Three-Terminal Fixed Positive Voltage Regulators

SiP7805 SiP7808 SiP7810 SiP7815 SiP7824
SiP7806 SiP7809 SiP7812 SiP7818

FEATURES

- Output Current In Excess Of 1.0 A
- No External Components Required
- Internal Thermal Overload Protection
- Internal Short-Circuit Current Limiting
- Output Transistor Safe-Area Compensation
- Output Voltage Offered In 2% Tolerance

MECHANICAL DATA

Case: TO-220AB*, TO-220F* (Isolated)
TO-263AA*

*Lead (Pb)-free packages

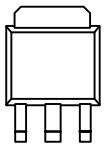
DESCRIPTION

These voltage regulators are monolithic integrated circuits designed as fixed-voltage regulators for a wide variety of applications including local, on-card regulation. These regulators employ internal current limiting, thermal shutdown, and safe-area protection. With adequate heatsinking the SiP78xx can deliver output currents in excess of 1.5 A.

Although designed primarily as a fixed voltage regulator, these devices can be used with external components to obtain adjustable voltages with currents.

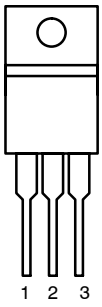
PACKAGING AND PIN DEFINITION

TO-263AA (D^2Pak)



1 2 3
Top View

TO-220AB/TO-220F (Isolated)



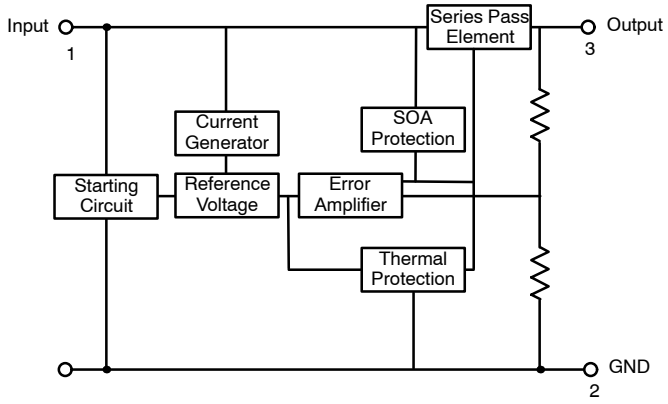
1 2 3
Top View

Pin Definition

1.. V_{IN}
2. GND
3. V_{OUT}

(Heatsink/tab connected to pin 2)

INTERNAL BLOCK DIAGRAM



ORDERING INFORMATION TO-220AB AND TO-220F (ISOLATED)

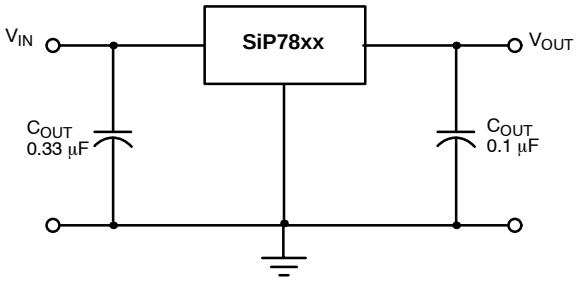
Part Number	Package	Packing Method
SiP7805BA—E3	TO-220AB	Tube 50 Pieces/Tube
SiP7806BA—E3		
SiP7808BA—E3		
SiP7809BA—E3		
SiP7810BA—E3		
SiP7812BA—E3		
SiP7815BA—E3		
SiP7818BA—E3		
SiP7824BA—E3		
SiP7805CF—E3	TO-220F (Isloated)	
SiP7806CF—E3		
SiP7808CF—E3		
SiP7809CF—E3		
SiP7810CF—E3		
SiP7812CF—E3		
SiP7815CF—E3		
SiP7818CF—E3		
SiP7824CF—E3		

