

## FEATURES

- Low Supply Current **300 $\mu$ A**
- 0.2 $\mu$ A Supply Current in SHUTDOWN  $\pm 10$ kV
- ESD Protection **0.1 $\mu$ F**
- Operates From a Single 3.3V Supply
- Uses Small Capacitors
- Operates To 120k Baud
- Three-State Outputs are High Impedance When Off
- Output Overvoltage Does Not Force Current Back Into Supplies
- EIA/TIA-562 I/O Lines Can Be Forced to  $\pm 25$ V Without Damage
- Flowthrough Architecture

## APPLICATIONS

- Notebook Computers
- Palmtop Computers

## DESCRIPTION

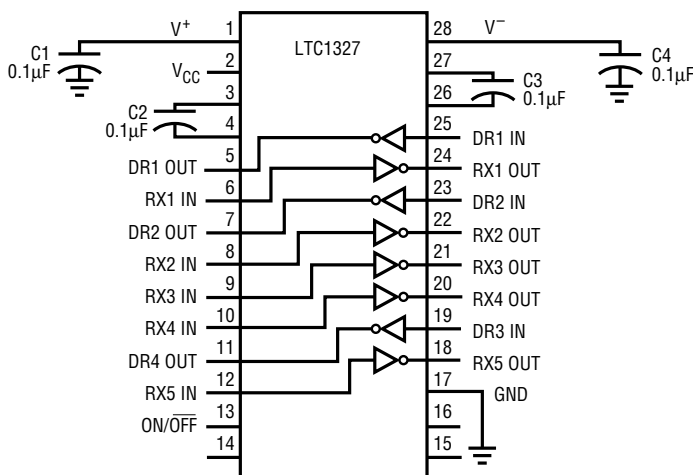
The LTC1327 is an advanced low power, three-driver/five-receiver EIA/TIA-562 transceiver. In the no load condition, the supply current is only **300 $\mu$ A**. The charge pump only requires four 0.1 $\mu$ F capacitors.

In SHUTDOWN mode, the supply current is further reduced to 0.2 $\mu$ A. All EIA/TIA-562 outputs assume a high impedance state in SHUTDOWN and with the power off.

The LTC1327 is fully compliant with all data rate and overvoltage EIA/TIA-562 specifications. The transceiver can operate up to 120k Baud with a 1000pF/3k $\Omega$  load. Both driver outputs and receiver inputs can be forced to  $\pm 25$ V without damage, and can survive multiple  $\pm 10$ kV ESD strikes.

