

MC7800, MC7800A, NCV7805



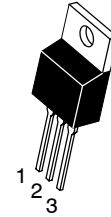
ON Semiconductor®

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1.0 A Positive Voltage Regulators

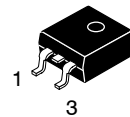
These voltage regulators are monolithic integrated circuits designed as fixed-voltage regulators for a wide variety of applications including local, on-card regulation. These regulators employ internal current limiting, thermal shutdown, and safe-area compensation. With adequate heatsinking they can 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 D²PAK-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



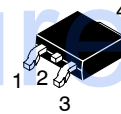
**TO-220-3
T SUFFIX
CASE 221A**

Heatsink surface
connected to Pin 2.



**D²PAK-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**

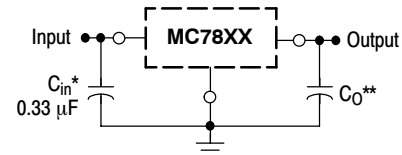
MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$, unless otherwise noted)

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	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	5.0	5.0	5.0	$^\circ\text{C}/\text{W}$
Storage Junction Temperature Range	T_{stg}	-65 to +150			$^\circ\text{C}$
Operating Junction Temperature	T_J	+150			$^\circ\text{C}$

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.

NOTE: ESD data available upon request.

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.

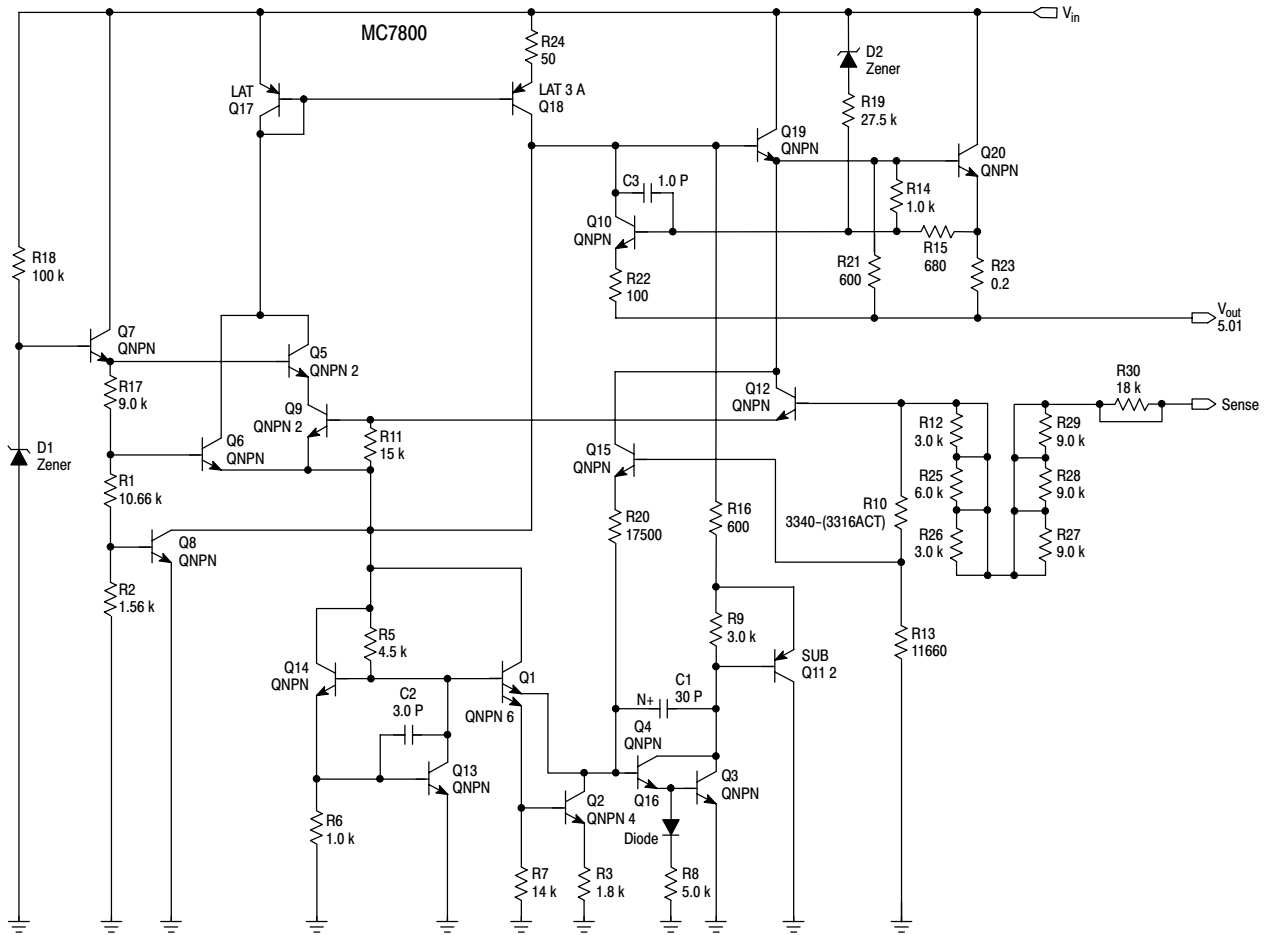
ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 354 of this data sheet.

DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 358 of this data sheet.

MC7800, MC7800A, NCV7805



This device contains 22 active transistors.

Figure 1. Representative Schematic Diagram

MC7800, MC7800A, NCV7805

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

Characteristic	Symbol	MC7805B, NCV7805			MC7805C			Unit
		Min	Typ	Max	Min	Typ	Max	
Output Voltage ($T_J = 25^\circ\text{C}$)	V_O	4.8	5.0	5.2	4.8	5.0	5.2	Vdc
Output Voltage ($5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_D \leq 5\text{ W}$) $7.0\text{ Vdc} \leq V_{in} \leq 20\text{ Vdc}$ $8.0\text{ Vdc} \leq V_{in} \leq 20\text{ Vdc}$	V_O	– 4.75	– 5.0	– 5.25	4.75 –	5.0 –	5.25 –	Vdc
Line Regulation (Note 4) $7.5\text{ Vdc} \leq V_{in} \leq 20\text{ Vdc}$, 1.0 A $8.0\text{ Vdc} \leq V_{in} \leq 12\text{ Vdc}$	Reg_{line}	– –	5.0 1.3	100 50	– –	0.5 0.8	20 10	mV
Load Regulation (Note 4) $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$ ($T_A = 25^\circ\text{C}$)	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 $7.0\text{ Vdc} \leq V_{in} \leq 25\text{ Vdc}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ ($T_A = 25^\circ\text{C}$)	ΔI_B	– –	– –	– 0.5	– –	0.3 0.08	1.0 0.8	mA
Ripple Rejection $8.0\text{ Vdc} \leq V_{in} \leq 18\text{ Vdc}$, $f = 120\text{ Hz}$	RR	–	68	–	62	83	–	dB
Dropout Voltage ($I_O = 1.0\text{ A}$, $T_J = 25^\circ\text{C}$)	$V_I - V_O$	–	2.0	–	–	2.0	–	Vdc
Output Noise Voltage ($T_A = 25^\circ\text{C}$) $10\text{ Hz} \leq f \leq 100\text{ kHz}$	V_n	–	10	–	–	10	–	$\mu\text{V}/V_O$
Output Resistance $f = 1.0\text{ kHz}$	r_O	–	0.9	–	–	0.9	–	$\text{m}\Omega$
Short Circuit Current Limit ($T_A = 25^\circ\text{C}$) $V_{in} = 35\text{ Vdc}$	I_{SC}	–	0.2	–	–	0.6	–	A
Peak Output Current ($T_J = 25^\circ\text{C}$)	I_{max}	–	2.2	–	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	–0.3	–	–	–0.3	–	$\text{mV}/^\circ\text{C}$

1. $T_{low} = 0^\circ\text{C}$ for MC78XXAC, C, $T_{high} = +125^\circ\text{C}$ 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.