ORDERING INFORMATION TO-263 D^2PAK

Part Number	Package	Packing Method
SiP7805BB-T8—E3	TO-263 D^2PAK	Tape/Reel 800 Pieces/Reel
SiP7806BB-T8—E3		
SiP7808BB-T8—E3		
SiP7809BB-T8—E3		
SiP7810BB-T8—E3		
SiP7812BB-T8—E3		
SiP7815BB-T8—E3		
SiP7818BB-T8—E3		
SiP7824BB-T8—E3		

—E3 designates lead free package

STANDARD APPLICATION



NOTE:
c. A common ground is required between the input and the output voltages.
d. The input voltage must remain typically 2.0 V above the output voltage even during the low point on the input ripple voltage.
e. xx = these two digits of the part number indicate output voltage.
f. C_{IN} is required if regulator is located an appreciable distance from the power supply filter.
g. C_{OUT} is not needed for stability, however it does improve transient response.

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C UNLESS OTHERWISE NOTED)

Parameter	Symbol	Limit	Unit
Input Voltage	V_{IN}	30[a]	V
		40[b]	
Operating Temperature Range	T_A	–20 to 85	°C
Storage Temperature Range	T_{stg}	–65 to 150	

Notes
a. SiP7805 through SiP7818
b. SiP7824 only

THERMAL RESISTANCE RATINGS

Parameter	Package	Symbol	Limit	Unit
Junction-to-Case	TO-220AB	R_{thJC}	5	°C/W
	TO-220F		15	
	TO-263		5	

SPECIFICATIONS							SiP7805
Parameter	Symbol	Test Conditions Unless Specified V_{IN} = 10 V, I_{OUT} = 500 mA, C_{IN} = 0.33 µF, C_{OUT} = 0.1 µF 0°C ≤ T_J ≤125°C		Limits Min	Typ	Max	Unit
Output Voltage	V_{OUT}	T_J = 25°C		4.90	5.0	5.10	V
		7.0 V ≤ V_{IN} ≤ 20 V, 5 mA ≤ I_{OUT} ≤ 1.0 A, P_D ≤ 15 W		4.85		5.15	
Line Regulation	ΔREG_{line}	T_J = 25°C	7.0 V ≤ V_{IN} < 25 V		3	100	mV
			8.0 V ≤ V_{IN} < 13 V		1	50	
Load Regulation	ΔREG_{load}		5 mA ≤ I_{OUT} < 1.0 A		15	100	
			250 mA ≤ I_{OUT} < 750 mA		5	50	
Quiescent Current	I_Q	I_{OUT} = 0, T_J = 25°C			4.2	8	mA
Quiescent Current Change	ΔI_Q	7.0 V ≤ V_{IN} ≤ 25 V				1.3	
		5 mA ≤ I_{OUT} ≤ 1.0 A				0.5	
Output Noise Voltage	V_N	10 Hz ≤ f ≤ 100 kHz, T_J = 25°C			40		µV
Ripple Rejection	RR	f = 120 Hz		62	78		dB
Dropout Voltage	V_{DROP}	I_{OUT} = 1.0 A, T_J = 25°C			2		V
Output Resistance	R_{OUT}	f = 1 kHz			17		mΩ
Output Short Circuit	I_{OS}	T_J = 25°C			750		mA
Peak Output	$I_{OUT(peak)}$				1.5		A
Temperature Coefficient	$\Delta V_{OUT}/\Delta T_J$	I_{OUT} = 5 mA, 0°C ≤ T_J ≤ 125°C			–0.6		mV/°C