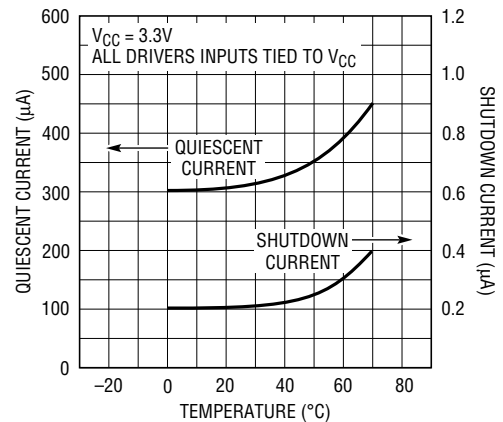
## TYPICAL APPLICATION

3-Drivers/5-Receivers with SHUTDOWN



1327 TA01

Supply Current vs Temperature

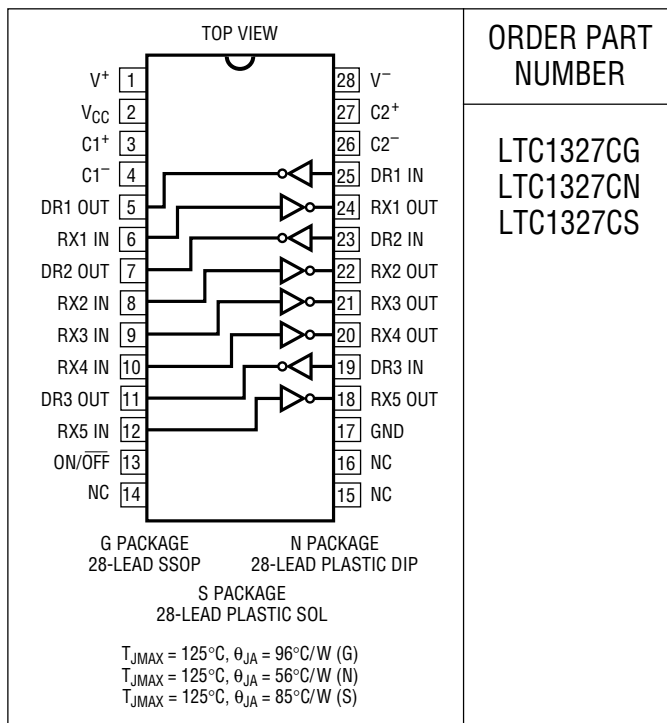


LTC1327 • TA02

## ABSOLUTE MAXIMUM RATINGS

Supply Voltage ( $V_{CC}$ ) .....	5V
Input Voltage	
Driver .....	-0.3V to ( $V_{CC} + 0.3V$ )
Receiver .....	-25V to 25V
On/Off Pin .....	-0.3V to ( $V_{CC} + 0.3V$ )
Output Voltage	
Driver .....	-25V to 25V
Receiver .....	-0.3V to ( $V_{CC} + 0.3V$ )
Short-Circuit Duration	
$V^+$ .....	30 sec
$V^-$ .....	30 sec
Driver Output .....	Indefinite
Receiver Output .....	Indefinite
Operating Temperature Range	
Commercial LTC1327C .....	0°C to 70°C
Storage Temperature Range .....	-65°C to 150°C
Lead Temperature (Soldering, 10 sec).....	300°C

## PACKAGE/ORDER INFORMATION



ORDER PART NUMBER

LTC1327CG  
LTC1327CN  
LTC1327CS

Consult factory for Industrial and Military grade parts.

## DC ELECTRICAL CHARACTERISTICS $V_{CC} = 3.3V, C1$ to $C4 = 0.1\mu F$ , unless otherwise noted.

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
<b>Any Driver</b>					
Output Voltage Swing	Positive Negative (3k to GND)	● ●	3.7 -3.7	4.5 -4.5	V V
Logic Input Voltage Level	Input Low Level ( $V_{OUT} = \text{High}$ ) Input High Level ( $V_{OUT} = \text{Low}$ )	● ●	2	1.4 1.4	0.8 V
Logic Input Current	$V_{IN} = 3.3$ $V_{IN} = 0$	● ●		5 -5	$\mu A$ $\mu A$
Output Short-Circuit Current	$V_{OUT} = 0V$			$\pm 7$	mA
Output Leakage Current	SHUTDOWN (Note 3), $V_{OUT} = \pm 20V$			$\pm 10$ $\pm 500$	$\mu A$
<b>Any Receiver</b>					
Input Voltage Thresholds	Input Low Threshold Input High Threshold	● ●	0.8	1.3 1.7	2.4 V
Hysteresis		●	0.1	0.4	1 V
Input Resistance	$V_{IN} = \pm 10V$		3	5	7 k $\Omega$
Output Voltage	Output Low, $I_{OUT} = -1.6mA$ ( $V_{CC} = 3.3V$ ) Output High, $I_{OUT} = 160\mu A$ ( $V_{CC} = 3.3V$ )	● ●	3	0.2 3.2	0.4 V
Output Short-Circuit Current	Sinking Current, $V_{OUT} = V_{CC}$		-2	-10	mA
Output Leakage Current	SHUTDOWN (Note 3), $0 \leq V_{OUT} \leq V_{CC}$	●		1	10 $\mu A$

