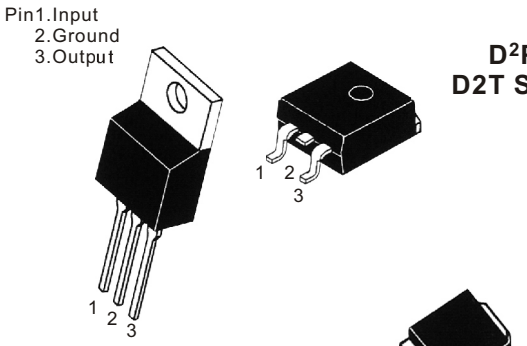
LM7800Series-Terminal Low Current Positive Voltage Regulators

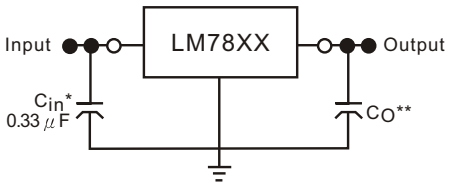
These voltage regulators are monolithic integrated circuits designed as fixed-voltage regulators for a wide variety of applications including local, on-card regulation. These regulators employ internal current limiting, thermal shutdown, and safe-area compensation. With adequate heatsinking they can deliver output currents in excess of 1.0A. Although designed primarily as a fixed voltage regulator, these devices can be used with external components to obtain adjustable voltages and currents.



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% and 4% Tolerance.
- Available in Surface Mount D^2PAK and Standard 3-Lead Transistor Packages.

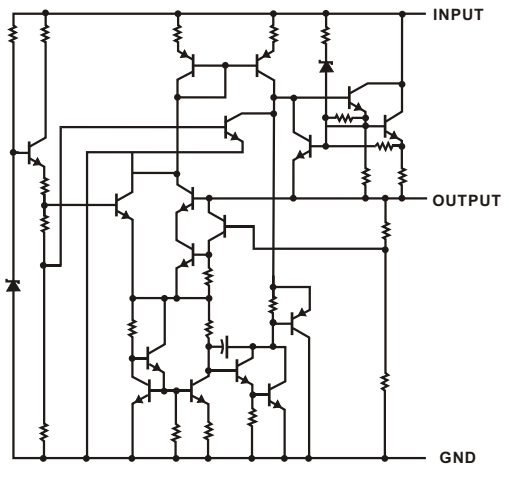
Standard Application



A common ground is required between the input and the output voltages. The input voltage must remain typically 2.0V above the output voltage even during the low point on the input ripple voltage.

*C_{in} is required if regulator is located in appreciable distance from power supply filter.
**C_O is not needed for stability; however, it does improve transient response.

Representative Schematic Diagram



ABSOLUTE MAXIMUM RATINGS OVER OPERATING TEMPERATURE RANGE (unless otherwise noted)

Characteristics	LM 7805 THRU LM 7820	LM7824 LM7827	UNIT
Input voltage	35	40	V
Operating free-air, case, or virtual junction temperature range	0 to 150	0 to 150	C
Storage temperature range	-65 to 150	-65 to 150	
Lead temperature 1.6 mm (1/16 inch) from case for 10 seconds	260	260	

RECOMMENDED OPERATING CONDITIONS

PARAMETER		MIN	MAX	UNIT
Input voltage, V_I	LM7805	7	25	V
	LM7806	8	25	
	LM7808	10.5	25	
	LM7809	11.5	27	
	LM7810	12.5	28	
	LM7812	14.5	30	
	LM7815	17.5	30	
	LM7818	21	33	
	LM7820	23	36	
	LM7824	26.5	39	
	LM7827	30	40	
Output current, I_O			1.5	A
Operating virtual junction temperature, T_J		0	125	C