MC7800, MC7800A, NCV7805

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

Characteristic	Symbol	MC7805AB/MC7805AC			Unit
		Min	Typ	Max	
Output Voltage ($T_J = 25^\circ\text{C}$)	V_O	4.9	5.0	5.1	Vdc
Output Voltage ($5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_D \leq 5\text{ W}$) $7.5\text{ Vdc} \leq V_{in} \leq 20\text{ Vdc}$	V_O	4.8	5.0	5.2	Vdc
Line Regulation (Note 4) $7.5\text{ Vdc} \leq V_{in} \leq 25\text{ Vdc}$, $I_O = 500\text{ mA}$ $8.0\text{ Vdc} \leq V_{in} \leq 12\text{ Vdc}$, $I_O = 1.0\text{ A}$ $8.0\text{ Vdc} \leq V_{in} \leq 12\text{ Vdc}$, $I_O = 1.0\text{ A}$, $T_J = 25^\circ\text{C}$ $7.3\text{ Vdc} \leq V_{in} \leq 20\text{ Vdc}$, $I_O = 1.0\text{ A}$, $T_J = 25^\circ\text{C}$	Reg_{line}	–	0.5 0.8 1.3 4.5	10 12 4.0 10	mV
Load Regulation (Note 4) $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$, $T_J = 25^\circ\text{C}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ $250\text{ mA} \leq I_O \leq 750\text{ mA}$	Reg_{load}	–	1.3 0.8 0.53	25 25 15	mV
Quiescent Current	I_B	–	3.2	6.0	mA
Quiescent Current Change $8.0\text{ Vdc} \leq V_{in} \leq 25\text{ Vdc}$, $I_O = 500\text{ mA}$ $7.5\text{ Vdc} \leq V_{in} \leq 20\text{ Vdc}$, $T_J = 25^\circ\text{C}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$	ΔI_B	–	0.3 – 0.08	0.8 0.8 0.5	mA
Ripple Rejection $8.0\text{ Vdc} \leq V_{in} \leq 18\text{ Vdc}$, $f = 120\text{ Hz}$, $I_O = 500\text{ mA}$	RR	68	83	–	dB
Dropout Voltage ($I_O = 1.0\text{ A}$, $T_J = 25^\circ\text{C}$)	$V_I - V_O$	–	2.0	–	Vdc
Output Noise Voltage ($T_A = 25^\circ\text{C}$) $10\text{ Hz} \leq f \leq 100\text{ kHz}$	V_n	–	10	–	$\mu\text{V}/V_O$
Output Resistance ($f = 1.0\text{ kHz}$)	r_O	–	0.9	–	$\text{m}\Omega$
Short Circuit Current Limit ($T_A = 25^\circ\text{C}$) $V_{in} = 35\text{ Vdc}$	I_{SC}	–	0.2	–	A
Peak Output Current ($T_J = 25^\circ\text{C}$)	I_{max}	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	–0.3	–	$\text{mV}/^\circ\text{C}$

3. $T_{low} = 0^\circ\text{C}$ for MC78XXAC, C $T_{high} = +125^\circ\text{C}$ 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.

MC7800, MC7800A, NCV7805

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

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

5. $T_{low} = 0^\circ\text{C}$ for MC78XXAC, C $T_{high} = +125^\circ\text{C}$ 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.

MC7800, MC7800A, NCV7805

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

Characteristic	Symbol	MC7806AC			Unit
		Min	Typ	Max	
Output Voltage ($T_J = 25^\circ\text{C}$)	V_O	5.88	6.0	6.12	Vdc
Output Voltage ($5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_D \leq 5\text{ W}$) $8.6\text{ Vdc} \leq V_{in} \leq 21\text{ Vdc}$	V_O	5.76	6.0	6.24	Vdc
Line Regulation (Note 8) $8.6\text{ Vdc} \leq V_{in} \leq 25\text{ Vdc}$, $I_O = 500\text{ mA}$ $9.0\text{ Vdc} \leq V_{in} \leq 13\text{ Vdc}$, $I_O = 1.0\text{ A}$	Reg_{line}	-	5.0	12	mV
Load Regulation (Note 8) $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$, $T_J = 25^\circ\text{C}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ $250\text{ mA} \leq I_O \leq 750\text{ mA}$	Reg_{load}	-	1.3	25	mV
Quiescent Current	I_B	-	3.3	6.0	mA
Quiescent Current Change $9.0\text{ Vdc} \leq V_{in} \leq 25\text{ Vdc}$, $I_O = 500\text{ mA}$ $9.0\text{ Vdc} \leq V_{in} \leq 21\text{ Vdc}$, $I_O = 1.0\text{ A}$, $T_J = 25^\circ\text{C}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$	ΔI_B	-	-	0.8	mA
Ripple Rejection $9.0\text{ Vdc} \leq V_{in} \leq 19\text{ Vdc}$, $f = 120\text{ Hz}$, $I_O = 500\text{ mA}$	RR	58	65	-	dB
Dropout Voltage ($I_O = 1.0\text{ A}$, $T_J = 25^\circ\text{C}$)	$V_I - V_O$	-	2.0	-	Vdc
Output Noise Voltage ($T_A = 25^\circ\text{C}$) $10\text{ Hz} \leq f \leq 100\text{ kHz}$	V_n	-	10	-	$\mu\text{V}/V_O$
Output Resistance ($f = 1.0\text{ kHz}$)	r_O	-	0.9	-	$\text{m}\Omega$
Short Circuit Current Limit ($T_A = 25^\circ\text{C}$) $V_{in} = 35\text{ Vdc}$	I_{SC}	-	0.2	-	A
Peak Output Current ($T_J = 25^\circ\text{C}$)	I_{max}	-	2.2	-	A
Average Temperature Coefficient of Output Voltage	TCV_O	-	-0.3	-	$\text{mV}/^\circ\text{C}$

7. $T_{low} = 0^\circ\text{C}$ for MC78XXAC, C $T_{high} = +125^\circ\text{C}$ 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.

MC7800, MC7800A, NCV7805

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

Characteristic	Symbol	MC7808B			MC7808C			Unit
		Min	Typ	Max	Min	Typ	Max	
Output Voltage ($T_J = 25^\circ\text{C}$)	V_O	7.7	8.0	8.3	7.7	8.0	8.3	Vdc
Output Voltage ($5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_D \leq 5\text{ W}$)	V_O							Vdc
$10.5\text{ Vdc} \leq V_{in} \leq 23\text{ Vdc}$		–	–	–	7.6	8.0	8.4	
$11.5\text{ Vdc} \leq V_{in} \leq 23\text{ Vdc}$		7.6	8.0	8.4	–	–	–	
Line Regulation, $T_J = 25^\circ\text{C}$, (Note 10)	Reg_{line}							mV
$10.5\text{ Vdc} \leq V_{in} \leq 25\text{ Vdc}$		–	6.0	160	–	6.0	32	
$11\text{ Vdc} \leq V_{in} \leq 17\text{ Vdc}$		–	1.7	80	–	1.7	16	
Load Regulation, $T_J = 25^\circ\text{C}$ (Note 10)	Reg_{load}	–	1.4	160	–	1.4	35	mV
$5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$								
Quiescent Current	I_B	–	3.3	8.0	–	3.3	8.0	mA
Quiescent Current Change	ΔI_B							mA
$10.5\text{ Vdc} \leq V_{in} \leq 25\text{ Vdc}$		–	–	–	–	–	1.0	
$5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$		–	–	0.5	–	–	0.5	
Ripple Rejection	RR	–	62	–	56	62	–	dB
$11.5\text{ Vdc} \leq V_{in} \leq 18\text{ Vdc}$, $f = 120\text{ Hz}$								
Dropout Voltage ($I_O = 1.0\text{ A}$, $T_J = 25^\circ\text{C}$)	$V_I - V_O$	–	2.0	–	–	2.0	–	Vdc
Output Noise Voltage ($T_A = 25^\circ\text{C}$)	V_n	–	10	–	–	10	–	$\mu\text{V}/V_O$
$10\text{ Hz} \leq f \leq 100\text{ kHz}$								
Output Resistance $f = 1.0\text{ kHz}$	r_O	–	0.9	–	–	0.9	–	$\text{m}\Omega$
Short Circuit Current Limit ($T_A = 25^\circ\text{C}$)	I_{SC}	–	0.2	–	–	0.2	–	A
$V_{in} = 35\text{ Vdc}$								
Peak Output Current ($T_J = 25^\circ\text{C}$)	I_{max}	–	2.2	–	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	–0.4	–	–	–0.4	–	$\text{mV}/^\circ\text{C}$

9. $T_{low} = 0^\circ\text{C}$ for MC78XXAC, C $T_{high} = +125^\circ\text{C}$ for MC78XXAC, C, NCV7805
 $= -40^\circ\text{C}$ 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.