**DC ELECTRICAL CHARACTERISTICS**  $V_{CC} = 3.3V$ ,  $C1$  to  $C4 = 0.1\mu F$ , unless otherwise noted.

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
<b>Power Supply Generator</b>					
$V^+$ Output Voltage	$I_{OUT} = 0mA$		5.7		V
	$I_{OUT} = 5mA$		5.5		V
$V^-$ Output Voltage	$I_{OUT} = 0mA$		-5.3		V
	$I_{OUT} = -5mA$		-5.0		V
Supply Rise Time	SHUTDOWN to Turn-On		0.2		ms
<b>Power Supply</b>					
$V_{CC}$ Supply Current	No Load (Note 2)	●	0.3	0.5	mA
Supply Leakage Current ( $V_{CC}$ )	SHUTDOWN (Note 3)	●	0.2	10	$\mu A$
On/Off Threshold Low		●	1.4	0.8	V
On/Off Threshold High		●	2	1.4	V

**AC CHARACTERISTICS**

Slew Rate	$R_L = 3k, C_L = 51pF$		3	6	30	$V/\mu s$
	$R_L = 3k, C_L = 1000pF$			5		$V/\mu s$
Driver Propagation Delay (TTL to EIA/TIA-562)	$t_{HLD}$	●		2	3.5	$\mu s$
	$t_{LHD}$	●		2	3.5	$\mu s$
Receiver Propagation Delay (EIA/TIA-562 to TTL)	$t_{HLR}$	●		0.3	0.8	$\mu s$
	$t_{LHR}$	●		0.2	0.8	$\mu s$

The ● denotes specifications which apply over the operating temperature ( $0^\circ C \leq T_A \leq 70^\circ C$ ).

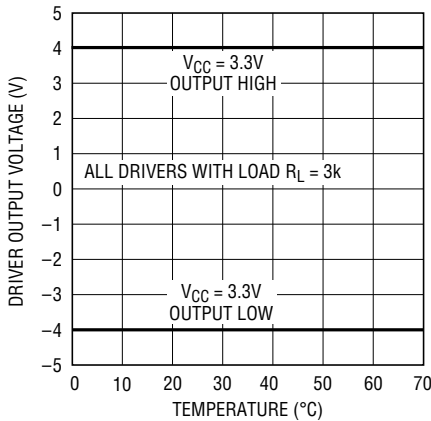
**Note 1:** Absolute Maximum Ratings are those values beyond which the life of the device may be impaired.

