MC7800, MC7800A, NCV7805

1.0 A 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 1.0 A. Although designed primarily as a fixed voltage regulator, these devices can be used with external components to obtain adjustable voltages and currents.

- 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−3, DPAK−3 and Standard 3−Lead Transistor Packages
- NCV Prefix for Automotive and Other Applications Requiring Site and Control Changes
- Pb−Free Packages are Available

MAXIMUM RATINGS (T_A = 25°C, unless otherwise noted)

Rating	Symbol	Value			Unit
		369C	221A	936	
Input Voltage (5.0 − 18 V) (24 V)	V_I	35 40			Vdc
Power Dissipation	P_D	Internally Limited			W
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	92	65	Figure 14	°C/W
Thermal Resistance, Junction−to−Case	$R_{\theta JC}$	5.0	5.0	5.0	°C/W
Storage Junction Temperature Range	T_{stg}	−65 to +150			°C
Operating Junction Temperature	T_J	+150			°C

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

*This device series contains ESD protection and exceeds the following tests:
Human Body Model 2000 V per MIL_STD_883, Method 3015.
Machine Model Method 200 V.

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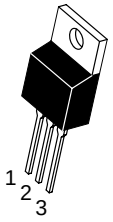
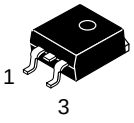


TO−220−3
T SUFFIX
CASE 221A

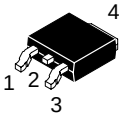
Heatsink surface connected to Pin 2.



Pin 1. Input
2. Ground
3. Output

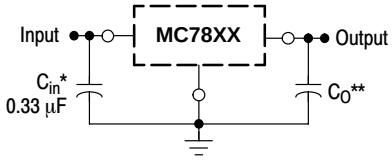
D^2PAK−3
D2T SUFFIX
CASE 936

Heatsink surface (shown as terminal 4 in case outline drawing) is connected to Pin 2.



DPAK−3
DT SUFFIX
CASE 369C

STANDARD APPLICATION



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

XX, These two digits of the type number indicate nominal voltage.

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

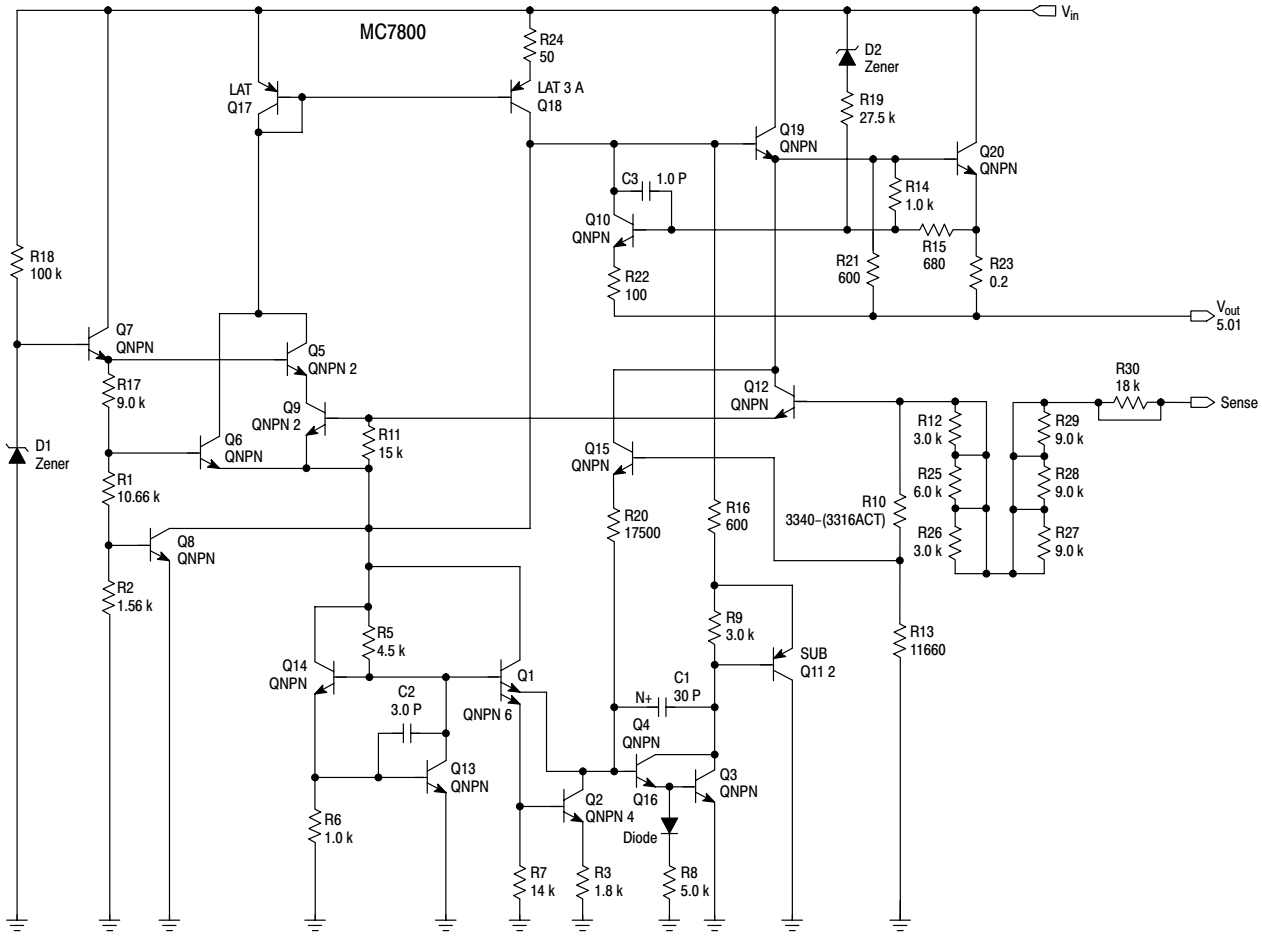
** C_O is not needed for stability; however, it does improve transient response. Values of less than 0.1 μF could cause instability.

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 22 of this data sheet.

DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 28 of this data sheet.



This device contains 22 active transistors.

Figure 1. Representative Schematic Diagram

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

Characteristic	Symbol	MC7805B, NCV7805			MC7805C			Unit
		Min	Typ	Max	Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	4.8	5.0	5.2	4.8	5.0	5.2	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W) 7.0 Vdc ≤ V_{in} ≤ 20 Vdc 8.0 Vdc ≤ V_{in} ≤ 20 Vdc	V_O	 – 4.75	 – 5.0	 – 5.25	 4.75 –	 5.0 –	 5.25 –	Vdc
Line Regulation (Note 4) 7.5 Vdc ≤ V_{in} ≤ 20 Vdc, 1.0 A 8.0 Vdc ≤ V_{in} ≤ 12 Vdc	Reg_{line}	 – –	5.0 1.3	100 50	– –	0.5 0.8	20 10	mV
Load Regulation (Note 4) 5.0 mA ≤ I_O ≤ 1.0 A 5.0 mA ≤ I_O ≤ 1.5 A (T_A = 25°C)	Reg_{load}	 – –	1.3 0.15	100 50	– –	1.3 1.3	25 25	mV
Quiescent Current	I_B	–	3.2	8.0	–	3.2	6.5	mA
Quiescent Current Change 7.0 Vdc ≤ V_{in} ≤ 25 Vdc 5.0 mA ≤ I_O ≤ 1.0 A (T_A = 25°C)	ΔI_B	 – –	 – –	 – 0.5	 – –	 0.3 0.08	 1.0 0.8	mA
Ripple Rejection 8.0 Vdc ≤ V_{in} ≤ 18 Vdc, f = 120 Hz	RR	–	68	–	62	83	–	dB
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	$V_I - V_O$	–	2.0	–	–	2.0	–	Vdc
Output Noise Voltage (T_A = 25°C) 10 Hz ≤ f ≤ 100 kHz	V_n	–	10	–	–	10	–	μV/V_O
Output Resistance f = 1.0 kHz	r_O	–	0.9	–	–	0.9	–	mΩ
Short Circuit Current Limit (T_A = 25°C) V_{in} = 35 Vdc	I_{SC}	–	0.2	–	–	0.6	–	A
Peak Output Current (T_J = 25°C)	I_{max}	–	2.2	–	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	−0.3	–	–	−0.3	–	mV/°C

1. T_{low} = 0°C for MC78XXAC, C, T_{high} = +125°C for MC78XXAC, NCV7805
   = −40°C for MC78XXB, MC78XXAB, NCV7805
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.

ELECTRICAL CHARACTERISTICS (V_{in} = 10 V, I_O = 1.0 A, T_J = T_{low} to T_{high} (Note 3), unless otherwise noted)

Characteristic	Symbol	MC7805AB/MC7805AC			Unit
		Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	4.9	5.0	5.1	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W) 7.5 Vdc ≤ V_{in} ≤ 20 Vdc	V_O	4.8	5.0	5.2	Vdc
Line Regulation (Note 4)	Reg_{line}				mV
7.5 Vdc ≤ V_{in} ≤ 25 Vdc, I_O = 500 mA		–	0.5	10	
8.0 Vdc ≤ V_{in} ≤ 12 Vdc, I_O = 1.0 A		–	0.8	12	
8.0 Vdc ≤ V_{in} ≤ 12 Vdc, I_O = 1.0 A, T_J = 25°C		–	1.3	4.0	
7.3 Vdc ≤ V_{in} ≤ 20 Vdc, I_O = 1.0 A, T_J = 25°C		–	4.5	10	
Load Regulation (Note 4)	Reg_{load}				mV
5.0 mA ≤ I_O ≤ 1.5 A, T_J = 25°C		–	1.3	25	
5.0 mA ≤ I_O ≤ 1.0 A		–	0.8	25	
250 mA ≤ I_O ≤ 750 mA		–	0.53	15	
Quiescent Current	I_B	–	3.2	6.0	mA
Quiescent Current Change	ΔI_B				mA
8.0 Vdc ≤ V_{in} ≤ 25 Vdc, I_O = 500 mA		–	0.3	0.8	
7.5 Vdc ≤ V_{in} ≤ 20 Vdc, T_J = 25°C		–	–	0.8	
5.0 mA ≤ I_O ≤ 1.0 A		–	0.08	0.5	
Ripple Rejection 8.0 Vdc ≤ V_{in} ≤ 18 Vdc, f = 120 Hz, I_O = 500 mA	RR	68	83	–	dB
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	$V_I - V_O$	–	2.0	–	Vdc
Output Noise Voltage (T_A = 25°C) 10 Hz ≤ f ≤ 100 kHz	V_n	–	10	–	$\mu V/V_O$
Output Resistance (f = 1.0 kHz)	r_O	–	0.9	–	mΩ
Short Circuit Current Limit (T_A = 25°C) V_{in} = 35 Vdc	I_{SC}	–	0.2	–	A
Peak Output Current (T_J = 25°C)	I_{max}	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	−0.3	–	mV/°C

3. T_{low} = 0°C for MC78XXAC, C T_{high} = +125°C for MC78XXAC, C, NCV7805
   = −40°C for MC78XXB, MC78XXAB, NCV7805
4. 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.