MC7800, MC7800A, NCV7805

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

Characteristic	Symbol	MC7808AB/MC7808AC			Unit
		Min	Typ	Max	
Output Voltage ($T_J = 25^\circ\text{C}$)	V_O	7.84	8.0	8.16	Vdc
Output Voltage ($5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_D \leq 5\text{ W}$) $10.6\text{ Vdc} \leq V_{in} \leq 23\text{ Vdc}$	V_O	7.7	8.0	8.3	Vdc
Line Regulation (Note 12) $10.6\text{ Vdc} \leq V_{in} \leq 25\text{ Vdc}$, $I_O = 500\text{ mA}$ $11\text{ Vdc} \leq V_{in} \leq 17\text{ Vdc}$, $I_O = 1.0\text{ A}$ $10.4\text{ Vdc} \leq V_{in} \leq 23\text{ Vdc}$, $T_J = 25^\circ\text{C}$	Reg _{line}	-	6.0 1.7 5.0	15 18 15	mV
Load Regulation (Note 12) $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$, $T_J = 25^\circ\text{C}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ $250\text{ mA} \leq I_O \leq 750\text{ mA}$	Reg _{load}	-	1.4 1.0 0.22	25 25 15	mV
Quiescent Current	I_B	-	3.3	6.0	mA
Quiescent Current Change $11\text{ Vdc} \leq V_{in} \leq 25\text{ Vdc}$, $I_O = 500\text{ mA}$ $10.6\text{ Vdc} \leq V_{in} \leq 23\text{ Vdc}$, $I_O = 1.0\text{ A}$, $T_J = 25^\circ\text{C}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$	ΔI_B	-	-	0.8 0.8 0.5	mA
Ripple Rejection $11.5\text{ Vdc} \leq V_{in} \leq 21.5\text{ Vdc}$, $f = 120\text{ Hz}$, $I_O = 500\text{ mA}$	RR	56	62	-	dB
Dropout Voltage ($I_O = 1.0\text{ A}$, $T_J = 25^\circ\text{C}$)	$V_I - V_O$	-	2.0	-	Vdc
Output Noise Voltage ($T_A = 25^\circ\text{C}$) $10\text{ Hz} \leq f \leq 100\text{ kHz}$	V_n	-	10	-	$\mu\text{V}/V_O$
Output Resistance $f = 1.0\text{ kHz}$	r_O	-	0.9	-	$\text{m}\Omega$
Short Circuit Current Limit ($T_A = 25^\circ\text{C}$) $V_{in} = 35\text{ Vdc}$	I_{SC}	-	0.2	-	A
Peak Output Current ($T_J = 25^\circ\text{C}$)	I_{max}	-	2.2	-	A
Average Temperature Coefficient of Output Voltage	TCV _O	-	-0.4	-	$\text{mV}/^\circ\text{C}$

11. $T_{low} = 0^\circ\text{C}$ for MC78XXAC, C $T_{high} = +125^\circ\text{C}$ 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.

MC7800, MC7800A, NCV7805

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

Characteristic	Symbol	MC7809B			MC7809C			Unit
		Min	Typ	Max	Min	Typ	Max	
Output Voltage ($T_J = 25^\circ\text{C}$)	V_O	8.65	9.0	9.35	8.65	9.0	9.35	Vdc
Output Voltage ($5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_D \leq 5\text{ W}$) $11.5\text{ Vdc} \leq V_{in} \leq 24\text{ Vdc}$	V_O	8.55	9.0	9.45	8.55	9.0	9.45	Vdc
Line Regulation, $T_J = 25^\circ\text{C}$ (Note 14) $11\text{ Vdc} \leq V_{in} \leq 26\text{ Vdc}$ $11.5\text{ Vdc} \leq V_{in} \leq 17\text{ Vdc}$	Reg_{line}	–	6.2	32	–	6.2	32	mV
Load Regulation, $T_J = 25^\circ\text{C}$ (Note 14) $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$	Reg_{load}	–	1.5	35	–	1.5	35	mV
Quiescent Current	I_B	–	3.4	8.0	–	3.4	8.0	mA
Quiescent Current Change $11.5\text{ Vdc} \leq V_{in} \leq 26\text{ Vdc}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$	ΔI_B	–	–	1.0	–	–	1.0	mA
Ripple Rejection $11.5\text{ Vdc} \leq V_{in} \leq 21.5\text{ Vdc}$, $f = 120\text{ Hz}$	RR	56	61	–	56	61	–	dB
Dropout Voltage ($I_O = 1.0\text{ A}$, $T_J = 25^\circ\text{C}$)	$V_I - V_O$	–	2.0	–	–	2.0	–	Vdc
Output Noise Voltage ($T_A = 25^\circ\text{C}$) $10\text{ Hz} \leq f \leq 100\text{ kHz}$	V_n	–	10	–	–	10	–	$\mu\text{V}/V_O$
Output Resistance $f = 1.0\text{ kHz}$	r_O	–	1.0	–	–	1.0	–	$\text{m}\Omega$
Short Circuit Current Limit ($T_A = 25^\circ\text{C}$) $V_{in} = 35\text{ Vdc}$	I_{SC}	–	0.2	–	–	0.2	–	A
Peak Output Current ($T_J = 25^\circ\text{C}$)	I_{max}	–	2.2	–	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	–0.5	–	–	–0.5	–	$\text{mV}/^\circ\text{C}$

13. $T_{low} = 0^\circ\text{C}$ for MC78XXAC, C $T_{high} = +125^\circ\text{C}$ for MC78XXAC, C, NCV7805
 $= -40^\circ\text{C}$ 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.

MC7800, MC7800A, NCV7805

ELECTRICAL CHARACTERISTICS ($V_{in} = 19\text{ V}$, $I_O = 500\text{ mA}$, $T_J = T_{low}$ to T_{high} (Note 15), unless otherwise noted)

Characteristic	Symbol	MC7812B			MC7812C			Unit
		Min	Typ	Max	Min	Typ	Max	
Output Voltage ($T_J = 25^\circ\text{C}$)	V_O	11.5	12	12.5	11.5	12	12.5	Vdc
Output Voltage ($5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_D \leq 5\text{ W}$)	V_O							Vdc
$14.5\text{ Vdc} \leq V_{in} \leq 27\text{ Vdc}$		–	–	–	11.4	12	12.6	
$15.5\text{ Vdc} \leq V_{in} \leq 27\text{ Vdc}$		11.4	12	12.6	–	–	–	
Line Regulation, $T_J = 25^\circ\text{C}$ (Note 16)	Reg_{line}							mV
$14.5\text{ Vdc} \leq V_{in} \leq 30\text{ Vdc}$		–	7.5	240	–	3.8	24	
$16\text{ Vdc} \leq V_{in} \leq 22\text{ Vdc}$		–	2.2	120	–	0.3	24	
$14.8\text{ Vdc} \leq V_{in} \leq 27\text{ Vdc}$, $I_O = 1.0\text{ A}$		–	–	–	–	–	48	
Load Regulation, $T_J = 25^\circ\text{C}$ (Note 16)	Reg_{load}	–	1.6	240	–	8.1	60	mV
$5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$								
Quiescent Current	I_B	–	3.4	8.0	–	3.4	6.5	mA
Quiescent Current Change	ΔI_B							mA
$14.5\text{ Vdc} \leq V_{in} \leq 30\text{ Vdc}$, $I_O = 1.0\text{ A}$, $T_J = 25^\circ\text{C}$		–	–	–	–	–	0.7	
$15\text{ Vdc} \leq V_{in} \leq 30\text{ Vdc}$		–	–	1.0	–	–	0.8	
$5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$		–	–	0.5	–	–	0.5	
Ripple Rejection	RR	–	60	–	55	60	–	dB
$15\text{ Vdc} \leq V_{in} \leq 25\text{ Vdc}$, $f = 120\text{ Hz}$								
Dropout Voltage ($I_O = 1.0\text{ A}$, $T_J = 25^\circ\text{C}$)	$V_I - V_O$	–	2.0	–	–	2.0	–	Vdc
Output Noise Voltage ($T_A = 25^\circ\text{C}$)	V_n	–	10	–	–	10	–	$\mu\text{V}/V_O$
$10\text{ Hz} \leq f \leq 100\text{ kHz}$								
Output Resistance $f = 1.0\text{ kHz}$	r_O	–	1.1	–	–	1.1	–	$\text{m}\Omega$
Short Circuit Current Limit ($T_A = 25^\circ\text{C}$)	I_{SC}	–	0.2	–	–	0.2	–	A
$V_{in} = 35\text{ Vdc}$								
Peak Output Current ($T_J = 25^\circ\text{C}$)	I_{max}	–	2.2	–	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	–0.8	–	–	–0.8	–	$\text{mV}/^\circ\text{C}$

15. $T_{low} = 0^\circ\text{C}$ for MC78XXAC, C $T_{high} = +125^\circ\text{C}$ for MC78XXAC, C, NCV7805
 $= -40^\circ\text{C}$ for MC78XXB, MC78XXAB, NCV7805

16. 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.

