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

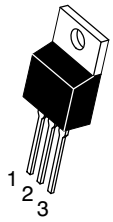
MAXIMUM RATINGS (T_A = 25°C, unless otherwise noted)

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.

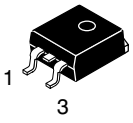
*This device series contains ESD protection and exceeds the following tests:
Human Body Model 2000 V per MIL_STD_883, Method 3015.
Machine Model Method 200 V.

ON Semiconductor®



TO−220−3
T SUFFIX
CASE 221AB

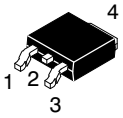
Heatsink surface connected to Pin 2.



Pin 1. Input
2. Ground
3. Output

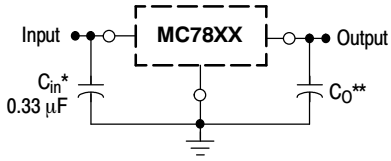
D^2PAK−3
D2T SUFFIX
CASE 936

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} = 19 V, I_O = 500 mA, T_J = T_{low} to 125°C (Note 16), unless otherwise noted)

Characteristic	Symbol	MC7812B/NCV7812B			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 MC78XXC, MC78XXAC,
= −40°C for NCV78XX, MC78XXB, MC78XXAB, and MC78XXAEB
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.

ORDERING INFORMATION

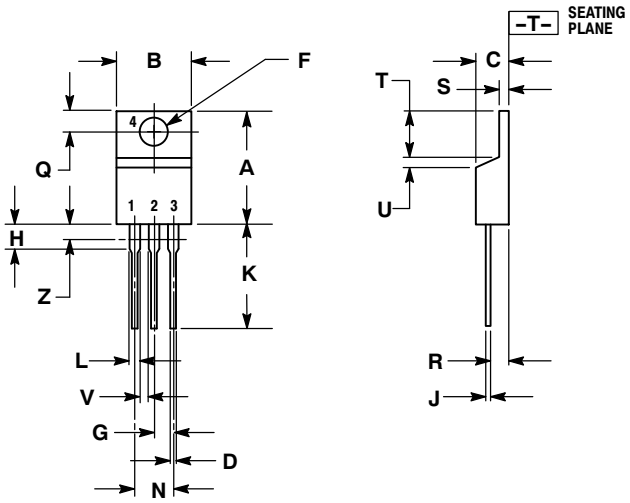
Device	Nominal Voltage	Operating Temperature Range	Package	Shipping†
MC7812BD2T	12 V	T_J = −40°C to +125°C	D^2PAK	50 Units /Rail
MC7812BD2TG			D^2PAK (Pb−free)	50 Units /Rail
MC7812BD2TR4			D^2PAK	800 / Tape & Reel
MC7812BD2TR4G			D^2PAK (Pb−free)	800 / Tape & Reel
MC7812BDT			DPAK	75 Units / Rail
MC7812BDTG			DPAK (Pb−free)	75 Units / Rail
MC7812BDTRK	12 V	T_J = −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*	12 V	T_J = −40°C to +125°C	D^2PAK	50 Units /Rail
NCV7812BD2TR4*			D^2PAK	800 / Tape & Reel
NCV7812BD2TR4G*			D^2PAK (Pb−free)	800 / Tape & Reel
NCV7812BT*			TO−220	50 Units /Rail
NCV7812BTG*			TO−220 (Pb−free)	50 Units /Rail
MC7812CD2T	12 V	T_J = 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
NCV7812ABTG*	12 V	T_J = −40°C to +125°C	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

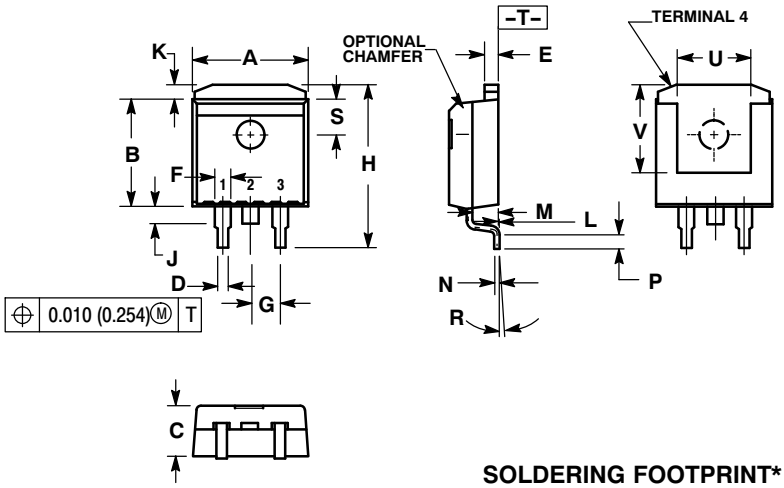


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

	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

PACKAGE DIMENSIONS

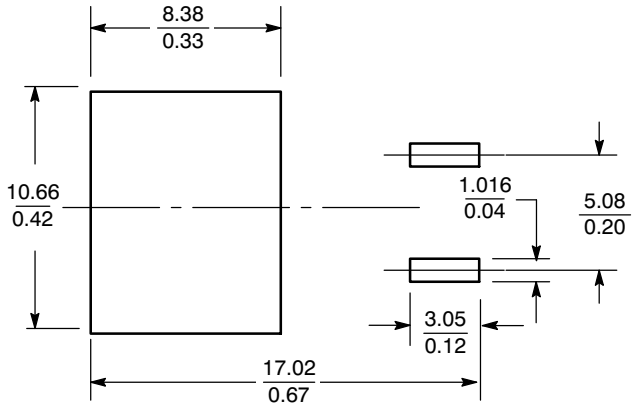
D²PAK–3
D2T SUFFIX
CASE 936–03
ISSUE B



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.