ELECTRICAL CHARACTERISTICS (V_{in} = 11 V, I_O = 500 mA, T_J = T_{low} to T_{high} (Note 5), unless otherwise noted)

Characteristic	Symbol	MC7806B			MC7806C			Unit
		Min	Typ	Max	Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	5.75	6.0	6.25	5.75	6.0	6.25	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W)	V_O							Vdc
8.0 Vdc ≤ V_{in} ≤ 21 Vdc		–	–	–	5.7	6.0	6.3	
9.0 Vdc ≤ V_{in} ≤ 21 Vdc		5.7	6.0	6.3	–	–	–	
Line Regulation, T_J = 25°C (Note 6)	Reg_{line}							mV
8.0 Vdc ≤ V_{in} ≤ 25 Vdc		–	5.5	120	–	0.5	24	
9.0 Vdc ≤ V_{in} ≤ 13 Vdc		–	1.4	60	–	0.8	12	
Load Regulation, T_J = 25°C (Note 6)	Reg_{load}	–	1.3	120	–	1.3	30	mV
5.0 mA ≤ I_O ≤ 1.5 A								
Quiescent Current (T_J = 25°C)	I_B	–	3.3	8.0	–	3.3	8.0	mA
Quiescent Current Change	ΔI_B							mA
8.0 Vdc ≤ V_{in} ≤ 25 Vdc		–	–	–	–	0.3	1.3	
5.0 mA ≤ I_O ≤ 1.0 A		–	–	0.5	–	0.08	0.5	
Ripple Rejection	RR	–	65	–	58	65	–	dB
9.0 Vdc ≤ V_{in} ≤ 19 Vdc, f = 120 Hz								
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	$V_I - V_O$	–	2.0	–	–	2.0	–	Vdc
Output Noise Voltage (T_A = 25°C)	V_n	–	10	–	–	10	–	$\mu V/V_O$
10 Hz ≤ f ≤ 100 kHz								
Output Resistance f = 1.0 kHz	r_O	–	0.9	–	–	0.9	–	mΩ
Short Circuit Current Limit (T_A = 25°C)	I_{SC}	–	0.2	–	–	0.2	–	A
V_{in} = 35 Vdc								
Peak Output Current (T_J = 25°C)	I_{max}	–	2.2	–	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	−0.3	–	–	−0.3	–	mV/°C

5. T_{low} = 0°C for MC78XXAC, C T_{high} = +125°C for MC78XXAC, NCV7805
   = −40°C for MC78XXB, MC78XXAB, NCV7805
6. 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.

ELECTRICAL CHARACTERISTICS (V_{in} = 11 V, I_O = 1.0 A, T_J = T_{low} to T_{high} (Note 7), unless otherwise noted)

Characteristic	Symbol	MC7806AC			Unit
		Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	5.88	6.0	6.12	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W) 8.6 Vdc ≤ V_{in} ≤ 21 Vdc	V_O	5.76	6.0	6.24	Vdc
Line Regulation (Note 8)	Reg_{line}				mV
8.6 Vdc ≤ V_{in} ≤ 25 Vdc, I_O = 500 mA		−	5.0	12	
9.0 Vdc ≤ V_{in} ≤ 13 Vdc, I_O = 1.0 A		−	1.4	15	
Load Regulation (Note 8)	Reg_{load}				mV
5.0 mA ≤ I_O ≤ 1.5 A, T_J = 25°C		−	1.3	25	
5.0 mA ≤ I_O ≤ 1.0 A		−	0.9	25	
250 mA ≤ I_O ≤ 750 mA		−	0.2	15	
Quiescent Current	I_B	−	3.3	6.0	mA
Quiescent Current Change	ΔI_B				mA
9.0 Vdc ≤ V_{in} ≤ 25 Vdc, I_O = 500 mA		−	−	0.8	
9.0 Vdc ≤ V_{in} ≤ 21 Vdc, I_O = 1.0 A, T_J = 25°C		−	−	0.8	
5.0 mA ≤ I_O ≤ 1.0 A		−	−	0.5	
Ripple Rejection 9.0 Vdc ≤ V_{in} ≤ 19 Vdc, f = 120 Hz, I_O = 500 mA	RR	58	65	−	dB
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	$V_I - V_O$	−	2.0	−	Vdc
Output Noise Voltage (T_A = 25°C) 10 Hz ≤ f ≤ 100 kHz	V_n	−	10	−	$\mu V/V_O$
Output Resistance (f = 1.0 kHz)	r_O	−	0.9	−	mΩ
Short Circuit Current Limit (T_A = 25°C) V_{in} = 35 Vdc	I_{SC}	−	0.2	−	A
Peak Output Current (T_J = 25°C)	I_{max}	−	2.2	−	A
Average Temperature Coefficient of Output Voltage	TCV_O	−	−0.3	−	mV/°C

7. T_{low} = 0°C for MC78XXAC, C T_{high} = +125°C for MC78XXAC, C, NCV7805
   = −40°C for MC78XXB, MC78XXAB, NCV7805
8. 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.

ELECTRICAL CHARACTERISTICS (V_{in} = 14 V, I_O = 500 mA, T_J = T_{low} to T_{high} (Note 9), unless otherwise noted)

Characteristic	Symbol	MC7808B			MC7808C			Unit
		Min	Typ	Max	Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	7.7	8.0	8.3	7.7	8.0	8.3	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W)	V_O							Vdc
10.5 Vdc ≤ V_{in} ≤ 23 Vdc		–	–	–	7.6	8.0	8.4	
11.5 Vdc ≤ V_{in} ≤ 23 Vdc		7.6	8.0	8.4	–	–	–	
Line Regulation, T_J = 25°C, (Note 10)	Reg_{line}							mV
10.5 Vdc ≤ V_{in} ≤ 25 Vdc		–	6.0	160	–	6.0	32	
11 Vdc ≤ V_{in} ≤ 17 Vdc		–	1.7	80	–	1.7	16	
Load Regulation, T_J = 25°C (Note 10)	Reg_{load}	–	1.4	160	–	1.4	35	mV
5.0 mA ≤ I_O ≤ 1.5 A								
Quiescent Current	I_B	–	3.3	8.0	–	3.3	8.0	mA
Quiescent Current Change	ΔI_B							mA
10.5 Vdc ≤ V_{in} ≤ 25 Vdc		–	–	–	–	–	1.0	
5.0 mA ≤ I_O ≤ 1.0 A		–	–	0.5	–	–	0.5	
Ripple Rejection	RR	–	62	–	56	62	–	dB
11.5 Vdc ≤ V_{in} ≤ 18 Vdc, f = 120 Hz								
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	$V_I - V_O$	–	2.0	–	–	2.0	–	Vdc
Output Noise Voltage (T_A = 25°C)	V_n	–	10	–	–	10	–	$\mu V/V_O$
10 Hz ≤ f ≤ 100 kHz								
Output Resistance f = 1.0 kHz	r_O	–	0.9	–	–	0.9	–	mΩ
Short Circuit Current Limit (T_A = 25°C)	I_{SC}	–	0.2	–	–	0.2	–	A
V_{in} = 35 Vdc								
Peak Output Current (T_J = 25°C)	I_{max}	–	2.2	–	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	−0.4	–	–	−0.4	–	mV/°C

9. T_{low} = 0°C for MC78XXAC, C T_{high} = +125°C for MC78XXAC, C, NCV7805
   = −40°C for MC78XXB, MC78XXAB, NCV7805
10. 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.

ELECTRICAL CHARACTERISTICS (V_{in} = 14 V, I_O = 1.0 A, T_J = T_{low} to T_{high} (Note 11), unless otherwise noted)

Characteristic	Symbol	MC7808AB/MC7808AC			Unit
		Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	7.84	8.0	8.16	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W) 10.6 Vdc ≤ V_{in} ≤ 23 Vdc	V_O	7.7	8.0	8.3	Vdc
Line Regulation (Note 12) 10.6 Vdc ≤ V_{in} ≤ 25 Vdc, I_O = 500 mA 11 Vdc ≤ V_{in} ≤ 17 Vdc, I_O = 1.0 A 10.4 Vdc ≤ V_{in} ≤ 23 Vdc, T_J = 25°C	Reg_{line}	 – – –	 6.0 1.7 5.0	 15 18 15	mV
Load Regulation (Note 12) 5.0 mA ≤ I_O ≤ 1.5 A, T_J = 25°C 5.0 mA ≤ I_O ≤ 1.0 A 250 mA ≤ I_O ≤ 750 mA	Reg_{load}	 – – –	 1.4 1.0 0.22	 25 25 15	mV
Quiescent Current	I_B	–	3.3	6.0	mA
Quiescent Current Change 11 Vdc ≤ V_{in} ≤ 25 Vdc, I_O = 500 mA 10.6 Vdc ≤ V_{in} ≤ 23 Vdc, I_O = 1.0 A, T_J = 25°C 5.0 mA ≤ I_O ≤ 1.0 A	ΔI_B	 – – –	 – – –	 0.8 0.8 0.5	mA
Ripple Rejection 11.5 Vdc ≤ V_{in} ≤ 21.5 Vdc, f = 120 Hz, I_O = 500 mA	RR	56	62	–	dB
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	$V_I - V_O$	–	2.0	–	Vdc
Output Noise Voltage (T_A = 25°C) 10 Hz ≤ f ≤ 100 kHz	V_n	–	10	–	$\mu V/V_O$
Output Resistance f = 1.0 kHz	r_O	–	0.9	–	mΩ
Short Circuit Current Limit (T_A = 25°C) V_{in} = 35 Vdc	I_{SC}	–	0.2	–	A
Peak Output Current (T_J = 25°C)	I_{max}	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	−0.4	–	mV/°C

11. T_{low} = 0°C for MC78XXAC, C T_{high} = +125°C for MC78XXAC, C, NCV7805
= −40°C for MC78XXB, MC78XXAB, NCV7805
12. 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.