LM7805 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, V_I=10V,I_O =500mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		LM7805			UNIT
			MIN	TYP	MAX	
Output voltage**		25℃	4.8	5	5.2	V
	I_O = 5mA to 1A, VI= 7V to 20V, P≦15W	0℃ to 125℃	4.75	5	5.25	
Input regulation	VI= 7V to 25V	25℃		3	100	mV
	VI= 8V to 12V			1	50	
Ripple rejection	VI= 8V to 18V, f= 120Hz	0℃ to 125℃	62	78		dB
Output regulation	I_O = 5mA to 1.5A	25℃		15	100	mV
	I_O = 250mA to750mA			5	50	
Output resistance	f= 1KHz	0℃ to 125℃		0.017		Ω
Temperature coefficient of output voltage	I_O = 5mA	0℃ to 125℃		-1.1		mV/℃
Output noise voltage	f=10Hz to 100KHz	25℃		40		μV
Dropout voltage	I_O = 1A	25℃		2.0		V
Bias current		25℃		4.2	8	mA
Bias current change	VI= 7V to 25V	0℃ to 125℃			1.3	
	I_O = 5mA to 1A				0.5	
Short-circuit output current		25℃		750		
Peak output current		25℃		2.2		A

LM7806 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, V_I=11V,I_O =500mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		LM7806			UNIT
			MIN	TYP	MAX	
Output voltage**		25℃	5.75	6	6.25	V
	I_O = 5mA to 1A, VI= 8V to 21V, P≦15W	0℃ to 125℃	5.7	6	6.3	
Input regulation	VI= 8V to 25V	25℃		5	120	mV
	VI= 9V to 13V			1.5	60	
Ripple rejection	VI= 9V to 19V, f= 120Hz	0℃ to 125℃	59	75		dB
Output regulation	I_O = 5mA to 1.5A	25℃		14	120	mV
	I_O = 250mA to750mA			4	60	
Output resistance	f= 1KHz	0℃ to 125℃		0.019		Ω
Temperature coefficient of output voltage	I_O = 5mA	0℃ to 125℃		-0.8		mV/℃
Output noise voltage	f=10Hz to 100KHz	25℃		45		μV
Dropout voltage	I_O = 1A	25℃		2.0		V
Bias current		25℃		4.3	8	mA
Bias current change	VI= 8V to 25V	0℃ to 125℃			1.3	
	I_O = 5mA to 1A				0.5	
Short-circuit output current		25℃		550		
Peak output current		25℃		2.2		A

LM7808 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, V_I=14V,I_O =500mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		LM7808			UNIT
			MIN	TYP	MAX	
Output voltage**		25℃	7.7	8	8.3	V
	I_O = 5mA to 1A, VI= 10.5V to 23V, P≦15W	0℃ to 125℃	7.6	8	8.4	
Input regulation	VI= 10.5V to 25V	25℃		6	160	mV
	VI= 11V to 17V			2	80	
Ripple rejection	VI= 11.5V to 21.5V, f= 120Hz	0℃ to 125℃	55	72		dB
Output regulation	I_O = 5mA to 1.5A	25℃		12	160	mV
	I_O = 250mA to750mA			4	80	
Output resistance	f= 1KHz	0℃ to 125℃		0.016		Ω
Temperature coefficient of output voltage	I_O = 5mA	0℃ to 125℃		-0.8		mV/℃
Output noise voltage	f=10Hz to 100KHz	25℃		52		μV
Dropout voltage	I_O = 1A	25℃		2.0		V
Bias current		25℃		4.3	8	mA
Bias current change	VI= 10.5V to 25V	0℃ to 125℃			1	
	I_O = 5mA to 1A				0.5	
Short-circuit output current		25℃		450		
Peak output current		25℃		2.2		A

LM7809 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, V_I=16V,I_O =500mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		LM7809			UNIT
			MIN	TYP	MAX	
Output voltage**		25℃	8.65	9	9.35	V
	I_O = 5mA to 1A, VI= 11.5V to 24V, P≦15W	0℃ to 125℃	8.55	9	9.45	
Input regulation	VI= 11.5V to 27V	25℃		7	180	mV
	VI= 13V to 19V			2	90	
Ripple rejection	VI= 12V to 22V, f= 120Hz	0℃ to 125℃	55	70		dB
Output regulation	I_O = 5mA to 1.5A	25℃		12	180	mV
	I_O = 250mA to750mA			4	90	
Output resistance	f= 1KHz	0℃ to 125℃		0.018		Ω
Temperature coefficient of output voltage	I_O = 5mA	0℃ to 125℃		-1.0		mV/℃
Output noise voltage	f=10Hz to 100KHz	25℃		60		μV
Dropout voltage	I_O = 1A	25℃		2.0		V
Bias current		25℃		4.3	8	mA
Bias current change	VI= 11.5V to 27V	0℃ to 125℃			1	
	I_O = 5mA to 1A				0.5	
Short-circuit output current		25℃		400		
Peak output current		25℃		2.2		A