**Note 2:** Supply current is measured with driver and receiver output unloaded and driver inputs tied high.

**Note 3:** Supply current measurement in SHUTDOWN mode is performed with  $V_{ON/OFF} = 0V$ .

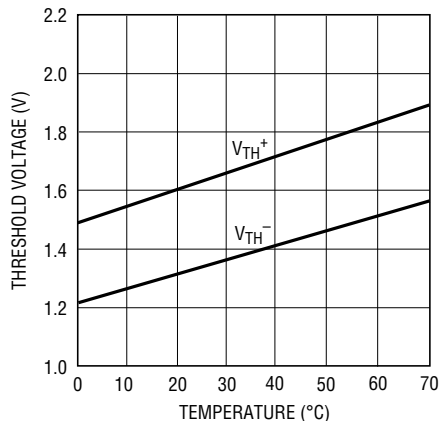
**TYPICAL PERFORMANCE CHARACTERISTICS**

**Driver Output Voltage vs Temperature**



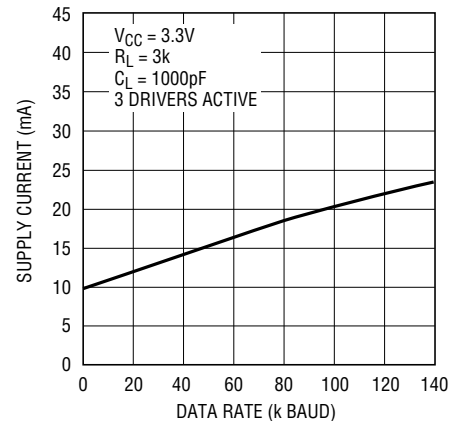
1327 G01

**Receiver Input Thresholds vs Temperature**



1327 G02

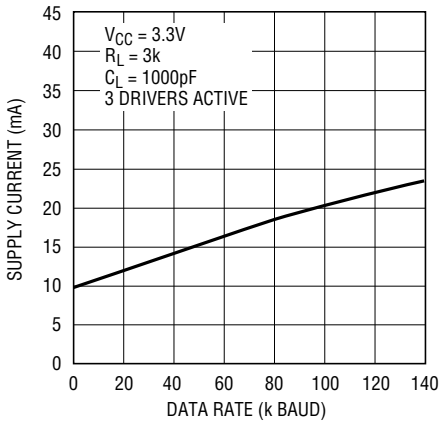
**Supply Current vs Data Rate**



1327 G03

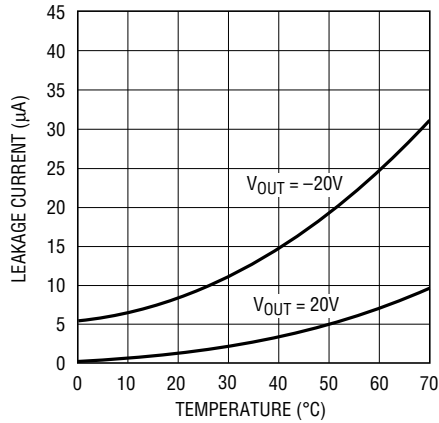
## TYPICAL PERFORMANCE CHARACTERISTICS

V<sub>CC</sub> Supply Current vs Data Rate



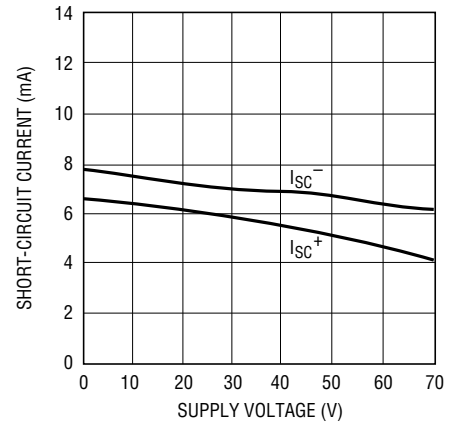
1327 G03

Driver Leakage in SHUTDOWN vs Temperature



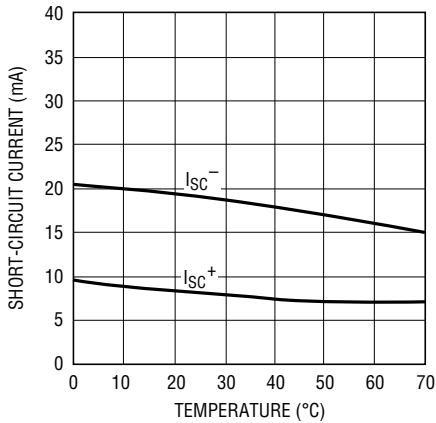
1327 G05

Driver Short-Circuit Current vs Supply Voltage



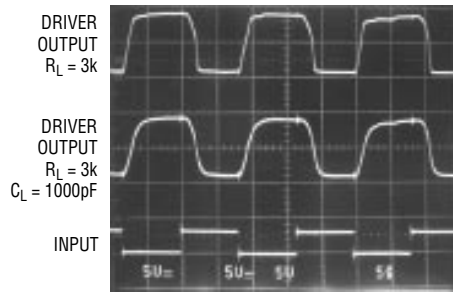
1327 G06

Receiver Short-Circuit Current vs Temperature



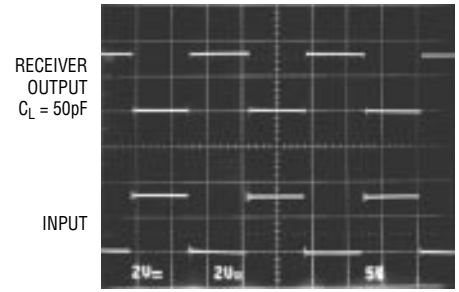
1327 G07

Driver Output Waveform



1327 G08

Receiver Output Waveform



1327 G09

## PIN FUNCTIONS

**V<sub>CC</sub>**: 3.3V Input Supply Pin. Supply current 0.2µA in the SHUTDOWN mode. This pin should be decoupled with a 0.1µF ceramic capacitor.