ELECTRICAL CHARACTERISTICS (V_{in} = 15 V, I_O = 500 mA, T_J = T_{low} to T_{high} (Note 13), unless otherwise noted)

Characteristic	Symbol	MC7809B			MC7809C			Unit
		Min	Typ	Max	Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	8.65	9.0	9.35	8.65	9.0	9.35	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W)	V_O							Vdc
11.5 Vdc ≤ V_{in} ≤ 24 Vdc		8.55	9.0	9.45	8.55	9.0	9.45	
Line Regulation, T_J = 25°C (Note 14)	Reg_{line}							mV
11 Vdc ≤ V_{in} ≤ 26 Vdc		–	6.2	32	–	6.2	32	
11.5 Vdc ≤ V_{in} ≤ 17 Vdc		–	1.8	16	–	1.8	16	
Load Regulation, T_J = 25°C (Note 14)	Reg_{load}	–	1.5	35	–	1.5	35	mV
5.0 mA ≤ I_O ≤ 1.5 A								
Quiescent Current	I_B	–	3.4	8.0	–	3.4	8.0	mA
Quiescent Current Change	ΔI_B							mA
11.5 Vdc ≤ V_{in} ≤ 26 Vdc		–	–	1.0	–	–	1.0	
5.0 mA ≤ I_O ≤ 1.0 A		–	–	0.5	–	–	0.5	
Ripple Rejection	RR	56	61	–	56	61	–	dB
11.5 Vdc ≤ V_{in} ≤ 21.5 Vdc, f = 120 Hz								
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	$V_I - V_O$	–	2.0	–	–	2.0	–	Vdc
Output Noise Voltage (T_A = 25°C)	V_n	–	10	–	–	10	–	$\mu V/V_O$
10 Hz ≤ f ≤ 100 kHz								
Output Resistance f = 1.0 kHz	r_O	–	1.0	–	–	1.0	–	mΩ
Short Circuit Current Limit (T_A = 25°C)	I_{SC}	–	0.2	–	–	0.2	–	A
V_{in} = 35 Vdc								
Peak Output Current (T_J = 25°C)	I_{max}	–	2.2	–	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	−0.5	–	–	−0.5	–	mV/°C

13. T_{low} = 0°C for MC78XXAC, C T_{high} = +125°C for MC78XXAC, C, NCV7805
= −40°C for MC78XXB, MC78XXAB, NCV7805
14. 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.

ELECTRICAL CHARACTERISTICS (V_{in} = 15 V, I_O = 1.0 A, T_J = 0°C to 125°C, unless otherwise noted)

Characteristic	Symbol	MC7809AC			Unit
		Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	8.82	9.0	9.18	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W) 11.5 Vdc ≤ V_{in} ≤ 24 Vdc	V_O	8.65	9.0	9.35	Vdc
Line Regulation (Note 15)	Reg_{line}				mV
11.5 Vdc ≤ V_{in} ≤ 26 Vdc, I_O = 500 mA		−	6.2	16	
12 Vdc ≤ V_{in} ≤ 17 Vdc, I_O = 1.0 A		−	1.8	7.0	
11.5 Vdc ≤ V_{in} ≤ 24 Vdc, T_J = 25°C		−	5.2	16	
Load Regulation (Note 15)	Reg_{load}				mV
5.0 mA ≤ I_O ≤ 1.5 A, T_J = 25°C		−	−	25	
5.0 mA ≤ I_O ≤ 1.0 A		−	−	25	
250 mA ≤ I_O ≤ 750 mA		−	−	15	
Quiescent Current	I_B	−	3.3	6.0	mA
Quiescent Current Change	ΔI_B				mA
11.5 Vdc ≤ V_{in} ≤ 26 Vdc, I_O = 500 mA		−	−	0.8	
11.5 Vdc ≤ V_{in} ≤ 24 Vdc, I_O = 1.0 A, T_J = 25°C		−	−	0.8	
5.0 mA ≤ I_O ≤ 1.0 A		−	−	0.5	
Ripple Rejection	RR				dB
11.5 Vdc ≤ V_{in} ≤ 21.5 Vdc, f = 120 Hz, I_O = 500 mA		56	61	−	
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	V_I _ V_O		2.0		Vdc
Output Noise Voltage (T_A = 25°C) 10 Hz ≤ f ≤ 100 kHz	Vn	−	10	−	μV/V_O
Output Resistance f = 1.0 kHz	r_O	−	1.0	−	mΩ
Short Circuit Current Limit (T_A = 25°C) V_{in} = 35 Vdc	I_{SC}	−	0.2		A
Peak Output Current (T_J = 25°C)	I_{max}	−	2.2	−	A
Average Temperature Coefficient of Output Voltage	TCV_O	−	−0.5	−	mV/°C

15. 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.

ELECTRICAL CHARACTERISTICS (V_{in} = 19 V, I_O = 500 mA, T_J = T_{low} to T_{high} (Note 16), unless otherwise noted)

Characteristic	Symbol	MC7812B			MC7812C			Unit
		Min	Typ	Max	Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	11.5	12	12.5	11.5	12	12.5	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W)	V_O							Vdc
14.5 Vdc ≤ V_{in} ≤ 27 Vdc		–	–	–	11.4	12	12.6	
15.5 Vdc ≤ V_{in} ≤ 27 Vdc		11.4	12	12.6	–	–	–	
Line Regulation, T_J = 25°C (Note 17)	Reg_{line}							mV
14.5 Vdc ≤ V_{in} ≤ 30 Vdc		–	7.5	240	–	3.8	24	
16 Vdc ≤ V_{in} ≤ 22 Vdc		–	2.2	120	–	0.3	24	
14.8 Vdc ≤ V_{in} ≤ 27 Vdc, I_O = 1.0 A		–	–	–	–	–	48	
Load Regulation, T_J = 25°C (Note 17)	Reg_{load}	–	1.6	240	–	8.1	60	mV
5.0 mA ≤ I_O ≤ 1.5 A								
Quiescent Current	I_B	–	3.4	8.0	–	3.4	6.5	mA
Quiescent Current Change	ΔI_B							mA
14.5 Vdc ≤ V_{in} ≤ 30 Vdc, I_O = 1.0 A, T_J = 25°C		–	–	–	–	–	0.7	
15 Vdc ≤ V_{in} ≤ 30 Vdc		–	–	1.0	–	–	0.8	
5.0 mA ≤ I_O ≤ 1.0 A		–	–	0.5	–	–	0.5	
Ripple Rejection	RR	–	60	–	55	60	–	dB
15 Vdc ≤ V_{in} ≤ 25 Vdc, f = 120 Hz								
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	$V_I - V_O$	–	2.0	–	–	2.0	–	Vdc
Output Noise Voltage (T_A = 25°C)	V_n	–	10	–	–	10	–	$\mu V/V_O$
10 Hz ≤ f ≤ 100 kHz								
Output Resistance f = 1.0 kHz	r_O	–	1.1	–	–	1.1	–	mΩ
Short Circuit Current Limit (T_A = 25°C)	I_{SC}	–	0.2	–	–	0.2	–	A
V_{in} = 35 Vdc								
Peak Output Current (T_J = 25°C)	I_{max}	–	2.2	–	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	−0.8	–	–	−0.8	–	mV/°C

16. T_{low} = 0°C for MC78XXAC, C T_{high} = +125°C for MC78XXAC, C, NCV7805
= −40°C for MC78XXB, MC78XXAB, NCV7805
17. 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.

ELECTRICAL CHARACTERISTICS (V_{in} = 19 V, I_O = 1.0 A, T_J = T_{low} to T_{high} (Note 18), unless otherwise noted)

Characteristic	Symbol	MC7812AB/MC7812AC			Unit
		Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	11.75	12	12.25	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W)	V_O	11.5	12	12.5	Vdc
14.8 Vdc ≤ V_{in} ≤ 27 Vdc					
Line Regulation (Note 19)	Reg_{line}				mV
14.8 Vdc ≤ V_{in} ≤ 30 Vdc, I_O = 500 mA		−	3.8	18	
16 Vdc ≤ V_{in} ≤ 22 Vdc, I_O = 1.0 A		−	2.2	20	
14.5 Vdc ≤ V_{in} ≤ 27 Vdc, T_J = 25°C		−	6.0	120	
Load Regulation (Note 19)	Reg_{load}				mV
5.0 mA ≤ I_O ≤ 1.5 A, T_J = 25°C		−	−	25	
5.0 mA ≤ I_O ≤ 1.0 A		−	−	25	
Quiescent Current	I_B	−	3.4	6.0	mA
Quiescent Current Change	ΔI_B				mA
15 Vdc ≤ V_{in} ≤ 30 Vdc, I_O = 500 mA		−	−	0.8	
14.8 Vdc ≤ V_{in} ≤ 27 Vdc, T_J = 25°C		−	−	0.8	
5.0 mA ≤ I_O ≤ 1.0 A, T_J = 25°C		−	−	0.5	
Ripple Rejection	RR	55	60	−	dB
15 Vdc ≤ V_{in} ≤ 25 Vdc, f = 120 Hz, I_O = 500 mA					
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	$V_I - V_O$	−	2.0	−	Vdc
Output Noise Voltage (T_A = 25°C)	V_n	−	10	−	$\mu V/V_O$
10 Hz ≤ f ≤ 100 kHz					
Output Resistance (f = 1.0 kHz)	r_O	−	1.1	−	mΩ
Short Circuit Current Limit (T_A = 25°C)	I_{SC}	−	0.2	−	A
V_{in} = 35 Vdc					
Peak Output Current (T_J = 25°C)	I_{max}	−	2.2	−	A
Average Temperature Coefficient of Output Voltage	TCV_O	−	−0.8	−	mV/°C

18. T_{low} = 0°C for MC78XXAC, C T_{high} = +125°C for MC78XXAC, C, NCV7805
= −40°C for MC78XXB, MC78XXAB, NCV7805
19. 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.