SPECIFICATIONS							SiP7806
Parameter	Symbol	Test Conditions Unless Specified V_{IN} = 11 V, I_{OUT} = 500 mA, C_{IN} = 0.33 µF, C_{OUT} = 0.1 µF 0°C ≤ T_J ≤125°C		Limits Min	Typ	Max	Unit
Output Voltage	V_{OUT}	T_J = 25°C		5.88	6.0	6.12	V
		8.0 V ≤ V_{IN} ≤ 21 V, 5 mA ≤ I_{OUT} ≤ 1.0 A, P_D ≤ 15 W		5.82		6.18	
Line Regulation	ΔREG_{line}	T_J = 25°C	8.0 V ≤ V_{IN} < 25 V		5	120	mV
			9.0 V ≤ V_{IN} < 13 V		1.5	60	
Load Regulation	ΔREG_{load}		5 mA ≤ I_{OUT} < 1.0 A		14	120	
			250 mA ≤ I_{OUT} < 750 mA		4	60	
Quiescent Current	I_Q	I_{OUT} = 0, T_J = 25°C			4.3	8.0	mA
Quiescent Current Change	ΔI_Q	8.0 V ≤ V_{IN} ≤ 25 V				1.3	
		5 mA ≤ I_{OUT} ≤ 1.0 A				0.5	
Output Noise Voltage	V_N	10 Hz ≤ f ≤ 100 kHz, T_J = 25°C			45		µV
Ripple Rejection	RR	f = 120 Hz, 9 V ≤ V_{IN} ≤ 19 V		59	75		dB
Dropout Voltage	V_{DROP}	I_{OUT} = 1.0 A, T_J = 25°C			2		V
Output Resistance	R_{OUT}	f = 1 kHz			19		mΩ
Output Short Circuit	I_{OS}	T_J = 25°C			550		mA
Peak Output	$I_{OUT(peak)}$				1.5		A
Temperature Coefficient	$\Delta V_{OUT}/\Delta T_J$	I_{OUT} = 5 mA, 0°C ≤ T_J ≤ 125°C			–0.7		mV/°C

SPECIFICATIONS							SiP7808
Parameter	Symbol	Test Conditions Unless Specified V_{IN} = 14 V, I_{OUT} = 500 mA, C_{IN} = 0.33 µF, C_{OUT} = 0.1 µF 0°C ≤ T_J ≤125°C		Limits Min	Typ	Max	Unit
Output Voltage	V_{OUT}	T_J = 25°C		7.84	8.0	8.16	V
		10.5 V ≤ V_{IN} ≤ 23 V, 5 mA ≤ I_{OUT} ≤ 1.0 A, P_D ≤ 15 W		7.76		8.24	
Line Regulation	ΔREG_{line}	T_J = 25°C	10.5 V ≤ V_{IN} < 25 V		6	160	mV
			11.0 V ≤ V_{IN} < 15 V		2	80	
Load Regulation	ΔREG_{load}		5 mA ≤ I_{OUT} < 1.0 A		12	160	
			250 mA ≤ I_{OUT} < 750 mA		4	80	
Quiescent Current	I_Q	I_{OUT} = 0, T_J = 25°C			4.3	8.0	mA
Quiescent Current Change	ΔI_Q	10.5 V ≤ V_{IN} ≤ 25 V				1	
		5 mA ≤ I_{OUT} ≤ 1.0 A				0.5	
Output Noise Voltage	V_N	10 Hz ≤ f ≤ 100 kHz, T_J = 25°C			52		µV
Ripple Rejection	RR	f = 120 Hz		56	72		dB
Dropout Voltage	V_{DROP}	I_{OUT} = 1.0 A, T_J = 25°C			2		V
Output Resistance	R_{OUT}	f = 1 kHz			16		mΩ
Output Short Circuit	I_{OS}	T_J = 25°C			450		mA
Peak Output	$I_{OUT(peak)}$				1.5		A
Temperature Coefficient	$\Delta V_{OUT}/\Delta T_J$	I_{OUT} = 5 mA, 0°C ≤ T_J ≤ 125°C			–0.8		mV/°C