**GND**: Ground Pin.

**ON/OFF**: TTL/CMOS Compatible Shutdown Pin. A logic low puts the device in SHUTDOWN mode which reduces the supply current to 0.2µA and places all drivers and receivers in high impedance state. This pin cannot float.

**V<sup>+</sup>**: Positive Supply Output (EIA/TIA-562 Drivers). V<sup>+</sup> ≅ 2V<sub>CC</sub> - 1V. This pin requires an external capacitor

C = 0.1µF for charge storage. The capacitor may be tied to ground or 3.3V. With multiple devices, the V<sup>+</sup> and V<sup>-</sup> pins may be paralleled into common capacitors. For large numbers of devices, increasing the size of the shared common storage capacitors is recommended to reduce ripple.

**V<sup>-</sup>**: Negative Supply Output (EIA/TIA-562 Drivers). V<sup>-</sup> ≅ -(2V<sub>CC</sub> - 1.3). This pin requires an external capacitor C = 0.1µF for a charge storage.

## PIN FUNCTIONS

**C1<sup>+</sup>, C1<sup>-</sup>, C2<sup>+</sup>, C2<sup>-</sup>:** Commutating Capacitor Inputs. These pins require two external capacitors  $C = 0.1\mu\text{F}$ . One from C1<sup>+</sup> to C1<sup>-</sup>, and another from C2<sup>+</sup> to C2<sup>-</sup>. To maintain charge pump efficiency, the capacitor's effective series resistance should be less than  $20\Omega$ .

**DR IN:** EIA/TIA-562 Driver Input Pins. Inputs are TTL/CMOS compatible. Inputs should not be allowed to float. Tie unused inputs to  $V_{CC}$ .

**DR OUT:** Driver Outputs at EIA/TIA-562 Voltage Levels. Outputs are in a high impedance state when in SHUT-

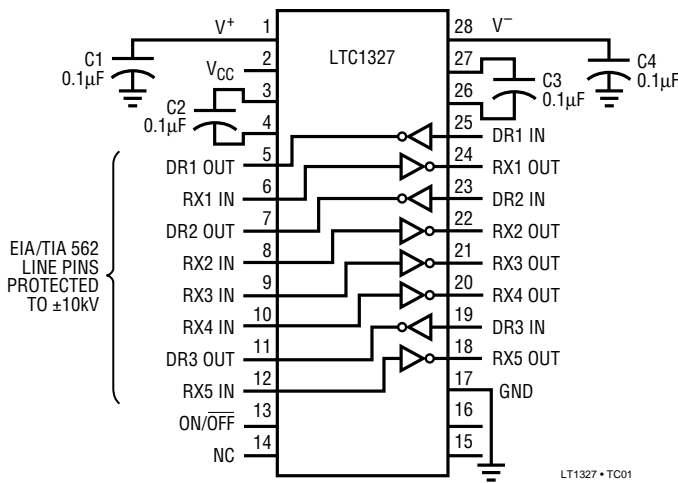
DOWN mode or  $V_{CC} = 0\text{V}$ . The driver outputs are protected against ESD to  $\pm 10\text{kV}$  for human body model discharges.

**RX IN:** Receiver Inputs. These pins can be forced to  $\pm 25\text{V}$  without damage. The receiver inputs are protected against ESD to  $\pm 10\text{kV}$  for human body model discharges. Each receiver provides  $0.4\text{V}$  of hysteresis for noise immunity.

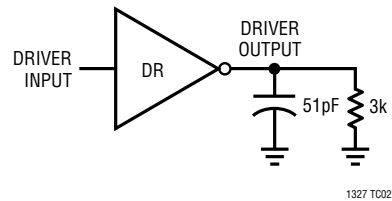
**RX OUT:** Receiver Outputs With TTL/CMOS Voltage Levels. Outputs are in a high impedance state when in SHUT-DOWN mode to allow data line sharing.