ELECTRICAL CHARACTERISTICS (V_{in} = 23 V, I_O = 500 mA, T_J = T_{low} to T_{high} (Note 20), unless otherwise noted)

Characteristic	Symbol	MC7815B			MC7815C			Unit
		Min	Typ	Max	Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	14.4	15	15.6	14.4	15	15.6	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W)	V_O							Vdc
17.5 Vdc ≤ V_{in} ≤ 30 Vdc		−	−	−	14.25	15	15.75	
18.5 Vdc ≤ V_{in} ≤ 30 Vdc		14.25	15	15.75	−	−	−	
Line Regulation, T_J = 25°C (Note 21)	Reg_{line}							mV
17.9 Vdc ≤ V_{in} ≤ 30 Vdc		−	8.5	300	−	8.5	30	
20 Vdc ≤ V_{in} ≤ 26 Vdc		−	3.0	150	−	3.0	28	
Load Regulation, T_J = 25°C (Note 21)	Reg_{load}	−	1.8	300	−	1.8	55	mV
5.0 mA ≤ I_O ≤ 1.5 A								
Quiescent Current	I_B	−	3.5	8.0	−	3.5	6.5	mA
Quiescent Current Change	ΔI_B							mA
17.5 Vdc ≤ V_{in} ≤ 30 Vdc		−	−	−	−	−	0.8	
17.5 Vdc ≤ V_{in} ≤ 30 Vdc, I_O = 1.0 A, T_J = 25°C		−	−	1.0	−	−	0.7	
5.0 mA ≤ I_O ≤ 1.0 A		−	−	0.5	−	−	0.5	
Ripple Rejection	RR	−	58	−	54	58	−	dB
18.5 Vdc ≤ V_{in} ≤ 28.5 Vdc, f = 120 Hz								
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	$V_I - V_O$	−	2.0	−	−	2.0	−	Vdc
Output Noise Voltage (T_A = 25°C)	V_n	−	10	−	−	10	−	$\mu V/V_O$
10 Hz ≤ f ≤ 100 kHz								
Output Resistance f = 1.0 kHz	r_O	−	1.2	−	−	1.2	−	mΩ
Short Circuit Current Limit (T_A = 25°C)	I_{SC}	−	0.2	−	−	0.2	−	A
V_{in} = 35 Vdc								
Peak Output Current (T_J = 25°C)	I_{max}	−	2.2	−	−	2.2	−	A
Average Temperature Coefficient of Output Voltage	TCV_O	−	−1.0	−	−	−1.0	−	mV/°C

20. T_{low} = 0°C for MC78XXAC, C T_{high} = +125°C for MC78XXAC, C, NCV7805
= −40°C for MC78XXB, MC78XXAB, NCV7805
21. 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.

ELECTRICAL CHARACTERISTICS (V_{in} = 23 V, I_O = 1.0 A, T_J = T_{low} to T_{high} (Note 22), unless otherwise noted)

Characteristic	Symbol	MC7815AB/MC7815AC			Unit
		Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	14.7	15	15.3	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W)	V_O	14.4	15	15.6	Vdc
17.9 Vdc ≤ V_{in} ≤ 30 Vdc					
Line Regulation (Note 23)	Reg_{line}				mV
17.9 Vdc ≤ V_{in} ≤ 30 Vdc, I_O = 500 mA		–	8.5	20	
20 Vdc ≤ V_{in} ≤ 26 Vdc		–	3.0	22	
17.5 Vdc ≤ V_{in} ≤ 30 Vdc, I_O = 1.0 A, T_J = 25°C		–	7.0	20	
Load Regulation (Note 23)	Reg_{load}				mV
5.0 mA ≤ I_O ≤ 1.5 A, T_J = 25°C		–	1.8	25	
5.0 mA ≤ I_O ≤ 1.0 A		–	1.5	25	
250 mA ≤ I_O ≤ 750 mA		–	1.2	15	
Quiescent Current	I_B	–	3.5	6.0	mA
Quiescent Current Change	ΔI_B				mA
17.5 Vdc ≤ V_{in} ≤ 30 Vdc, I_O = 500 mA		–	–	0.8	
17.5 Vdc ≤ V_{in} ≤ 30 Vdc, I_O = 1.0 A, T_J = 25°C		–	–	0.8	
5.0 mA ≤ I_O ≤ 1.0 A		–	–	0.5	
Ripple Rejection	RR	60	80	–	dB
18.5 Vdc ≤ V_{in} ≤ 28.5 Vdc, f = 120 Hz, I_O = 500 mA					
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	$V_I - V_O$	–	2.0	–	Vdc
Output Noise Voltage (T_A = 25°C)	V_n	–	10	–	$\mu V/V_O$
10 Hz ≤ f ≤ 100 kHz					
Output Resistance f = 1.0 kHz	r_O	–	1.2	–	mΩ
Short Circuit Current Limit (T_A = 25°C)	I_{SC}	–	0.2	–	A
V_{in} = 35 Vdc					
Peak Output Current (T_J = 25°C)	I_{max}	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	−1.0	–	mV/°C

22. T_{low} = 0°C for MC78XXAC, C T_{high} = +125°C for MC78XXAC, C, NCV7805
= −40°C for MC78XXB, MC78XXAB, NCV7805
23. 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.

ELECTRICAL CHARACTERISTICS (V_{in} = 27 V, I_O = 500 mA, T_J = T_{low} to T_{high} (Note 24), unless otherwise noted)

Characteristic	Symbol	MC7818B			MC7818C			Unit
		Min	Typ	Max	Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	17.3	18	18.7	17.3	18	18.7	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W)	V_O							Vdc
21 Vdc ≤ V_{in} ≤ 33 Vdc		–	–	–	17.1	18	18.9	
22 Vdc ≤ V_{in} ≤ 33 Vdc		17.1	18	18.9	–	–	–	
Line Regulation, (Note 25)	Reg_{line}							mV
21 Vdc ≤ V_{in} ≤ 33 Vdc		–	9.5	360	–	9.5	50	
24 Vdc ≤ V_{in} ≤ 30 Vdc		–	3.2	180	–	3.2	25	
Load Regulation, (Note 25)	Reg_{load}	–	2.0	360	–	2.0	55	mV
5.0 mA ≤ I_O ≤ 1.5 A								
Quiescent Current	I_B	–	3.5	8.0	–	3.5	6.5	mA
Quiescent Current Change	ΔI_B							mA
21 Vdc ≤ V_{in} ≤ 33 Vdc		–	–	–	–	–	1.0	
5.0 mA ≤ I_O ≤ 1.0 A		–	–	0.5	–	–	0.5	
Ripple Rejection	RR	–	57	–	53	57	–	dB
22 Vdc ≤ V_{in} ≤ 33 Vdc, f = 120 Hz								
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	$V_{il} - V_O$	–	2.0	–	–	2.0	–	Vdc
Output Noise Voltage (T_A = 25°C)	V_n	–	10	–	–	10	–	$\mu V/V_O$
10 Hz ≤ f ≤ 100 kHz								
Output Resistance f = 1.0 kHz	r_O	–	1.3	–	–	1.3	–	mΩ
Short Circuit Current Limit (T_A = 25°C)	I_{SC}	–	0.2	–	–	0.2	–	A
V_{in} = 35 Vdc								
Peak Output Current (T_J = 25°C)	I_{max}	–	2.2	–	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	−1.5	–	–	−1.5	–	mV/°C

24. T_{low} = 0°C for MC78XXAC, C T_{high} = +125°C for MC78XXAC, C, NCV7805
= −40°C for MC78XXB, MC78XXAB, NCV7805
25. 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.

ELECTRICAL CHARACTERISTICS (V_{in} = 27 V, I_O = 1.0 A, T_J = T_{low} to T_{high} (Note 26), unless otherwise noted)

Characteristic	Symbol	MC7818AC			Unit
		Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	17.64	18	18.36	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W)	V_O	17.3	18	18.7	Vdc
21 Vdc ≤ V_{in} ≤ 33 Vdc					
Line Regulation (Note 27)	Reg_{line}				mV
21 Vdc ≤ V_{in} ≤ 33 Vdc, I_O = 500 mA		−	9.5	22	
24 Vdc ≤ V_{in} ≤ 30 Vdc, I_O = 1.0 A		−	3.2	25	
24 Vdc ≤ V_{in} ≤ 30 Vdc, I_O = 1.0 A, T_J = 25°C		−	3.2	10.5	
20.6 Vdc ≤ V_{in} ≤ 33 Vdc, I_O = 1.0 A, T_J = 25°C		−	8.0	22	
Load Regulation (Note 27)	Reg_{load}				mV
5.0 mA ≤ I_O ≤ 1.5 A, T_J = 25°C		−	2.0	25	
5.0 mA ≤ I_O ≤ 1.0 A		−	1.8	25	
250 mA ≤ I_O ≤ 750 mA		−	1.5	15	
Quiescent Current	I_B	−	3.5	6.0	mA
Quiescent Current Change	ΔI_B				mA
21 Vdc ≤ V_{in} ≤ 33 Vdc, I_O = 500 mA		−	−	0.8	
21.5 Vdc ≤ V_{in} ≤ 30 Vdc, T_J = 25°C		−	−	0.8	
5.0 mA ≤ I_O ≤ 1.0 A		−	−	0.5	
Ripple Rejection	RR	53	57	−	dB
22 Vdc ≤ V_{in} ≤ 32 Vdc, f = 120 Hz, I_O = 500 mA					
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	$V_I - V_O$	−	2.0	−	Vdc
Output Noise Voltage (T_A = 25°C)	V_n	−	10	−	$\mu V/V_O$
10 Hz ≤ f ≤ 100 kHz					
Output Resistance f = 1.0 kHz	r_O	−	1.3	−	mΩ
Short Circuit Current Limit (T_A = 25°C)	I_{SC}	−	0.2	−	A
V_{in} = 35 Vdc					
Peak Output Current (T_J = 25°C)	I_{max}	−	2.2	−	A
Average Temperature Coefficient of Output Voltage	TCV_O	−	−1.5	−	mV/°C

26. T_{low} = 0°C for MC78XXAC, C T_{high} = +125°C for MC78XXAC, C, NCV7805
= −40°C for MC78XXB, MC78XXAB, NCV7805
27. 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.