SPECIFICATIONS							SiP7809
Parameter	Symbol	Test Conditions Unless Specified V_{IN} = 15 V, I_{OUT} = 500 mA, C_{IN} = 0.33 µF, C_{OUT} = 0.1 µF 0°C ≤ T_J ≤125°C		Limits Min	Typ	Max	Unit
Output Voltage	V_{OUT}	T_J = 25°C		8.82	9	9.18	V
		11.5 V ≤ V_{IN} ≤ 24 V, 5 mA ≤ I_{OUT} ≤ 1.0 A, P_D ≤ 15 W		8.73		9.27	
Line Regulation	ΔREG_{line}	T_J = 25°C	11.5 V ≤ V_{IN} < 27 V		6	180	mV
			12.0 V ≤ V_{IN} < 16 V		2	90	
Load Regulation	ΔREG_{load}		5 mA ≤ I_{OUT} < 1.0 A		12	180	
			250 mA ≤ I_{OUT} < 750 mA		4	90	
Quiescent Current	I_Q	I_{OUT} = 0, T_J = 25°C			4.3	8	mA
Quiescent Current Change	ΔI_Q	11.5 V ≤ V_{IN} ≤ 27 V				1	
		5 mA ≤ I_{OUT} ≤ 1.0 A				0.5	
Output Noise Voltage	V_N	10 Hz ≤ f ≤ 100 kHz, T_J = 25°C			52		µV
Ripple Rejection	RR	f = 120 Hz, 12 V ≤ V_{IN} ≤ 22 V		55	72		dB
Dropout Voltage	V_{DROP}	I_{OUT} = 1.0 A, T_J = 25°C			2		V
Output Resistance	R_{OUT}	f = 1 kHz			16		mΩ
Output Short Circuit	I_{OS}	T_J = 25°C			450		mA
Peak Output	$I_{OUT(peak)}$				1.5		A
Temperature Coefficient	$\Delta V_{OUT}/\Delta T_J$	I_{OUT} = 5 mA, 0°C ≤ T_J ≤ 125°C			–1		mV/°C

SPECIFICATIONS							SiP7810
Parameter	Symbol	Test Conditions Unless Specified V_{IN} = 16 V, I_{OUT} = 500 mA, C_{IN} = 0.33 µF, C_{OUT} = 0.1 µF 0°C ≤ T_J ≤125°C		Limits Min	Typ	Max	Unit
Output Voltage	V_{OUT}	T_J = 25°C		9.80	10	10.20	V
		12.5 V ≤ V_{IN} ≤ 25 V, 5 mA ≤ I_{OUT} ≤ 1.0 A, P_D ≤ 15 W		9.70		10.30	
Line Regulation	ΔREG_{line}	T_J = 25°C	12.5 V ≤ V_{IN} < 28 V		10	200	mV
			13.0 V ≤ V_{IN} < 17 V		3	100	
Load Regulation	ΔREG_{load}		10 mA ≤ I_{OUT} < 1.0 A		12	200	
			250 mA ≤ I_{OUT} < 750 mA		4	100	
Quiescent Current	I_Q	I_{OUT} = 0, T_J = 25°C			4.3	8	mA
Quiescent Current Change	ΔI_Q	12.5 V ≤ V_{IN} ≤ 28 V				1	
		5 mA ≤ I_{OUT} ≤ 1.0 A				0.5	
Output Noise Voltage	V_N	10 Hz ≤ f ≤ 100 kHz, T_J = 25°C			70		µV
Ripple Rejection	RR	f = 120 Hz, 13 V ≤ V_{IN} ≤ 23 V		54	71		dB
Dropout Voltage	V_{DROP}	I_{OUT} = 1.0 A, T_J = 25°C			2		V
Output Resistance	R_{OUT}	f = 1 kHz			18		mΩ
Output Short Circuit	I_{OS}	T_J = 25°C			400		mA
Peak Output	$I_{OUT(peak)}$				1.5		A
Temperature Coefficient	$\Delta V_{OUT}/\Delta T_J$	I_{OUT} = 5 mA, 0°C ≤ T_J ≤ 125°C			–1		mV/°C

