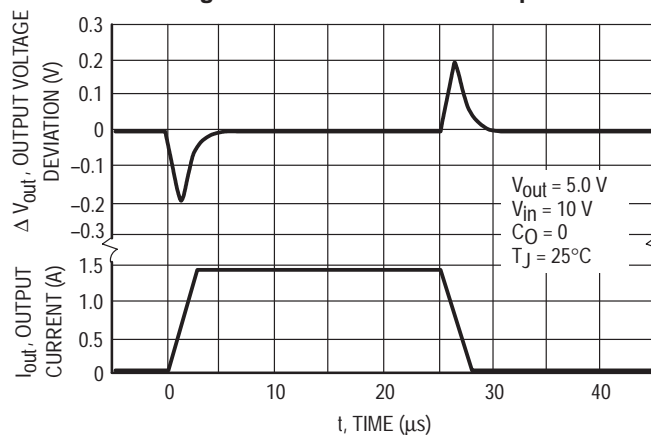
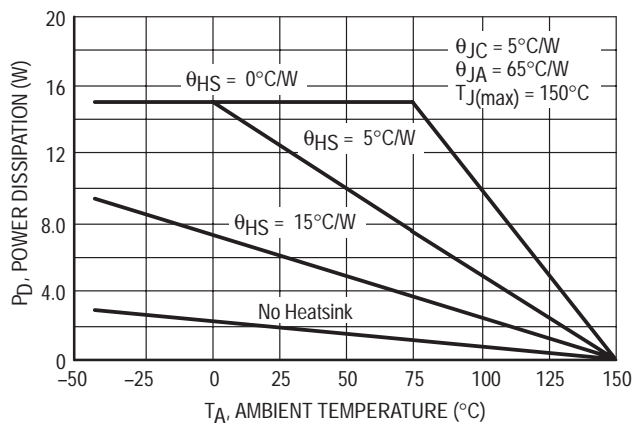


Figure 13. Worst Case Power Dissipation versus Ambient Temperature (Case 221A)



LM340, A Series

APPLICATIONS INFORMATION

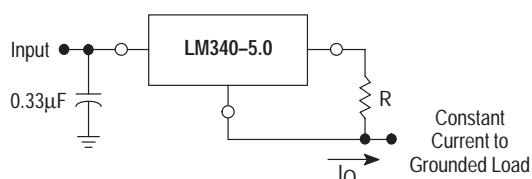
Design Considerations

The LM340, A series of fixed voltage regulators are designed with Thermal Overload Protection that shuts down the circuit when subjected to an excessive power overload condition, Internal Short Circuit Protection that limits the maximum current the circuit will pass, and Output Transistor Safe-Area Compensation that reduces the output short circuit current as the voltage across the pass transistor is increased.

In many low current applications, compensation capacitors are not required. However, it is recommended that the regulator input be bypassed with a capacitor if the

regulator is connected to the power supply filter with long wire lengths, or if the output load capacitance is large. An input bypass capacitor should be selected to provide good high-frequency characteristics to insure stable operation under all load conditions. A 0.33 μF or larger tantalum, mylar, or other capacitor having low internal impedance at high frequencies should be chosen. The bypass capacitor should be mounted with the shortest possible leads directly across the regulators input terminals. Normally good construction techniques should be used to minimize ground loops and lead resistance drops since the regulator has no external sense lead.

Figure 14. Current Regulator



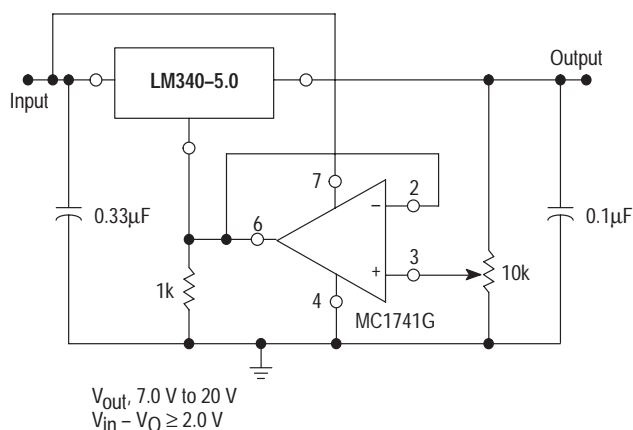
These regulators can also be used as a current source when connected as above. In order to minimize dissipation the LM340-5.0 is chosen in this application. Resistor R determines the current as follows:

$$I_O = \frac{5.0 \text{ V}}{R} + I_Q$$

$I_Q \cong 1.5 \text{ mA}$ over line and load changes

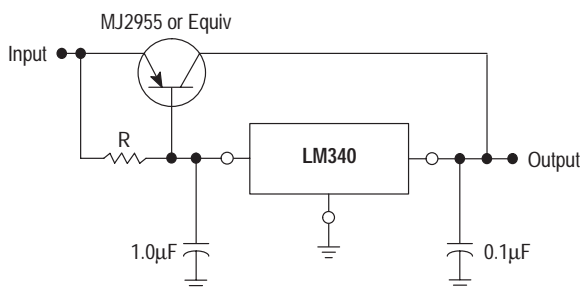
For example, a 1 A current source would require R to be a 5 Ω , 10 W resistor and the output voltage compliance would be the input voltage less 7.0 V.

Figure 15. Adjustable Output Regulator



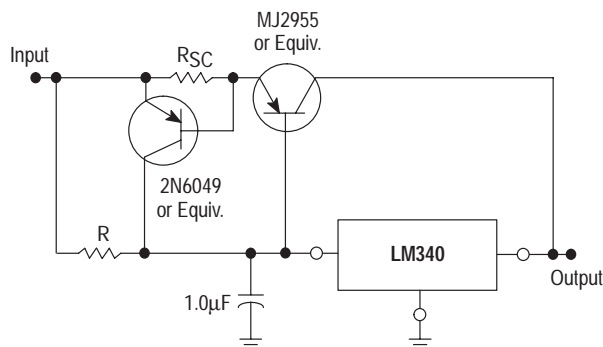
The addition of an operational amplifier allows adjustment to higher or intermediate values while retaining regulation characteristics. The minimum voltage obtainable with this arrangement is 2.0 V greater than the regulator voltage.

Figure 16. Current Boost Regulator



The LM340, A series can be current boosted with a PNP transistor. The MJ2955 provides current to 5.0 A. Resistor R in conjunction with the V_{BE} of the PNP determines when the pass transistor begins conducting; this circuit is not short circuit proof. Input-output differential voltage minimum is increased by V_{BE} of the pass transistor.

Figure 17. Short Circuit Protection



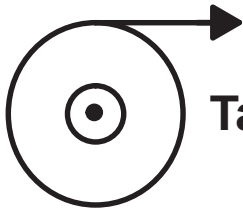
The circuit of Figure 17 can be modified to provide supply protection against short circuits by adding a short circuit sense resistor, R_{SC} , and an additional PNP transistor. The current sensing PNP must be able to handle the short circuit current of the three-terminal regulator. Therefore, 4.0 A plastic power transistor is specified.

Tape and Reel Options

In Brief . . .

Motorola offers the convenience of Tape and Reel packaging for our growing family of standard integrated circuit products. Reels are available to support the requirements of both first and second generation pick-and-place equipment. The packaging fully conforms to the latest EIA-481A specification. The antistatic embossed tape provides a secure cavity, sealed with a peel-back cover tape.

	Page
Tape and Reel Configurations	12-2
Tape and Reel Information Table	12-4
Analog MPQ Table	12-5

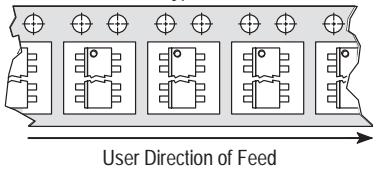


Tape and Reel Configurations

Mechanical Polarization

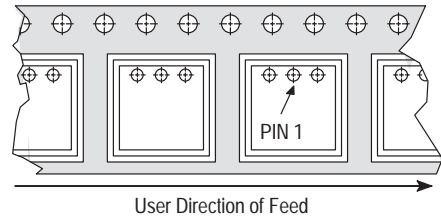
SOIC and Micro-8 DEVICES

Typical



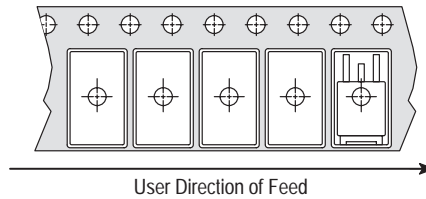
PLCC DEVICES

Typical



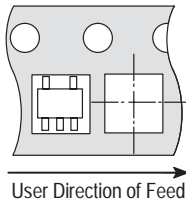
DPAK and D²PAK DEVICES

Typical



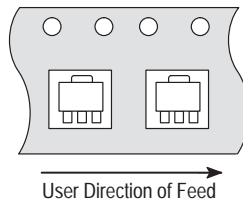
SOT-23 (5 Pin) DEVICES

Typical



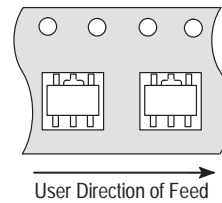
SOT-89 (3 Pin) DEVICES

Typical



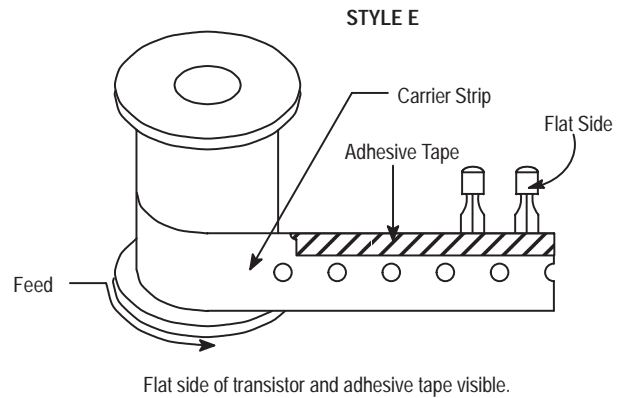
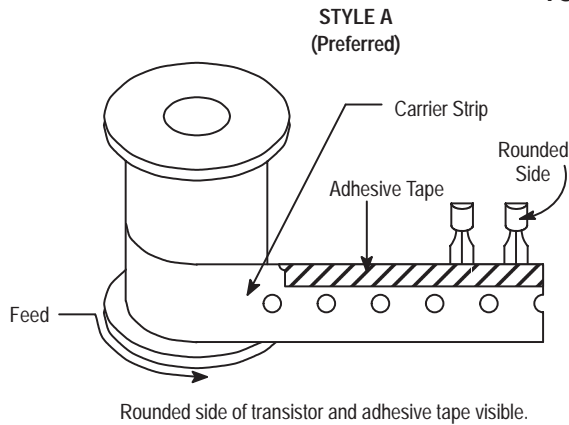
SOT-89 (5 Pin) DEVICES

Typical

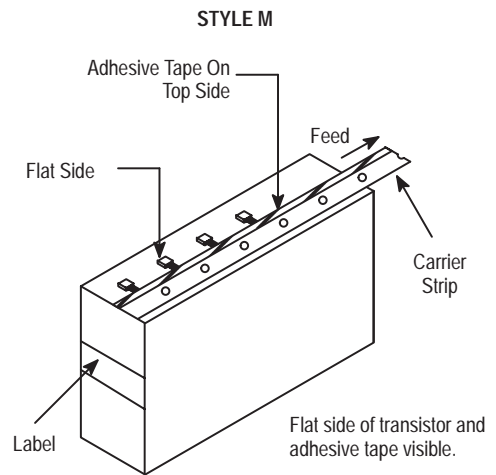
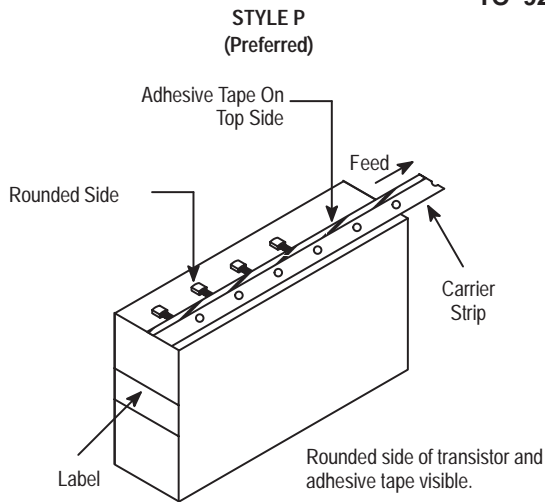


Tape and Reel Configurations (continued)

TO-92 Reel Styles



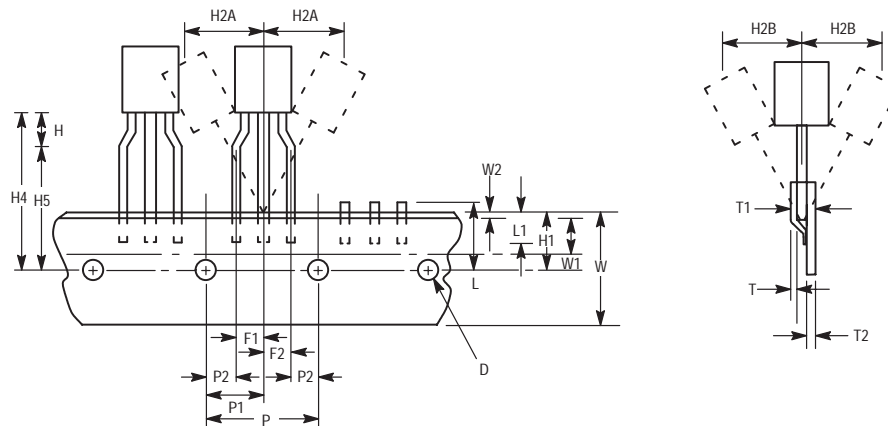
TO-92 Ammo Pack Styles



Style P ammo pack is equivalent to Styles A and B of reel pack dependent on feed orientation from box.

Style M ammo pack is equivalent to Style E of reel pack dependent on feed orientation from box.

TO-92 EIA Radial Tape in Fan Fold Box or On Reel



Tape and Reel Information Table

Package	Tape Width (mm)	Devices ⁽¹⁾ per Reel	Reel Size (inch)	Device Suffix
SO-8, SOP-8	12	2,500	13	R2
SO-14	16	2,500	13	R2
SO-16	16	2,500	13	R2
SO-16L, SO-8+8L WIDE	16	1,000	13	R2
SO-20L WIDE	24	1,000	13	R2
SO-24L WIDE	24	1,000	13	R2
SO-28L WIDE	24	1,000	13	R2
SO-28L WIDE	32	1,000	13	R3
Micro-8	12	2,500	13	R2
PLCC-20	16	1,000	13	R2
PLCC-28	24	500	13	R2
PLCC-44	32	500	13	R2
PLCC-52	32	500	13	R2
PLCC-68	44	250	13	R2
PLCC-84	44	250	13	R2
TO-226AA (TO-92) ⁽²⁾	18	2,000	13	RA, RE, RP, or RM (Ammo Pack) only
DPAK	16	2,500	13	RK
D ² PAK	24	800	13	R4
SOT-23 (5 Pin)	8	3,000	7	TR
SOT-89 (3/5 Pin)	12	1,000	7	T1

⁽¹⁾ Minimum order quantity is 1 reel. Distributors/OEM customers may break lots or reels at their option, however broken reels may not be returned.

⁽²⁾ Integrated circuits in TO-226AA packages are available in Styes A and E only, with optional "Ammo Pack" (Suffix RP or RM). The RA and RP configurations are preferred. For ordering information please contact your local Motorola Semiconductor Sales Office.

Analog MPQ Table

Tape/Reel and Ammo Pack

Package Type	Package Code	MPQ
PLCC		
Case 775	0802	1000/reel
Case 776	0804	500/reel
Case 777	0801	500/reel
SOIC		
Case 751	0095	2500/reel
Case 751A	0096	2500/reel
Case 751B	0097	2500/reel
Case 751G	2003	1000/reel
Case 751D	2005	1000/reel
Case 751E	2008	1000/reel
Case 751F	2009	1000/reel
Micro-8		
Case 846A	-	2500/reel
TO-92		
Case 29	0031	2000/reel
Case 29	0031	2000/Ammo Pack
DPAK		
Case 369A	-	2500/reel
D2PAK		
Case 936	-	800/reel
SOT-23 (5 Pin)		
Case 1212	-	3000/reel
SOT-89 (3 Pin)		
Case 1213	-	1000/reel
SOT-89 (5 Pin)		
Case 1214	-	1000/reel

Packaging Information

In Brief . . .

The packaging availability for each device type is indicated on the individual data sheets and the Selector Guide. All of the outline dimensions for the packages are given in this section.

The maximum power consumption an integrated circuit can tolerate at a given operating ambient temperature can be found from the equation:

$$P_{D(TA)} = \frac{T_{J(max)} - T_A}{R_{\theta JA(Typ)}}$$

where:

$P_{D(TA)}$ = *Power Dissipation allowable at a given operating ambient temperature. This must be greater than the sum of the products of the supply voltages and supply currents at the worst case operating condition.*

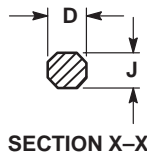
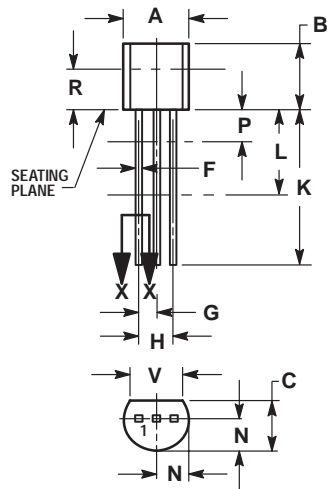
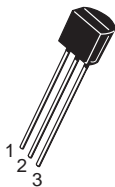
$T_{J(max)}$ = *Maximum operating Junction Temperature as listed in the Maximum Ratings Section. See individual data sheets for $T_{J(max)}$ information.*

T_A = *Maximum desired operating Ambient Temperature*

$R_{\theta JA(Typ)}$ = *Typical Thermal Resistance Junction-to-Ambient*

Case Outline Dimensions

LP, P, Z SUFFIX
CASE 29-04
 Plastic Package
 (TO-226AA/TO-92)
 ISSUE AD

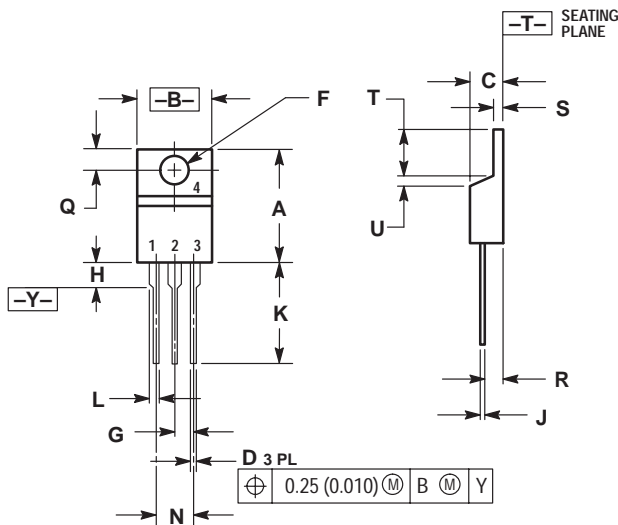
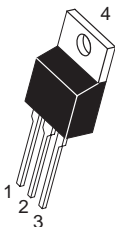


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. DIMENSION F APPLIES BETWEEN P AND L. DIMENSION D AND J APPLY BETWEEN L AND K MINIMUM. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
B	0.170	0.210	4.32	5.33
C	0.125	0.165	3.18	4.19
D	0.016	0.022	0.41	0.55
F	0.016	0.019	0.41	0.48
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.015	0.020	0.39	0.50
K	0.500	---	12.70	---
L	0.250	---	6.35	---
N	0.080	0.105	2.04	2.66
P	---	0.100	---	2.54
R	0.115	---	2.93	---
V	0.135	---	3.43	---

KC, T SUFFIX
CASE 221A-06
 Plastic Package
 ISSUE Y

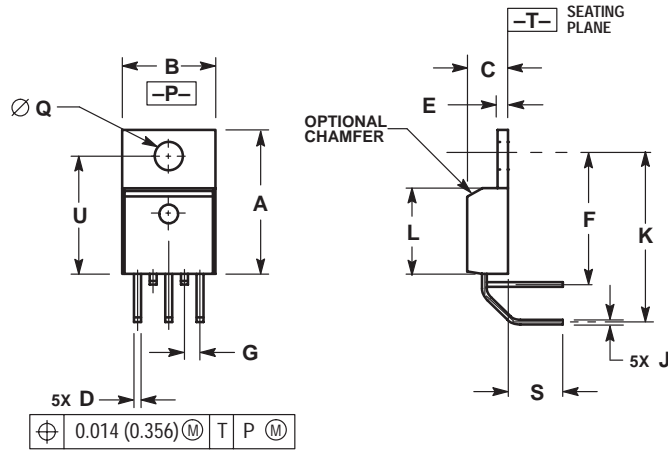
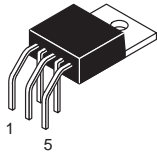


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.560	0.625	14.23	15.87
B	0.380	0.420	9.66	10.66
C	0.140	0.190	3.56	4.82
D	0.020	0.045	0.51	1.14
F	0.139	0.155	3.53	3.93
G	0.100 BSC	---	2.54 BSC	---
H	---	0.280	---	7.11
J	0.012	0.045	0.31	1.14
K	0.500	0.580	12.70	14.73
L	0.045	0.070	1.15	1.77
N	0.200 BSC	---	5.08 BSC	---
Q	0.100	0.135	2.54	3.42
R	0.080	0.115	2.04	2.92
S	0.020	0.055	0.51	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27