MC7800, MC7800A, NCV7805

ELECTRICAL CHARACTERISTICS ($V_{in} = 19\text{ V}$, $I_O = 1.0\text{ A}$, $T_J = T_{low}$ to T_{high} (Note 17), unless otherwise noted)

Characteristic	Symbol	MC7812AB/MC7812AC			Unit
		Min	Typ	Max	
Output Voltage ($T_J = 25^\circ\text{C}$)	V_O	11.75	12	12.25	Vdc
Output Voltage ($5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_D \leq 5\text{ W}$) $14.8\text{ Vdc} \leq V_{in} \leq 27\text{ Vdc}$	V_O	11.5	12	12.5	Vdc
Line Regulation (Note 18) $14.8\text{ Vdc} \leq V_{in} \leq 30\text{ Vdc}$, $I_O = 500\text{ mA}$ $16\text{ Vdc} \leq V_{in} \leq 22\text{ Vdc}$, $I_O = 1.0\text{ A}$ $14.5\text{ Vdc} \leq V_{in} \leq 27\text{ Vdc}$, $T_J = 25^\circ\text{C}$	Reg_{line}	–	3.8 2.2 6.0	18 20 120	mV
Load Regulation (Note 18) $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$, $T_J = 25^\circ\text{C}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$	Reg_{load}	–	–	25 25	mV
Quiescent Current	I_B	–	3.4	6.0	mA
Quiescent Current Change $15\text{ Vdc} \leq V_{in} \leq 30\text{ Vdc}$, $I_O = 500\text{ mA}$ $14.8\text{ Vdc} \leq V_{in} \leq 27\text{ Vdc}$, $T_J = 25^\circ\text{C}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $T_J = 25^\circ\text{C}$	ΔI_B	–	–	0.8 0.8 0.5	mA
Ripple Rejection $15\text{ Vdc} \leq V_{in} \leq 25\text{ Vdc}$, $f = 120\text{ Hz}$, $I_O = 500\text{ mA}$	RR	55	60	–	dB
Dropout Voltage ($I_O = 1.0\text{ A}$, $T_J = 25^\circ\text{C}$)	$V_I - V_O$	–	2.0	–	Vdc
Output Noise Voltage ($T_A = 25^\circ\text{C}$) $10\text{ Hz} \leq f \leq 100\text{ kHz}$	V_n	–	10	–	$\mu\text{V}/V_O$
Output Resistance ($f = 1.0\text{ kHz}$)	r_O	–	1.1	–	$\text{m}\Omega$
Short Circuit Current Limit ($T_A = 25^\circ\text{C}$) $V_{in} = 35\text{ Vdc}$	I_{SC}	–	0.2	–	A
Peak Output Current ($T_J = 25^\circ\text{C}$)	I_{max}	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	–0.8	–	$\text{mV}/^\circ\text{C}$

17. $T_{low} = 0^\circ\text{C}$ for MC78XXAC, C $T_{high} = +125^\circ\text{C}$ for MC78XXAC, C, NCV7805
= -40°C for MC78XXB, MC78XXAB, NCV7805

18. 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.

MC7800, MC7800A, NCV7805

ELECTRICAL CHARACTERISTICS ($V_{in} = 23\text{ V}$, $I_O = 500\text{ mA}$, $T_J = T_{low}$ to T_{high} (Note 19), unless otherwise noted)

Characteristic	Symbol	MC7815B			MC7815C			Unit
		Min	Typ	Max	Min	Typ	Max	
Output Voltage ($T_J = 25^\circ\text{C}$)	V_O	14.4	15	15.6	14.4	15	15.6	Vdc
Output Voltage ($5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_D \leq 5\text{ W}$)	V_O							Vdc
$17.5\text{ Vdc} \leq V_{in} \leq 30\text{ Vdc}$		–	–	–	14.25	15	15.75	
$18.5\text{ Vdc} \leq V_{in} \leq 30\text{ Vdc}$		14.25	15	15.75	–	–	–	
Line Regulation, $T_J = 25^\circ\text{C}$ (Note 20)	Reg_{line}							mV
$17.9\text{ Vdc} \leq V_{in} \leq 30\text{ Vdc}$		–	8.5	300	–	8.5	30	
$20\text{ Vdc} \leq V_{in} \leq 26\text{ Vdc}$		–	3.0	150	–	3.0	28	
Load Regulation, $T_J = 25^\circ\text{C}$ (Note 20)	Reg_{load}	–	1.8	300	–	1.8	55	mV
$5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$								
Quiescent Current	I_B	–	3.5	8.0	–	3.5	6.5	mA
Quiescent Current Change	ΔI_B							mA
$17.5\text{ Vdc} \leq V_{in} \leq 30\text{ Vdc}$		–	–	–	–	–	0.8	
$17.5\text{ Vdc} \leq V_{in} \leq 30\text{ Vdc}$, $I_O = 1.0\text{ A}$, $T_J = 25^\circ\text{C}$		–	–	1.0	–	–	0.7	
$5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$		–	–	0.5	–	–	0.5	
Ripple Rejection	RR	–	58	–	54	58	–	dB
$18.5\text{ Vdc} \leq V_{in} \leq 28.5\text{ Vdc}$, $f = 120\text{ Hz}$								
Dropout Voltage ($I_O = 1.0\text{ A}$, $T_J = 25^\circ\text{C}$)	$V_I - V_O$	–	2.0	–	–	2.0	–	Vdc
Output Noise Voltage ($T_A = 25^\circ\text{C}$)	V_n	–	10	–	–	10	–	$\mu\text{V}/V_O$
$10\text{ Hz} \leq f \leq 100\text{ kHz}$								
Output Resistance $f = 1.0\text{ kHz}$	r_O	–	1.2	–	–	1.2	–	$\text{m}\Omega$
Short Circuit Current Limit ($T_A = 25^\circ\text{C}$)	I_{SC}	–	0.2	–	–	0.2	–	A
$V_{in} = 35\text{ Vdc}$								
Peak Output Current ($T_J = 25^\circ\text{C}$)	I_{max}	–	2.2	–	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	–1.0	–	–	–1.0	–	$\text{mV}/^\circ\text{C}$

19. $T_{low} = 0^\circ\text{C}$ for MC78XXAC, C $T_{high} = +125^\circ\text{C}$ for MC78XXAC, C, NCV7805
 = -40°C for MC78XXB, MC78XXAB, NCV7805

20. 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.

MC7800, MC7800A, NCV7805

ELECTRICAL CHARACTERISTICS ($V_{in} = 23\text{ V}$, $I_O = 1.0\text{ A}$, $T_J = T_{low}$ to T_{high} (Note 21), unless otherwise noted)

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

21. $T_{low} = 0^\circ\text{C}$ for MC78XXAC, C $T_{high} = +125^\circ\text{C}$ for MC78XXAC, C, NCV7805
 $= -40^\circ\text{C}$ for MC78XXB, MC78XXAB, NCV7805

22. 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.