SPECIFICATIONS							SiP7812
Parameter	Symbol	Test Conditions Unless Specified V_{IN} = 19 V, I_{OUT} = 500 mA, C_{IN} = 0.33 µF, C_{OUT} = 0.1 µF 0°C ≤ T_J ≤125°C		Limits Min	Typ	Max	Unit
Output Voltage	V_{OUT}	T_J = 25°C		11.76	12.0	12.24	V
		14.5 V ≤ V_{IN} ≤ 27 V, 5 mA ≤ I_{OUT} ≤ 1.0 A, P_D ≤ 15 W		11.64		12.36	
Line Regulation	ΔREG_{line}	T_J = 25°C	14.0 V ≤ V_{IN} < 30 V		10	240	mV
			15.0 V ≤ V_{IN} < 19 V		3	120	
Load Regulation	ΔREG_{load}		10 mA ≤ I_{OUT} < 1.0 A		12	240	
			250 mA ≤ I_{OUT} < 750 mA		4	120	
Quiescent Current	I_Q	I_{OUT} = 0, T_J = 25°C			4.3	8	mA
Quiescent Current Change	ΔI_Q	14.5 V ≤ V_{IN} ≤ 30 V				1	
		5 mA ≤ I_{OUT} ≤ 1.0 A				0.5	
Output Noise Voltage	V_N	10 Hz ≤ f ≤ 100 kHz, T_J = 25°C			75		µV
Ripple Rejection	RR	f = 120 Hz, 15 V ≤ V_{IN} ≤ 25 V		55	71		dB
Dropout Voltage	V_{DROP}	I_{OUT} = 1.0 A, T_J = 25°C			2		V
Output Resistance	R_{OUT}	f = 1 kHz			18		mΩ
Output Short Circuit	I_{OS}	T_J = 25°C			350		mA
Peak Output	$I_{OUT(peak)}$				1.5		A
Temperature Coefficient	$\Delta V_{OUT}/\Delta T_J$	I_{OUT} = 5 mA, 0°C ≤ T_J ≤ 125°C			–1		mV/°C

SPECIFICATIONS							SiP7815
Parameter	Symbol	Test Conditions Unless Specified V_{IN} = 23 V, I_{OUT} = 500 mA, C_{IN} = 0.33 µF, C_{OUT} = 0.1 µF 0°C ≤ T_J ≤125°C		Limits Min	Typ	Max	Unit
Output Voltage	V_{OUT}	T_J = 25°C		14.7	15.0	15.3	V
		17.5 V ≤ V_{IN} ≤ 30 V, 5 mA ≤ I_{OUT} ≤ 1.0 A, P_D ≤ 15 W		14.55		15.45	
Line Regulation	ΔREG_{line}	T_J = 25°C	17.5 V ≤ V_{IN} < 30 V		11	300	mV
			13.0 V ≤ V_{IN} < 17 V		3	150	
Load Regulation	ΔREG_{load}		10 mA ≤ I_{OUT} < 1.0 A		12	300	
			250 mA ≤ I_{OUT} < 750 mA		4	150	
Quiescent Current	I_Q	I_{OUT} = 0, T_J = 25°C			4.4	8	mA
Quiescent Current Change	ΔI_Q	17.5 V ≤ V_{IN} ≤ 30 V				1	
		5 mA ≤ I_{OUT} ≤ 1.0 A				0.5	
Output Noise Voltage	V_N	10 Hz ≤ f ≤ 100 kHz, T_J = 25°C			90		µV
Ripple Rejection	RR	f = 120 Hz, 18 V ≤ V_{IN} ≤ 28 V		54	70		dB
Dropout Voltage	V_{DROP}	I_{OUT} = 1.0 A, T_J = 25°C			2		V
Output Resistance	R_{OUT}	f = 1 kHz			19		mΩ
Output Short Circuit	I_{OS}	T_J = 25°C			230		mA
Peak Output	$I_{OUT(peak)}$				1.5		A
Temperature Coefficient	$\Delta V_{OUT}/\Delta T_J$	I_{OUT} = 5 mA, 0°C ≤ T_J ≤ 125°C			–1		mV/°C