TH SUFFIX
CASE 314A-03
 Plastic Package
 ISSUE D

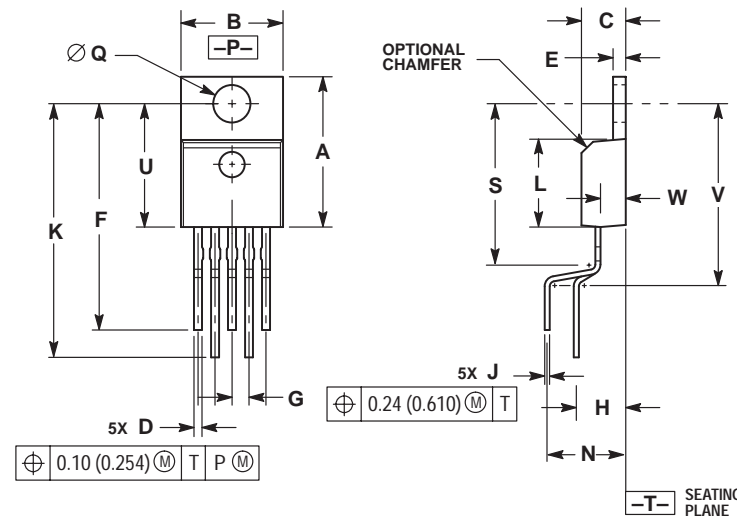
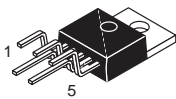


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION D DOES NOT INCLUDE INTERCONNECT BAR (DAMBAR) PROTRUSION. DIMENSION D INCLUDING PROTRUSION SHALL NOT EXCEED 0.043 (1.092) MAXIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.572	0.613	14.529	15.570
B	0.390	0.415	9.906	10.541
C	0.170	0.180	4.318	4.572
D	0.025	0.038	0.635	0.965
E	0.048	0.055	1.219	1.397
F	0.570	0.585	14.478	14.859
G	0.067 BSC		1.702 BSC	
J	0.015	0.025	0.381	0.635
K	0.730	0.745	18.542	18.923
L	0.320	0.365	8.128	9.271
Q	0.140	0.153	3.556	3.886
S	0.210	0.260	5.334	6.604
U	0.468	0.505	11.888	12.827

T, TV SUFFIX
CASE 314B-05
 Plastic Package
 ISSUE J

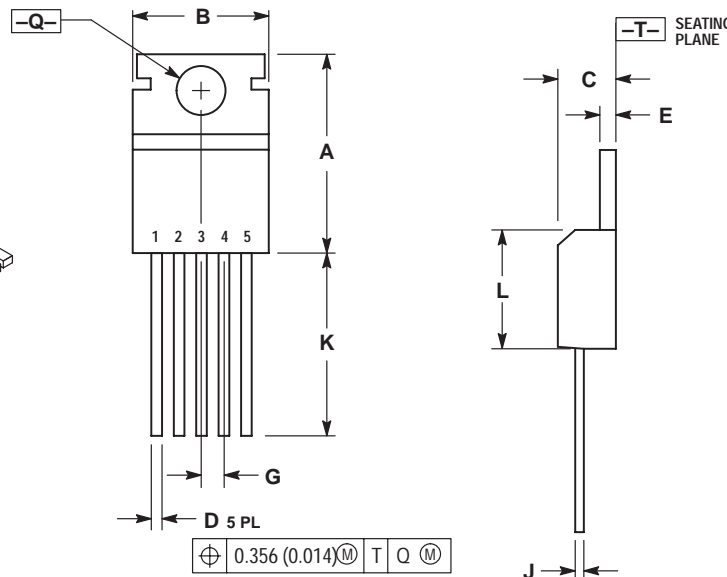
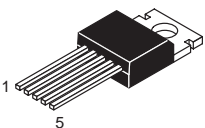


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION D DOES NOT INCLUDE INTERCONNECT BAR (DAMBAR) PROTRUSION. DIMENSION D INCLUDING PROTRUSION SHALL NOT EXCEED 0.043 (1.092) MAXIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.572	0.613	14.529	15.570
B	0.390	0.415	9.906	10.541
C	0.170	0.180	4.318	4.572
D	0.025	0.038	0.635	0.965
E	0.048	0.055	1.219	1.397
F	0.850	0.935	21.590	23.749
G	0.067 BSC		1.702 BSC	
H	0.166 BSC		4.216 BSC	
J	0.015	0.025	0.381	0.635
K	0.900	1.100	22.860	27.940
L	0.320	0.365	8.128	9.271
N	0.320 BSC		8.128 BSC	
Q	0.140	0.153	3.556	3.886
S	---	0.620	---	15.748
U	0.468	0.505	11.888	12.827
V	---	0.735	---	18.669
W	0.090	0.110	2.286	2.794

T SUFFIX
CASE 314C-01
 Plastic Package
 ISSUE A

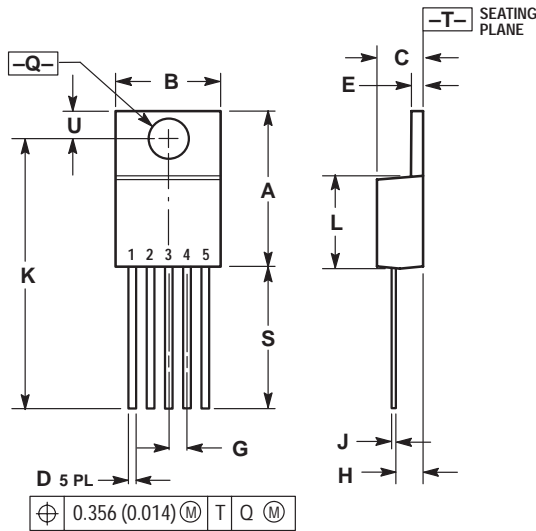
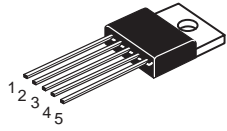


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION D DOES NOT INCLUDE INTERCONNECT BAR (DAMBAR) PROTRUSION. DIMENSION D INCLUDING PROTRUSION SHALL NOT EXCEED 10.92 (0.043) MAXIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.610	0.625	15.59	15.88
B	0.380	0.420	9.65	10.67
C	0.160	0.190	4.06	4.83
D	0.020	0.040	0.51	1.02
E	0.035	0.055	0.89	1.40
G	0.067 BSC		1.702 BSC	
J	0.015	0.025	0.38	0.64
K	0.500	---	12.70	---
L	0.355	0.370	9.02	9.40
Q	0.139	0.147	3.53	3.73

T, T1 SUFFIX
CASE 314D-03
 Plastic Package
 ISSUE D

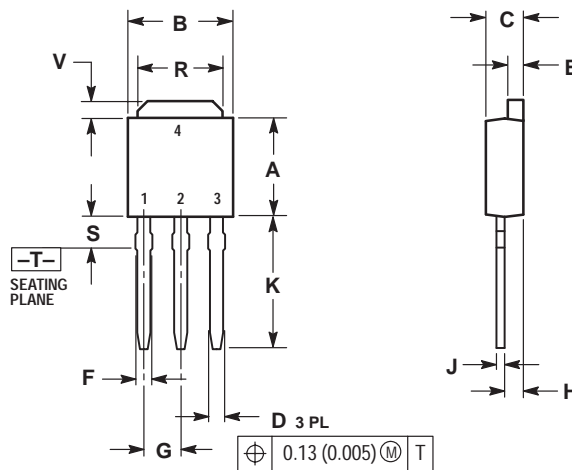
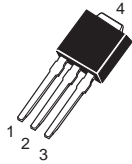


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION D DOES NOT INCLUDE INTERCONNECT BAR (DAMBAR) PROTRUSION. DIMENSION D INCLUDING PROTRUSION SHALL NOT EXCEED 10.92 (0.043) MAXIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.572	0.613	14.529	15.570
B	0.390	0.415	9.906	10.541
C	0.170	0.180	4.318	4.572
D	0.025	0.038	0.635	0.965
E	0.048	0.055	1.219	1.397
G	0.067 BSC		1.702 BSC	
H	0.087	0.112	2.210	2.845
J	0.015	0.025	0.381	0.635
K	1.020	1.065	25.908	27.051
L	0.320	0.365	8.128	9.271
Q	0.140	0.153	3.556	3.886
U	0.105	0.117	2.667	2.972
S	0.543	0.582	13.792	14.783

\varnothing 0.356 (0.014) (M) T Q (M)

DT-1 SUFFIX
CASE 369-07
 Plastic Package (DPAK)
 ISSUE K

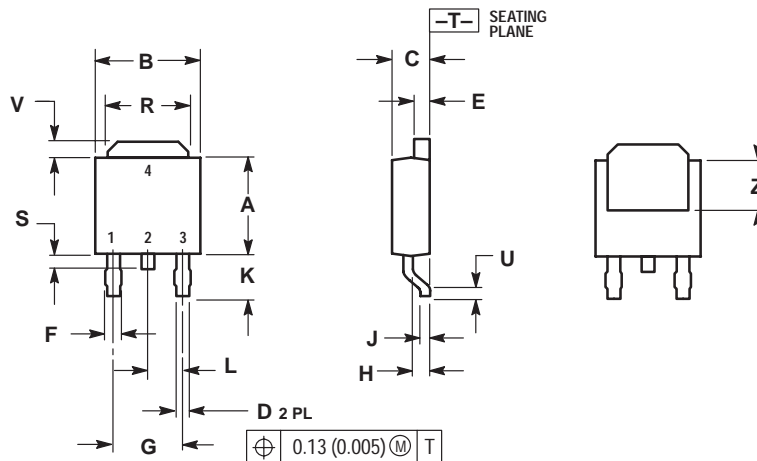
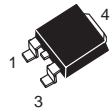


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.250	5.97	6.35
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
E	0.033	0.040	0.84	1.01
F	0.037	0.047	0.94	1.19
G	0.090 BSC		2.29 BSC	
H	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.350	0.380	8.89	9.65
R	0.175	0.215	4.45	5.46
S	0.050	0.090	1.27	2.28
V	0.030	0.050	0.77	1.27

\varnothing 0.13 (0.005) (M) T

DT SUFFIX
CASE 369A-13
 Plastic Package (DPAK)
 ISSUE Y

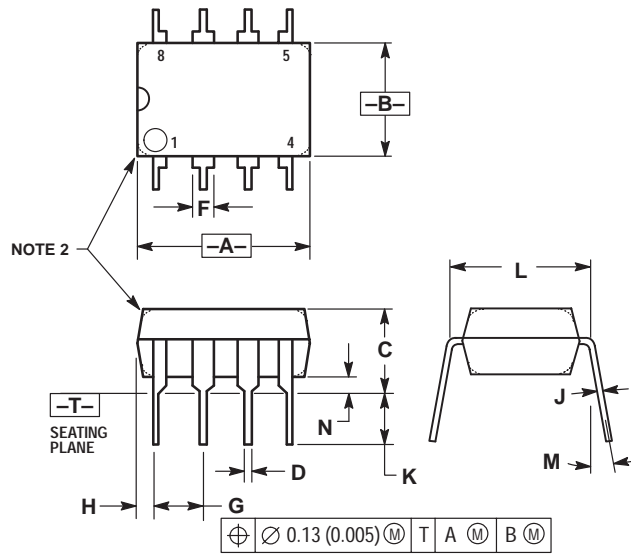
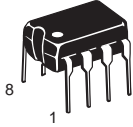


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.235	0.250	5.97	6.35
B	0.250	0.265	6.35	6.73
C	0.086	0.094	2.19	2.38
D	0.027	0.035	0.69	0.88
E	0.033	0.040	0.84	1.01
F	0.037	0.047	0.94	1.19
G	0.180 BSC		4.58 BSC	
H	0.034	0.040	0.87	1.01
J	0.018	0.023	0.46	0.58
K	0.102	0.114	2.60	2.89
L	0.090 BSC		2.29 BSC	
R	0.175	0.215	4.45	5.46
S	0.020	0.050	0.51	1.27
U	0.020	---	0.51	---
V	0.030	0.050	0.77	1.27
Z	0.138	---	3.51	---

\varnothing 0.13 (0.005) (M) T

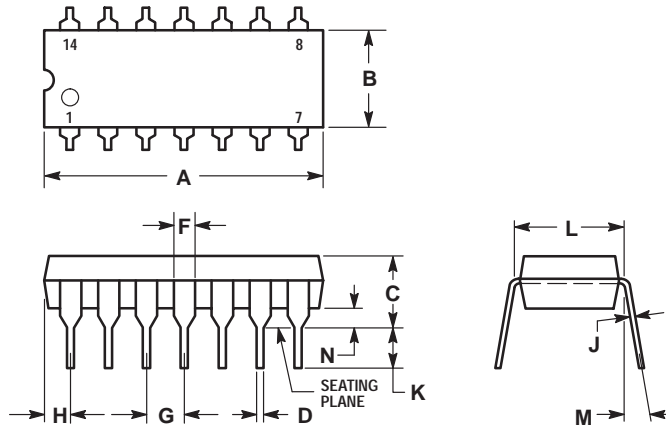
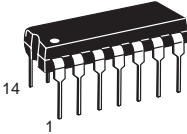
DP1, N, P, P1 SUFFIX
CASE 626-05
 Plastic Package
 ISSUE K



- NOTES:
1. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
 2. PACKAGE CONTOUR OPTIONAL (ROUND OR SQUARE CORNERS).
 3. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.40	10.16	0.370	0.400
B	6.10	6.60	0.240	0.260
C	3.94	4.45	0.155	0.175
D	0.38	0.51	0.015	0.020
F	1.02	1.78	0.040	0.070
G	2.54 BSC		0.100 BSC	
H	0.76	1.27	0.030	0.050
J	0.20	0.30	0.008	0.012
K	2.92	3.43	0.115	0.135
L	7.62 BSC		0.300 BSC	
M	— 10°		— 10°	
N	0.76	1.01	0.030	0.040

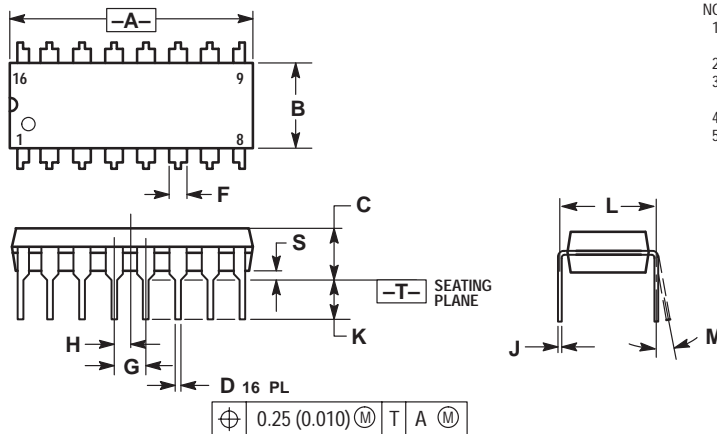
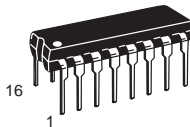
N, P, N-14, P2 SUFFIX
CASE 646-06
 Plastic Package
 ISSUE L



- NOTES:
1. LEADS WITHIN 0.13 (0.005) RADIUS OF TRUE POSITION AT SEATING PLANE AT MAXIMUM MATERIAL CONDITION.
 2. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
 3. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
 4. ROUNDED CORNERS OPTIONAL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.715	0.770	18.16	19.56
B	0.240	0.260	6.10	6.60
C	0.145	0.185	3.69	4.69
D	0.015	0.021	0.38	0.53
F	0.040	0.070	1.02	1.78
G	0.100 BSC		2.54 BSC	
H	0.052	0.095	1.32	2.41
J	0.008	0.015	0.20	0.38
K	0.115	0.135	2.92	3.43
L	0.300 BSC		7.62 BSC	
M	0° 10°		0° 10°	
N	0.015	0.039	0.39	1.01

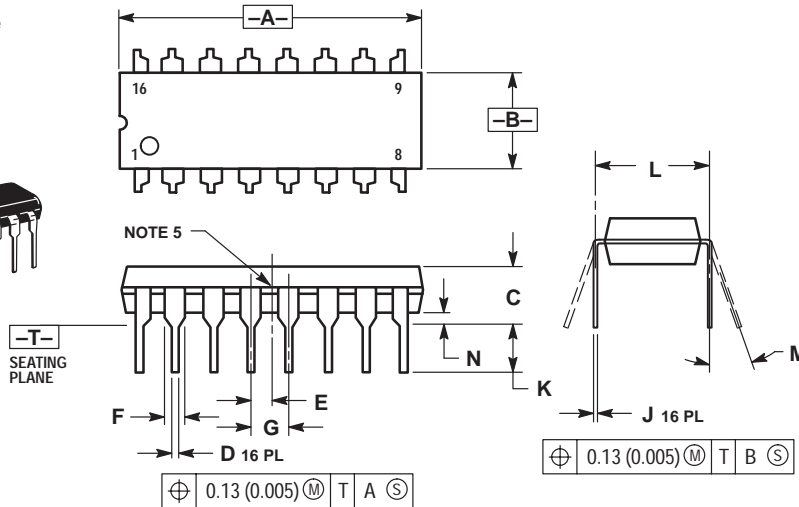
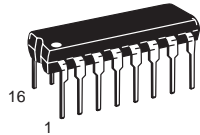
DP2, N, P, PC SUFFIX
CASE 648-08
 Plastic Package
 ISSUE R



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
 4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
 5. ROUNDED CORNERS OPTIONAL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.740	0.770	18.80	19.55
B	0.250	0.270	6.35	6.85
C	0.145	0.175	3.69	4.44
D	0.015	0.021	0.39	0.53
F	0.040	0.70	1.02	1.77
G	0.100 BSC		2.54 BSC	
H	0.050 BSC		1.27 BSC	
J	0.008	0.015	0.21	0.38
K	0.110	0.130	2.80	3.30
L	0.295	0.305	7.50	7.74
M	0° 10°		0° 10°	
S	0.020	0.040	0.51	1.01

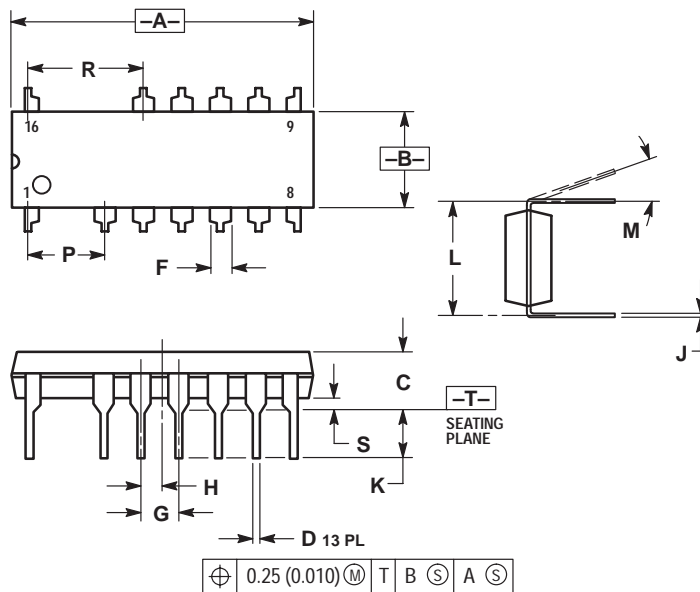
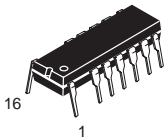
B, P, P2, V SUFFIX
CASE 648C-03
 Plastic Package
 (DIP-16)
 ISSUE C



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
 4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
 5. INTERNAL LEAD CONNECTION BETWEEN 4 AND 5, 12 AND 13.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.740	0.840	18.80	21.34
B	0.240	0.260	6.10	6.60
C	0.145	0.185	3.69	4.69
D	0.015	0.021	0.38	0.53
E	0.050 BSC			
F	0.040	0.70	1.02	1.78
G	0.100 BSC			
J	0.008	0.015	0.20	0.38
K	0.115	0.135	2.92	3.43
L	0.300 BSC			
M	0°	10°	0°	10°
N	0.015	0.040	0.39	1.01

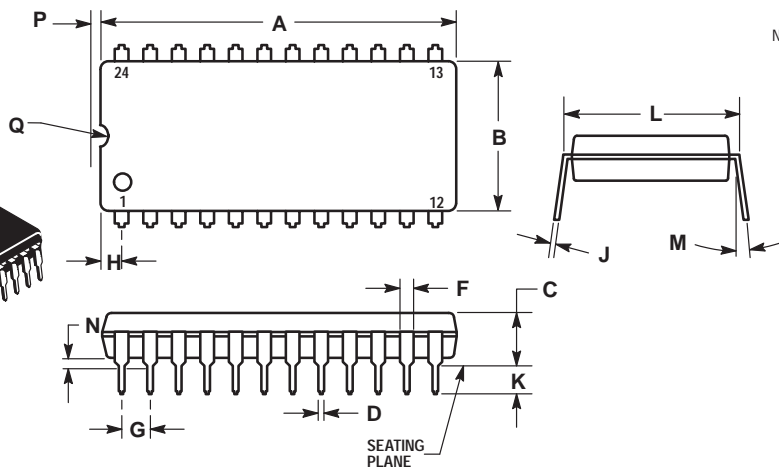
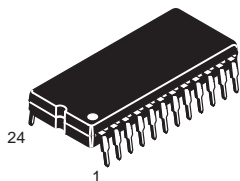
P SUFFIX
CASE 648E-01
 Plastic Package
 (DIP-16)
 ISSUE O



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
 4. DIMENSION A AND B DOES NOT INCLUDE MOLD PROTRUSION.
 5. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.25 (0.010).
 6. ROUNDED CORNER OPTIONAL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.740	0.760	18.80	19.30
B	0.245	0.260	6.23	6.60
C	0.145	0.175	3.69	4.44
D	0.015	0.021	0.39	0.53
F	0.050	0.070	1.27	1.77
G	0.100 BSC			
H	0.050 BSC			
J	0.008	0.015	0.21	0.38
K	0.120	0.140	3.05	3.55
L	0.295	0.305	7.50	7.74
M	0°	10°	0°	10°
P	0.200 BSC			
R	0.300 BSC			
S	0.015	0.035	0.39	0.88