ELECTRICAL CHARACTERISTICS (V_{in} = 33 V, I_O = 500 mA, T_J = T_{low} to T_{high} (Note 28), unless otherwise noted)

Characteristic	Symbol	MC7824B			MC7824C			Unit
		Min	Typ	Max	Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	23	24	25	23	24	25	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W)	V_O							Vdc
27 Vdc ≤ V_{in} ≤ 38 Vdc		–	–	–	22.8	24	25.2	
28 Vdc ≤ V_{in} ≤ 38 Vdc		22.8	24	25.2	–	–	–	
Line Regulation, (Note 29)	Reg_{line}							mV
27 Vdc ≤ V_{in} ≤ 38 Vdc		–	11.5	480	–	2.7	60	
30 Vdc ≤ V_{in} ≤ 36 Vdc		–	3.8	240	–	2.7	48	
Load Regulation, (Note 29)	Reg_{load}	–	2.1	480	–	4.4	65	mV
5.0 mA ≤ I_O ≤ 1.5 A								
Quiescent Current	I_B	–	3.6	8.0	–	3.6	6.5	mA
Quiescent Current Change	ΔI_B							mA
27 Vdc ≤ V_{in} ≤ 38 Vdc		–	–	–	–	–	1.0	
5.0 mA ≤ I_O ≤ 1.0 A		–	–	0.5	–	–	0.5	
Ripple Rejection	RR	–	54	–	50	54	–	dB
28 Vdc ≤ V_{in} ≤ 38 Vdc, f = 120 Hz								
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	$V_I - V_O$	–	2.0	–	–	2.0	–	Vdc
Output Noise Voltage (T_A = 25°C)	V_n	–	10	–	–	10	–	$\mu V/V_O$
10 Hz ≤ f ≤ 100 kHz								
Output Resistance f = 1.0 kHz	r_O	–	1.4	–	–	1.4	–	mΩ
Short Circuit Current Limit (T_A = 25°C)	I_{SC}	–	0.2	–	–	0.2	–	A
V_{in} = 35 Vdc								
Peak Output Current (T_J = 25°C)	I_{max}	–	2.2	–	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	−2.0	–	–	−2.0	–	mV/°C

28. T_{low} = 0°C for MC78XXAC, C T_{high} = +125°C for MC78XXAC, C, NCV7805
= −40°C for MC78XXB, MC78XXAB, NCV7805
29. 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.

ELECTRICAL CHARACTERISTICS (V_{in} = 33 V, I_O = 1.0 A, T_J = T_{low} to T_{high} (Note 30), unless otherwise noted)

Characteristic	Symbol	MC7824AC			Unit
		Min	Typ	Max	
Output Voltage (T_J = 25°C)	V_O	23.5	24	24.5	Vdc
Output Voltage (5.0 mA ≤ I_O ≤ 1.0 A, P_D ≤ 15 W)	V_O	23.2	24	25.8	Vdc
27.3 Vdc ≤ V_{in} ≤ 38 Vdc					
Line Regulation (Note 31)	Reg_{line}				mV
27 Vdc ≤ V_{in} ≤ 38 Vdc, I_O = 500 mA		−	11.5	25	
30 Vdc ≤ V_{in} ≤ 36 Vdc, I_O = 1.0 A		−	3.8	28	
30 Vdc ≤ V_{in} ≤ 36 Vdc, T_J = 25°C		−	3.8	12	
26.7 Vdc ≤ V_{in} ≤ 38 Vdc, I_O = 1.0 A, T_J = 25°C		−	10	25	
Load Regulation (Note 31)	Reg_{load}				mV
5.0 mA ≤ I_O ≤ 1.5 A, T_J = 25°C		−	2.1	15	
5.0 mA ≤ I_O ≤ 1.0 A		−	2.0	25	
250 mA ≤ I_O ≤ 750 mA		−	1.8	15	
Quiescent Current	I_B	−	3.6	6.0	mA
Quiescent Current Change	ΔI_B				mA
27.3 Vdc ≤ V_{in} ≤ 38 Vdc, I_O = 500 mA		−	−	0.8	
27 Vdc ≤ V_{in} ≤ 38 Vdc, T_J = 25°C		−	−	0.8	
5.0 mA ≤ I_O ≤ 1.0 A		−	−	0.5	
Ripple Rejection	RR	45	54	−	dB
28 Vdc ≤ V_{in} ≤ 38 Vdc, f = 120 Hz, I_O = 500 mA					
Dropout Voltage (I_O = 1.0 A, T_J = 25°C)	$V_I - V_O$	−	2.0	−	Vdc
Output Noise Voltage (T_A = 25°C)	V_n	−	10	−	$\mu V/V_O$
10 Hz ≤ f ≤ 100 kHz					
Output Resistance (f = 1.0 kHz)	r_O	−	1.4	−	mΩ
Short Circuit Current Limit (T_A = 25°C)	I_{SC}	−	0.2	−	A
V_{in} = 35 Vdc					
Peak Output Current (T_J = 25°C)	I_{max}	−	2.2	−	A
Average Temperature Coefficient of Output Voltage	TCV_O	−	−2.0	−	mV/°C

30. T_{low} = 0°C for MC78XXAC, C T_{high} = +125°C for MC78XXAC, C, NCV7805
= −40°C for MC78XXB, MC78XXAB, NCV7805

31. 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.

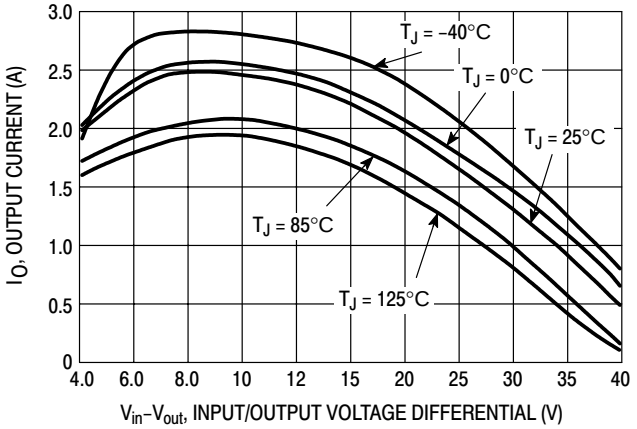


Figure 2. Peak Output Current as a Function of Input/Output Differential Voltage (MC78XXC, AC, B)

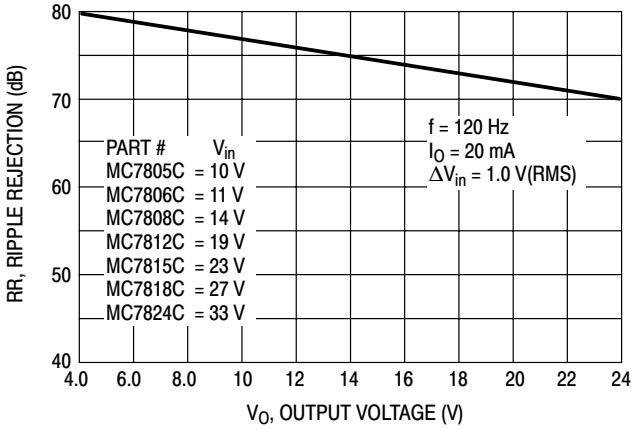


Figure 3. Ripple Rejection as a Function of Output Voltages (MC78XXC, AC, B)

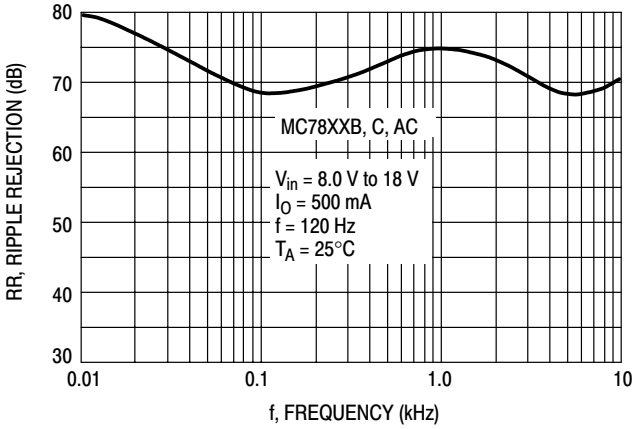


Figure 4. Ripple Rejection as a Function of Frequency (MC78XXC, AC, B)

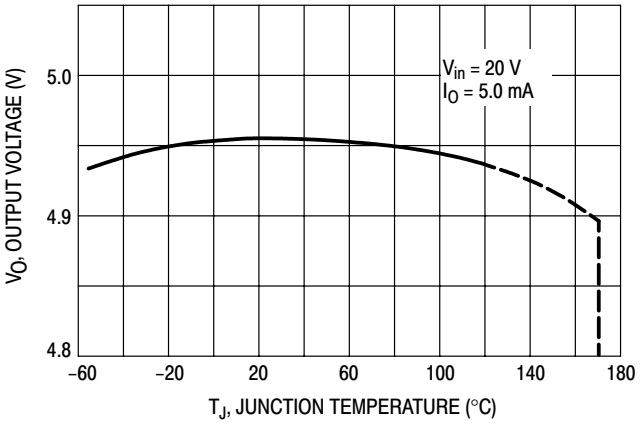


Figure 5. Output Voltage as a Function of Junction Temperature (MC7805C, AC, B)

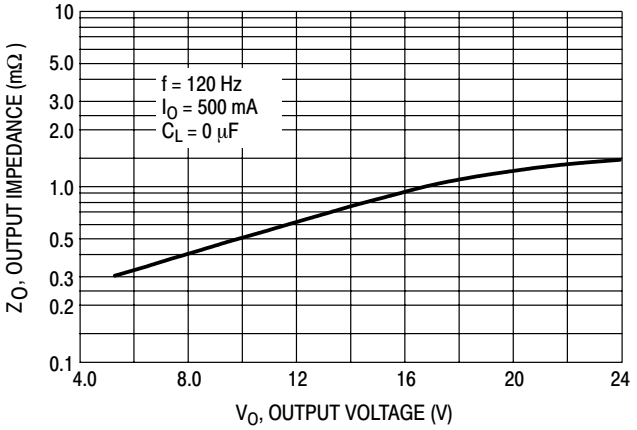


Figure 6. Output Impedance as a Function of Output Voltage (MC78XXC, AC, B)

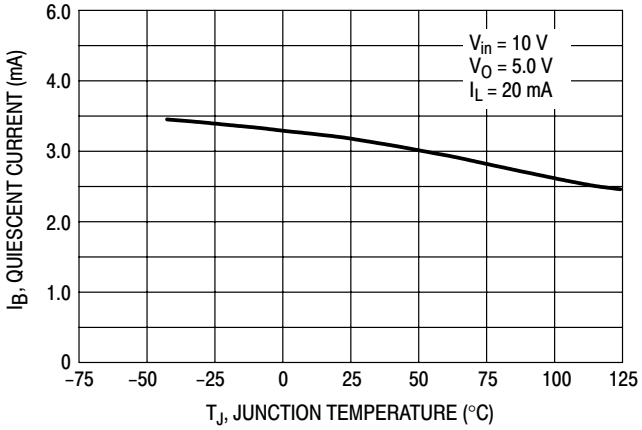


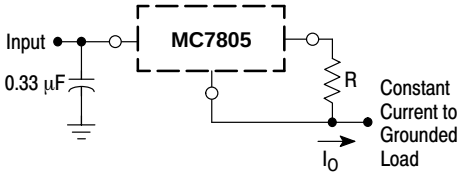
Figure 7. Quiescent Current as a Function of Temperature (MC78XXC, AC, B)

APPLICATIONS INFORMATION

Design Considerations

The MC7800 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.