LM7810 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, V_I=17V,I_O =500mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		LM7810			UNIT
			MIN	TYP	MAX	
Output voltage**		25℃	9.6	10	10.4	V
	I_O = 5mA to 1A, VI= 12.5V to 25V, P≦15W	0℃ to 125℃	9.5	10	10.5	
Input regulation	VI= 12.5V to 28V	25℃		7	200	mV
	VI= 14V to 20V			2	100	
Ripple rejection	VI= 13V to 23V, f= 120Hz	0℃ to 125℃	55	71		dB
Output regulation	I_O = 5mA to 1.5A	25℃		12	200	mV
	I_O = 250mA to750mA			4	100	
Output resistance	f= 1KHz	0℃ to 125℃		0.018		Ω
Temperature coefficient of output voltage	I_O = 5mA	0℃ to 125℃		-1.0		mV/℃
Output noise voltage	f=10Hz to 100KHz	25℃		70		μV
Dropout voltage	I_O = 1A	25℃		2.0		V
Bias current		25℃		4.3	8	mA
Bias current change	VI= 12.5V to 28V	0℃ to 125℃			1	
	I_O = 5mA to 1A				0.5	
Short-circuit output current		25℃		400		
Peak output current		25℃		2.2		A

LM7812 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, V_I=19V,I_O =500mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		LM7812			UNIT
			MIN	TYP	MAX	
Output voltage**		25℃	11.5	12	12.5	V
	I_O = 5mA to 1A, VI= 14.5V to 27V, P≦15W	0℃ to 125℃	11.4	12	12.6	
Input regulation	VI= 14.5V to 30V	25℃		10	240	mV
	VI= 16V to 22V			3	120	
Ripple rejection	VI= 15V to 25V, f= 120Hz	0℃ to 125℃	55	71		dB
Output regulation	I_O = 5mA to 1.5A	25℃		12	240	mV
	I_O = 250mA to750mA			4	120	
Output resistance	f= 1KHz	0℃ to 125℃		0.018		Ω
Temperature coefficient of output voltage	I_O = 5mA	0℃ to 125℃		-1.0		mV/℃
Output noise voltage	f=10Hz to 100KHz	25℃		75		μV
Dropout voltage	I_O = 1A	25℃		2.0		V
Bias current		25℃		4.3	8	mA
Bias current change	VI= 14.5V to 30V	0℃ to 125℃			1	
	I_O = 5mA to 1A				0.5	
Short-circuit output current		25℃		350		
Peak output current		25℃		2.2		A

LM7815 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, V_I=23V,I_O =500mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		LM7815			UNIT
			MIN	TYP	MAX	
Output voltage**		25℃	14.4	15	15.6	V
	I_O = 5mA to 1A, VI= 17.5V to 30V, P≦15W	0℃ to 125℃	14.25	15	15.75	
Input regulation	VI= 17.5V to 30V	25℃		12	300	mV
	VI= 20V to 26V			3	150	
Ripple rejection	VI= 18.5V to 28.5V, f= 120Hz	0℃ to 125℃	54	70		dB
Output regulation	I_O = 5mA to 1.5A	25℃		12	300	mV
	I_O = 250mA to750mA			4	150	
Output resistance	f= 1KHz	0℃ to 125℃		0.019		Ω
Temperature coefficient of output voltage	I_O = 5mA	0℃ to 125℃		-1.0		mV/℃
Output noise voltage	f=10Hz to 100KHz	25℃		90		μV
Dropout voltage	I_O = 1A	25℃		2.0		V
Bias current		25℃		4.3	8	mA
Bias current change	VI= 17.5V to 30V	0℃ to 125℃			1	
	I_O = 5mA to 1A				0.5	
Short-circuit output current		25℃		230		
Peak output current		25℃		2.1		A