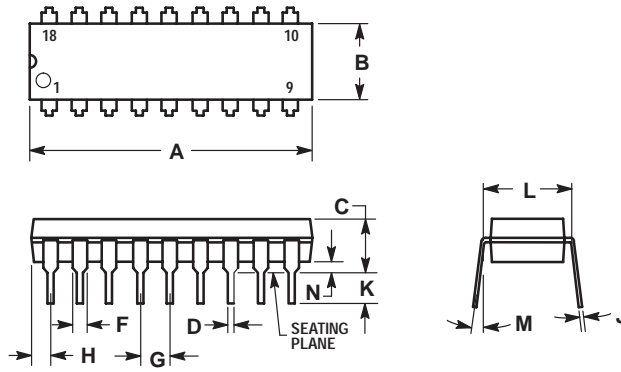
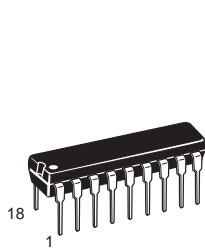
P SUFFIX
CASE 649-03
 Plastic Package
 ISSUE D



- NOTES:
1. LEADS WITHIN 0.13 (0.005) RADIUS OF TRUE POSITION AT SEATING PLANE AT MAXIMUM MATERIAL CONDITION.
 2. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	31.50	32.13	1.240	1.265
B	13.21	13.72	0.520	0.540
C	4.70	5.21	0.185	0.205
D	0.38	0.51	0.015	0.020
F	1.02	1.52	0.040	0.060
G	2.54 BSC		0.100 BSC	
H	1.65	2.16	0.065	0.085
J	0.20	0.30	0.008	0.012
K	2.92	3.43	0.115	0.135
L	14.99	15.49	0.590	0.610
M	---	10	---	10°
N	0.51	1.02	0.020	0.040
P	0.13	0.38	0.005	0.015
Q	0.51	0.76	0.020	0.030

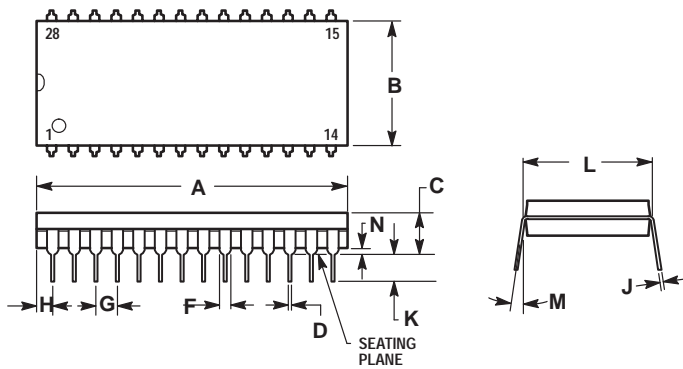
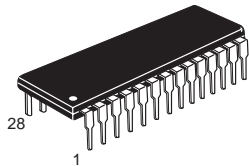
A, B, N, P SUFFIX
CASE 707-02
 Plastic Package
 ISSUE C



- NOTES:
1. POSITIONAL TOLERANCE OF LEADS (D), SHALL BE WITHIN 0.25 (0.010) AT MAXIMUM MATERIAL CONDITION, IN RELATION TO SEATING PLANE AND EACH OTHER.
 2. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
 3. DIMENSION B DOES NOT INCLUDE MOLD FLASH.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	22.22	23.24	0.875	0.915
B	6.10	6.60	0.240	0.260
C	3.56	4.57	0.140	0.180
D	0.36	0.56	0.014	0.022
F	1.27	1.78	0.050	0.070
G	2.54 BSC		0.100 BSC	
H	1.02	1.52	0.040	0.060
J	0.20	0.30	0.008	0.012
K	2.92	3.43	0.115	0.135
L	7.62 BSC		0.300 BSC	
M	0°	15°	0°	15°
N	0.51	1.02	0.020	0.040

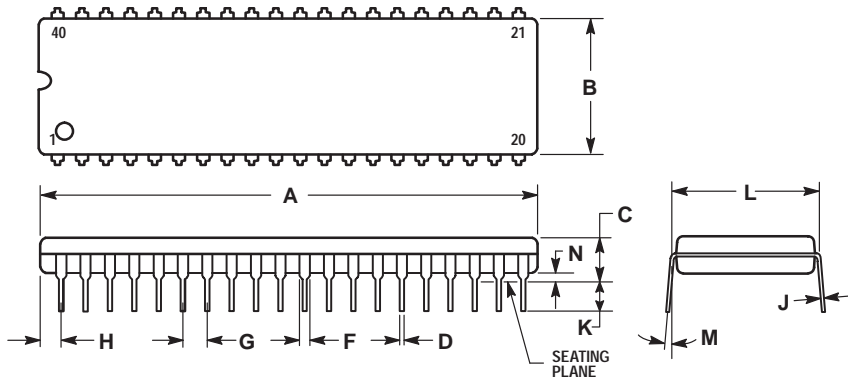
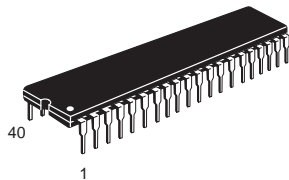
P SUFFIX
CASE 710-02
 Plastic Package
 ISSUE B



- NOTES:
1. POSITIONAL TOLERANCE OF LEADS (D), SHALL BE WITHIN 0.25 (0.010) AT MAXIMUM MATERIAL CONDITION, IN RELATION TO SEATING PLANE AND EACH OTHER.
 2. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
 3. DIMENSION B DOES NOT INCLUDE MOLD FLASH.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	36.45	37.21	1.435	1.465
B	13.72	14.22	0.540	0.560
C	3.94	5.08	0.155	0.200
D	0.36	0.56	0.014	0.022
F	1.02	1.52	0.040	0.060
G	2.54 BSC		0.100 BSC	
H	1.65	2.16	0.065	0.085
J	0.20	0.38	0.008	0.015
K	2.92	3.43	0.115	0.135
L	15.24 BSC		0.600 BSC	
M	0°	15°	0°	15°
N	0.51	1.02	0.020	0.040

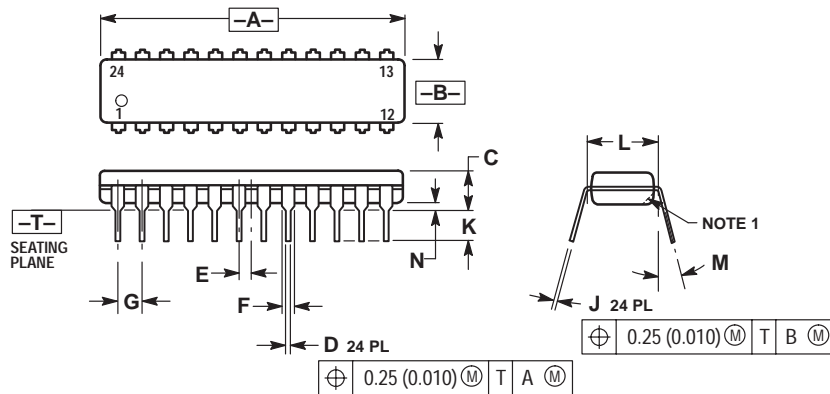
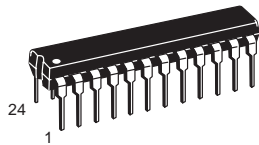
P SUFFIX
CASE 711-03
 Plastic Package
 ISSUE C



- NOTES:
1. POSITIONAL TOLERANCE OF LEADS (D), SHALL BE WITHIN 0.25 (0.010) AT MAXIMUM MATERIAL CONDITION, IN RELATION TO SEATING PLANE AND EACH OTHER.
 2. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
 3. DIMENSION B DOES NOT INCLUDE MOLD FLASH.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	51.69	52.45	2.035	2.065
B	13.72	14.22	0.540	0.560
C	3.94	5.08	0.155	0.200
D	0.36	0.56	0.014	0.022
F	1.02	1.52	0.040	0.060
G	2.54 BSC		0.100 BSC	
H	1.65	2.16	0.065	0.085
J	0.20	0.38	0.008	0.015
K	2.92	3.43	0.115	0.135
L	15.24 BSC		0.600 BSC	
M	0°	15°	0°	15°
N	0.51	1.02	0.020	0.040

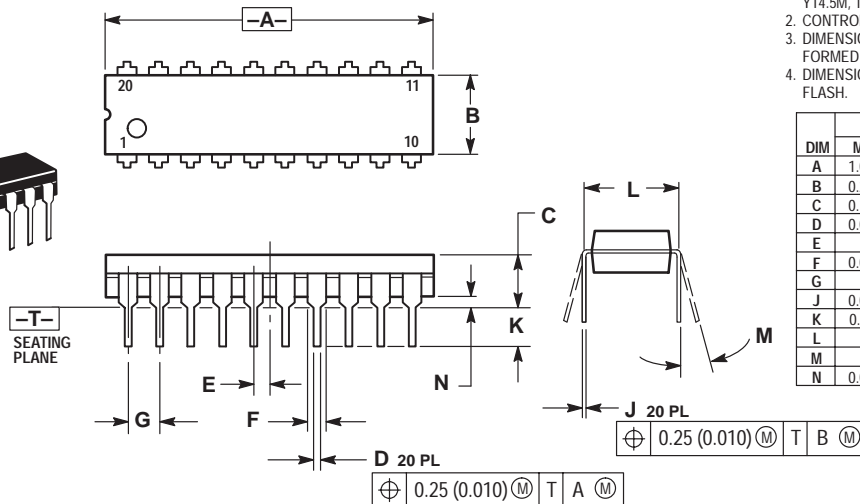
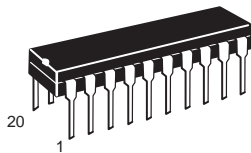
F, P, P-3 SUFFIX
CASE 724-03
 Plastic Package
 (NDIP-24)
 ISSUE D



- NOTES:
1. CHAMFERED CONTOUR OPTIONAL.
 2. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
 3. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 4. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	1.230	1.265	31.25	32.13
B	0.250	0.270	6.35	6.85
C	0.145	0.175	3.69	4.44
D	0.015	0.020	0.38	0.51
E	0.050 BSC		1.27 BSC	
F	0.040	0.060	1.02	1.52
G	0.100 BSC		2.54 BSC	
J	0.007	0.012	0.18	0.30
K	0.110	0.140	2.80	3.55
L	0.300 BSC		7.62 BSC	
M	0°	15°	0°	15°
N	0.020	0.040	0.51	1.01

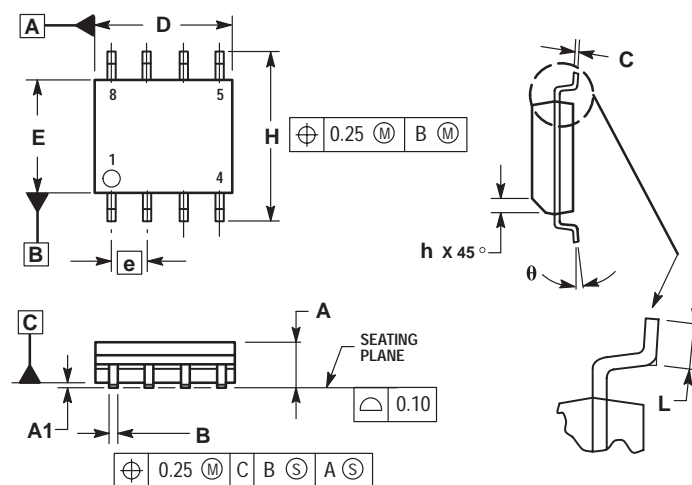
H, P, DP SUFFIX
CASE 738-03
 Plastic Package
 ISSUE E



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
 4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	1.010	1.070	25.66	27.17
B	0.240	0.260	6.10	6.60
C	0.150	0.180	3.81	4.57
D	0.015	0.022	0.39	0.55
E	0.050 BSC		1.27 BSC	
F	0.050	0.070	1.27	1.77
G	0.100 BSC		2.54 BSC	
J	0.008	0.015	0.21	0.38
K	0.110	0.140	2.80	3.55
L	0.300 BSC		7.62 BSC	
M	0°	15°	0°	15°
N	0.020	0.040	0.51	1.01

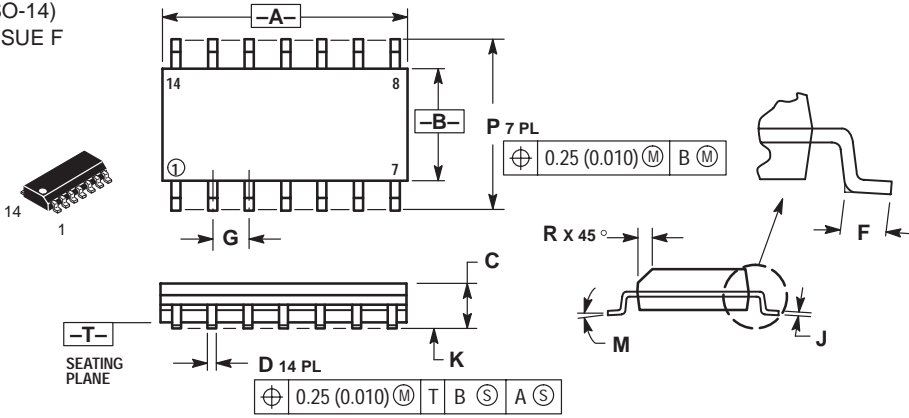
D, D1, D2 SUFFIX
CASE 751-05
 Plastic Package
 (SO-8, SOP-8)
 ISSUE R



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 2. DIMENSIONS ARE IN MILLIMETERS.
 3. DIMENSION D AND E DO NOT INCLUDE MOLD PROTRUSION.
 4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
 5. DIMENSION B DOES NOT INCLUDE MOLD PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 TOTAL IN EXCESS OF THE B DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS	
	MIN	MAX
A	1.35	1.75
A1	0.10	0.25
B	0.35	0.49
C	0.18	0.25
D	4.80	5.00
E	3.80	4.00
e	1.27 BSC	
H	5.80	6.20
h	0.25	0.50
L	0.40	1.25
θ	0°	7°

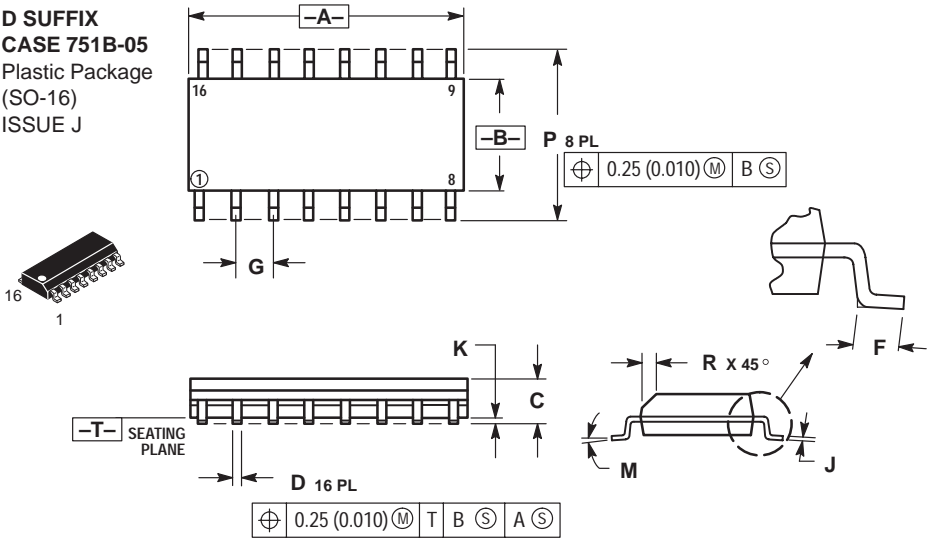
D SUFFIX
CASE 751A-03
 Plastic Package
 (SO-14)
 ISSUE F



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
 4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
 5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	8.55	8.75	0.337	0.344
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.228	0.244
R	0.25	0.50	0.010	0.019

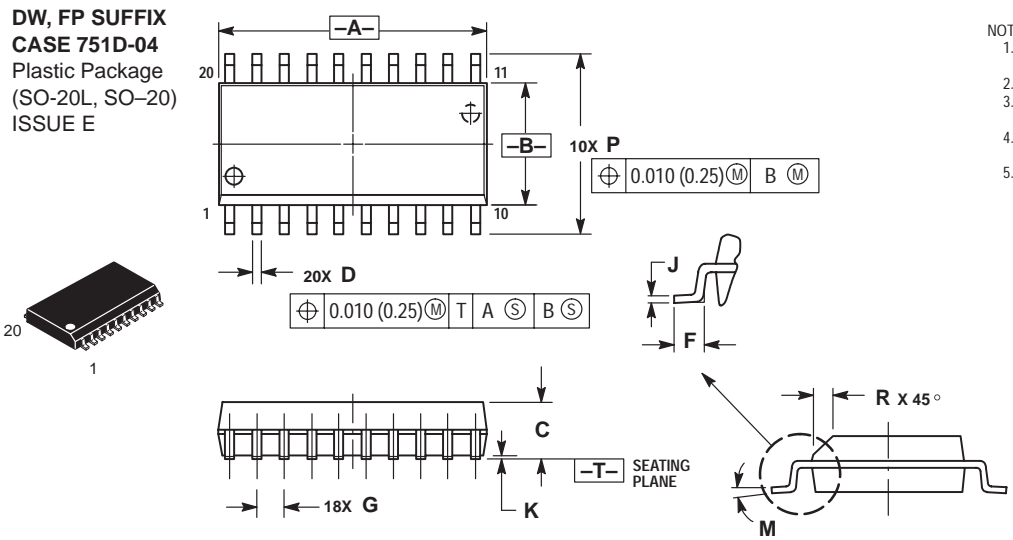
D SUFFIX
CASE 751B-05
 Plastic Package
 (SO-16)
 ISSUE J



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
 4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
 5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.80	10.00	0.386	0.393
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

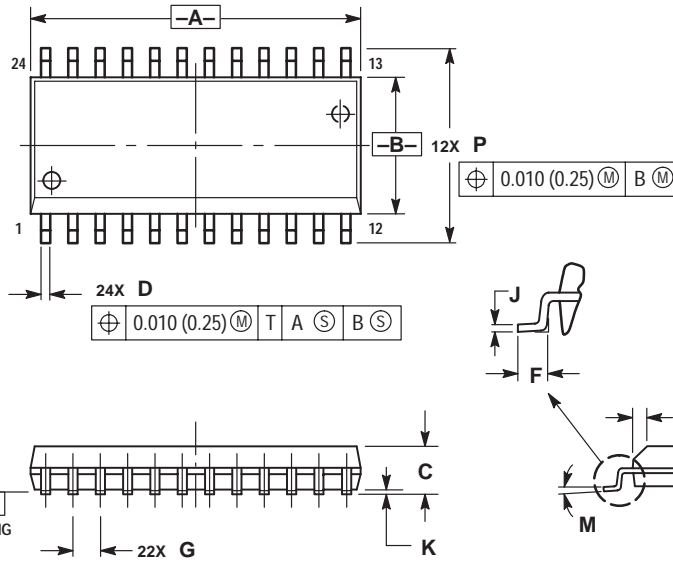
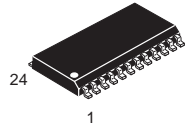
DW, FP SUFFIX
CASE 751D-04
 Plastic Package
 (SO-20L, SO-20)
 ISSUE E



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
 4. MAXIMUM MOLD PROTRUSION 0.150 (0.006) PER SIDE.
 5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.13 (0.005) TOTAL IN EXCESS OF D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	12.65	12.95	0.499	0.510
B	7.40	7.60	0.292	0.299
C	2.35	2.65	0.093	0.104
D	0.35	0.49	0.014	0.019
F	0.50	0.90	0.020	0.035
G	1.27 BSC		0.050 BSC	
J	0.25	0.32	0.010	0.012
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	10.05	10.55	0.395	0.415
R	0.25	0.75	0.010	0.029

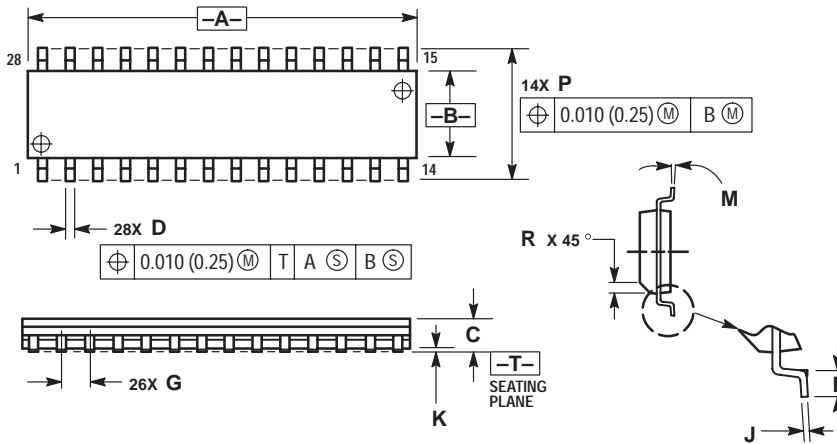
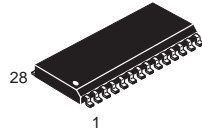
DW SUFFIX
CASE 751E-04
 Plastic Package
 (SO-24L,
 SOP (16+4+4)L)
 ISSUE E



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
 4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
 5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.13 (0.005) TOTAL IN EXCESS OF D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	15.25	15.54	0.601	0.612
B	7.40	7.60	0.292	0.299
C	2.35	2.65	0.093	0.104
D	0.35	0.49	0.014	0.019
F	0.41	0.90	0.016	0.035
G	1.27 BSC		0.050 BSC	
J	0.23	0.32	0.009	0.013
K	0.13	0.29	0.005	0.011
M	0°	8°	0°	8°
P	10.05	10.55	0.395	0.415
R	0.25	0.75	0.010	0.029

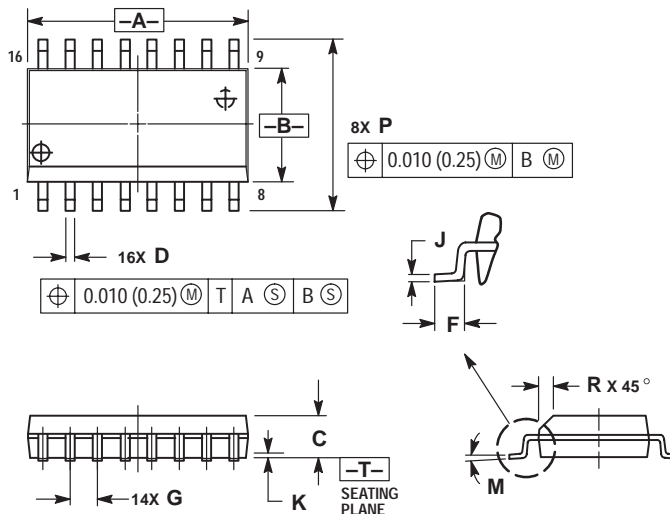
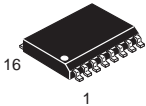
DW SUFFIX
CASE 751F-04
 Plastic Package
 (SO-28L, SOIC-28)
 ISSUE E