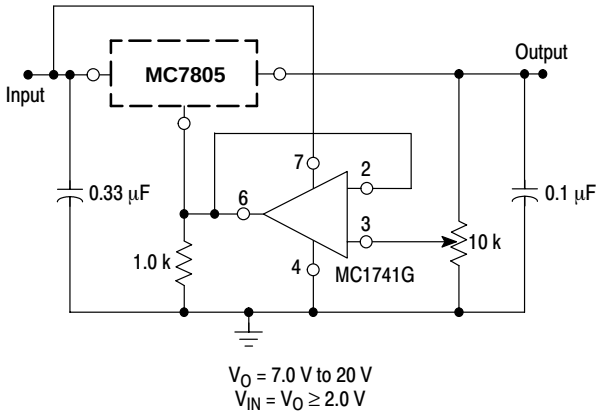
The MC7800 regulators can also be used as a current source when connected as above. In order to minimize dissipation the MC7805C is chosen in this application. Resistor R determines the current as follows:

$$I_O = \frac{5.0\ V}{R} + I_B$$

$I_B \cong 3.2$ mA over line and load changes.

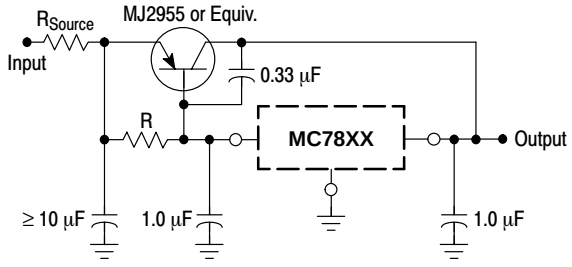
For example, a 1.0 A current source would require R to be a 5.0 Ω, 10 W resistor and the output voltage compliance would be the input voltage less 7.0 V.

Figure 8. Current 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.

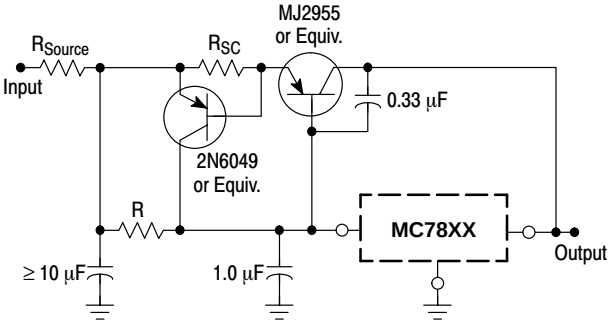
Figure 9. Adjustable Output Regulator



XX = 2 digits of type number indicating voltage.

The MC7800 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 10. Current Boost Regulator



XX = 2 digits of type number indicating voltage.

The circuit of Figure 10 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, a four−ampere plastic power transistor is specified.

Figure 11. Short Circuit Protection

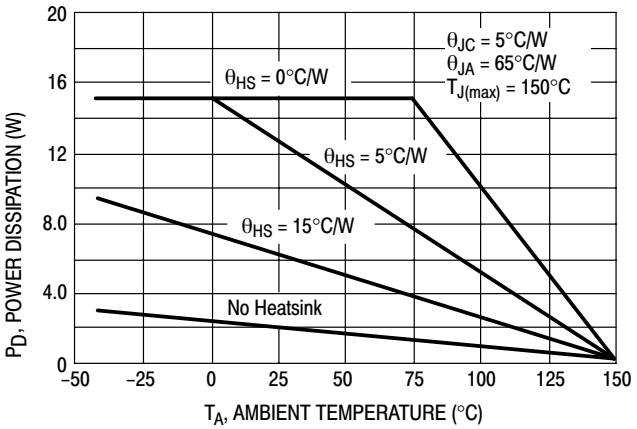


Figure 12. Worst Case Power Dissipation versus Ambient Temperature (Case 221A)

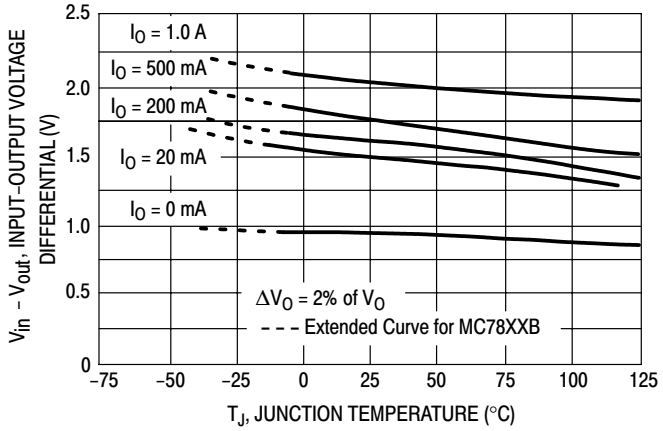


Figure 13. Input Output Differential as a Function of Junction Temperature (MC78XXC, AC, B)

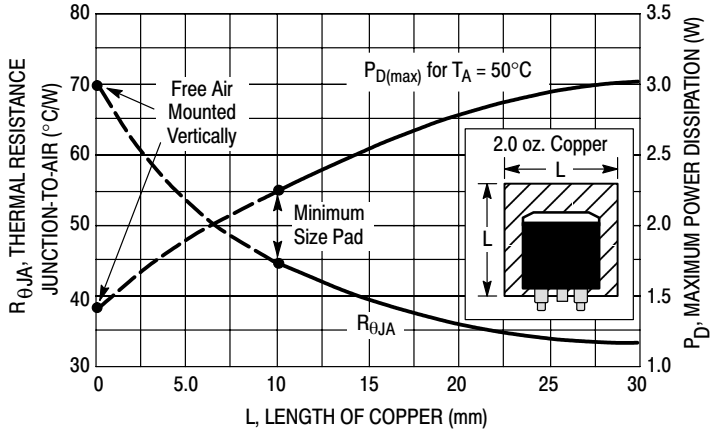


Figure 14. D²PAK Thermal Resistance and Maximum Power Dissipation versus P.C.B. Copper Length

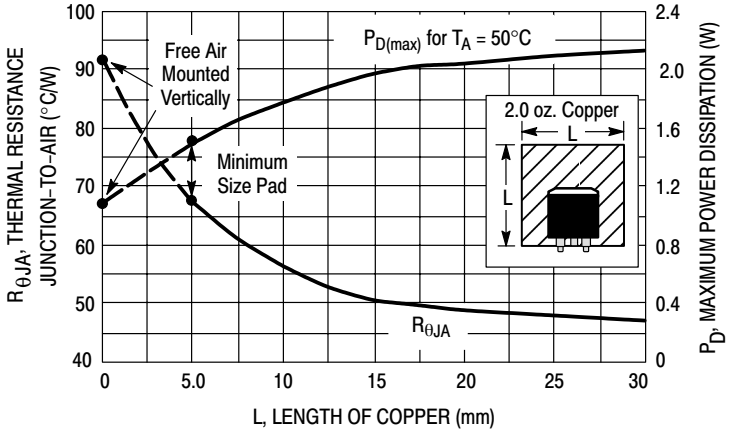


Figure 15. DPAK Thermal Resistance and Maximum Power Dissipation versus P.C.B. Copper Length

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.

Long Term Stability − Output voltage stability under accelerated life test conditions with the maximum rated voltage listed in the devices' electrical characteristics and maximum power dissipation.

ORDERING INFORMATION

Device	Nominal Voltage	Operating Temperature Range	Package	Shipping†
MC7805ABD2T	5.0 V	T = −40°C to +125°C	D^2PAK	50 Units /Rail
MC7805ABD2TG			D^2PAK (Pb−free)	50 Units /Rail
MC7805ABD2TR4			D^2PAK	800 / Tape & Reel
MC7805ABD2TR4G			D^2PAK (Pb−free)	800 / Tape & Reel
MC7805ABT			TO 220	50 Units /Rail
MC7805ABTG			TO 220 (Pb−free)	50 Units /Rail
MC7805ACD2T		T = 0°C to +125°C	D^2PAK	50 Units /Rail
MC7805ACD2TG			D^2PAK (Pb−free)	50 Units /Rail
MC7805ACD2TR4			D^2PAK	800 / Tape & Reel
MC7805ACD2TR4G			D^2PAK (Pb−free)	800 / Tape & Reel
MC7805ACT			TO 220	50 Units /Rail
MC7805ACTG			TO 220 (Pb−free)	50 Units /Rail
MC7805BD2T		T = −40°C to +125°C	D^2PAK	50 Units /Rail
MC7805BD2TG			D^2PAK (Pb−free)	50 Units /Rail
MC7805BD2TR4			D^2PAK	800 / Tape & Reel
MC7805BD2TR4G			D^2PAK (Pb−free)	800 / Tape & Reel
MC7805BDT			DPAK	75 Units / Rail
MC7805BDTG			DPAK (Pb−free)	75 Units / Rail
MC7805BDTRK			DPAK	2500 / Tape & Reel
MC7805BDTRKG			DPAK (Pb−free)	2500 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*NCV devices: T_{low} = −40°C, T_{high} = +125°C. Guaranteed by design. NCV prefix is for automotive and other applications requiring site and change control.