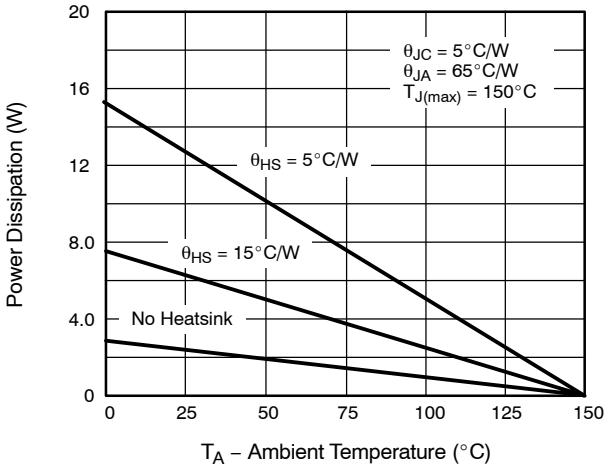
SPECIFICATIONS							SiP7818
Parameter	Symbol	Test Conditions Unless Specified V_{IN} = 27 V, I_{OUT} = 500 mA, C_{IN} = 0.33 µF, C_{OUT} = 0.1 µF 0°C ≤ T_J ≤125°C		Limits Min	Typ	Max	Unit
Output Voltage	V_{OUT}	T_J = 25°C		17.64	18.0	18.36	V
		21 V ≤ V_{IN} ≤ 33 V, 5 mA ≤ I_{OUT} ≤ 1.0 A, P_D ≤ 15 W		17.46		18.54	
Line Regulation	ΔREG_{line}	T_J = 25°C	21.0 V ≤ V_{IN} < 33 V		15	360	mV
			22.0 V ≤ V_{IN} < 26 V		5	180	
Load Regulation	ΔREG_{load}		10 mA ≤ I_{OUT} < 1.0 A		12	360	
			250 mA ≤ I_{OUT} < 750 mA		4	180	
Quiescent Current	I_Q	I_{OUT} = 0, T_J = 25°C			4.5	8	mA
Quiescent Current Change	ΔI_Q	21.0 V ≤ V_{IN} ≤ 33 V				1	
		5 mA ≤ I_{OUT} ≤ 1.0 A				0.5	
Output Noise Voltage	V_N	10 Hz ≤ f ≤ 100 kHz, T_J = 25°C			110		µV
Ripple Rejection	RR	f = 120 Hz, 21 V ≤ V_{IN} ≤ 31 V		53	69		dB
Dropout Voltage	V_{DROP}	I_{OUT} = 1.0 A, T_J = 25°C			2		V
Output Resistance	R_{OUT}	f = 1 kHz			22		mΩ
Output Short Circuit	I_{OS}	T_J = 25°C			200		mA
Peak Output	$I_{OUT(peak)}$				1.5		A
Temperature Coefficient	$\Delta V_{OUT}/\Delta T_J$	I_{OUT} = 5 mA, 0°C ≤ T_J ≤ 125°C			–1		mV/°C