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
 4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
 5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.13 (0.005) TOTAL IN EXCESS OF D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	17.80	18.05	0.701	0.711
B	7.40	7.60	0.292	0.299
C	2.35	2.65	0.093	0.104
D	0.35	0.49	0.014	0.019
F	0.41	0.90	0.016	0.035
G	1.27 BSC		0.050 BSC	
J	0.23	0.32	0.009	0.013
K	0.13	0.29	0.005	0.011
M	0°	8°	0°	8°
P	10.01	10.55	0.395	0.415
R	0.25	0.75	0.010	0.029

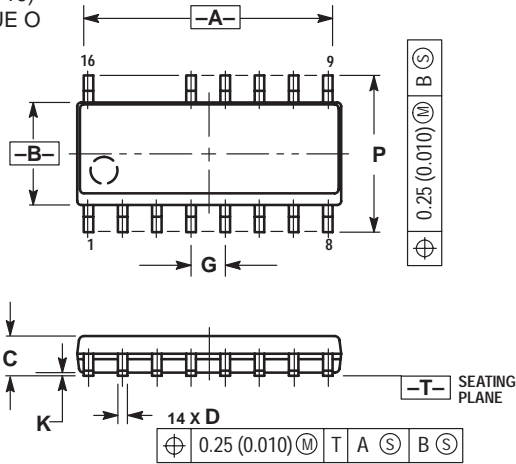
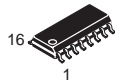
DW SUFFIX
CASE 751G-02
 Plastic Package
 (SO-16L, SOP-16L,
 SOP-8+8L)
 ISSUE A



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
 4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
 5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.13 (0.005) TOTAL IN EXCESS OF D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.15	10.45	0.400	0.411
B	7.40	7.60	0.292	0.299
C	2.35	2.65	0.093	0.104
D	0.35	0.49	0.014	0.019
F	0.50	0.90	0.020	0.035
G	1.27 BSC		0.050 BSC	
J	0.25	0.32	0.010	0.012
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	10.05	10.55	0.395	0.415
R	0.25	0.75	0.010	0.029

D SUFFIX
CASE 751K-01
 Plastic Package
 (SO-16)
 ISSUE O

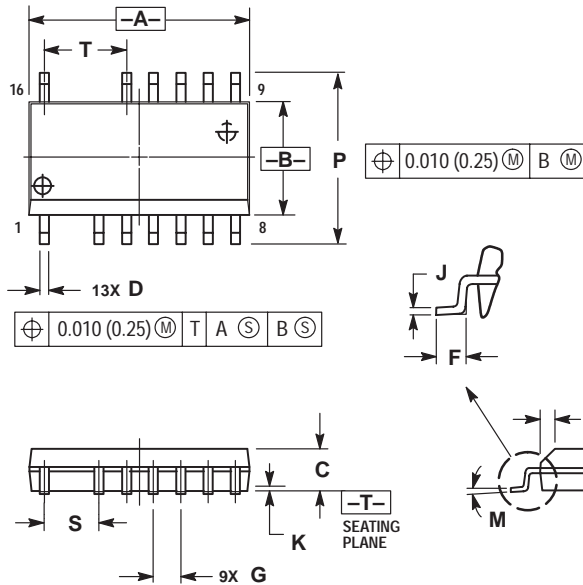
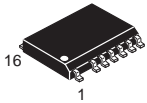


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.80	10.00	0.368	0.393
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

DW SUFFIX
CASE 751N-01
 Plastic Package
 (SOP-16L)
 ISSUE O

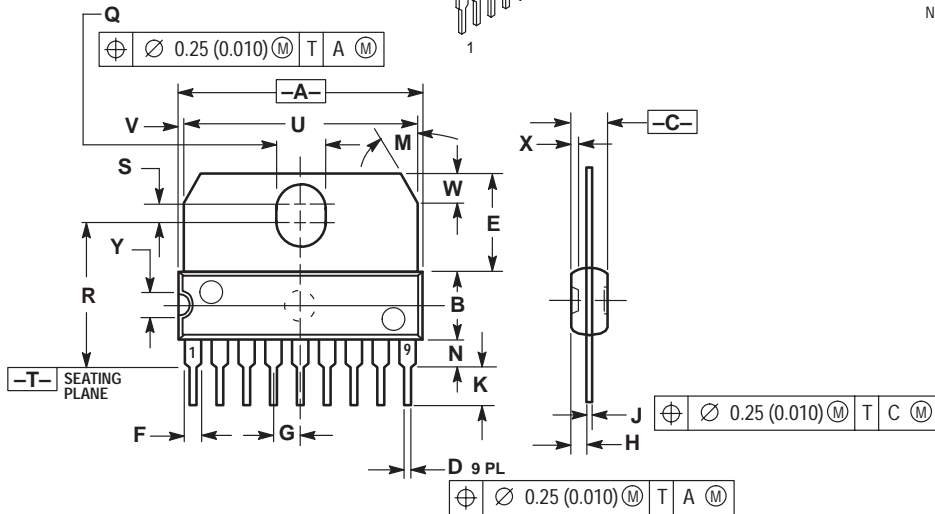
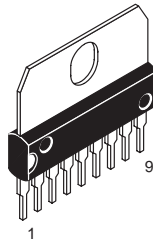


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.13 (0.005) TOTAL IN EXCESS OF D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.15	10.45	0.400	0.411
B	7.40	7.60	0.292	0.299
C	2.35	2.65	0.093	0.104
D	0.35	0.49	0.014	0.019
F	0.50	0.90	0.020	0.035
G	1.27 BSC		0.050 BSC	
J	0.25	0.32	0.010	0.012
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	10.05	10.55	0.395	0.415
R	0.25	0.75	0.010	0.029
S	2.54 BSC		0.100 BSC	
T	3.81 BSC		0.150 BSC	

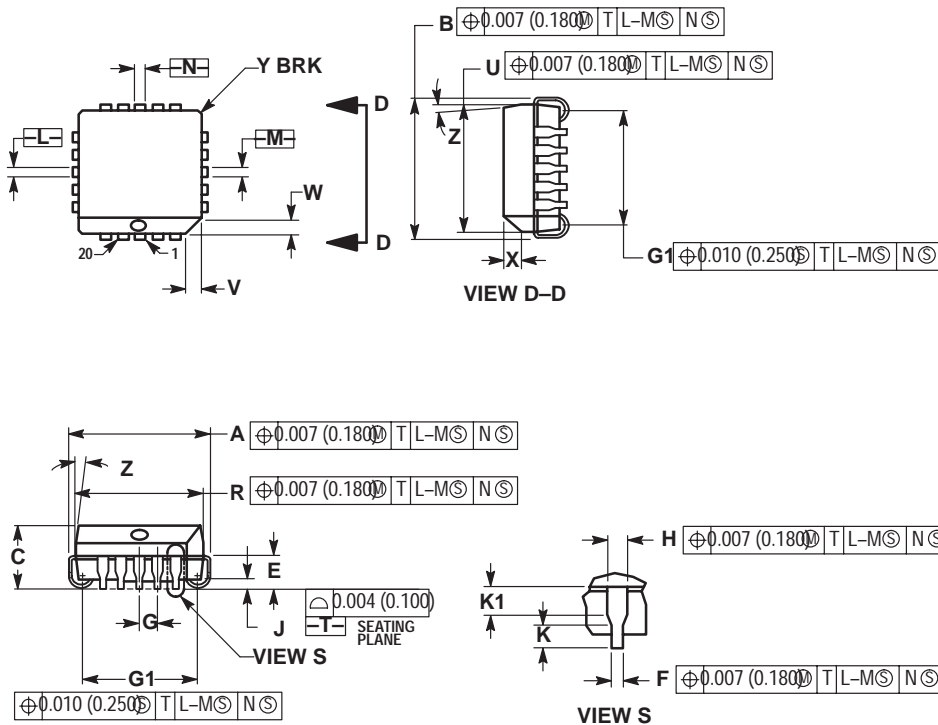
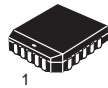
CASE 762-01
 Plastic Medium Power Package
 (SIP-9)
 ISSUE C



- NOTES:
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	22.40	23.00	0.873	0.897
B	6.40	6.60	0.252	0.260
C	3.45	3.65	0.135	1.143
D	0.40	0.55	0.015	0.021
E	9.35	9.60	0.368	0.377
F	1.40	1.60	0.055	0.062
G	2.54 BSC		0.100 BSC	
H	1.51	1.71	0.059	0.067
J	0.360	0.400	0.014	0.015
K	3.95	4.20	0.155	0.165
M	30° BSC		30° BSC	
N	2.50	2.70	0.099	0.106
Q	3.15	3.45	0.124	0.135
R	13.60	13.90	0.535	0.547
S	1.65	1.95	0.064	0.076
U	22.00	22.20	0.866	0.874
V	0.55	0.75	0.021	0.029
W	2.89 BSC		0.113 BSC	
X	0.65	0.75	0.025	0.029
Y	2.70	2.80	0.106	0.110

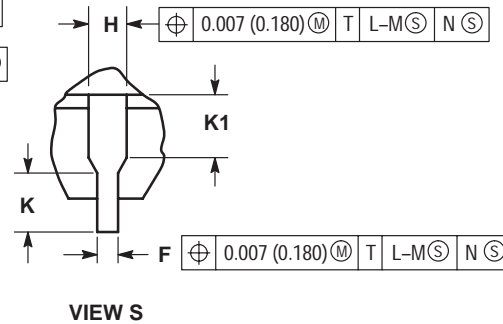
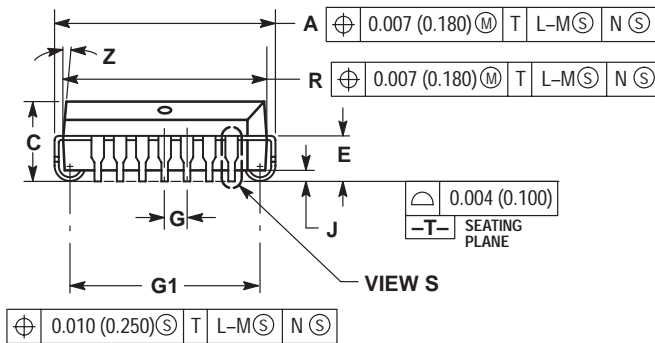
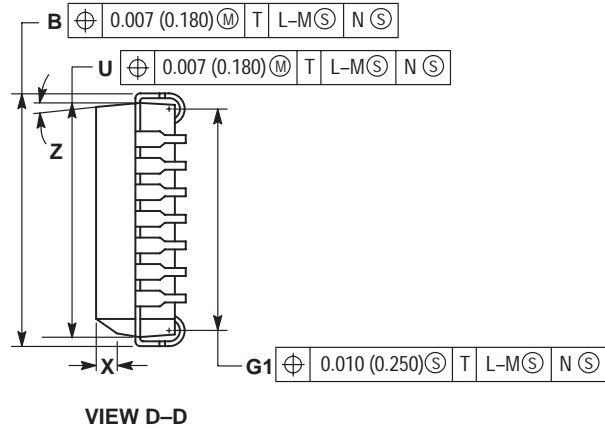
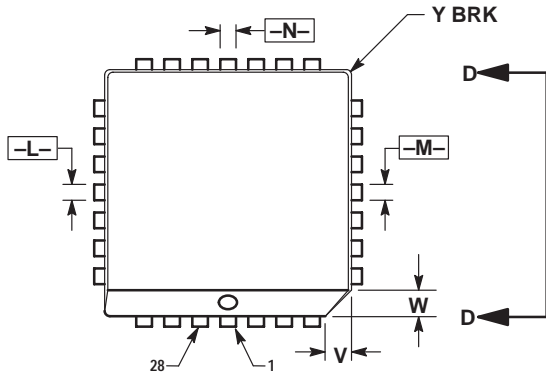
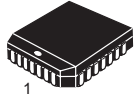
FN SUFFIX
CASE 775-02
 Plastic Package
 (PLCC-20)
 ISSUE C



- NOTES:
 1. DATUMS -L-, -M-, AND -N- DETERMINED WHERE TOP OF LEAD SHOULDER EXITS PLASTIC BODY AT MOLD PARTING LINE.
 2. DIMENSION G1, TRUE POSITION TO BE MEASURED AT DATUM -T-, SEATING PLANE.
 3. DIMENSIONS R AND U DO NOT INCLUDE MOLD FLASH. ALLOWABLE MOLD FLASH IS 0.010 (0.250) PER SIDE.
 4. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 5. CONTROLLING DIMENSION: INCH.
 6. THE PACKAGE TOP MAY BE SMALLER THAN THE PACKAGE BOTTOM BY UP TO 0.012 (0.300). DIMENSIONS R AND U ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY EXCLUSIVE OF MOLD FLASH, TIE BAR BURRS, GATE BURRS AND INTERLEAD FLASH, BUT INCLUDING ANY MISMATCH BETWEEN THE TOP AND BOTTOM OF THE PLASTIC BODY.
 7. DIMENSION H DOES NOT INCLUDE DAMBAR PROTRUSION OR INTRUSION. THE DAMBAR PROTRUSION(S) SHALL NOT CAUSE THE H DIMENSION TO BE GREATER THAN 0.037 (0.940). THE DAMBAR INTRUSION(S) SHALL NOT CAUSE THE H DIMENSION TO BE SMALLER THAN 0.025 (0.635).

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.385	0.395	9.78	10.03
B	0.385	0.395	9.78	10.03
C	0.165	0.180	4.20	4.57
E	0.090	0.110	2.29	2.79
F	0.013	0.019	0.33	0.48
G	0.050 BSC		1.27 BSC	
H	0.026	0.032	0.66	0.81
J	0.020	---	0.51	---
K	0.025	---	0.64	---
R	0.350	0.356	8.89	9.04
U	0.350	0.356	8.89	9.04
V	0.042	0.048	1.07	1.21
W	0.042	0.048	1.07	1.21
X	0.042	0.056	1.07	1.42
Y	---	0.020	---	0.50
Z	2°	10°	---	10°
G1	0.310	0.330	7.88	8.38
K1	0.040	---	1.02	---

FN SUFFIX
CASE 776-02
 Plastic Package
 (PLCC-28)
 ISSUE D

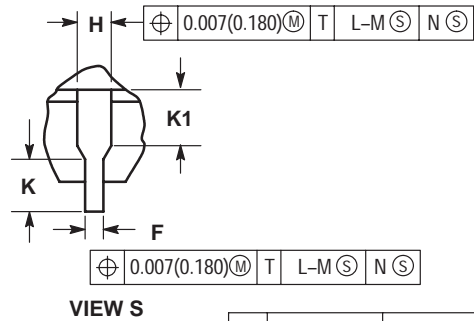
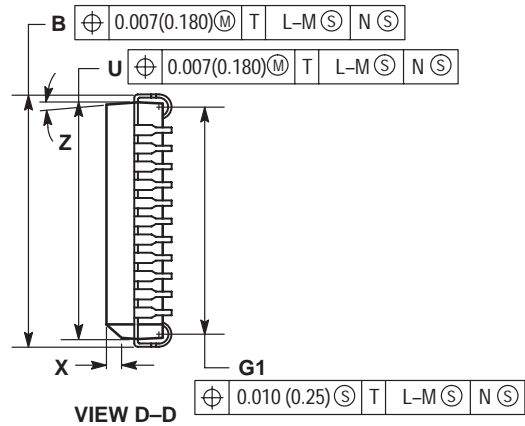
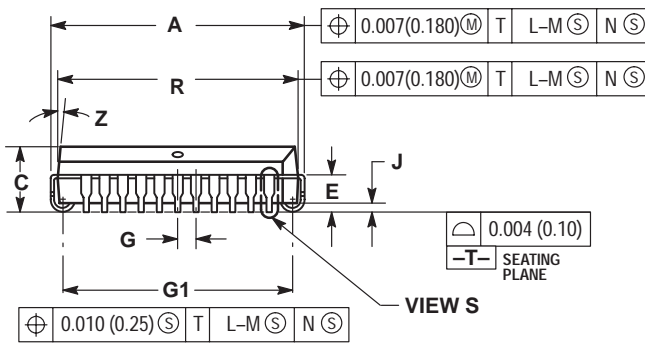
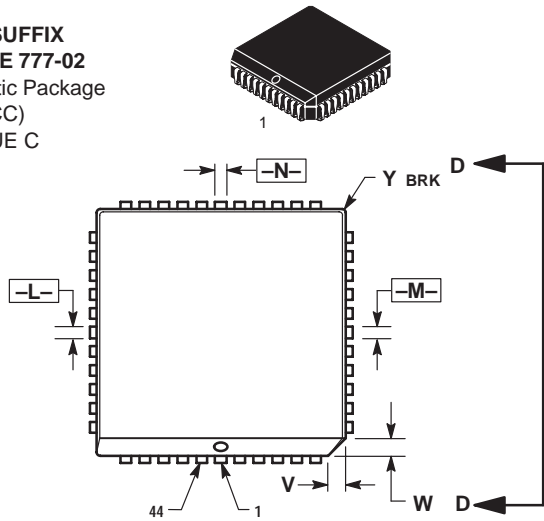


NOTES:

- DATUMS -L-, -M-, AND -N- DETERMINED WHERE TOP OF LEAD SHOULDER EXITS PLASTIC BODY AT MOLD PARTING LINE.
- DIMENSION G1, TRUE POSITION TO BE MEASURED AT DATUM -T-, SEATING PLANE.
- DIMENSIONS R AND U DO NOT INCLUDE MOLD FLASH. ALLOWABLE MOLD FLASH IS 0.010 (0.250) PER SIDE.
- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: INCH.
- THE PACKAGE TOP MAY BE SMALLER THAN THE PACKAGE BOTTOM BY UP TO 0.012 (0.300). DIMENSIONS R AND U ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY EXCLUSIVE OF MOLD FLASH, TIE BAR BURRS, GATE BURRS AND INTERLEAD FLASH, BUT INCLUDING ANY MISMATCH BETWEEN THE TOP AND BOTTOM OF THE PLASTIC BODY.
- DIMENSION H DOES NOT INCLUDE DAMBAR PROTRUSION OR INTRUSION. THE DAMBAR PROTRUSION(S) SHALL NOT CAUSE THE H DIMENSION TO BE GREATER THAN 0.037 (0.940). THE DAMBAR INTRUSION(S) SHALL NOT CAUSE THE H DIMENSION TO BE SMALLER THAN 0.025 (0.635).

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.485	0.495	12.32	12.57
B	0.485	0.495	12.32	12.57
C	0.165	0.180	4.20	4.57
E	0.090	0.110	2.29	2.79
F	0.013	0.019	0.33	0.48
G	0.050 BSC		1.27 BSC	
H	0.026	0.032	0.66	0.81
J	0.020	---	0.51	---
K	0.025	---	0.64	---
R	0.450	0.456	11.43	11.58
U	0.450	0.456	11.43	11.58
V	0.042	0.048	1.07	1.21
W	0.042	0.048	1.07	1.21
X	0.042	0.056	1.07	1.42
Y	---	0.020	---	0.50
Z	2°	10°	2°	10°
G1	0.410	0.430	10.42	10.92
K1	0.040	---	1.02	---

FN SUFFIX
CASE 777-02
 Plastic Package
 (PLCC)
 ISSUE C

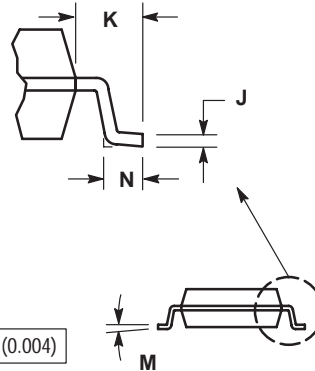
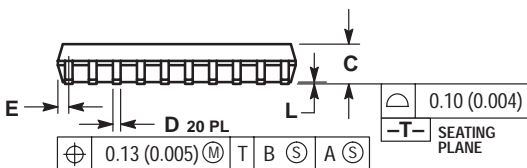
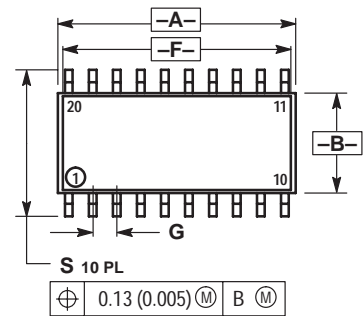
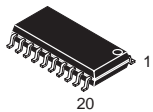


- NOTES:
- DATUMS -L-, -M-, AND -N- ARE DETERMINED WHERE TOP OF LEAD SHOULDER EXITS PLASTIC BODY AT MOLD PARTING LINE.
 - DIMENSION G1, TRUE POSITION TO BE MEASURED AT DATUM -T-, SEATING PLANE.
 - DIMENSIONS R AND U DO NOT INCLUDE MOLD FLASH. ALLOWABLE MOLD FLASH IS 0.010 (0.25) PER SIDE.
 - DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 - CONTROLLING DIMENSION: INCH.

- THE PACKAGE TOP MAY BE SMALLER THAN THE PACKAGE BOTTOM BY UP TO 0.012 (0.300). DIMENSIONS R AND U ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY EXCLUSIVE OF MOLD FLASH, TIE BAR BURRS, GATE BURRS AND INTERLEAD FLASH, BUT INCLUDING ANY MISMATCH BETWEEN THE TOP AND BOTTOM OF THE PLASTIC BODY.
- DIMENSION H DOES NOT INCLUDE DAMBAR PROTRUSION OR INTRUSION. THE DAMBAR PROTRUSION(S) SHALL NOT CAUSE THE H DIMENSION TO BE GREATER THAN 0.037 (0.940). THE DAMBAR INTRUSION(S) SHALL NOT CAUSE THE H DIMENSION TO BE SMALLER THAN 0.025 (0.635).