## TEST CIRCUITS

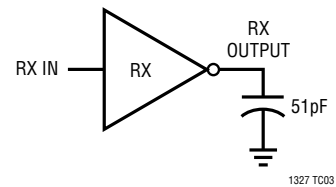
ESD Test Circuit



Driver Timing Test Load

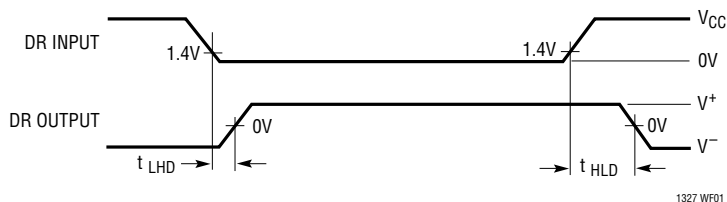


Receiver Timing Test Load

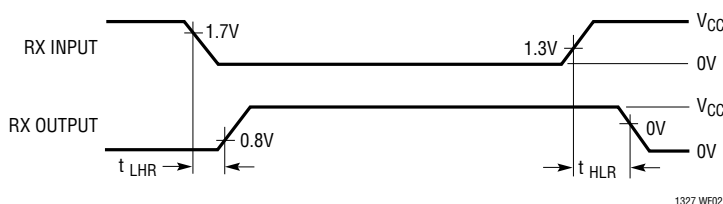


## SWITCHING TIME WAVEFORMS

Driver Propagation Delay Timing



Receiver Propagation Delay Timing



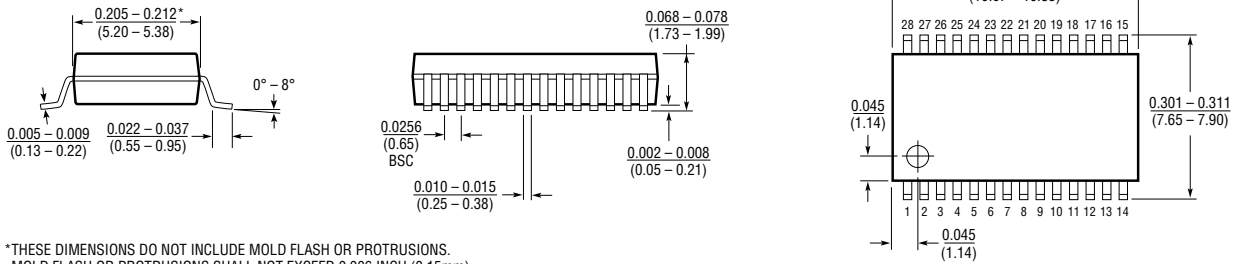
## APPLICATIONS INFORMATION

The LTC1327 is compatible with RS232 parts. This table shows some devices and the receiver input thresholds.

MANUFACTURER	PART NUMBER	COMPATIBLE	INPUT LOW THRESHOLD (V <sub>IL</sub> )			INPUT HIGH THRESHOLD (V <sub>IH</sub> )		
			MIN	TYP	MAX	MIN	TYP	MAX
Linear Technology	LT1080	√	0.8	1.3	–	–	1.7	2.4
	LT1137A	√	0.8	1.3	–	–	1.7	2.4
	LT1330	√	0.8	1.3	–	–	1.7	2.4
	LT1281	√	0.8	1.3	–	–	1.7	2.4
	All Others	√						
Texas Instruments	SN75189	√	0.65	1	1.25	0.9	1.3	1.6
	SN75189A	√	0.65	1	1.25	1.55	1.9	2.25
	MAX232	√	0.8	1.2	–	–	1.7	2.4
	SN75C185	√	0.65	1	1.25	1.6	2.1	2.55
Maxim	MAX232A	√	0.8	1.3	–	–	1.8	2.4
	MAX241	√	0.6	1.2	–	–	1.5	2.4
Sipex	SP232	√	0.8	1.2	–	–	1.7	2.4
	SP301	√	0.75	–	1.35	1.75	2.5	
Motorola	MC1489	√	0.75	–	1.25	1	–	1.5
	MC1489A	√	0.75	0.8	1.25	1.75	1.95	2.25
National	DS1489	√	0.75	1	1.25	1	1.25	1.5
	DS14C89A	√	0.5	–	1.9	1.3	–	2.7