SPECIFICATIONS — SiP7824

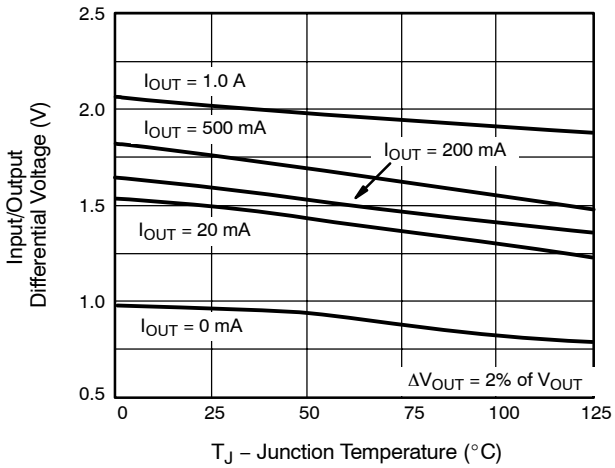
Parameter	Symbol	Test Conditions Unless Specified V_{IN} = 33 V, I_{OUT} = 500 mA, C_{IN} = 0.33 µF, C_{OUT} = 0.1 µF 0°C ≤ T_J ≤125°C		Limits Min	Limits Typ	Limits Max	Unit
Output Voltage	V_{OUT}	T_J = 25°C		23.52	24.0	24.48	V
		26.0 V ≤ V_{IN} ≤ 38 V, 5 mA ≤ I_{OUT} ≤ 1.0 A, P_D ≤ 15 W		23.28		24.72	
Line Regulation	ΔREG_{line}	T_J = 25°C	26.0 V ≤ V_{IN} < 38 V		18	480	mV
			27.0 V ≤ V_{IN} < 32 V		6	240	
Load Regulation	ΔREG_{load}		10 mA ≤ I_{OUT} < 1.0 A		12	480	
			250 mA ≤ I_{OUT} < 750 mA		4	240	
Quiescent Current	I_Q	I_{OUT} = 0, T_J = 25°C			4.6	8	mA
Quiescent Current Change	ΔI_Q	26.0 V ≤ V_{IN} ≤ 38 V				1	
		5 mA ≤ I_{OUT} ≤ 1.0 A				0.5	
Output Noise Voltage	V_N	10 Hz ≤ f ≤ 100 kHz, T_J = 25°C			170		µV
Ripple Rejection	RR	f = 120 Hz, 26 V ≤ V_{IN} ≤ 36 V		55	66		dB
Dropout Voltage	V_{DROP}	I_{OUT} = 1.0 A, T_J = 25°C			2		V
Output Resistance	R_{OUT}	f = 1 kHz			28		mΩ
Output Short Circuit	I_{OS}	T_J = 25°C			150		mA
Peak Output	$I_{OUT(peak)}$				1.5		A
Temperature Coefficient	$\Delta V_{OUT}/\Delta T_J$	I_{OUT} = 5 mA, 0°C ≤ T_J ≤ 125°C			–1.5		mV/°C

TYPICAL CHARACTERISTICS (T_A = 25°C Unless Otherwise Noted)

