MC7800, MC7800A, MC7800AE, NCV7800

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 1.5%, 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

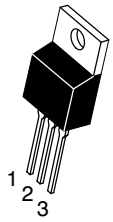
MAXIMUM RATINGS (T_A = 25°C, unless otherwise noted)

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 15	°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

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

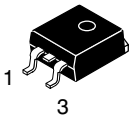
*This device series contains ESD protection and exceeds the following tests:
Human Body Model 2000 V per MIL_STD_883, Method 3015.
Machine Model Method 200 V.

ON Semiconductor®



TO−220−3
T SUFFIX
CASE 221AB

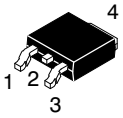
Heatsink surface connected to Pin 2.



Pin 1. Input
2. Ground
3. Output

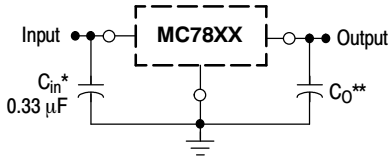
D^2PAK−3
D2T SUFFIX
CASE 936

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 23 of this data sheet.

DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 30 of this data sheet.

Publication Order Number:
MC7800/D

ELECTRICAL CHARACTERISTICS (V_{in} = 23 V, I_O = 500 mA, T_J = T_{low} to 125°C (Note 20), unless otherwise noted)

Characteristic	Symbol	MC7815B/NCV7815B			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 MC78XXC, MC78XXAC,
= −40°C for NCV78XX, MC78XXB, MC78XXAB, and MC78XXAEB
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} = 27 V, I_O = 500 mA, T_J = T_{low} to 125°C (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 MC78XXC, MC78XXAC,
= −40°C for NCV78XX, MC78XXB, MC78XXAB, and MC78XXAEB
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.

ORDERING INFORMATION

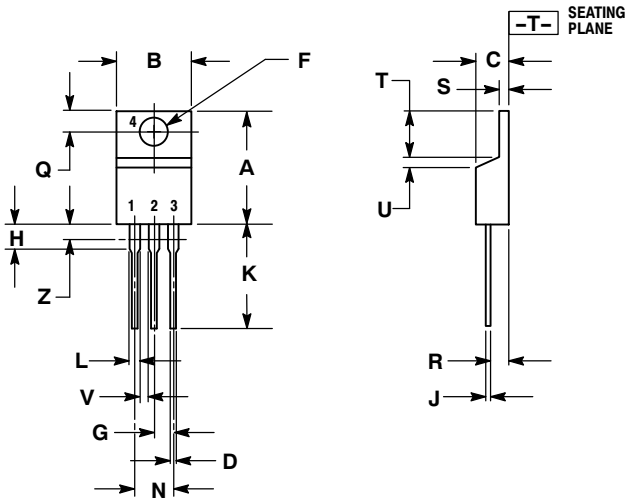
Device	Nominal Voltage	Operating Temperature Range	Package	Shipping†
MC7815CD2T	15 V	T_J = 0°C to +125°C	D^2PAK	50 Units /Rail
MC7815CD2TG			D^2PAK (Pb−free)	50 Units /Rail
MC7815CD2TR4			D^2PAK	800 / Tape & Reel
MC7815CD2TR4G			D^2PAK (Pb−free)	800 / Tape & Reel
MC7815CDT			DPAK	75 Units / Rail
MC7815CDTG			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_J = 0°C to +125°C	TO−220	50 Units /Rail
MC7818ACTG			TO−220 (Pb−free)	50 Units /Rail
MC7818BT		T_J = −40°C to +125°C	TO−220	50 Units /Rail
MC7818BTG			TO−220 (Pb−free)	50 Units /Rail
MC7818CD2T		T_J = 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.

PACKAGE DIMENSIONS

TO−220, SINGLE GAUGE
T SUFFIX
CASE 221AB−01
ISSUE O



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	0.020	0.055	0.508	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