ORDERING INFORMATION

Device	Nominal Voltage	Operating Temperature Range	Package	Shipping†
MC7805BT			TO 220	50 Units /Rail
MC7805BTG			TO 220 (Pb−free)	50 Units /Rail
NCV7805BD2T*			D^2PAK	50 Units /Rail
NCV7805BD2TG*			D^2PAK (Pb−free)	50 Units /Rail
NCV7805BD2TR4*			D^2PAK	800 / Tape & Reel
NCV7805BD2TR4G*			D^2PAK (Pb−free)	800 / Tape & Reel
NCV7805BT*			TO 220	50 Units /Rail
NCV7805BTG*			TO 220 (Pb−free)	50 Units /Rail
MC7805CD2T		T = 0°C to +125°C	D^2PAK	50 Units /Rail
MC7805CD2TG			D^2PAK (Pb−free)	50 Units /Rail
MC7805CD2TR4			D^2PAK	800 / Tape & Reel
MC7805CD2TR4G			D^2PAK (Pb−free)	800 / Tape & Reel
MC7805CDT			DPAK	75 Units / Rail
MC7805CDTG			DPAK (Pb−free)	75 Units / Rail
MC7805CDTRK			DPAK	2500 / Tape & Reel
MC7805CDTRKG			DPAK (Pb−free)	2500 / Tape & Reel
MC7805CT			TO 220	50 Units /Rail
MC7805CTG			TO 220 (Pb−free)	50 Units /Rail
MC7806ACT	6.0 V	T = 0°C to +125°C	TO 220	50 Units /Rail
MC7806ACTG			TO 220 (Pb−free)	50 Units /Rail
MC7806BD2T		T = −40°C to +125°C	D^2PAK	50 Units /Rail
MC7806BD2TG			D^2PAK (Pb−free)	50 Units /Rail
MC7806BD2TR4			D^2PAK	800 / Tape & Reel
MC7806BD2TR4G			D^2PAK (Pb−free)	800 / Tape & Reel
MC7806BT			TO 220	50 Units /Rail
MC7806BTG			TO 220 (Pb−free)	50 Units /Rail
MC7806CT		T = 0°C to +125°C	TO 220	50 Units /Rail
MC7806CTG			TO 220 (Pb−free)	50 Units /Rail

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*NCV devices: T_{low} = −40°C, T_{high} = +125°C. Guaranteed by design. NCV prefix is for automotive and other applications requiring site and change control.

ORDERING INFORMATION

Device	Nominal Voltage	Operating Temperature Range	Package	Shipping†
MC7808ABD2T	8.0 V	T = −40°C to +125°C	D^2PAK	50 Units /Rail
MC7808ABD2TG			D^2PAK (Pb−free)	50 Units /Rail
MC7808ABD2TR4			D^2PAK	800 / Tape & Reel
MC7808ABD2TR4G			D^2PAK (Pb−free)	800 / Tape & Reel
MC7808ABT			TO 220	50 Units /Rail
MC7808ABTG			TO 220 (Pb−free)	50 Units /Rail
MC7808ACT		T = 0°C to +125°C	TO 220	50 Units /Rail
MC7808ACTG			TO 220 (Pb−free)	50 Units /Rail
MC7808BD2T		T = −40°C to +125°C	D^2PAK	50 Units /Rail
MC7808BD2TG			D^2PAK (Pb−free)	50 Units /Rail
MC7808BD2TR4			D^2PAK	800 / Tape & Reel
MC7808BD2TR4G			D^2PAK (Pb−free)	800 / Tape & Reel
MC7808BDT			DPAK	75 Units / Rail
MC7808BDTG			DPAK (Pb−free)	75 Units / Rail
MC7808BDTRK			DPAK	2500 / Tape & Reel
MC7808BDTRKG			DPAK (Pb−free)	2500 / Tape & Reel
MC7808BT			TO 220	50 Units /Rail
MC7808BTG			TO 220 (Pb−free)	50 Units /Rail
MC7808CD2T		T = 0°C to +125°C	D^2PAK	50 Units /Rail
MC7808CD2TG			D^2PAK (Pb−free)	50 Units /Rail
MC7808CD2TR4			D^2PAK	800 / Tape & Reel
MC7808CD2TR4G			D^2PAK (Pb−free)	800 / Tape & Reel
MC7808CDT			DPAK	75 Units / Rail
MC7808CDTG			DPAK (Pb−free)	75 Units / Rail
MC7808CDTRK			DPAK	2500 / Tape & Reel
MC7808CDTRKG			DPAK (Pb−free)	2500 / Tape & Reel
MC7808CT			TO 220	50 Units /Rail
MC7808CTG			TO 220 (Pb−free)	50 Units /Rail

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*NCV devices: T_{low} = −40°C, T_{high} = +125°C. Guaranteed by design. NCV prefix is for automotive and other applications requiring site and change control.

ORDERING INFORMATION

Device	Nominal Voltage	Operating Temperature Range	Package	Shipping†
MC7809ACT	9.0 V	T = 0°C to +125°C	TO 220	50 Units /Rail
MC7809ACTG			TO 220 (Pb−free)	50 Units /Rail
MC7809BT		T = −40°C to +125°C	TO 220	50 Units /Rail
MC7809BTG			TO 220 (Pb−free)	50 Units /Rail
MC7809CD2T		T = 0°C to +125°C	D^2PAK	50 Units /Rail
MC7809CD2TG			D^2PAK (Pb−free)	50 Units /Rail
MC7809CD2TR4			D^2PAK	800 / Tape & Reel
MC7809CD2TR4G			D^2PAK (Pb−free)	800 / Tape & Reel
MC7809CT			TO 220	50 Units /Rail
MC7809CTG			TO 220 (Pb−free)	50 Units /Rail
MC7812ABD2T	12 V	T = −40°C to +125°C	D^2PAK	50 Units /Rail
MC7812ABD2TG			D^2PAK (Pb−free)	50 Units /Rail
MC7812ABD2TR4			D^2PAK	800 / Tape & Reel
MC7812ABD2TR4G			D^2PAK (Pb−free)	800 / Tape & Reel
MC7812ABT			TO 220	50 Units /Rail
MC7812ABTG			TO 220 (Pb−free)	50 Units /Rail
MC7812ACD2T		T = 0°C to +125°C	D^2PAK	50 Units /Rail
MC7812ACD2TG			D^2PAK (Pb−free)	50 Units /Rail
MC7812ACD2TR4			D^2PAK	800 / Tape & Reel
MC7812ACD2TR4G			D^2PAK (Pb−free)	800 / Tape & Reel
MC7812ACT			TO 220	50 Units /Rail
MC7812ACTG			TO 220 (Pb−free)	50 Units /Rail
MC7812BD2T		T = −40°C to +125°C	D^2PAK	50 Units /Rail
MC7812BD2TG			D^2PAK (Pb−free)	50 Units /Rail
MC7812BD2TR4			D^2PAK	800 / Tape & Reel
MC7812BD2TR4G			D^2PAK (Pb−free)	800 / Tape & Reel
MC7812BDT			DPAK	75 Units / Rail
MC7812BDTG			DPAK (Pb−free)	75 Units / Rail

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*NCV devices: T_{low} = −40°C, T_{high} = +125°C. Guaranteed by design. NCV prefix is for automotive and other applications requiring site and change control.

ORDERING INFORMATION

Device	Nominal Voltage	Operating Temperature Range	Package	Shipping†
MC7812BDTRK	12 V	T = −40°C to +125°C	DPAK	2500 / Tape & Reel
MC7812BDTRKG			DPAK (Pb−free)	2500 / Tape & Reel
MC7812BT			TO 220	50 Units /Rail
MC7812BTG			TO 220 (Pb−free)	50 Units /Rail
NCV7812BD2T *			D^2PAK	50 Units /Rail
NCV7812BD2TR4 *			D^2PAK	800 / Tape & Reel
NCV7812BT *			TO 220	50 Units /Rail
MC7812CD2T		T = 0°C to +125°C	D^2PAK	50 Units /Rail
MC7812CD2TG			D^2PAK (Pb−free)	50 Units /Rail
MC7812CD2TR4			D^2PAK	800 / Tape & Reel
MC7812CD2TR4G			D^2PAK (Pb−free)	800 / Tape & Reel
MC7812CDT			DPAK	75 Units / Rail
MC7812CDTG			DPAK (Pb−free)	75 Units / Rail
MC7812CDTRK			DPAK	2500 / Tape & Reel
MC7812CDTRKG			DPAK (Pb−free)	2500 / Tape & Reel
MC7812CT			TO 220	50 Units /Rail
MC7812CTG			TO 220 (Pb−free)	50 Units /Rail
MC7815ABD2T	15 V	T = −40°C to +125°C	D^2PAK	50 Units /Rail
MC7815ABD2TG			D^2PAK (Pb−free)	50 Units /Rail
MC7815ABD2TR4			D^2PAK	800 / Tape & Reel
MC7815ABD2TR4G			D^2PAK (Pb−free)	800 / Tape & Reel
MC7815ABT			TO 220	50 Units /Rail
MC7815ABTG			TO 220 (Pb−free)	50 Units /Rail
MC7815ACD2T		T = 0°C to +125°C	D^2PAK	50 Units /Rail
MC7815ACD2TG			D^2PAK (Pb−free)	50 Units /Rail
MC7815ACT			TO 220	50 Units /Rail
MC7815ACTG			TO 220 (Pb−free)	50 Units /Rail
MC7815BD2T		T = −40°C to +125°C	D^2PAK	50 Units /Rail
MC7815BD2TG			D^2PAK (Pb−free)	50 Units /Rail

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*NCV devices: T_{low} = −40°C, T_{high} = +125°C. Guaranteed by design. NCV prefix is for automotive and other applications requiring site and change control.