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.685	0.695	17.40	17.65
B	0.685	0.695	17.40	17.65
C	0.165	0.180	4.20	4.57
E	0.090	0.110	2.29	2.79
F	0.013	0.019	0.33	0.48
G	0.050 BSC		1.27 BSC	
H	0.026	0.032	0.66	0.81
J	0.020	---	0.51	---
K	0.025	---	0.64	---
R	0.650	0.656	16.51	16.66
U	0.650	0.656	16.51	16.66
V	0.042	0.048	1.07	1.21
W	0.042	0.048	1.07	1.21
X	0.042	0.056	1.07	1.42
Y	---	0.020	---	0.50
Z	2°	10°	2°	10°
G1	0.610	0.630	15.50	16.00
K1	0.040	---	1.02	---

M SUFFIX
CASE 803C
PRELIMINARY
 Plastic Package

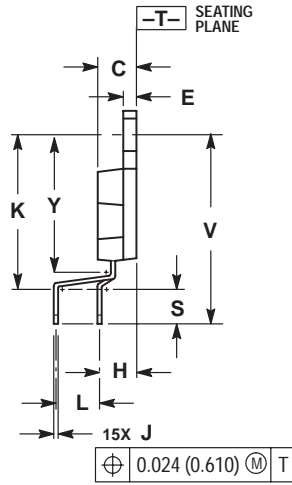
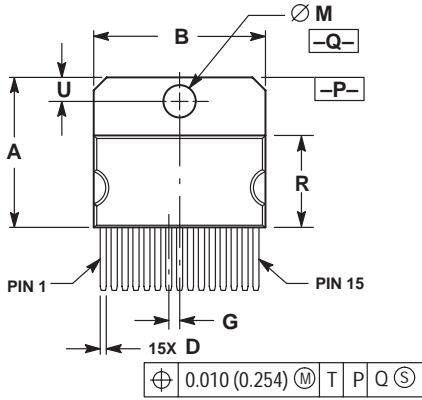
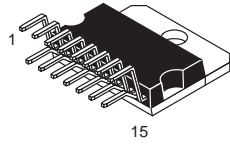


- NOTES:
- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 - CONTROLLING DIMENSION: MILLIMETER.
 - DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
 - MAXIMUM MOLD PROTRUSION 0.15 (0.008) PER SIDE.
 - DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.13 (0.006) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	12.35	12.80	0.486	0.504
B	5.10	5.45	0.201	0.215
C	1.95	2.05	0.077	0.081
D	0.35	0.50	0.014	0.020
E	---	0.81	---	0.032
F	12.40*		0.488*	
G	1.15	1.39	0.045	0.055
H	0.59	0.81	0.023	0.032
J	0.18	0.27	0.007	0.011
K	1.10	1.50	0.043	0.059
L	0.05	0.20	0.001	0.008
M	0°	10°	0°	10°
N	0.50	0.85	0.020	0.033
S	7.40	8.20	0.291	0.323

*APPROXIMATE

TV SUFFIX
CASE 821C-04
 Plastic Package
 (15-Pin ZIP)
 ISSUE D

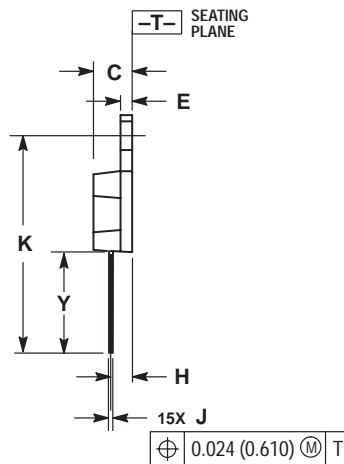
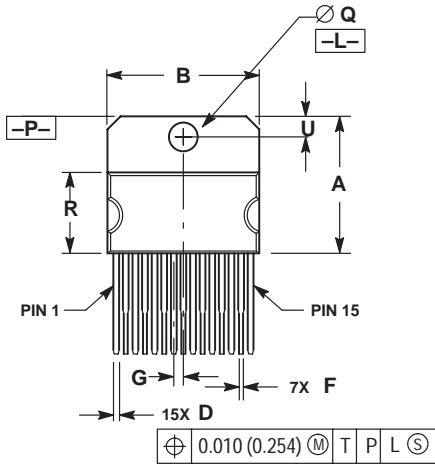
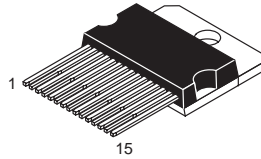


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION R DOES NOT INCLUDE MOLD FLASH OR PROTRUSIONS.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH OR PROTRUSIONS.
5. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.010 (0.250).
6. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.003 (0.076) TOTAL IN EXCESS OF THE D DIMENSION, AT MAXIMUM MATERIAL CONDITION.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.684	0.694	17.374	17.627
B	0.784	0.792	19.914	20.116
C	0.173	0.181	4.395	4.597
D	0.024	0.031	0.610	0.787
E	0.058	0.062	1.473	1.574
G	0.050 BSC		1.270 BSC	
H	0.169 BSC		4.293 BSC	
J	0.018	0.024	0.458	0.609
K	0.700	0.710	17.780	18.034
L	0.200 BSC		5.080 BSC	
M	0.148	0.151	3.760	3.835
R	0.416	0.426	10.567	10.820
S	0.157	0.167	3.988	4.242
U	0.105	0.115	2.667	2.921
V	0.868 REF		22.047 REF	
Y	0.625	0.639	15.875	16.231

T SUFFIX
CASE 821D-03
 Plastic Package
 ISSUE C

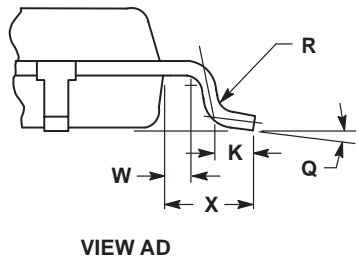
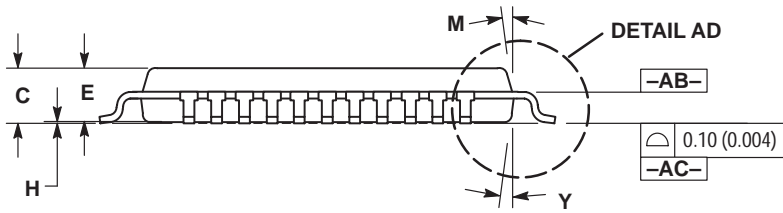
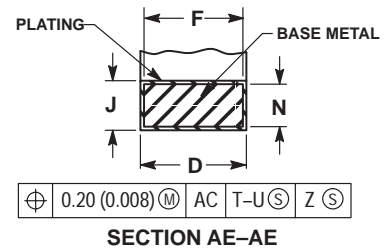
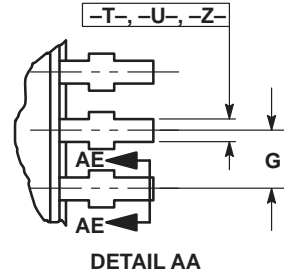
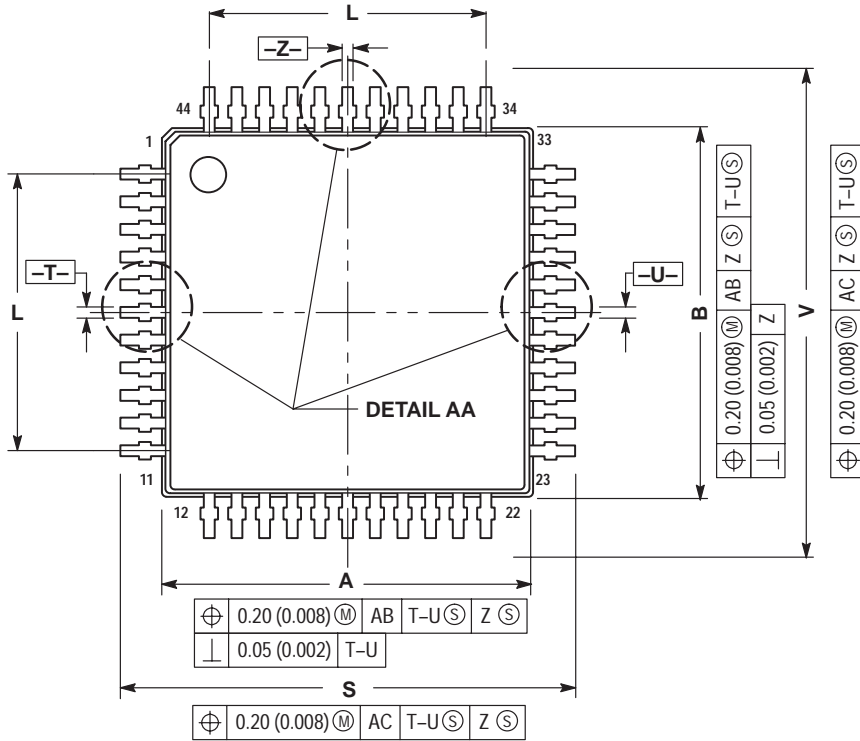
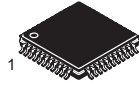


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION R DOES NOT INCLUDE MOLD FLASH OR PROTRUSIONS.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH OR PROTRUSIONS.
5. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.010 (0.250).
6. DELETED
7. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.003 (0.076) TOTAL IN EXCESS OF THE D DIMENSION, AT MAXIMUM MATERIAL CONDITION.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.681	0.694	17.298	17.627
B	0.784	0.792	19.914	20.116
C	0.173	0.181	4.395	4.597
D	0.024	0.031	0.610	0.787
E	0.058	0.062	1.473	1.574
F	0.016	0.023	0.407	0.584
G	0.050 BSC		1.270 BSC	
H	0.110 BSC		2.794 BSC	
J	0.018	0.024	0.458	0.609
K	1.078	1.086	27.382	27.584
Q	0.148	0.151	3.760	3.835
R	0.416	0.426	10.567	10.820
U	0.110 BSC		2.794 BSC	
Y	0.503 REF		12.776 REF	

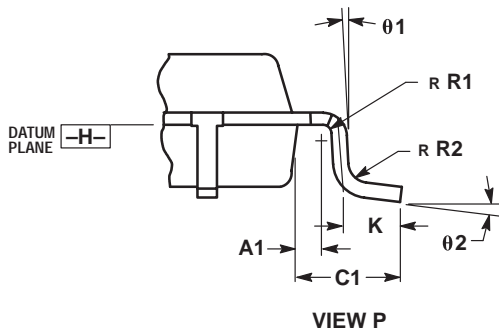
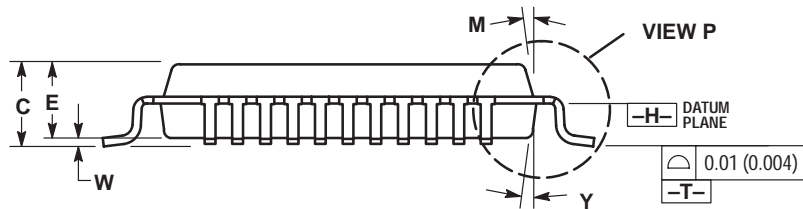
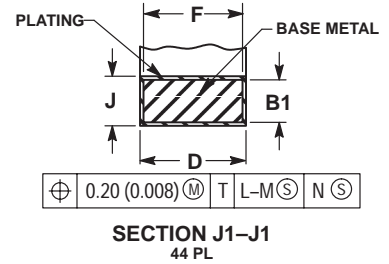
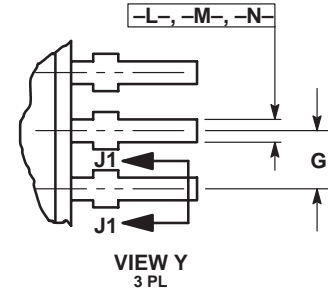
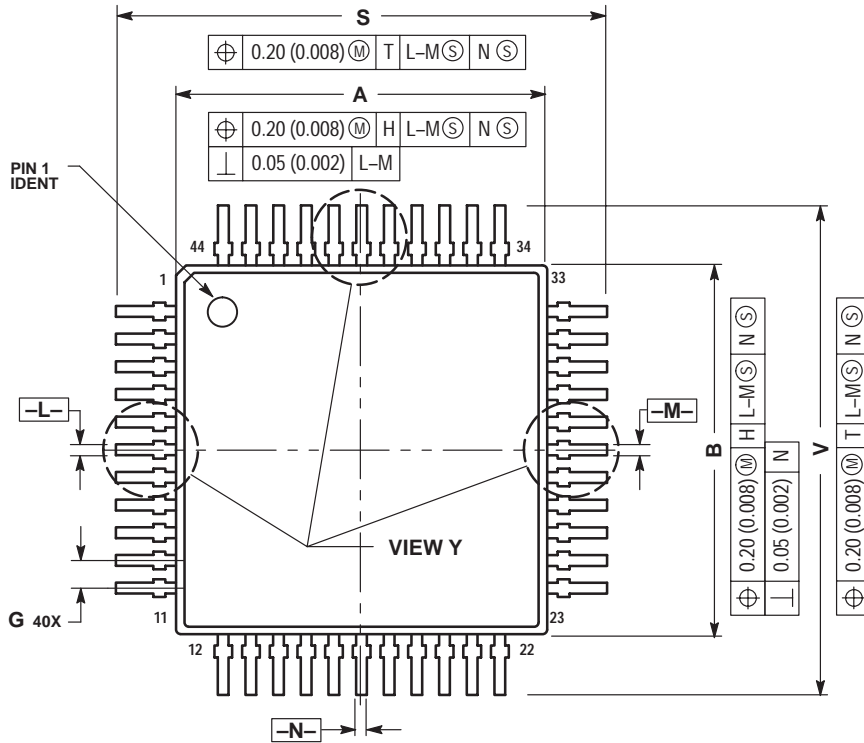
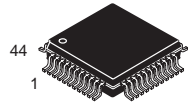
FTB SUFFIX
CASE 824D-01
 Plastic Package
 (TQFP-44)
 ISSUE O



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DATUM PLANE -AB- IS LOCATED AT BOTTOM OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE BOTTOM OF THE PARTING LINE.
 4. DATUMS -T-, -U- AND -Z- TO BE DETERMINED AT DATUM PLANE -AB-.
 5. DIMENSIONS S AND V TO BE DETERMINED AT SEATING PLANE -AC-.
 6. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.25 (0.010) PER SIDE. DIMENSIONS A AND B DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE -AB-.
 7. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. DAMBAR PROTRUSION SHALL NOT CAUSE THE D DIMENSION TO EXCEED 0.530 (0.021).

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.950	10.050	0.392	0.396
B	9.950	10.050	0.392	0.396
C	1.400	1.600	0.055	0.063
D	0.300	0.450	0.012	0.018
E	1.350	1.450	0.053	0.057
F	0.300	0.400	0.012	0.016
G	0.800 BSC		0.031 BSC	
H	0.050	0.150	0.002	0.006
J	0.090	0.200	0.004	0.008
K	0.450	0.550	0.018	0.022
L	8.000 BSC		0.315 BSC	
M	12° REF		12° REF	
N	0.090	0.160	0.004	0.006
Q	1°	5°	1°	5°
R	0.100	0.200	0.004	0.008
S	11.900	12.100	0.469	0.476
V	11.900	12.100	0.469	0.476
W	0.200 REF		0.008 REF	
X	1.000 REF		0.039 REF	
Y	12° REF		12° REF	

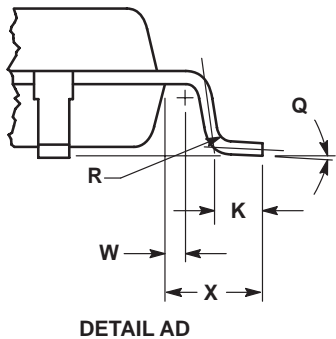
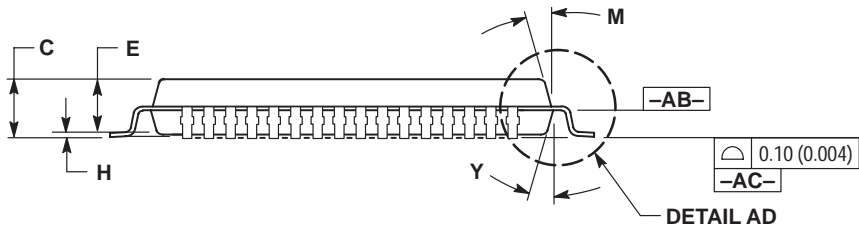
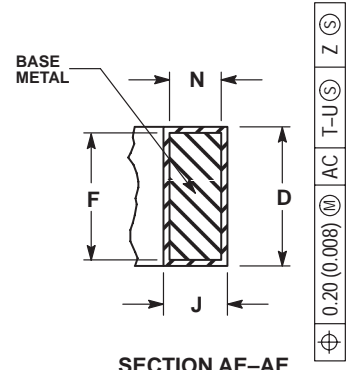
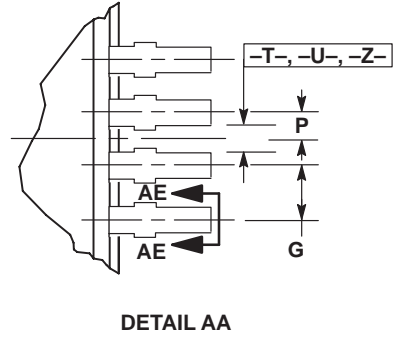
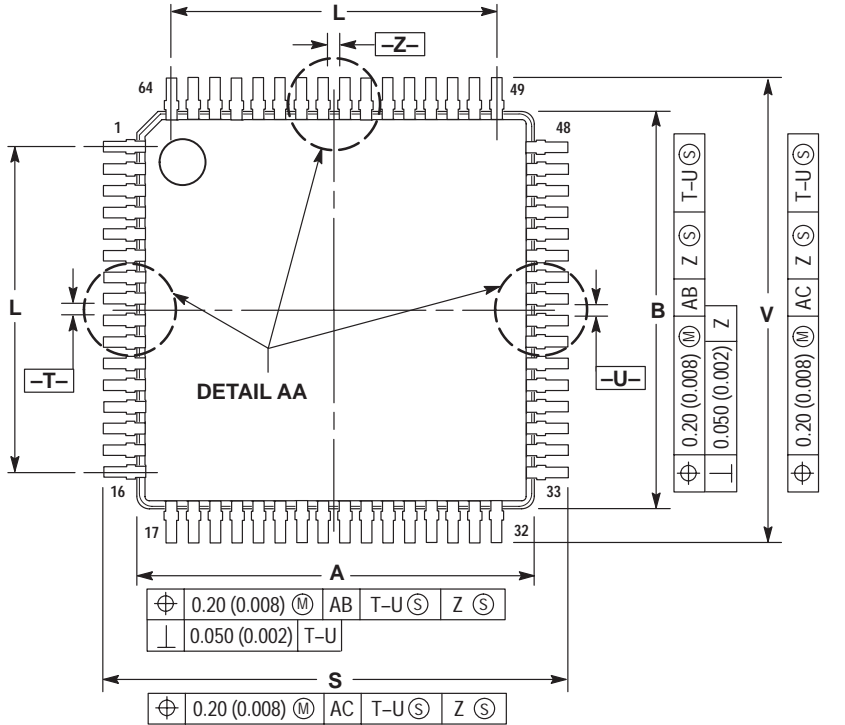
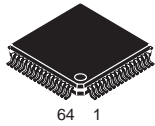
FB SUFFIX
CASE 824E-02
 Plastic Package
 (QFP)
 ISSUE A



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DATUM PLANE -H- IS LOCATED AT BOTTOM OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE BOTTOM OF THE PARTING LINE.
 4. DATUMS -L-, -M- AND -N- TO BE DETERMINED AT DATUM PLANE -H-.
 5. DIMENSIONS S AND V TO BE DETERMINED AT SEATING PLANE -T-.
 6. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.25 (0.010) PER SIDE. DIMENSIONS A AND B DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE -H-.
 7. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. DAMBAR PROTRUSION SHALL NOT CAUSE THE D DIMENSION TO EXCEED 0.530 (0.021).

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.90	10.10	0.390	0.398
B	9.90	10.10	0.390	0.398
C	2.00	2.21	0.079	0.087
D	0.30	0.45	0.0118	0.0177
E	2.00	2.10	0.079	0.083
F	0.30	0.40	0.012	0.016
G	0.80 BSC		0.031 BSC	
J	0.13	0.23	0.005	0.009
K	0.65	0.95	0.026	0.037
M	5° 10°		5° 10°	
S	12.95	13.45	0.510	0.530
V	12.95	13.45	0.510	0.530
W	0.000	0.210	0.000	0.008
Y	5° 10°		5° 10°	
A1	0.450 REF		0.018 REF	
B1	0.130	0.170	0.005	0.007
C1	1.600 REF		0.063 REF	
R1	0.130	0.300	0.005	0.012
R2	0.130	0.300	0.005	0.012
theta 1	5° 10°		5° 10°	
theta 2	0° 7°		0° 7°	

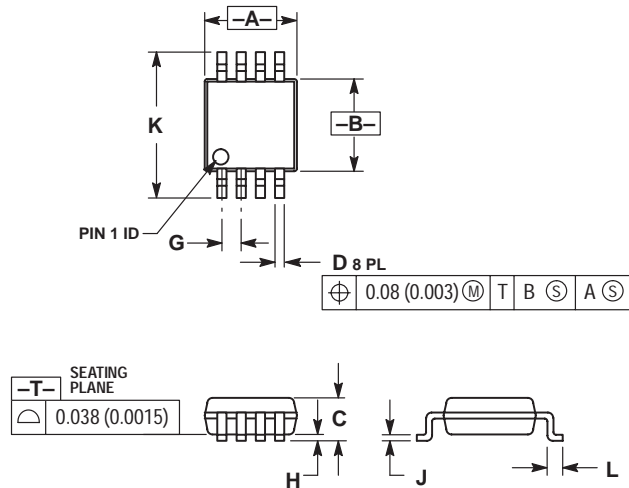
FB SUFFIX
CASE 840F-01
 Plastic Package
 ISSUE O



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DATUM PLANE -AB- IS LOCATED AT BOTTOM OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE BOTTOM OF THE PARTING LINE.
 4. DATUMS -T-, -U- AND -Z- TO BE DETERMINED AT DATUM PLANE -AC-.
 5. DIMENSIONS S AND V TO BE DETERMINED AT SEATING PLANE -AC-.
 6. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.25 (0.010) PER SIDE. DIMENSIONS A AND B DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE -AB-.
 7. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. DAMBAR PROTRUSION SHALL NOT CAUSE THE D DIMENSION TO EXCEED 0.350 (0.014).