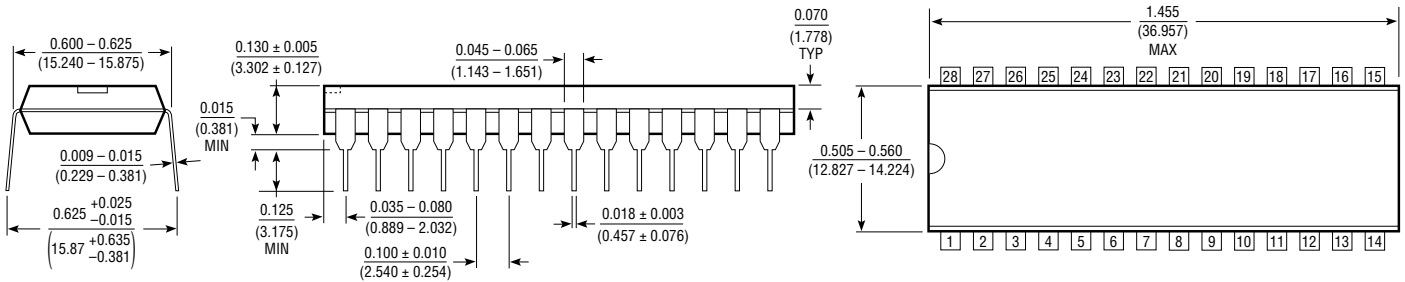
**PACKAGE DESCRIPTION** Dimensions in inches (millimeters) unless otherwise noted.

**G Package  
28-Lead SSOP**

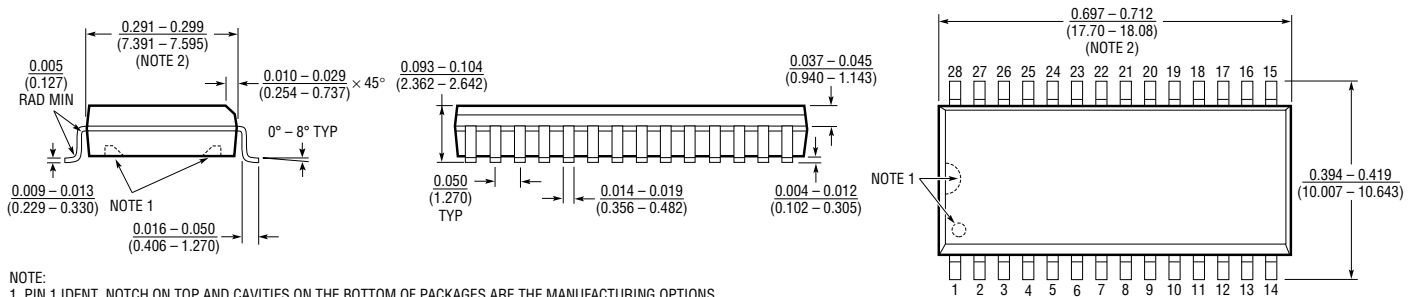


\*THESE DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.  
MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.006 INCH (0.15mm).

**N Package  
28-Lead Plastic DIP**



**S Package  
28-Lead Plastic SOL**



- NOTE:
- PIN 1 IDENT, NOTCH ON TOP AND CAVITIES ON THE BOTTOM OF PACKAGES ARE THE MANUFACTURING OPTIONS. THE PART MAY BE SUPPLIED WITH OR WITHOUT ANY OF THE OPTIONS.
  - THESE DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.006 INCH (0.15mm).

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