LM7818 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, V_I=27V,I_O =500mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		LM7818			UNIT
			MIN	TYP	MAX	
Output voltage**		25℃	17.3	18	18.7	V
	I_O = 5mA to 1A, VI= 21V to 33V, P≦15W	0℃ to 125℃	17.1	18	18.9	
Input regulation	VI= 21V to 33V	25℃		15	360	mV
	VI= 24V to 30V			5	180	
Ripple rejection	VI= 22V to 32V, f= 120Hz	0℃ to 125℃	53	69		dB
Output regulation	I_O = 5mA to 1.5A	25℃		12	360	mV
	I_O = 250mA to750mA			4	180	
Output resistance	f= 1KHz	0℃ to 125℃		0.022		Ω
Temperature coefficient of output voltage	I_O = 5mA	0℃ to 125℃		-1.0		mV/℃
Output noise voltage	f=10Hz to 100KHz	25℃		110		μV
Dropout voltage	I_O = 1A	25℃		2.0		V
Bias current		25℃		4.5	8	mA
Bias current change	VI= 21V to 33V	0℃ to 125℃			1	
	I_O = 5mA to 1A				0.5	
Short-circuit output current		25℃		200		
Peak output current		25℃		2.1		A

LM7820 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, V_I=29V,I_O =500mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		LM7820			UNIT
			MIN	TYP	MAX	
Output voltage**		25℃	19.2	20	20.8	V
	I_O = 5mA to 1A, VI= 23V to 35V, P≦15W	0℃ to 125℃	19	20	21	
Input regulation	VI= 23V to 35V	25℃		18	400	mV
	VI= 26V to 32V			7	200	
Ripple rejection	VI= 24V to 34V, f= 120Hz	0℃ to 125℃	51	66		dB
Output regulation	I_O = 5mA to 1.5A	25℃		15	400	mV
	I_O = 250mA to750mA			7	200	
Output resistance	f= 1KHz	0℃ to 125℃		0.027		Ω
Temperature coefficient of output voltage	I_O = 5mA	0℃ to 125℃		-1.3		mV/℃
Output noise voltage	f=10Hz to 100KHz	25℃		150		μV
Dropout voltage	I_O = 1A	25℃		2.0		V
Bias current		25℃		4.5	8	mA
Bias current change	VI= 23V to 35V	0℃ to 125℃			1	
	I_O = 5mA to 1A				0.5	
Short-circuit output current		25℃		180		
Peak output current		25℃		2.1		A

LM7824 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, V_I=33V,I_O =500mA (unless otherwise noted)

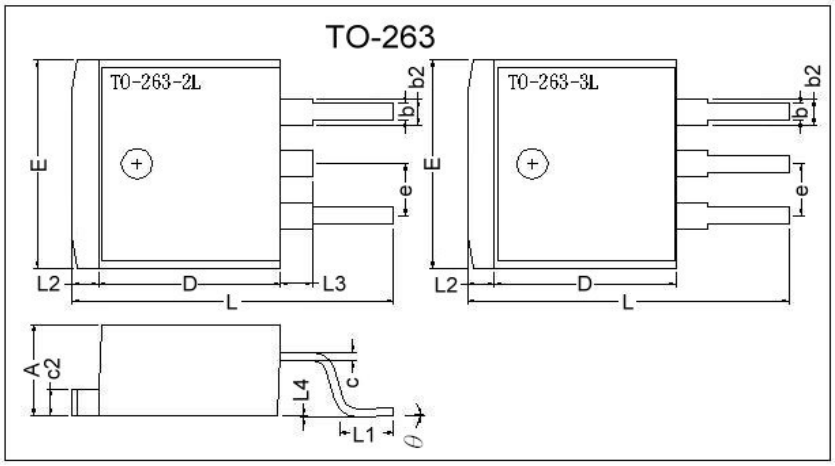
PARAMETER	TEST CONDITIONS*		LM7824			UNIT
			MIN	TYP	MAX	
Output voltage**		25℃	23	24	25	V
	I_O = 5mA to 1A, VI= 27V to 38V, P≦15W	0℃ to 125℃	22.8	24	25.2	
Input regulation	VI= 27V to 38V	25℃		18	480	mV
	VI= 30V to 36V			6	240	
Ripple rejection	VI= 28V to 38V, f= 120Hz	0℃ to 125℃	50	66		dB
Output regulation	I_O = 5mA to 1.5A	25℃		12	480	mV
	I_O = 250mA to750mA			4	240	
Output resistance	f= 1KHz	0℃ to 125℃		0.028		Ω
Temperature coefficient of output voltage	I_O = 5mA	0℃ to 125℃		-1.5		mV/℃
Output noise voltage	f=10Hz to 100KHz	25℃		170		μV
Dropout voltage	I_O = 1A	25℃		2.0		V
Bias current		25℃		4.6	8	mA
Bias current change	VI= 27V to 38V	0℃ to 125℃			1	
	I_O = 5mA to 1A				0.5	
Short-circuit output current		25℃		150		
Peak output current		25℃		2.1		A