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.950	10.050	0.392	0.396
B	9.950	10.050	0.392	0.396
C	1.400	1.600	0.055	0.063
D	0.170	0.270	0.007	0.011
E	1.350	1.450	0.053	0.057
F	0.170	0.230	0.007	0.009
G	0.500 BSC		0.020 BSC	
H	0.050	0.150	0.002	0.006
J	0.090	0.200	0.004	0.008
K	0.450	0.550	0.018	0.022
L	7.500 BSC		0.295 BSC	
M	12° REF		12° REF	
N	0.090	0.160	0.004	0.006
P	0.250 BSC		0.010 BSC	
Q	1°	5°	1°	5°
R	0.100	0.200	0.004	0.008
S	11.900	12.100	0.469	0.476
V	11.900	12.100	0.469	0.476
W	0.200 REF		0.008 REF	
X	1.000 REF		0.039 REF	
Y	12° REF		12° REF	

DM SUFFIX
CASE 846A-02
 Plastic Package
 (Micro-8)
 ISSUE C

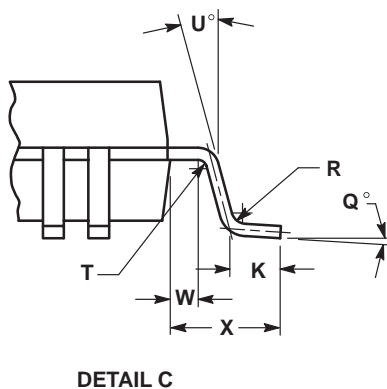
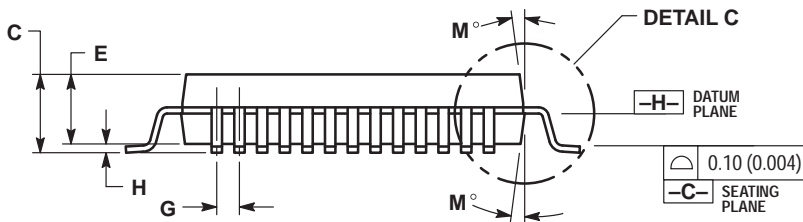
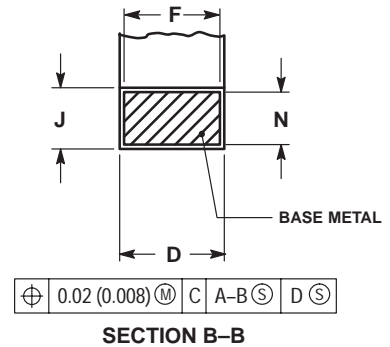
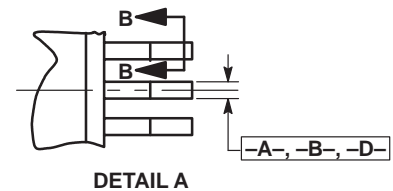
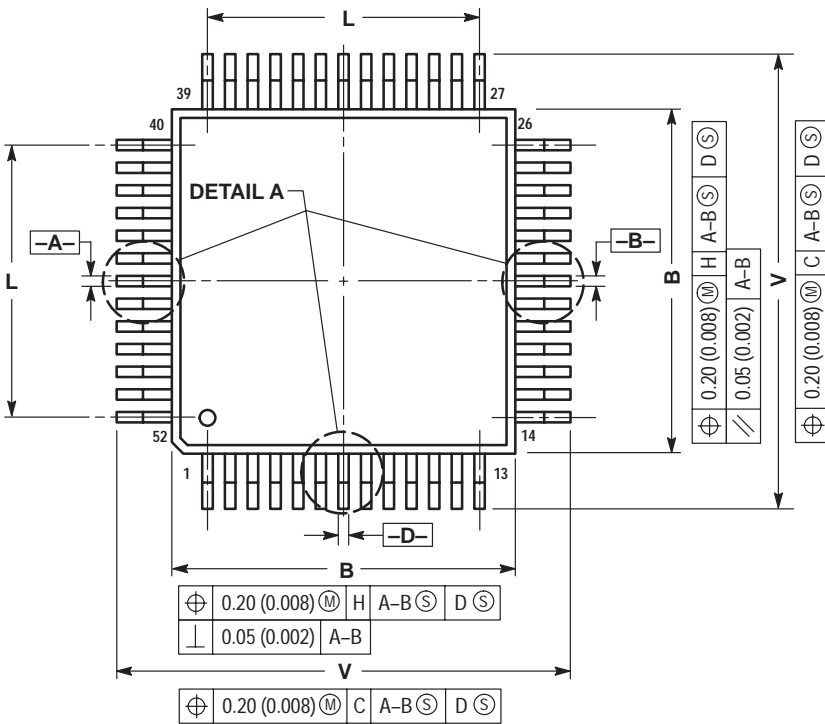
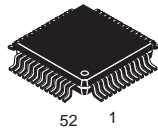


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.90	3.10	0.114	0.122
B	2.90	3.10	0.114	0.122
C	---	1.10	---	0.043
D	0.25	0.40	0.010	0.016
G	0.65 BSC		0.026 BSC	
H	0.05	0.15	0.002	0.006
J	0.13	0.23	0.005	0.009
K	4.75	5.05	0.187	0.199
L	0.40	0.70	0.016	0.028

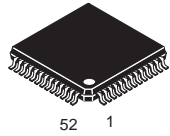
FB SUFFIX
CASE 848B-04
 Plastic Package
 (TQFP-52)
 ISSUE C



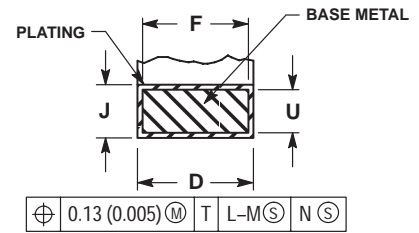
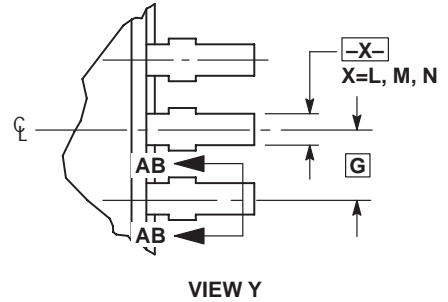
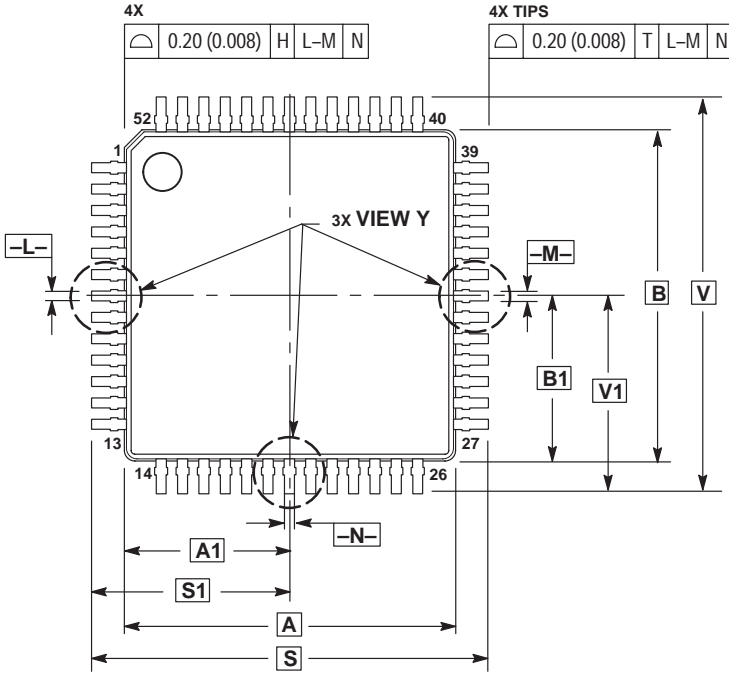
- NOTES:
- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 - CONTROLLING DIMENSION: MILLIMETER.
 - DATUM PLANE -H- IS LOCATED AT BOTTOM OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE BOTTOM OF THE PARTING LINE.
 - DATUMS -A-, -B- AND -D- TO BE DETERMINED AT DATUM PLANE -H-.
 - DIMENSIONS S AND V TO BE DETERMINED AT SEATING PLANE -C-.
 - DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.25 (0.010) PER SIDE. DIMENSIONS A AND B DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE -H-.
 - DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.90	10.10	0.390	0.398
B	9.90	10.10	0.390	0.398
C	2.10	2.45	0.083	0.096
D	0.22	0.38	0.009	0.015
E	2.00	2.10	0.079	0.083
F	0.22	0.33	0.009	0.013
G	0.65 BSC		0.026 BSC	
H	---	0.25	---	0.010
J	0.13	0.23	0.005	0.009
K	0.65	0.95	0.026	0.037
L	7.80 REF		0.307 REF	
M	5°	10°	5°	10°
N	0.13	0.17	0.005	0.007
Q	0°	7°	0°	7°
R	0.13	0.30	0.005	0.012
S	12.95	13.45	0.510	0.530
T	0.13	---	0.005	---
U	0°	---	0°	---
V	12.95	13.45	0.510	0.530
W	0.35	0.45	0.014	0.018
X	1.6 REF		0.063 REF	

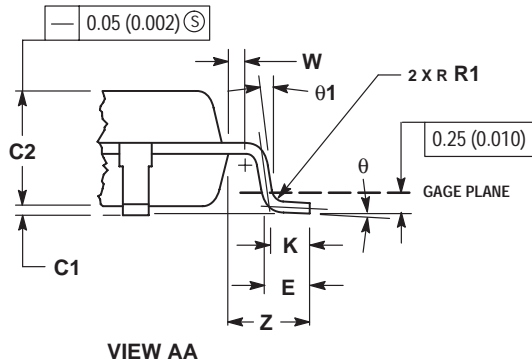
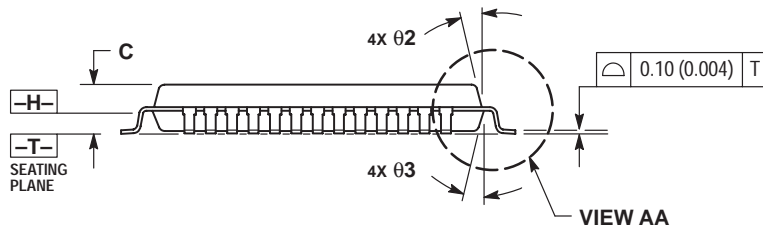
FB SUFFIX
CASE 848D-03
 Plastic Package
 ISSUE C



52 1



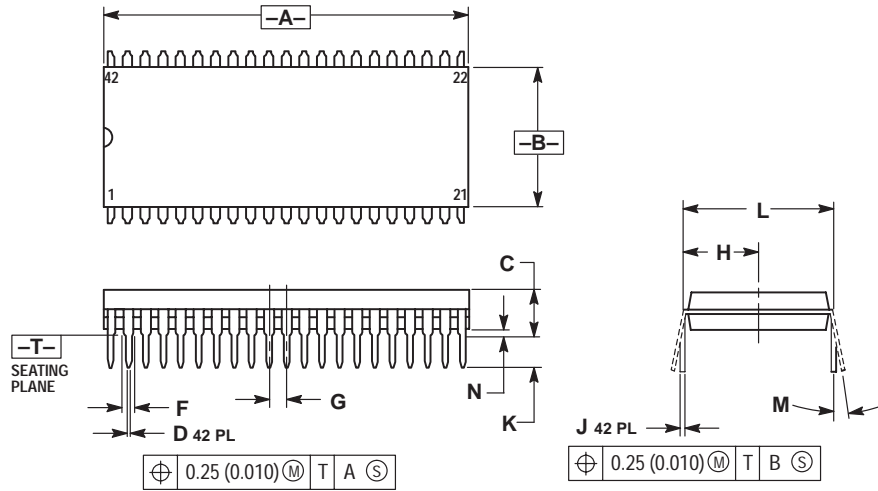
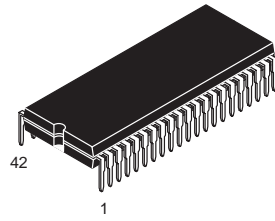
SECTION AB-AB
 ROTATED 90° CLOCKWISE



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DATUM PLANE -H- IS LOCATED AT BOTTOM OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE BOTTOM OF THE PARTING LINE.
 4. DATUMS -L-, -M- AND -N- TO BE DETERMINED AT DATUM PLANE -H-.
 5. DIMENSIONS S AND V TO BE DETERMINED AT SEATING PLANE -T-.
 6. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.25 (0.010) PER SIDE. DIMENSIONS A AND B DO NOT INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE -H-.
 7. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. DAMBAR PROTRUSION SHALL NOT CAUSE THE LEAD WIDTH TO EXCEED 0.46 (0.018). MINIMUM SPACE BETWEEN PROTRUSION AND ADJACENT LEAD OR PROTRUSION 0.07 (0.003).

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.00 BSC	0.394 BSC		
A1	5.00 BSC	0.197 BSC		
B	10.00 BSC	0.394 BSC		
B1	5.00 BSC	0.197 BSC		
C	---	1.70	---	0.067
C1	0.05	0.20	0.002	0.008
C2	1.30	1.50	0.051	0.059
D	0.20	0.40	0.008	0.016
E	0.45	0.75	0.018	0.030
F	0.22	0.35	0.009	0.014
G	0.65 BSC	0.026 BSC		
J	0.07	0.20	0.003	0.008
K	0.50 REF	0.020 REF		
R1	0.08	0.20	0.003	0.008
S	12.00 BSC	0.472 BSC		
S1	6.00 BSC	0.236 BSC		
U	0.09	0.16	0.004	0.006
V	12.00 BSC	0.472 BSC		
V1	6.00 BSC	0.236 BSC		
W	0.20 REF	0.008 REF		
Z	1.00 REF	0.039 REF		
theta	0°	7°	0°	7°
theta 1	0°	---	0°	---
theta 2	12° REF	12° REF		
theta 3	5°	13°	5°	13°

B SUFFIX
CASE 858-01
 Plastic Package
 ISSUE O

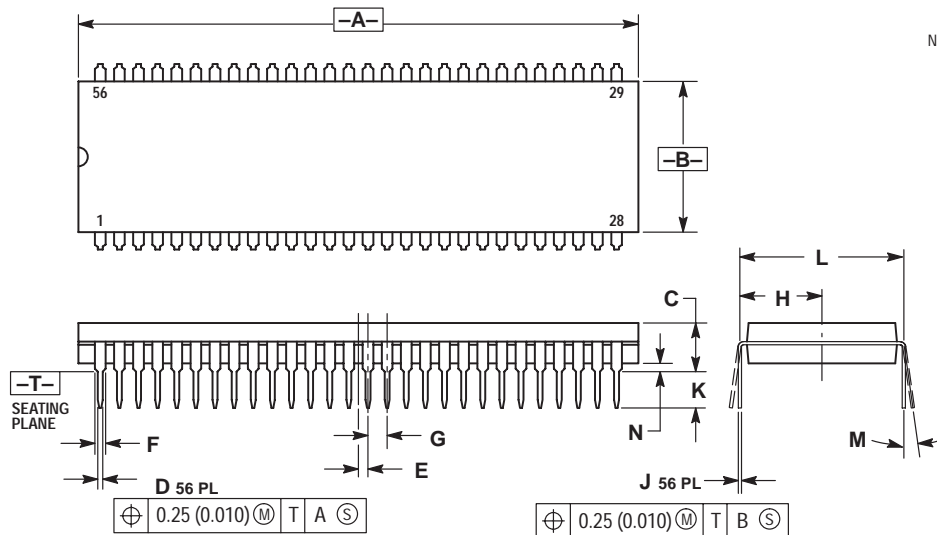
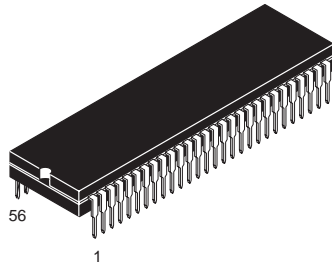


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH. MAXIMUM MOLD FLASH 0.25 (0.010).

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	1.435	1.465	36.45	37.21
B	0.540	0.560	13.72	14.22
C	0.155	0.200	3.94	5.08
D	0.014	0.022	0.36	0.56
F	0.032	0.046	0.81	1.17
G	0.070 BSC		1.778 BSC	
H	0.300 BSC		7.62 BSC	
J	0.008	0.015	0.20	0.38
K	0.115	0.135	2.92	3.43
L	0.600 BSC		15.24 BSC	
M	0°	15°	0°	15°
N	0.020	0.040	0.51	1.02

B SUFFIX
CASE 859-01
 Plastic Package
 (SDIP)
 ISSUE O

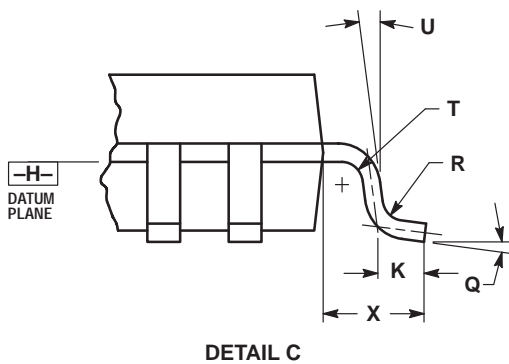
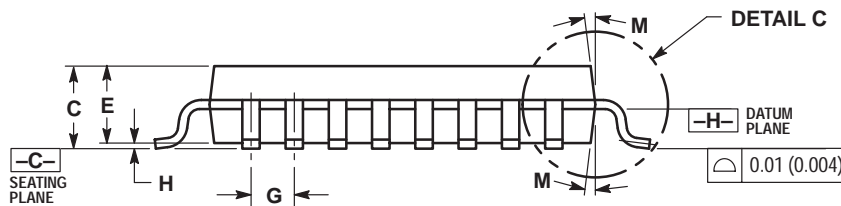
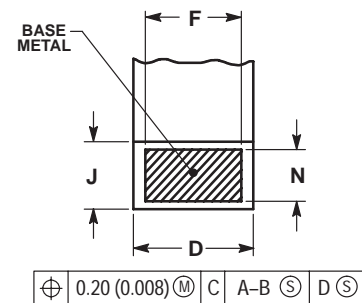
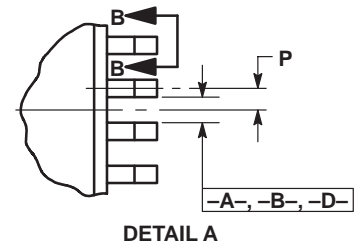
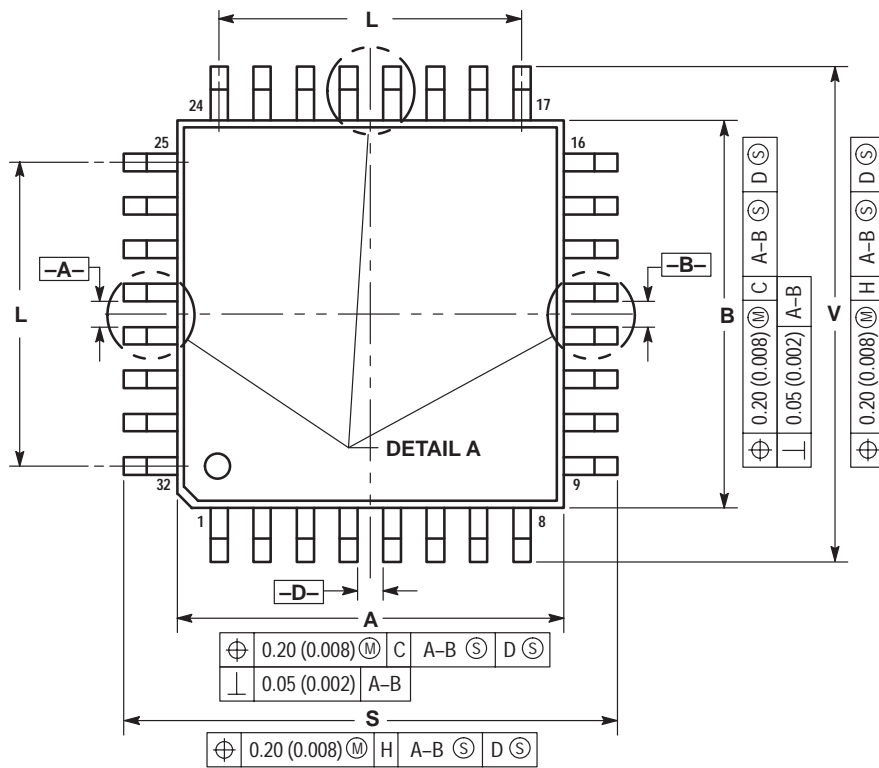
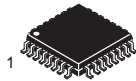


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH. MAXIMUM MOLD FLASH 0.25 (0.010)

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	2.035	2.065	51.69	52.45
B	0.540	0.560	13.72	14.22
C	0.155	0.200	3.94	5.08
D	0.014	0.022	0.36	0.56
E	0.035 BSC		0.89 BSC	
F	0.032	0.046	0.81	1.17
G	0.070 BSC		1.778 BSC	
H	0.300 BSC		7.62 BSC	
J	0.008	0.015	0.20	0.38
K	0.115	0.135	2.92	3.43
L	0.600 BSC		15.24 BSC	
M	0°	15°	0°	15°
N	0.020	0.040	0.51	1.02