MC7800, MC7800A, NCV7805

ELECTRICAL CHARACTERISTICS ($V_{in} = 27\text{ V}$, $I_O = 500\text{ mA}$, $T_J = T_{low}$ to T_{high} (Note 23), unless otherwise noted)

Characteristic	Symbol	MC7818B			MC7818C			Unit
		Min	Typ	Max	Min	Typ	Max	
Output Voltage ($T_J = 25^\circ\text{C}$)	V_O	17.3	18	18.7	17.3	18	18.7	Vdc
Output Voltage ($5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_D \leq 5\text{ W}$)	V_O							Vdc
$21\text{ Vdc} \leq V_{in} \leq 33\text{ Vdc}$		–	–	–	17.1	18	18.9	
$22\text{ Vdc} \leq V_{in} \leq 33\text{ Vdc}$		17.1	18	18.9	–	–	–	
Line Regulation, (Note 24)	Reg_{line}							mV
$21\text{ Vdc} \leq V_{in} \leq 33\text{ Vdc}$		–	9.5	360	–	9.5	50	
$24\text{ Vdc} \leq V_{in} \leq 30\text{ Vdc}$		–	3.2	180	–	3.2	25	
Load Regulation, (Note 24)	Reg_{load}	–	2.0	360	–	2.0	55	mV
$5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$								
Quiescent Current	I_B	–	3.5	8.0	–	3.5	6.5	mA
Quiescent Current Change	ΔI_B							mA
$21\text{ Vdc} \leq V_{in} \leq 33\text{ Vdc}$		–	–	–	–	–	1.0	
$5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$		–	–	0.5	–	–	0.5	
Ripple Rejection	RR	–	57	–	53	57	–	dB
$22\text{ Vdc} \leq V_{in} \leq 33\text{ Vdc}$, $f = 120\text{ Hz}$								
Dropout Voltage ($I_O = 1.0\text{ A}$, $T_J = 25^\circ\text{C}$)	$V_{il} - V_O$	–	2.0	–	–	2.0	–	Vdc
Output Noise Voltage ($T_A = 25^\circ\text{C}$)	V_n	–	10	–	–	10	–	$\mu\text{V}/V_O$
$10\text{ Hz} \leq f \leq 100\text{ kHz}$								
Output Resistance $f = 1.0\text{ kHz}$	r_O	–	1.3	–	–	1.3	–	$\text{m}\Omega$
Short Circuit Current Limit ($T_A = 25^\circ\text{C}$)	I_{SC}	–	0.2	–	–	0.2	–	A
$V_{in} = 35\text{ Vdc}$								
Peak Output Current ($T_J = 25^\circ\text{C}$)	I_{max}	–	2.2	–	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	–1.5	–	–	–1.5	–	$\text{mV}/^\circ\text{C}$

23. $T_{low} = 0^\circ\text{C}$ for MC78XXAC, C $T_{high} = +125^\circ\text{C}$ for MC78XXAC, C, NCV7805
 = -40°C for MC78XXB, MC78XXAB, NCV7805

24. 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.

MC7800, MC7800A, NCV7805

ELECTRICAL CHARACTERISTICS ($V_{in} = 27\text{ V}$, $I_O = 1.0\text{ A}$, $T_J = T_{low}$ to T_{high} (Note 25), unless otherwise noted)

Characteristic	Symbol	MC7818AC			Unit
		Min	Typ	Max	
Output Voltage ($T_J = 25^\circ\text{C}$)	V_O	17.64	18	18.36	Vdc
Output Voltage ($5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_D \leq 5\text{ W}$) $21\text{ Vdc} \leq V_{in} \leq 33\text{ Vdc}$	V_O	17.3	18	18.7	Vdc
Line Regulation (Note 26) $21\text{ Vdc} \leq V_{in} \leq 33\text{ Vdc}$, $I_O = 500\text{ mA}$ $24\text{ Vdc} \leq V_{in} \leq 30\text{ Vdc}$, $I_O = 1.0\text{ A}$ $24\text{ Vdc} \leq V_{in} \leq 30\text{ Vdc}$, $I_O = 1.0\text{ A}$, $T_J = 25^\circ\text{C}$ $20.6\text{ Vdc} \leq V_{in} \leq 33\text{ Vdc}$, $I_O = 1.0\text{ A}$, $T_J = 25^\circ\text{C}$	Reg_{line}	-	9.5 3.2 3.2 8.0	22 25 10.5 22	mV
Load Regulation (Note 26) $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$, $T_J = 25^\circ\text{C}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ $250\text{ mA} \leq I_O \leq 750\text{ mA}$	Reg_{load}	-	2.0 1.8 1.5	25 25 15	mV
Quiescent Current	I_B	-	3.5	6.0	mA
Quiescent Current Change $21\text{ Vdc} \leq V_{in} \leq 33\text{ Vdc}$, $I_O = 500\text{ mA}$ $21.5\text{ Vdc} \leq V_{in} \leq 30\text{ Vdc}$, $T_J = 25^\circ\text{C}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$	ΔI_B	-	-	0.8 0.8 0.5	mA
Ripple Rejection $22\text{ Vdc} \leq V_{in} \leq 32\text{ Vdc}$, $f = 120\text{ Hz}$, $I_O = 500\text{ mA}$	RR	53	57	-	dB
Dropout Voltage ($I_O = 1.0\text{ A}$, $T_J = 25^\circ\text{C}$)	$V_I - V_O$	-	2.0	-	Vdc
Output Noise Voltage ($T_A = 25^\circ\text{C}$) $10\text{ Hz} \leq f \leq 100\text{ kHz}$	V_n	-	10	-	$\mu\text{V}/V_O$
Output Resistance $f = 1.0\text{ kHz}$	r_O	-	1.3	-	$\text{m}\Omega$
Short Circuit Current Limit ($T_A = 25^\circ\text{C}$) $V_{in} = 35\text{ Vdc}$	I_{SC}	-	0.2	-	A
Peak Output Current ($T_J = 25^\circ\text{C}$)	I_{max}	-	2.2	-	A
Average Temperature Coefficient of Output Voltage	TCV_O	-	-1.5	-	$\text{mV}/^\circ\text{C}$

25. $T_{low} = 0^\circ\text{C}$ for MC78XXAC, C $T_{high} = +125^\circ\text{C}$ for MC78XXAC, C, NCV7805
= -40°C for MC78XXB, MC78XXAB, NCV7805

26. 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.

MC7800, MC7800A, NCV7805

ELECTRICAL CHARACTERISTICS ($V_{in} = 33\text{ V}$, $I_O = 500\text{ mA}$, $T_J = T_{low}$ to T_{high} (Note 27), unless otherwise noted)

Characteristic	Symbol	MC7824B			MC7824C			Unit
		Min	Typ	Max	Min	Typ	Max	
Output Voltage ($T_J = 25^\circ\text{C}$)	V_O	23	24	25	23	24	25	Vdc
Output Voltage ($5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$, $P_D \leq 5\text{ W}$)	V_O							Vdc
27 Vdc $\leq V_{in} \leq 38\text{ Vdc}$		–	–	–	22.8	24	25.2	
28 Vdc $\leq V_{in} \leq 38\text{ Vdc}$		22.8	24	25.2	–	–	–	
Line Regulation, (Note 28)	Reg_{line}							mV
27 Vdc $\leq V_{in} \leq 38\text{ Vdc}$		–	11.5	480	–	2.7	60	
30 Vdc $\leq V_{in} \leq 36\text{ Vdc}$		–	3.8	240	–	2.7	48	
Load Regulation, (Note 28)	Reg_{load}	–	2.1	480	–	4.4	65	mV
5.0 mA $\leq I_O \leq 1.5\text{ A}$								
Quiescent Current	I_B	–	3.6	8.0	–	3.6	6.5	mA
Quiescent Current Change	ΔI_B							mA
27 Vdc $\leq V_{in} \leq 38\text{ Vdc}$		–	–	–	–	–	1.0	
5.0 mA $\leq I_O \leq 1.0\text{ A}$		–	–	0.5	–	–	0.5	
Ripple Rejection	RR	–	54	–	50	54	–	dB
28 Vdc $\leq V_{in} \leq 38\text{ Vdc}$, $f = 120\text{ Hz}$								
Dropout Voltage ($I_O = 1.0\text{ A}$, $T_J = 25^\circ\text{C}$)	$V_I - V_O$	–	2.0	–	–	2.0	–	Vdc
Output Noise Voltage ($T_A = 25^\circ\text{C}$)	V_n	–	10	–	–	10	–	$\mu\text{V}/V_O$
10 Hz $\leq f \leq 100\text{ kHz}$								
Output Resistance $f = 1.0\text{ kHz}$	r_O	–	1.4	–	–	1.4	–	$\text{m}\Omega$
Short Circuit Current Limit ($T_A = 25^\circ\text{C}$)	I_{SC}	–	0.2	–	–	0.2	–	A
$V_{in} = 35\text{ Vdc}$								
Peak Output Current ($T_J = 25^\circ\text{C}$)	I_{max}	–	2.2	–	–	2.2	–	A
Average Temperature Coefficient of Output Voltage	TCV_O	–	–2.0	–	–	–2.0	–	$\text{mV}/^\circ\text{C}$

27. $T_{low} = 0^\circ\text{C}$ for MC78XXAC, C $T_{high} = +125^\circ\text{C}$ for MC78XXAC, C, NCV7805
 $= -40^\circ\text{C}$ for MC78XXB, MC78XXAB, NCV7805

28. 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.