Power Dissipation vs. Ambient Temperature—TO-220AB

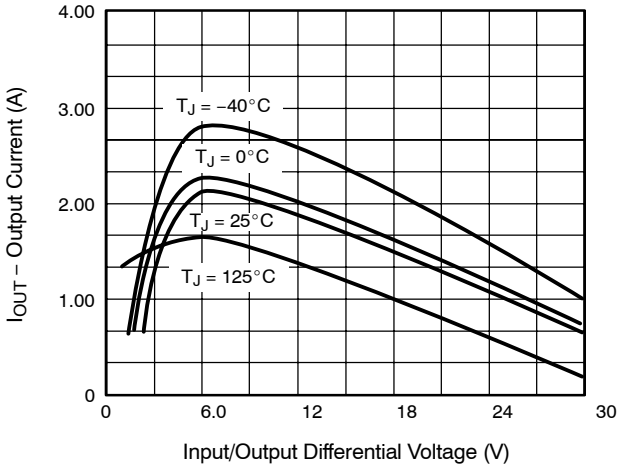


Dropout Voltage vs. Junction Temperature

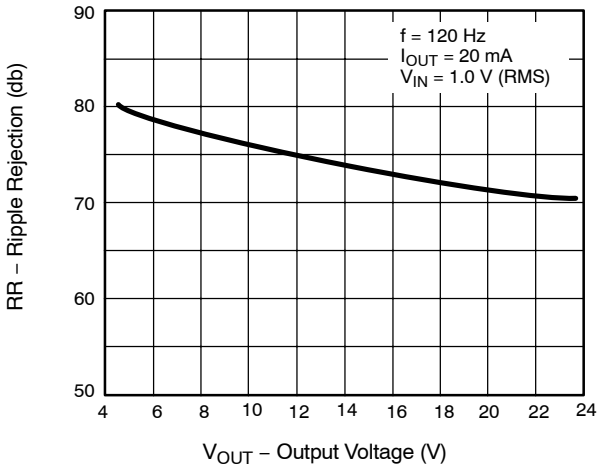


TYPICAL CHARACTERISTICS (T_A = 25°C Unless Otherwise Noted)

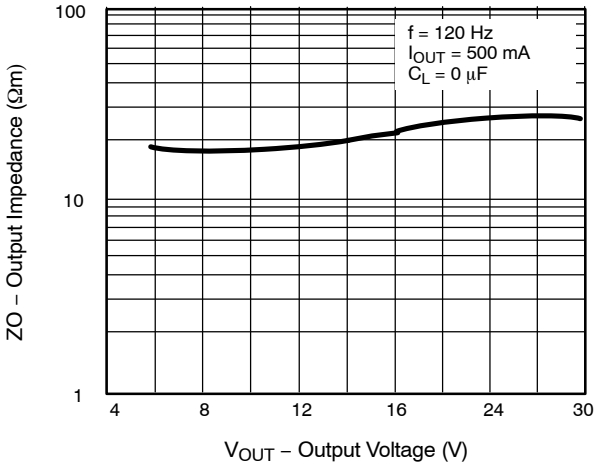
Peak Output Current



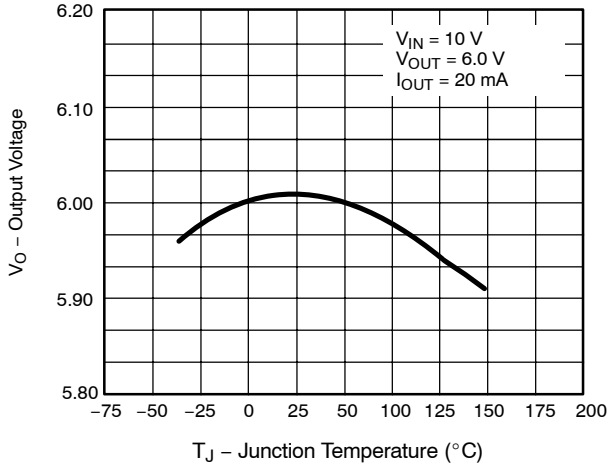
Ripple Rejection Ratio vs. Output Voltage



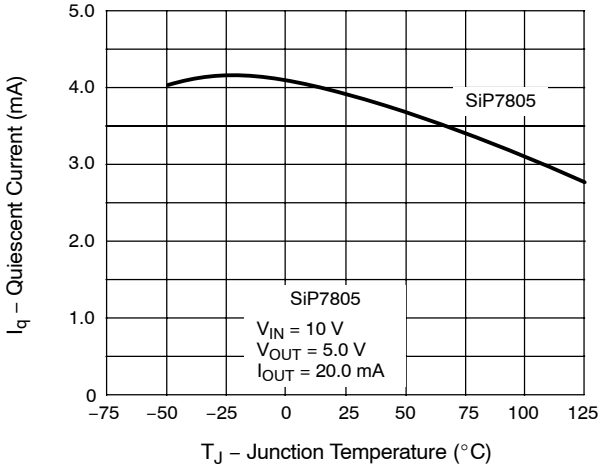
Output Impedance (mΩ) vs. Output Voltage



Output Voltage vs. Junction Temperature



Quiescent Current vs. Junction Temperature



Output Voltage vs. Input Voltage