FB, FTB SUFFIX
CASE 873-01
 Plastic Package
 (TQFP-32)
 ISSUE A

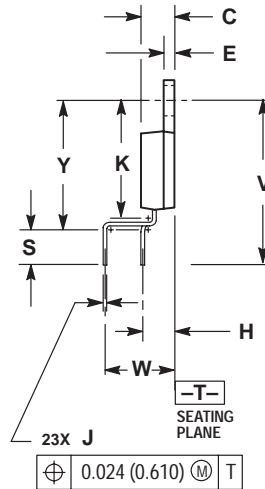
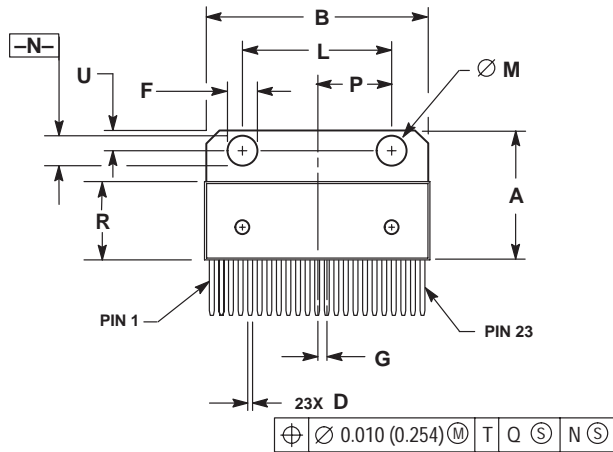
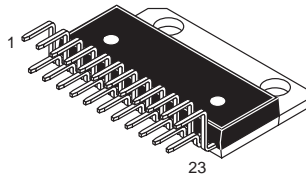


NOTES:

- DIMENSION AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: MILLIMETER.
- DATUM PLANE -H- IS LOCATED AT BOTTOM OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE BOTTOM OF THE PARTING LINE.
- DATUMS -A-, -B- AND -D- TO BE DETERMINED AT DATUM PLANE -H-.
- DIMENSIONS S AND V TO BE DETERMINED AT SEATING PLANE -C-.
- DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.25 (0.010) PER SIDE. DIMENSIONS A AND B DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE -H-.
- DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	6.95	7.10	0.274	0.280
B	6.95	7.10	0.274	0.280
C	1.40	1.60	0.055	0.063
D	0.273	0.373	0.010	0.015
E	1.30	1.50	0.051	0.059
F	0.273	---	0.010	---
G	0.80 BSC	---	0.031 BSC	---
H	---	0.20	---	0.008
J	0.119	0.197	0.005	0.008
K	0.33	0.57	0.013	0.022
L	5.6 REF	---	0.220 REF	---
M	6°	8°	6°	8°
N	0.119	0.135	0.005	0.005
P	0.40 BSC	---	0.016 BSC	---
Q	5°	10°	5°	10°
R	0.15	0.25	0.006	0.010
S	8.85	9.15	0.348	0.360
T	0.15	0.25	0.006	0.010
U	5°	11°	5°	11°
V	8.85	9.15	0.348	0.360
X	1.00 REF	---	0.039 REF	---

T SUFFIX
CASE 894-03
 Plastic Package
 (23-Pin SZIP)
 ISSUE B

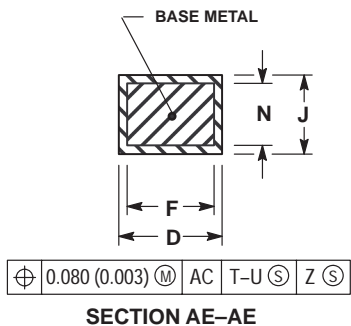
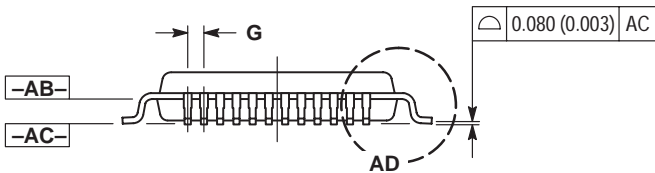
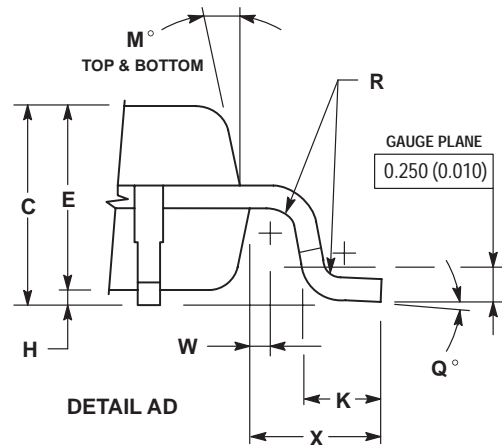
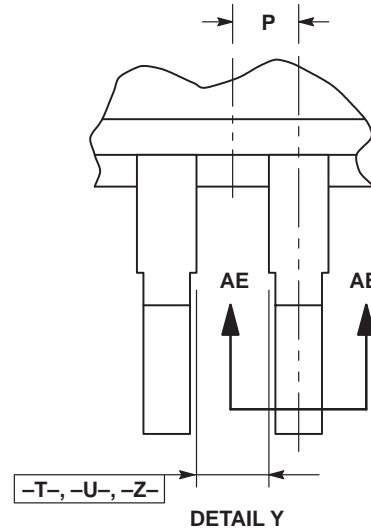
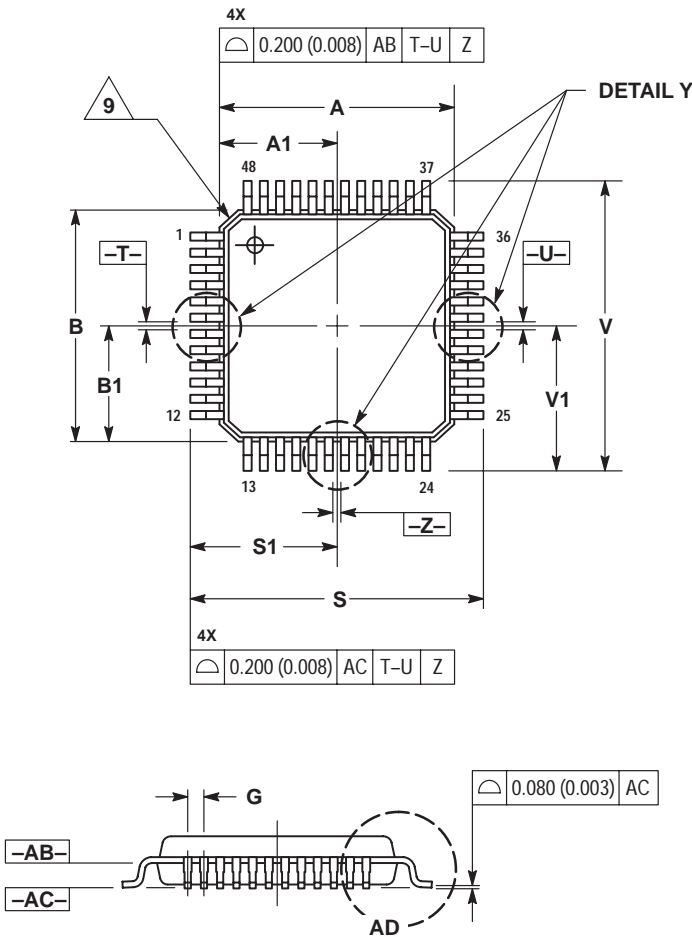
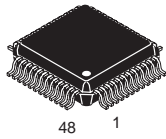


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION R DOES NOT INCLUDE MOLD FLASH OR PROTRUSIONS.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH OR PROTRUSIONS.
5. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.010 (0.250).
6. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.003 (0.076) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.684	0.694	17.374	17.627
B	1.183	1.193	30.048	30.302
C	0.175	0.179	4.445	4.547
D	0.026	0.031	0.660	0.787
E	0.058	0.062	1.473	1.574
F	0.165	0.175	4.191	4.445
G	0.050 BSC		1.270 BSC	
H	0.169 BSC		4.293 BSC	
J	0.014	0.020	0.356	0.508
K	0.625	0.639	15.875	16.231
L	0.770	0.790	19.558	20.066
M	0.148	0.152	3.760	3.861
N	0.148	0.152	3.760	3.861
P	0.390 BSC		9.906 BSC	
R	0.416	0.424	10.566	10.770
S	0.157	0.167	3.988	4.242
U	0.105	0.115	2.667	2.921
V	0.868 REF		22.047 REF	
W	0.200 BSC		5.080 BSC	
Y	0.700	0.710	17.780	18.034

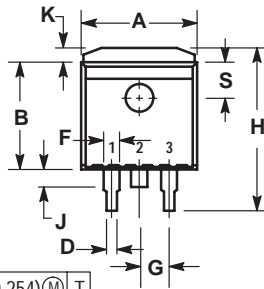
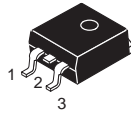
FTA SUFFIX
CASE 932-02
Plastic Package
(TQFP-48)
ISSUE D



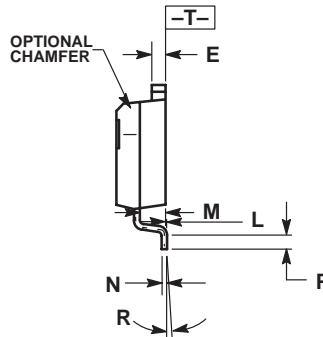
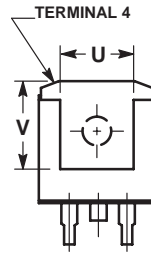
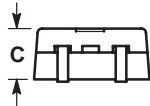
- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DATUM PLANE -AB- IS LOCATED AT BOTTOM OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE BOTTOM OF THE PARTING LINE.
 4. DATUMS -T-, -U-, AND -Z- TO BE DETERMINED AT DATUM PLANE -AB-.
 5. DIMENSIONS S AND V TO BE DETERMINED AT SEATING PLANE -AC-.
 6. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.250 (0.010) PER SIDE. DIMENSIONS A AND B DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE -AB-.
 7. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. DAMBAR PROTRUSION SHALL NOT CAUSE THE D DIMENSION TO EXCEED 0.350 (0.014).
 8. MINIMUM SOLDER PLATE THICKNESS SHALL BE 0.0076 (0.0003).
 9. EXACT SHAPE OF EACH CORNER IS OPTIONAL.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	7.000 BSC		0.276 BSC	
A1	3.500 BSC		0.138 BSC	
B	7.000 BSC		0.276 BSC	
B1	3.500 BSC		0.138 BSC	
C	1.400	1.600	0.055	0.063
D	0.170	0.270	0.007	0.011
E	1.350	1.450	0.053	0.057
F	0.170	0.230	0.007	0.009
G	0.500 BASIC		0.020 BASIC	
H	0.050	0.150	0.002	0.006
J	0.090	0.200	0.004	0.008
K	0.500	0.700	0.020	0.028
M	12° REF		12° REF	
N	0.090	0.160	0.004	0.006
P	0.250 BASIC		0.010 BASIC	
Q	1°	5°	1°	5°
R	0.150	0.250	0.006	0.010
S	9.000 BSC		0.354 BSC	
S1	4.500 BSC		0.177 BSC	
V	9.000 BSC		0.354 BSC	
V1	4.500 BSC		0.177 BSC	
W	0.200 REF		0.008 REF	
X	1.000 REF		0.039 REF	

D2T SUFFIX
CASE 936-03
 Plastic Package
 ISSUE B



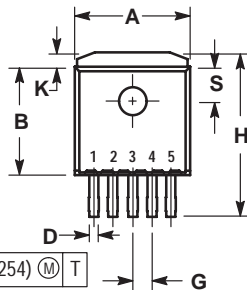
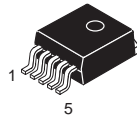
⊕ 0.010 (0.254) Ⓜ T



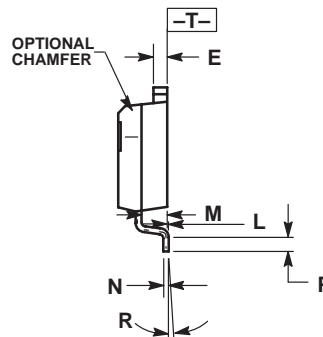
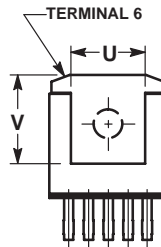
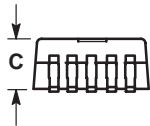
- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. TAB CONTOUR OPTIONAL WITHIN DIMENSIONS A AND K.
 4. DIMENSIONS U AND V ESTABLISH A MINIMUM MOUNTING SURFACE FOR TERMINAL 4.
 5. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH OR GATE PROTRUSIONS. MOLD FLASH AND GATE PROTRUSIONS NOT TO EXCEED 0.025 (0.635) MAXIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.386	0.403	9.804	10.236
B	0.356	0.368	9.042	9.347
C	0.170	0.180	4.318	4.572
D	0.026	0.036	0.660	0.914
E	0.045	0.055	1.143	1.397
F	0.051 REF		1.295 REF	
G	0.100 BSC		2.540 BSC	
H	0.539	0.579	13.691	14.707
J	0.125 MAX		3.175 MAX	
K	0.050 REF		1.270 REF	
L	0.000	0.010	0.000	0.254
M	0.088	0.102	2.235	2.591
N	0.018	0.026	0.457	0.660
P	0.058	0.078	1.473	1.981
R	5° REF		5° REF	
S	0.116 REF		2.946 REF	
U	0.200 MIN		5.080 MIN	
V	0.250 MIN		6.350 MIN	

D2T SUFFIX
CASE 936A-02
 Plastic Package
 (D²PAK)
 ISSUE A



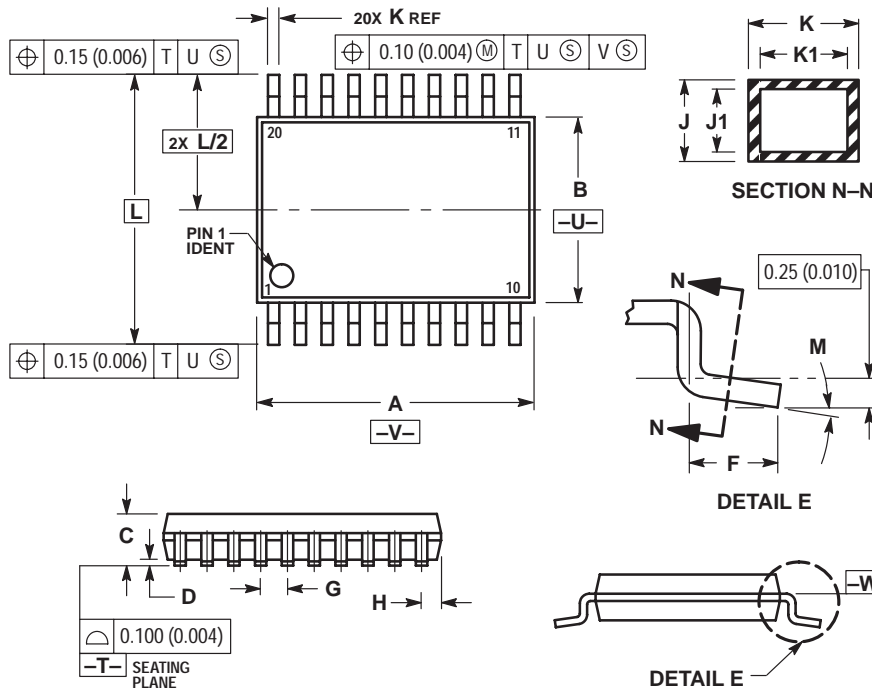
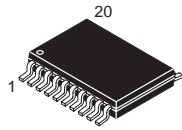
⊕ 0.010 (0.254) Ⓜ T



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. TAB CONTOUR OPTIONAL WITHIN DIMENSIONS A AND K.
 4. DIMENSIONS U AND V ESTABLISH A MINIMUM MOUNTING SURFACE FOR TERMINAL 6.
 5. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH OR GATE PROTRUSIONS. MOLD FLASH AND GATE PROTRUSIONS NOT TO EXCEED 0.025 (0.635) MAXIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.386	0.403	9.804	10.236
B	0.356	0.368	9.042	9.347
C	0.170	0.180	4.318	4.572
D	0.026	0.036	0.660	0.914
E	0.045	0.055	1.143	1.397
G	0.067 BSC		1.702 BSC	
H	0.539	0.579	13.691	14.707
K	0.050 REF		1.270 REF	
L	0.000	0.010	0.000	0.254
M	0.088	0.102	2.235	2.591
N	0.018	0.026	0.457	0.660
P	0.058	0.078	1.473	1.981
R	5° REF		5° REF	
S	0.116 REF		2.946 REF	
U	0.200 MIN		5.080 MIN	
V	0.250 MIN		6.350 MIN	

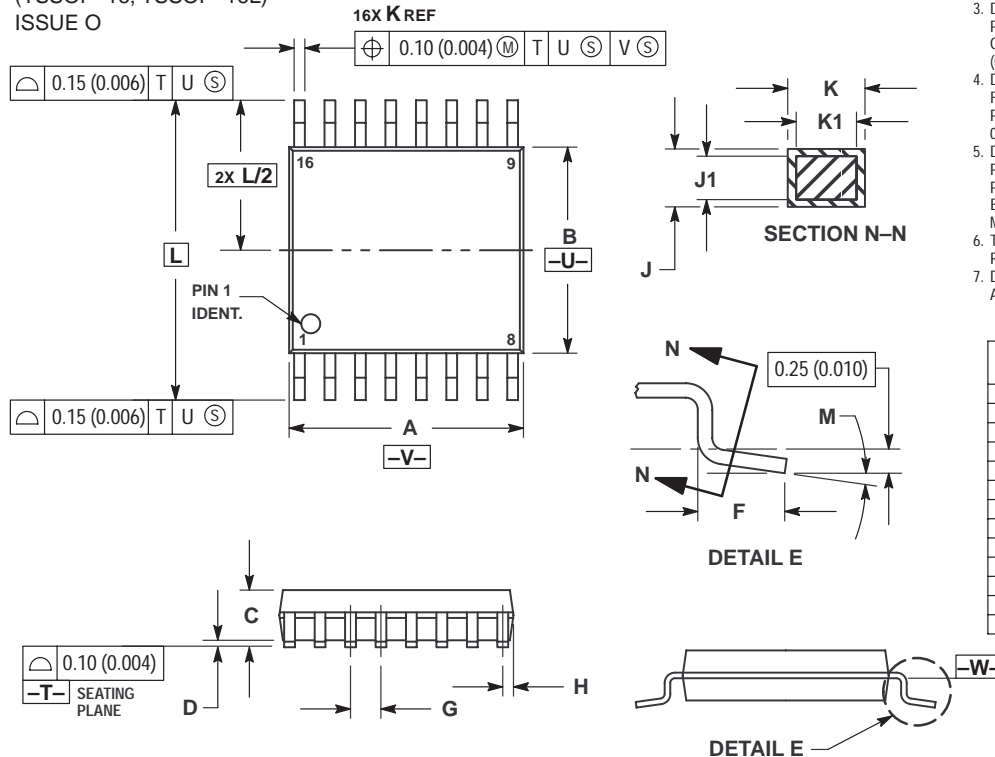
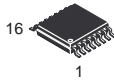
DT, DTB SUFFIX
CASE 948E-02
 Plastic Package
 (TSSOP-20)
 ISSUE A



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
 4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
 5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
 6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
 7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	6.40	6.60	0.252	0.260
B	4.30	4.50	0.169	0.177
C	---	1.20	---	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.27	0.37	0.011	0.015
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC		0.252 BSC	
M	0°	8°	0°	8°

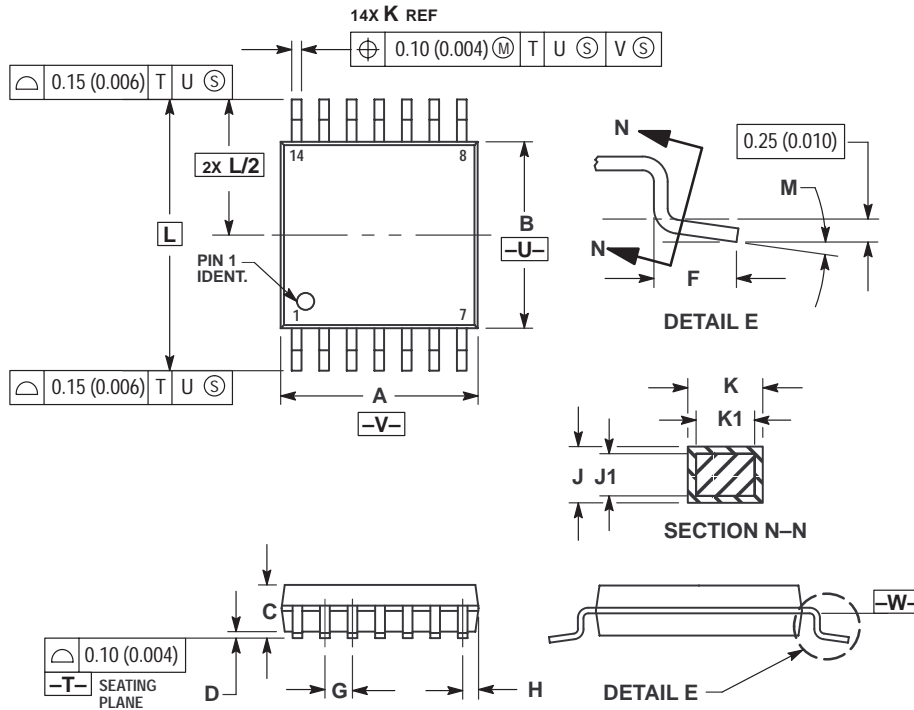
DTB SUFFIX
CASE 948F-01
 Plastic Package
 (TSSOP-16, TSSOP-16L)
 ISSUE O



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
 4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
 5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
 6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
 7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.90	5.10	0.193	0.200
B	4.30	4.50	0.169	0.177
C	---	1.20	---	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.18	0.28	0.007	0.011
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC		0.252 BSC	
M	0°	8°	0°	8°