MC7800, MC7800A, NCV7805

ELECTRICAL CHARACTERISTICS ($V_{in} = 33\text{ V}$, $I_O = 1.0\text{ A}$, $T_J = T_{low}$ to T_{high} (Note 29), unless otherwise noted)

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

29. $T_{low} = 0^\circ\text{C}$ for MC78XXAC, C $T_{high} = +125^\circ\text{C}$ for MC78XXAC, C, NCV7805
 = -40°C for MC78XXB, MC78XXAB, NCV7805

30. 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.

MC7800, MC7800A, NCV7805

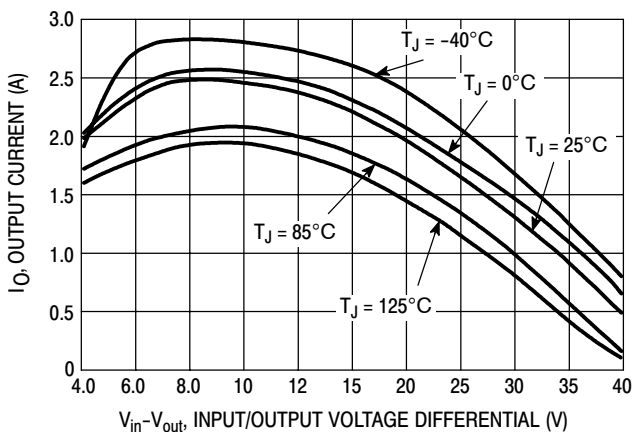


Figure 2. Peak Output Current as a Function of Input/Output Differential Voltage (MC78XXC, AC, B)

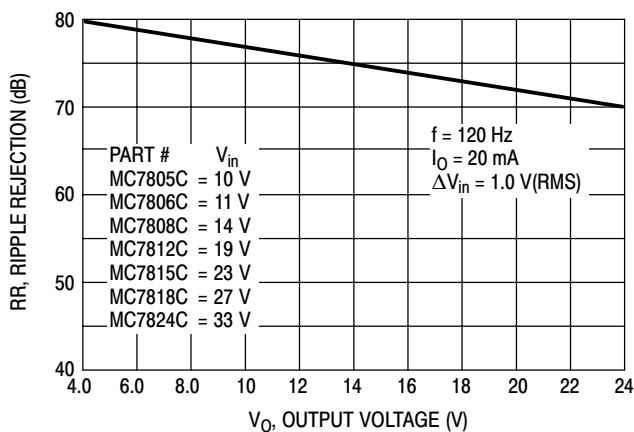


Figure 3. Ripple Rejection as a Function of Output Voltages (MC78XXC, AC, B)

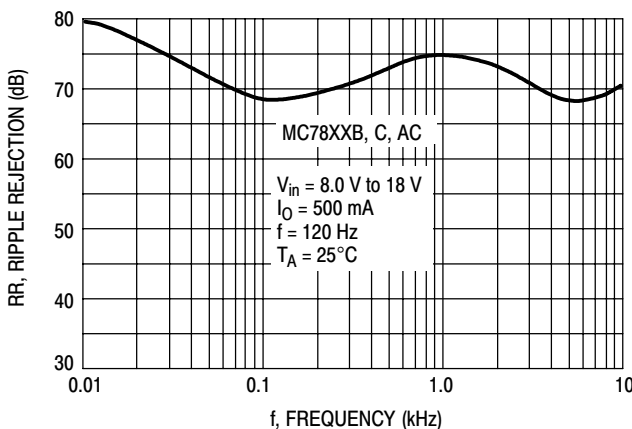


Figure 4. Ripple Rejection as a Function of Frequency (MC78XXC, AC, B)

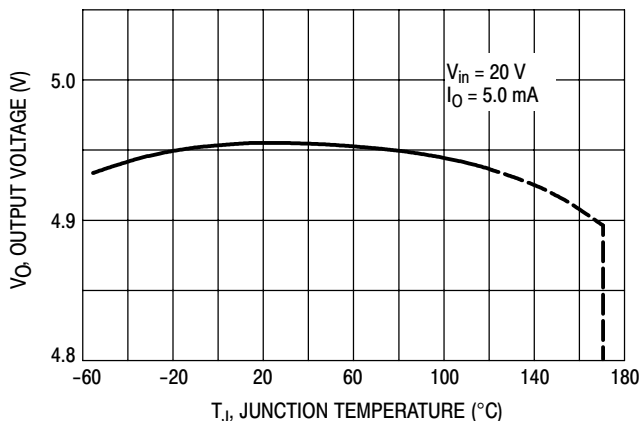


Figure 5. Output Voltage as a Function of Junction Temperature (MC7805C, AC, B)

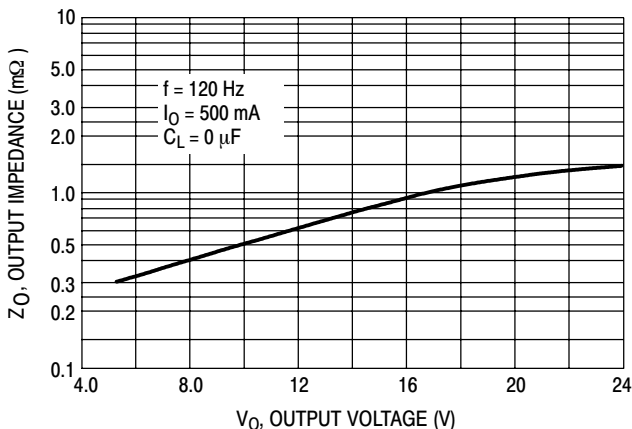


Figure 6. Output Impedance as a Function of Output Voltage (MC78XXC, AC, B)

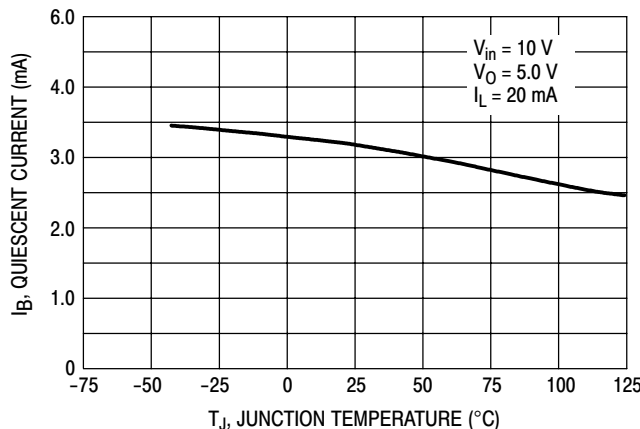


Figure 7. Quiescent Current as a Function of Temperature (MC78XXC, AC, B)

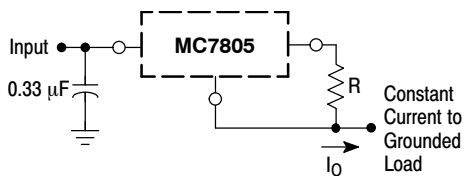
APPLICATIONS INFORMATION

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.