ORDERING INFORMATION

Device	Nominal Voltage	Operating Temperature Range	Package	Shipping†
MC7815BD2TR4	15 V	T = −40°C to +125°C	D^2PAK	800 / Tape & Reel
MC7815BD2TR4G			D^2PAK (Pb−free)	800 / Tape & Reel
MC7815BDT			DPAK	75 Units / Rail
MC7815BDTG			DPAK (Pb−free)	75 Units / Rail
MC7815BDTRK			DPAK	2500 / Tape & Reel
MC7815BDTRKG			DPAK (Pb−free)	2500 / Tape & Reel
MC7815BT			TO 220	50 Units /Rail
MC7815BTG			TO 220 (Pb−free)	50 Units /Rail
MC7815CD2T		T = 0°C to +125°C	D^2PAK	50 Units /Rail
MC7815CD2TG			D^2PAK (Pb−free)	50 Units /Rail
MC7815CD2TR4			D^2PAK	800 / Tape & Reel
MC7815CD2TR4G			D^2PAK (Pb−free)	800 / Tape & Reel
MC7815CDT			DPAK	75 Units / Rail
MC7815CDTG			DPAK (Pb−free)	75 Units / Rail
MC7815CDTRK			DPAK	2500 / Tape & Reel
MC7815CDTRKG			DPAK (Pb−free)	2500 / Tape & Reel
MC7815CT			TO 220	50 Units /Rail
MC7815CTG			TO 220 (Pb−free)	50 Units /Rail
MC7818ACT	18 V	T = 0°C to +125°C	TO 220	50 Units /Rail
MC7818ACTG			TO 220 (Pb−free)	50 Units /Rail
MC7818BT		T = −40°C to +125°C	TO 220	50 Units /Rail
MC7818BTG			TO 220 (Pb−free)	50 Units /Rail
MC7818CD2T		T = 0°C to +125°C	D^2PAK	50 Units /Rail
MC7818CD2TR4			D^2PAK	800 / Tape & Reel
MC7818CD2TR4G			D^2PAK (Pb−free)	800 / Tape & Reel
MC7818CT			TO 220	50 Units /Rail
MC7818CTG			TO 220 (Pb−free)	50 Units /Rail

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*NCV devices: T_{low} = −40°C, T_{high} = +125°C. Guaranteed by design. NCV prefix is for automotive and other applications requiring site and change control.

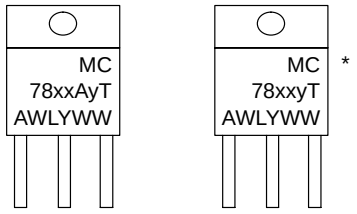
ORDERING INFORMATION

Device	Nominal Voltage	Operating Temperature Range	Package	Shipping†
MC7824ACT	24 V	T = 0°C to +125°C	TO 220	50 Units /Rail
MC7824ACTG			TO 220 (Pb−free)	50 Units /Rail
MC7824BD2T		T = −40°C to +125°C	D^2PAK	50 Units /Rail
MC7824BD2TG			D^2PAK (Pb−free)	50 Units /Rail
MC7824BD2TR4			D^2PAK	800 / Tape & Reel
MC7824BD2TR4G			D^2PAK (Pb−free)	800 / Tape & Reel
MC7824BT			TO 220	50 Units /Rail
MC7824BTG			TO 220 (Pb−free)	50 Units /Rail
MC7824CD2T		T = 0°C to +125°C	D^2PAK	50 Units /Rail
MC7824CD2TG			D^2PAK (Pb−free)	50 Units /Rail
MC7824CD2TR4			D^2PAK	800 / Tape & Reel
MC7824CD2TR4G			D^2PAK (Pb−free)	800 / Tape & Reel
MC7824CT			TO 220	50 Units /Rail
MC7824CTG			TO 220 (Pb−free)	50 Units /Rail

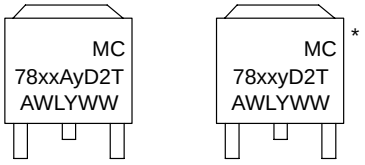
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*NCV devices: T_{low} = −40°C, T_{high} = +125°C. Guaranteed by design. NCV prefix is for automotive and other applications requiring site and change control.

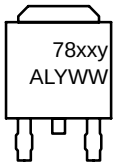
MARKING DIAGRAMS



TO−220−3
T SUFFIX
CASE 221A



D^2PAK−3
D2T SUFFIX
CASE 936



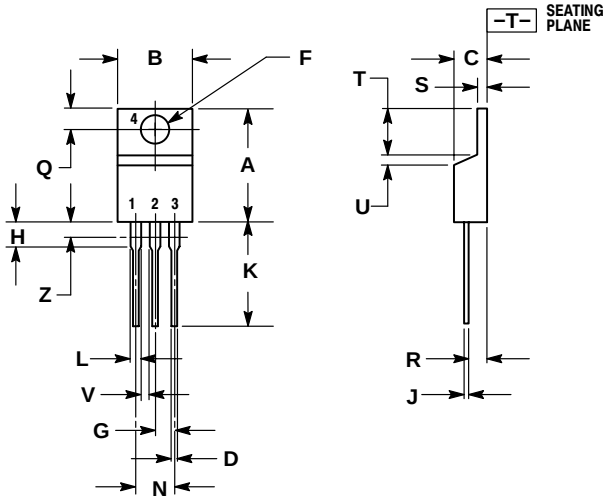
DPAK−3
DT SUFFIX
CASE 369C

*This marking diagram also applies to NCV78xx family.

xx = 05, 06, 08, 09, 12, 15, 18, or 24
y = B or C
A = Assembly Location
WL, L = Wafer Lot
Y = Year
WW = Work Week

PACKAGE DIMENSIONS

TO−220−3
T SUFFIX
CASE 221A−09
ISSUE AA

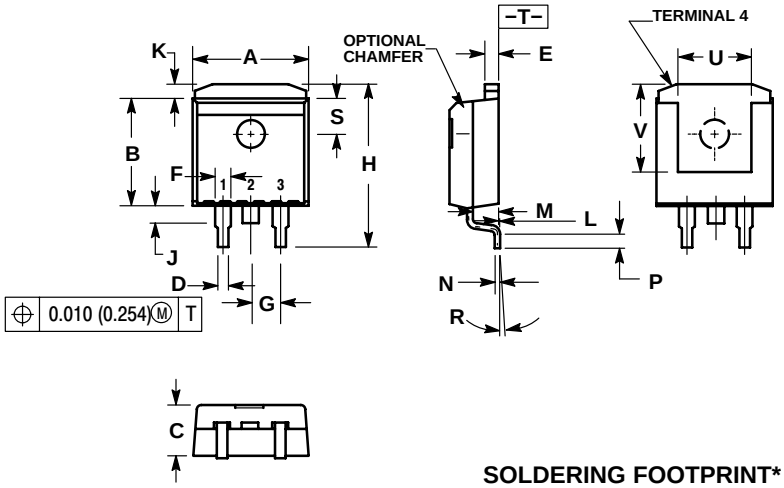


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04

PACKAGE DIMENSIONS

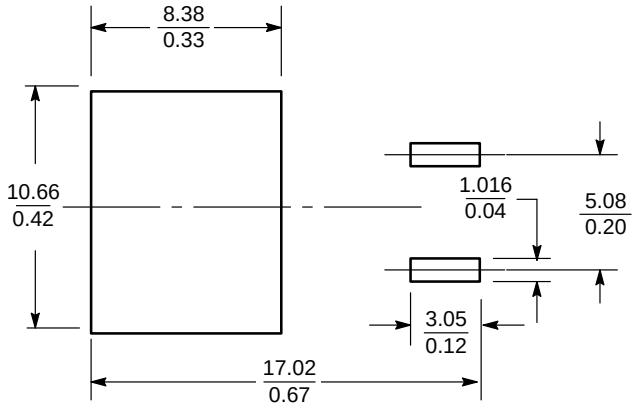
D²PAK−3
D2T SUFFIX
CASE 936−03
ISSUE B



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.

	INCHES		MILLIMETERS	
DIM	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	

SOLDERING FOOTPRINT*



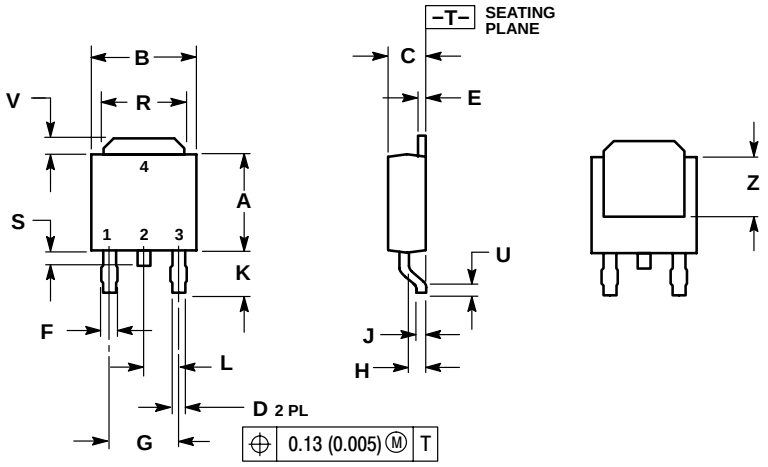
SCALE 3:1 $\left(\frac{\text{mm}}{\text{inches}}\right)$

D²PAK−3

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

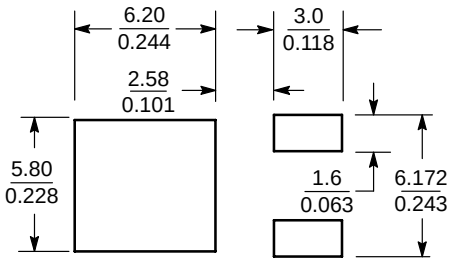
DPAK−3
DT SUFFIX
CASE 369C−01
ISSUE O



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

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.235	0.245	5.97	6.22
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	0.018	0.023	0.46	0.58
F	0.037	0.045	0.94	1.14
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	0.180	0.215	4.57	5.45
S	0.025	0.040	0.63	1.01
U	0.020	−−−	0.51	−−−
V	0.035	0.050	0.89	1.27
Z	0.155	−−−	3.93	−−−

SOLDERING FOOTPRINT*



SCALE 3:1 $\left(\frac{\text{mm}}{\text{inches}}\right)$

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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