DTB SUFFIX
CASE 948G-01
 Plastic Package
 (TSSOP-14)
 ISSUE O

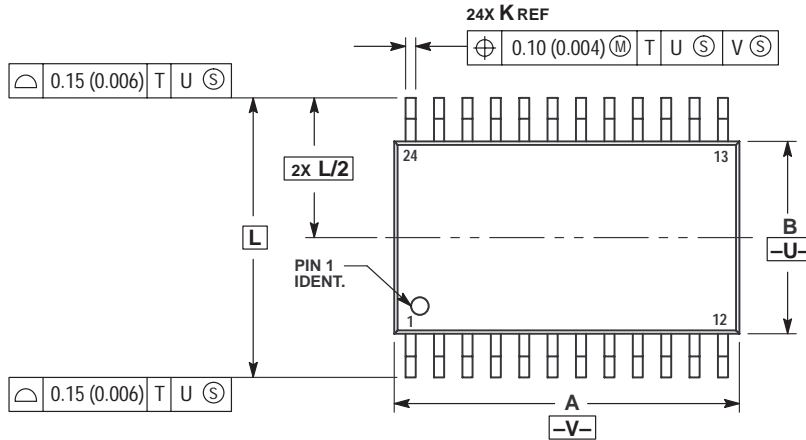
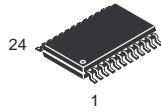


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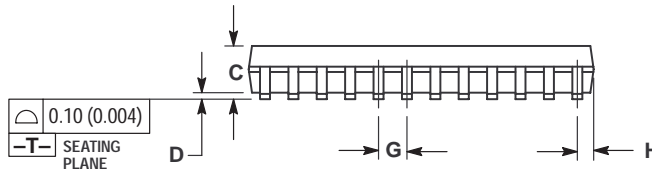
- 1 DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- 2 CONTROLLING DIMENSION: MILLIMETER.
- 3 DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
- 4 DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
- 5 DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
- 6 TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
- 7 DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.90	5.10	0.193	0.200
B	4.30	4.50	0.169	0.177
C	---	1.20	---	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.50	0.60	0.020	0.024
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC		0.252 BSC	
M	0°	8°	0°	8°

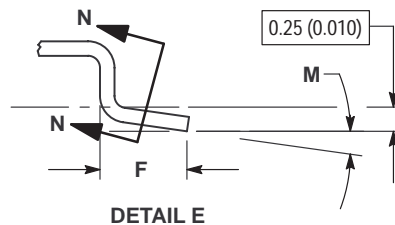
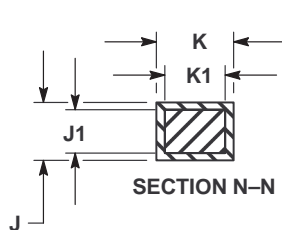
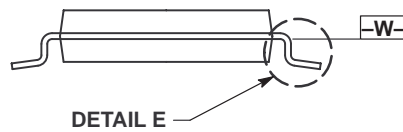
DTB SUFFIX
CASE 948H-01
 Plastic Package
 ISSUE O



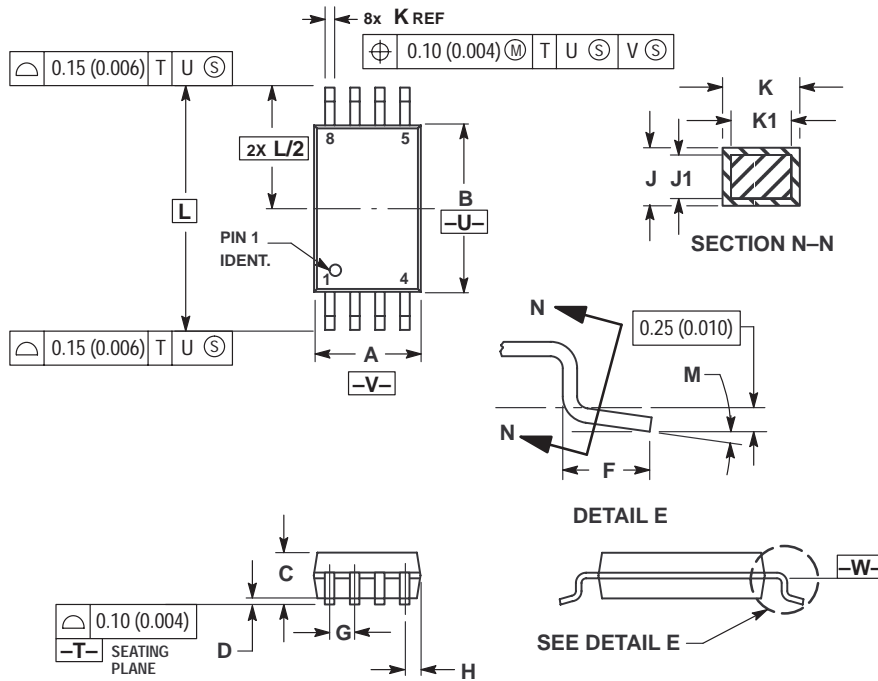
- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
 4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
 5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
 6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
 7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	7.70	7.90	0.303	0.311
B	4.30	4.50	0.169	0.177
C	---	1.20	---	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.27	0.37	0.011	0.015
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC		0.252 BSC	
M	0°	8°	0°	8°



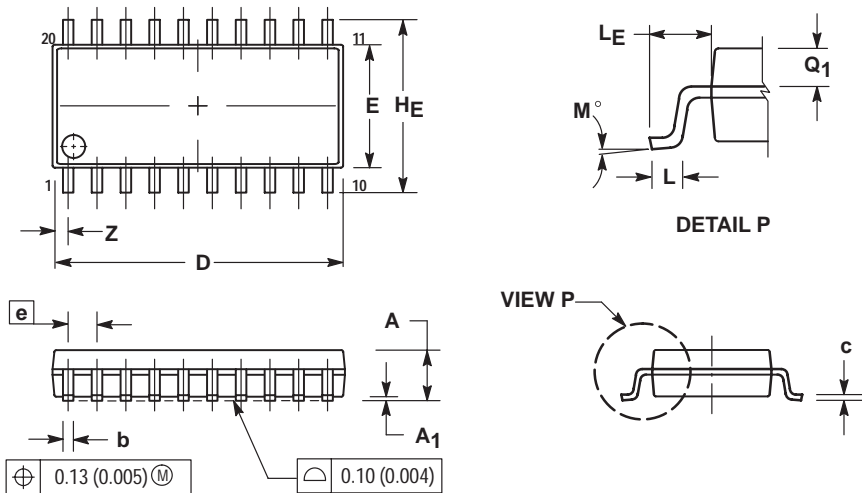
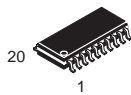
DTB SUFFIX
CASE 948J-01
 Plastic Package
 (TSSOP-8)
 ISSUE O



- NOTES:
- 1 DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 - 2 CONTROLLING DIMENSION: MILLIMETER.
 - 3 DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
 - 4 DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
 - 5 DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
 - 6 TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
 - 7 DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.90	3.10	0.114	0.122
B	4.30	4.50	0.169	0.177
C	---	1.20	---	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.50	0.60	0.020	0.024
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC		0.252 BSC	
M	0°	8°	0°	8°

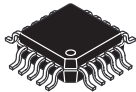
M SUFFIX
CASE 967-01
 Plastic Package
 (EIAJ-20)
 ISSUE O



- NOTES:
- 1 DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 - 2 CONTROLLING DIMENSION: MILLIMETER.
 - 3 DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS AND ARE MEASURED AT THE PARTING LINE. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
 - 4 TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
 - 5 THE LEAD WIDTH DIMENSION (b) DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSIONS AND ADJACENT LEAD TO BE 0.46 (0.018).

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	---	2.05	---	0.081
A ₁	0.05	0.20	0.002	0.008
b	0.35	0.50	0.014	0.020
c	0.18	0.27	0.007	0.011
D	12.35	12.80	0.486	0.504
E	5.10	5.45	0.201	0.215
e	1.27 BSC		0.050 BSC	
H _F	7.40	8.20	0.291	0.323
L	0.50	0.85	0.020	0.033
L _F	1.10	1.50	0.043	0.059
M	0°	10°	0°	10°
Q ₁	0.70	0.90	0.028	0.035
Z	---	0.81	---	0.032

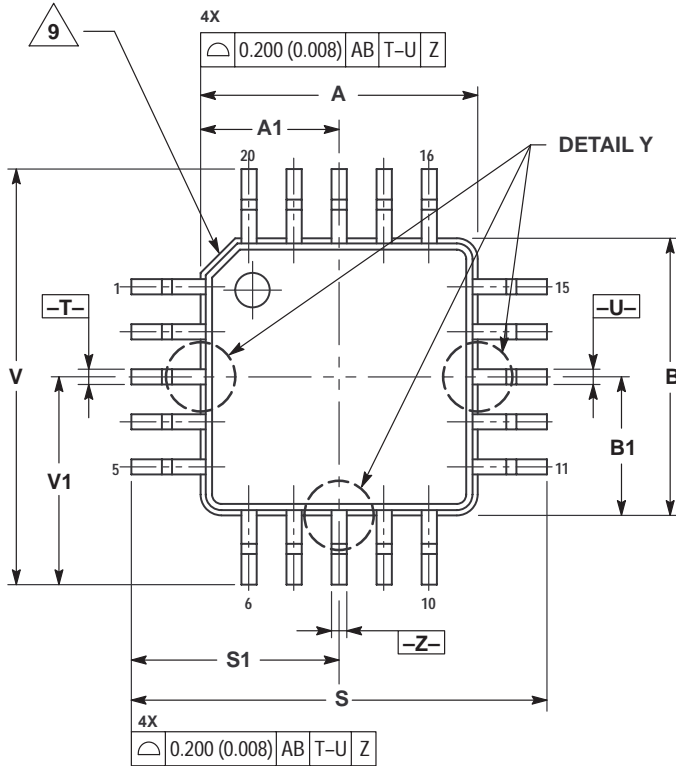
FTB SUFFIX
CASE 976-01
 Plastic Package
 (TQFP-20)
 ISSUE O



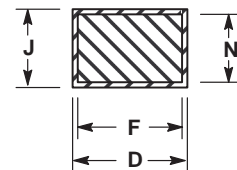
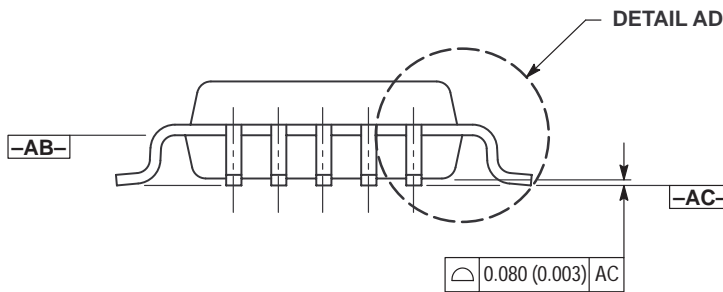
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NOTES:

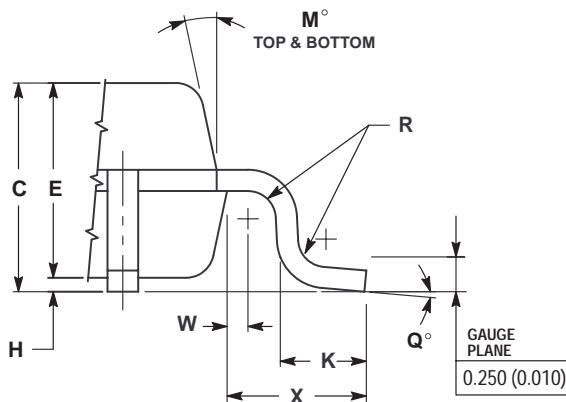
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DATUM PLANE -AB- IS LOCATED AT BOTTOM OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE BOTTOM OF THE PARTING LINE.
4. DATUMS -T-, -U-, AND -Z- TO BE DETERMINED AT DATUM PLANE -AB-.
5. DIMENSIONS S AND V TO BE DETERMINED AT DATUM PLANE -AC-.
6. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.250 (0.010) PER SIDE. DIMENSIONS A AND B DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE -AB-.
7. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. DAMBAR PROTRUSION SHALL NOT CAUSE THE D DIMENSION TO EXCEED 0.350 (0.014).
8. MINIMUM SOLDER PLATE THICKNESS SHALL BE 0.0076 (0.0003).
9. EXACT SHAPE OF EACH CORNER IS OPTIONAL.



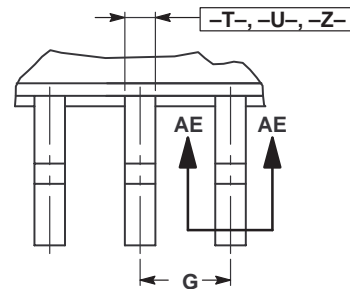
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.000 BSC		0.157 BSC	
A1	2.000 BSC		0.079 BSC	
B	4.000 BSC		0.157 BSC	
B1	2.000 BSC		0.079 BSC	
C	1.400	1.600	0.055	0.063
D	0.170	0.270	0.007	0.011
E	1.350	1.450	0.053	0.057
F	0.170	0.230	0.007	0.009
G	0.650 BSC		0.026 BSC	
H	0.050	0.150	0.002	0.006
J	0.090	0.200	0.004	0.008
K	0.500	0.700	0.020	0.028
M	12° REF		12° REF	
N	0.090	0.160	0.004	0.006
P	0.250 BSC		0.010 BSC	
Q	1°	5°	1°	5°
R	0.150	0.250	0.006	0.010
S	6.000 BSC		0.236 BSC	
S1	3.000 BSC		0.118 BSC	
V	6.000 BSC		0.236 BSC	
V1	3.000 BSC		0.118 BSC	
W	0.200 REF		0.008 REF	
X	1.000 REF		0.039 REF	



SECTION AE-AE

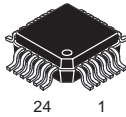


DETAIL AD



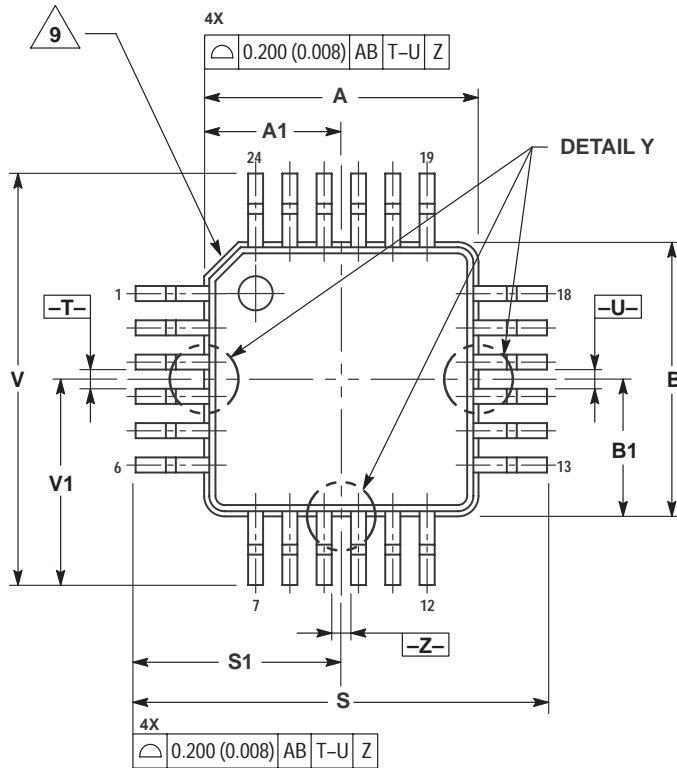
DETAIL Y

FTA SUFFIX
CASE 977-01
Plastic Package
ISSUE O

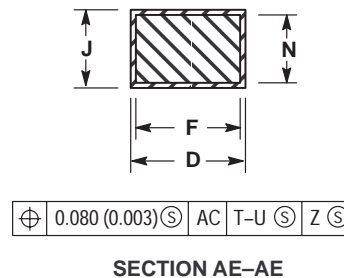
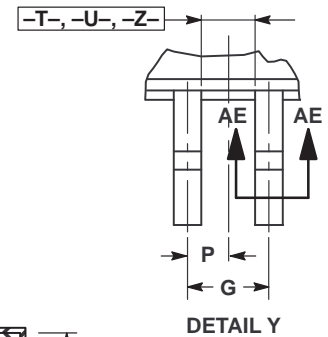
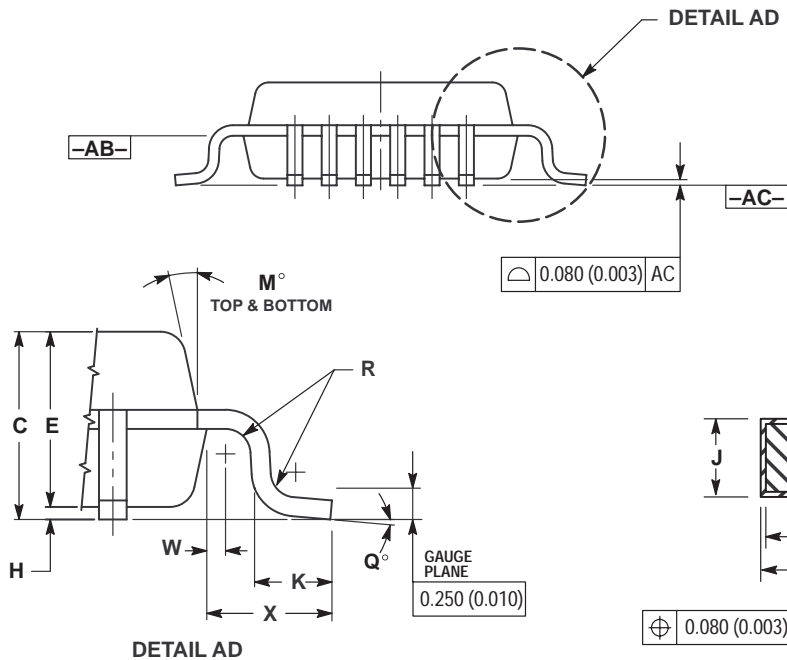


24 1

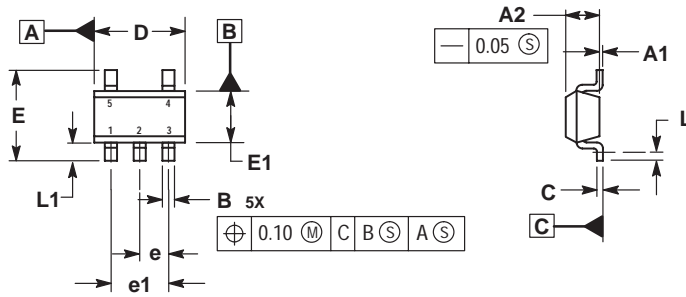
- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DATUM PLANE -AB- IS LOCATED AT BOTTOM OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE BOTTOM OF THE PARTING LINE.
 4. DATUMS -T-, -U-, AND -Z- TO BE DETERMINED AT DATUM PLANE -AB-.
 5. DIMENSIONS S AND V TO BE DETERMINED AT DATUM PLANE -AC-.
 6. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.250 (0.010) PER SIDE. DIMENSIONS A AND B DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE -AB-.
 7. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. DAMBAR PROTRUSION SHALL NOT CAUSE THE D DIMENSION TO EXCEED 0.350 (0.014).
 8. MINIMUM SOLDER PLATE THICKNESS SHALL BE 0.0076 (0.0003).
 9. EXACT SHAPE OF EACH CORNER IS OPTIONAL.



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.000 BSC		0.157 BSC	
A1	2.000 BSC		0.079 BSC	
B	4.000 BSC		0.157 BSC	
B1	2.000 BSC		0.079 BSC	
C	1.400	1.600	0.055	0.063
D	0.170	0.270	0.007	0.011
E	1.350	1.450	0.053	0.057
F	0.170	0.230	0.007	0.009
G	0.500 BSC		0.020 BSC	
H	0.050	0.150	0.002	0.006
J	0.090	0.200	0.004	0.008
K	0.500	0.700	0.020	0.028
M	12° REF		12° REF	
N	0.090	0.160	0.004	0.006
P	0.250 BSC		0.010 BSC	
Q	1°	5°	1°	5°
R	0.150	0.250	0.006	0.010
S	6.000 BSC		0.236 BSC	
S1	3.000 BSC		0.118 BSC	
V	6.000 BSC		0.236 BSC	
V1	3.000 BSC		0.118 BSC	
W	0.200 REF		0.008 REF	
X	1.000 REF		0.039 REF	



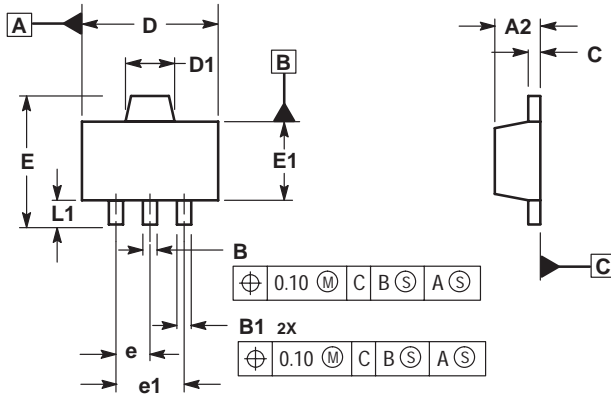
N SUFFIX
CASE 1212-01
 Plastic Package
 (SOT-23)
 ISSUE O



- NOTES:
 1. DIMENSIONS ARE IN MILLIMETERS.
 2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
 3. DATUM C IS A SEATING PLANE.

MILLIMETERS		
DIM	MIN	MAX
A1	0.00	0.10
A2	1.00	1.30
B	0.30	0.50
C	0.10	0.25
D	2.80	3.00
E	2.50	3.10
E1	1.50	1.80
e	0.95 BSC	
e1	1.90 BSC	
L	0.20	----
L1	0.45	0.75

H SUFFIX
CASE 1213-01
 Plastic Package
 (SOT-89)
 ISSUE O



- NOTES:
 1. DIMENSIONS ARE IN MILLIMETERS.
 2. INTERPRET DIMENSIONS AND TOLERANCING PER ASME Y14.5M, 1994.
 3. DATUM C IS A SEATING PLANE.

MILLIMETERS		
DIM	MIN	MAX
A2	1.40	1.60
B	0.37	0.57
B1	0.32	0.52
C	0.30	0.50
D	4.40	4.60
D1	1.50	1.70
E	----	4.25
E1	2.40	2.60
e	1.50 BSC	
e1	3.00 BSC	
L1	0.80	----