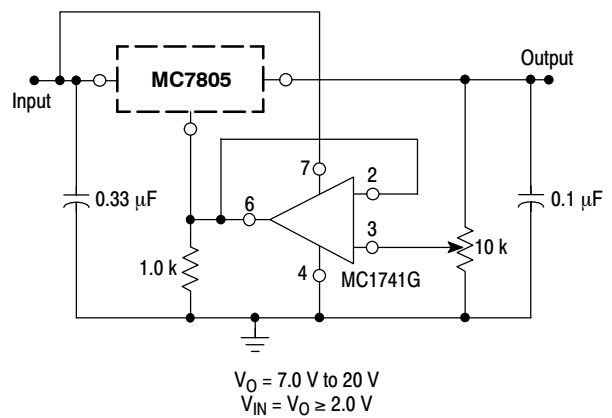
The MC7800 regulators can also be used as a current source when connected as above. In order to minimize dissipation the MC7805C is chosen in this application. Resistor R determines the current as follows:

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

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

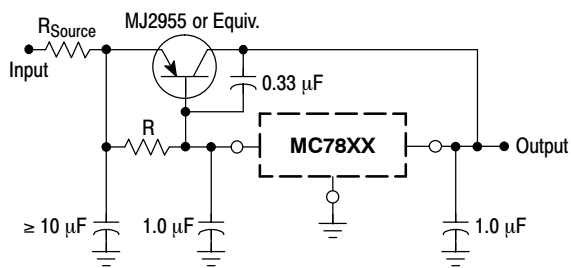
For example, a 1.0 A current source would require R to be a 5.0 Ω, 10 W resistor and the output voltage compliance would be the input voltage less 7.0 V.

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.

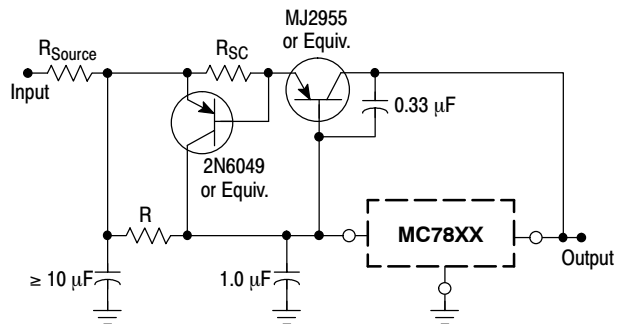
Figure 9. Adjustable Output Regulator



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

MC7800, MC7800A, NCV7805

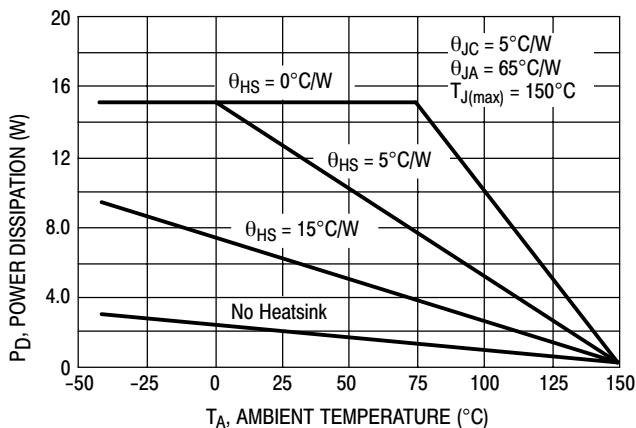


Figure 12. Worst Case Power Dissipation versus Ambient Temperature (Case 221A)

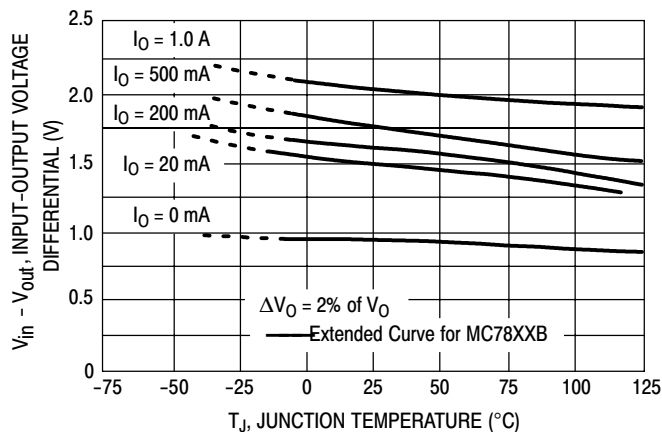


Figure 13. Input Output Differential as a Function of Junction Temperature (MC78XXC, AC, B)

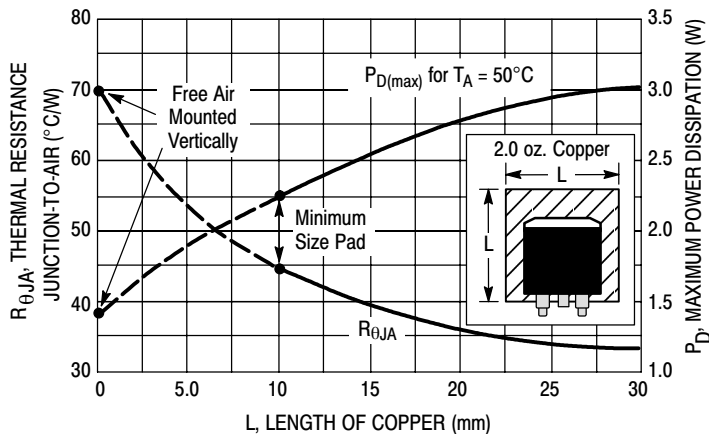


Figure 14. D²PAK Thermal Resistance and Maximum Power Dissipation versus P.C.B. Copper Length

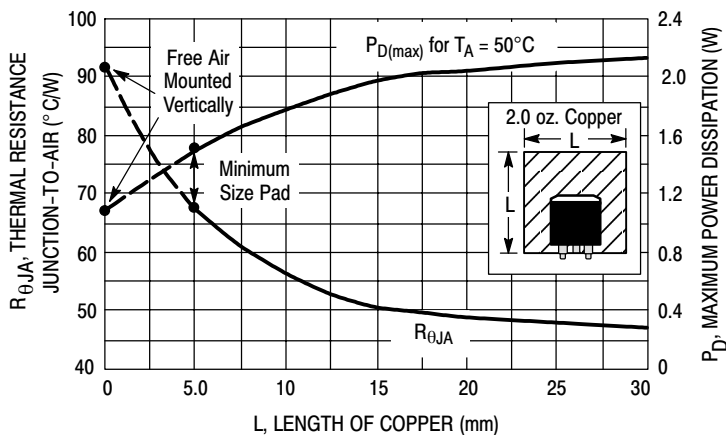


Figure 15. DPAK Thermal Resistance and Maximum Power Dissipation versus P.C.B. Copper Length

MC7800, MC7800A, NCV7805

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	Output Voltage	Temperature Range	Package	Shipping [†]
MC7805ABD2T	5.0 V	T = -40° to +125°C	D2PAK	50 Units / Rail
MC7805ABD2TR4			D2PAK	800 / Tape & Reel
MC7805ABT			TO-220	50 Units / Rail
MC7805ACD2T		T = 0° to +125°C	D2PAK	50 Units / Rail
MC7805ACD2TG			D2PAK (Pb-Free)	50 Units / Rail
MC7805ACD2TR4			D2PAK	800 / Tape & Reel
MC7805ACD2TR4G			D2PAK (Pb-Free)	800 / Tape & Reel
MC7805ACT			TO-220	50 Units / Rail
MC7805ACTG			TO-220 (Pb-Free)	50 Units / Rail
MC7805BD2T		T = -40° to +125°C	D2PAK	50 Units / Rail
MC7805BD2TG			D2PAK (Pb-Free)	50 Units / Rail
MC7805BD2TR4			D2PAK	800 / Tape & Reel
MC7805BD2TR4G			D2PAK (Pb-Free)	800 / Tape & Reel
MC7805BDT			DPAK	75 Units / Rail
MC7805BDTRK			DPAK	2500 / Tape & Reel
MC7805BDTRKG			DPAK (Pb-Free)	2500 / Tape & Reel
MC7805BT			TO-220	50 Units / Rail
MC7805BTG			TO-220 (Pb-Free)	50 Units / Rail
NCV7805BD2T*			D2PAK	50 Units / Rail
NCV7805BD2TR4*			D2PAK	50 Units / Rail
NCV7805BT*			TO-220	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.