LM7827 ELECTRICAL CHARACTERISTICS AT SPECIFIED VIRTUAL JUNCTION TEMPERATURE, V_I=36V,I_O =500mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS*		LM7827			UNIT
			MIN	TYP	MAX	
Output voltage**		25℃	25.9	27	28.1	V
	I_O = 5mA to 1A, VI= 30V to 40V, P≦15W	0℃ to 125℃	25.7	27	28.3	
Input regulation	VI= 30V to 40V	25℃		25	540	mV
	VI= 33V to 39V			10	270	
Ripple rejection	VI= 30V to 40V, f= 120Hz	0℃ to 125℃	50	64		dB
Output regulation	I_O = 5mA to 1.5A	25℃		20	540	mV
	I_O = 250mA to750mA			9	270	
Output resistance	f= 1KHz	0℃ to 125℃		0.030		Ω
Temperature coefficient of output voltage	I_O = 5mA	0℃ to 125℃		-1.6		mV/℃
Output noise voltage	f=10Hz to 100KHz	25℃		200		μV
Dropout voltage	I_O = 1A	25℃		2.0		V
Bias current		25℃		4.8	8	mA
Bias current change	VI= 30V to 40V	0℃ to 125℃			1	
	I_O = 5mA to 1A				0.5	
Short-circuit output current		25℃		120		
Peak output current		25℃		2.1		A

*** Pulse testing techniques are used to maintain the junction temperature as colse to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.33 μF capacitor across the input and a 0.1 μF capacitor across the output.**
**** This specification applies only for dc power dissipation permitted by absolute maximum ratings.**

PACKAGE DIMENSIONS



REF.	Min.	Max.	REF.	Min.	Max.
A	4.40	4.80	c2	1.25	1.45
b	0.76	1.00	b2	1.17	1.47
L4	0.00	0.30 B	D	8.6	9.0
c	0.36	0.5	e	2.54 REF.	
L3	1.50 REF.		L	14.6	15.8
L1	2.29	2.79	θ	0°	8°
E	9.80	10.4	L2	1.27 REF.	