MC7800, MC7800A, NCV7805

ORDERING INFORMATION

Device	Output Voltage	Temperature Range	Package	Shipping [†]
MC7805CD2T	5.0 V	T = 0° to +125°C	D2PAK	50 Units / Rail
MC7805CD2TR4			D2PAK	800 / Tape & Reel
MC7805CD2TR4G			D2PAK (Pb-Free)	800 / Tape & Reel
MC7805CDT			DPAK	75 Units / Rail
MC7805CDTRK			DPAK	2500 / Tape & Reel
MC7805CT			TO-220	50 Units / Rail
MC7805CTG			TO-220 (Pb-Free)	50 Units / Rail
MC7806ACT	6.0 V	T = 0° to +125°C	TO-220	50 Units / Rail
MC7806BD2T		T = -40° to +125°C	D2PAK	50 Units / Rail
MC7806BD2TG			D2PAK (Pb-Free)	50 Units / Rail
MC7806BD2TR4			D2PAK	800 / Tape & Reel
MC7806BD2TR4G			D2PAK (Pb-Free)	800 / Tape & Reel
MC7806BT			TO-220	50 Units / Rail
MC7806CT		T = 0° to +125°C	TO-220	50 Units / Rail
MC7806CTG		TO-220 (Pb-Free)	50 Units / Rail	
MC7808ABD2T	8.0 V	T = -40° to +125°C	D2PAK	50 Units / Rail
MC7808ABD2TR4			D2PAK	800 / Tape & Reel
MC7808ABT			TO-220	50 Units / Rail
MC7808ACT		T = 0° to +125°C	TO-220	50 Units / Rail
MC7808BD2T		T = -40° to +125°C	D2PAK	50 Units / Rail
MC7808BD2TG			D2PAK (Pb-Free)	50 Units / Rail
MC7808BD2TR4			D2PAK	800 / Tape & Reel
MC7808BDT			DPAK	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

[†]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.

MC7800, MC7800A, NCV7805

ORDERING INFORMATION

Device	Output Voltage	Temperature Range	Package	Shipping [†]	
MC7808CD2T	8.0 V	T = 0° to +125°C	D2PAK	50 Units / Rail	
MC7808CD2TR4			D2PAK	800 / Tape & Reel	
MC7808CD2TR4G			D2PAK (Pb-Free)	800 / Tape & Reel	
MC7808CDT			DPAK	75 Units / Rail	
MC7808CDTRK			DPAK	2500 / Tape & Reel	
MC7808CDTT5			DPAK	2500 / Tape & Reel	
MC7808CDTT5G			DPAK (Pb-Free)	2500 / Tape & Reel	
MC7808CT			TO-220	50 Units / Rail	
MC7808CTG			TO-220 (Pb-Free)	50 Units / Rail	
MC7809ACT			9.0 V	T = 0° to +125°C	TO-220
MC7809BT	T = -40° to +125°C	TO-220		50 Units / Rail	
MC7809CD2T	T = 0° to +125°C	D2PAK		50 Units / Rail	
MC7809CD2TR4		D2PAK		800 / Tape & Reel	
MC7809CT		TO-220		50 Units / Rail	
MC7809CTG		TO-220 (Pb-Free)		50 Units / Rail	
MC7812ABD2T	12 V	T = -40° to +125°C	D2PAK	50 Units / Rail	
MC7812ABD2TR4			D2PAK	800 / Tape & Reel	
MC7812ABT			TO-220	50 Units / Rail	
MC7812ACD2T		T = 0° to +125°C	D2PAK	50 Units / Rail	
MC7812ACD2TR4			D2PAK	800 / Tape & Reel	
MC7812ACT			TO-220	50 Units / Rail	
MC7812ACTG			TO-220 (Pb-Free)	50 Units / Rail	
MC7812BD2T			T = -40° to +125°C	D2PAK	50 Units / Rail
MC7812BD2TR4				D2PAK	800 / Tape & Reel
MC7812BD2TR4G		D2PAK (Pb-Free)		800 / Tape & Reel	
MC7812BDT		DPAK		75 Units / Rail	
MC7812BDTRK		DPAK		2500 / Tape & Reel	
MC7812BT		TO-220		50 Units / Rail	
MC7812BTG		TO-220 (Pb-Free)		50 Units / Rail	
NCV7812BD2T*		D2PAK		50 Units / Rail	
NCV7812BD2TR4*		D2PAK		800 / Tape & Reel	
NCV7812BT*		TO-220	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.

MC7800, MC7800A, NCV7805

ORDERING INFORMATION

Device	Output Voltage	Temperature Range	Package	Shipping [†]
MC7812CD2T	12 V	T = 0° to +125°C	D2PAK	50 Units / Rail
MC7812CD2TG			D2PAK (Pb-Free)	50 Units / Rail
MC7812CD2TR4			D2PAK	800 / Tape & Reel
MC7812CD2TR4G			D2PAK (Pb-Free)	800 / Tape & Reel
MC7812CDT			DPAK	75 Units / Rail
MC7812CDTRK			DPAK	2500 / Tape & Reel
MC7812CT			TO-220	50 Units / Rail
MC7812CTG			TO-220 (Pb-Free)	50 Units / Rail
MC7815ABD2T	15 V	T = -40° to +125°C	D2PAK	50 Units / Rail
MC7815ABD2TR4			D2PAK	800 / Tape & Reel
MC7815ABT			TO-220	50 Units / Rail
MC7815ACD2T		T = 0° to +125°C	D2PAK	50 Units / Rail
MC7815ACD2TG			D2PAK (Pb-Free)	800 / Tape & Reel
MC7815ACT			TO-220	50 Units / Rail
MC7815ACTG			TO-220 (Pb-Free)	50 Units / Rail
MC7815BD2T		T = -40° to +125°C	D2PAK	50 Units / Rail
MC7815BD2TR4			D2PAK	800 / Tape & Reel
MC7815BD2TR4G			D2PAK (Pb-Free)	800 / Tape & Reel
MC7815BDT			DPAK	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° to +125°C	D2PAK
MC7815CD2TR4		D2PAK		800 / Tape & Reel
MC7815CDT		DPAK		75 Units / Rail
MC7815CDTRK		DPAK		2500 / Tape & Reel
MC7815CT		TO-220		50 Units / Rail
MC7815CTG		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.

MC7800, MC7800A, NCV7805

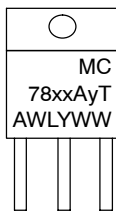
ORDERING INFORMATION

Device	Output Voltage	Temperature Range	Package	Shipping [†]
MC7818ACT	18 V	T = 0° to +125°C	TO-220	50 Units / Rail
MC7818BT		T = -40° to +125°C	TO-220	50 Units / Rail
MC7818CD2T		T = 0° to +125°C	D2PAK	50 Units / Rail
MC7818CD2TR4			D2PAK	800 / Tape & Reel
MC7818CT			TO-220	50 Units / Rail
MC7818CTG			TO-220 (Pb-Free)	50 Units / Rail
MC7824ACT	24 V	T = 0° to +125°C	TO-220	50 Units / Rail
MC7824ACTG			TO-220 (Pb-Free)	50 Units / Rail
MC7824BD2T		T = -40° to +125°C	D2PAK	50 Units / Rail
MC7824BD2TR4			D2PAK	800 / Tape & Reel
MC7824BT			TO-220	50 Units / Rail
MC7824BTG		TO-220 (Pb-Free)	50 Units / Rail	
MC7824CD2T		T = 0° to +125°C	D2PAK	50 Units / Rail
MC7824CD2TR4			D2PAK	800 / Tape & Reel
MC7824CT			TO-220	50 Units / Rail
MC7824CTG			TO-220 (Pb-Free)	50 Units / Rail

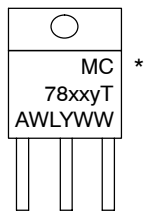
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*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.

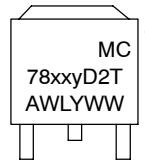
MARKING DIAGRAMS



TO-220-3
T SUFFIX
CASE 221A



D²PAK-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