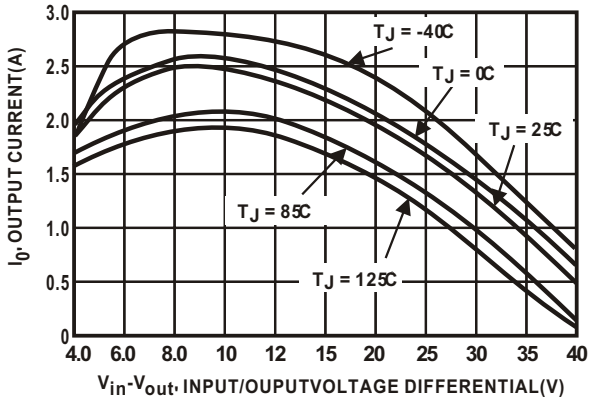


Figure 1.Peak Output Current as a Function of Input/Output Differential Voltage

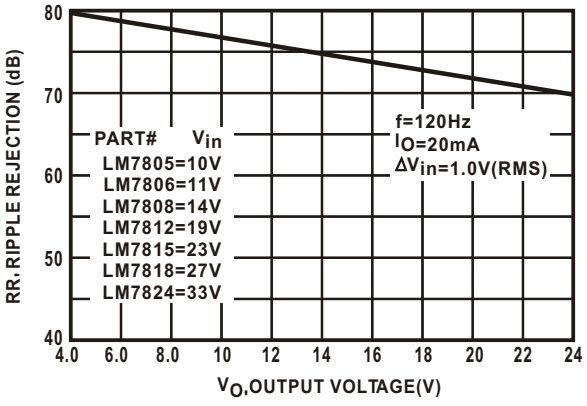


Figure 2.Ripple Rejection as a Function of Output Voltages

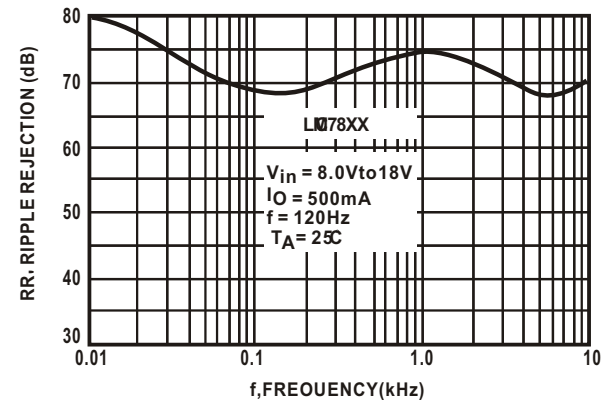


Figure 3.Ripple Rejection as a Function of Frequency

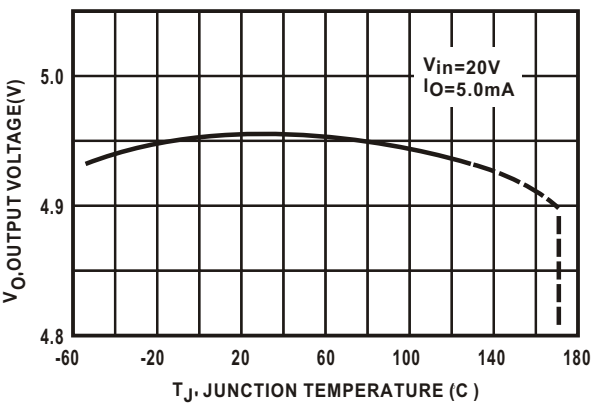


Figure 4.Output Voltage as a Function of Junction Temperature

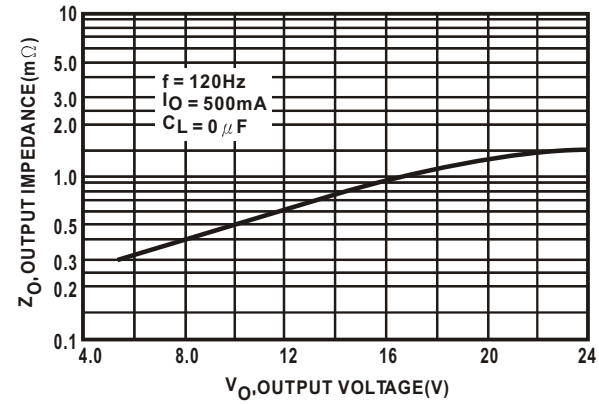


Figure 5.Output Impedance as a Function of Output Voltage

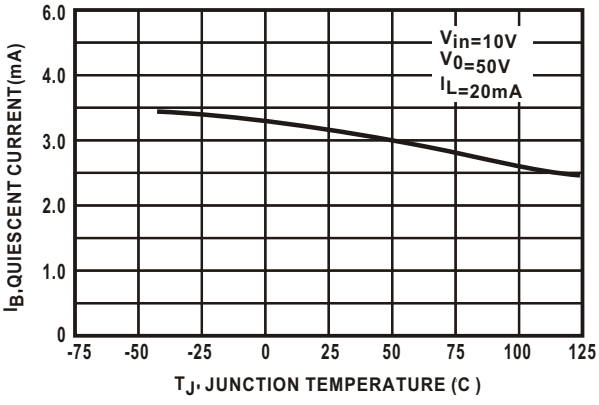


Figure 6.Quiescent Current as a Function of Temperature