MOTOROLA

MCT7800 Series

Three-Terminal 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 fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

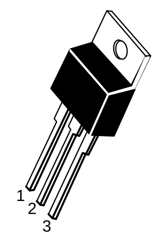
- Output Current in Excess of 1.0 A
- No External Components Required
- Internal Thermal Overload Protection
- Internal Short Circuit Current Limiting
- Output Transistor Safe-Area Compensation
- Output Voltage Offered with a 4% Tolerance
- Available in Surface Mount D^2PAK and Standard 3-Lead Transistor Packages

This MCT-prefixed device is intended to be a possible replacement for the similar device with the MC-prefix. Because the MCT device originates from different source material, there may be subtle differences in typical parameter values or characteristic curves. Due to the diversity of potential applications, Motorola can not assure identical performance in all circuits. Motorola recommends that the customer qualify the MCT-prefixed device in each potential application.

THREE-TERMINAL POSITIVE FIXED VOLTAGE REGULATORS

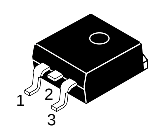
T SUFFIX
PLASTIC PACKAGE
CASE 221A

Heatsink surface connected to Pin 2.



Pin 1. Input
2. Ground
3. Output

D2T SUFFIX
PLASTIC PACKAGE
CASE 936
(D^2PAK)



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

DEVICE TYPE/NOMINAL OUTPUT VOLTAGE

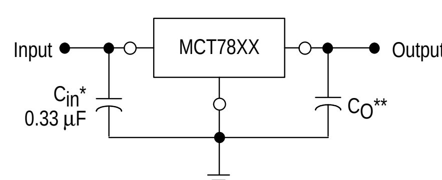
MCT7805	5.0 V	MCT7812	12 V
MCT7806	6.0 V	MCT7815	15 V
MCT7808	8.0 V	MCT7818	18 V
MCT7809	9.0 V	MCT7824	24 V

ORDERING INFORMATION

Device	Output Voltage Tolerance	Tested Operating Temperature Range	Package
MCT78XXBD2T	4%	T_J = – 40° to +125°C	Surface Mount
MCT78XXBT			Insertion Mount
MCT78XXCD2T		T_J = 0° to +125°C	Surface Mount
MCT78XXCT			Insertion Mount

XX indicates nominal voltage.

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.

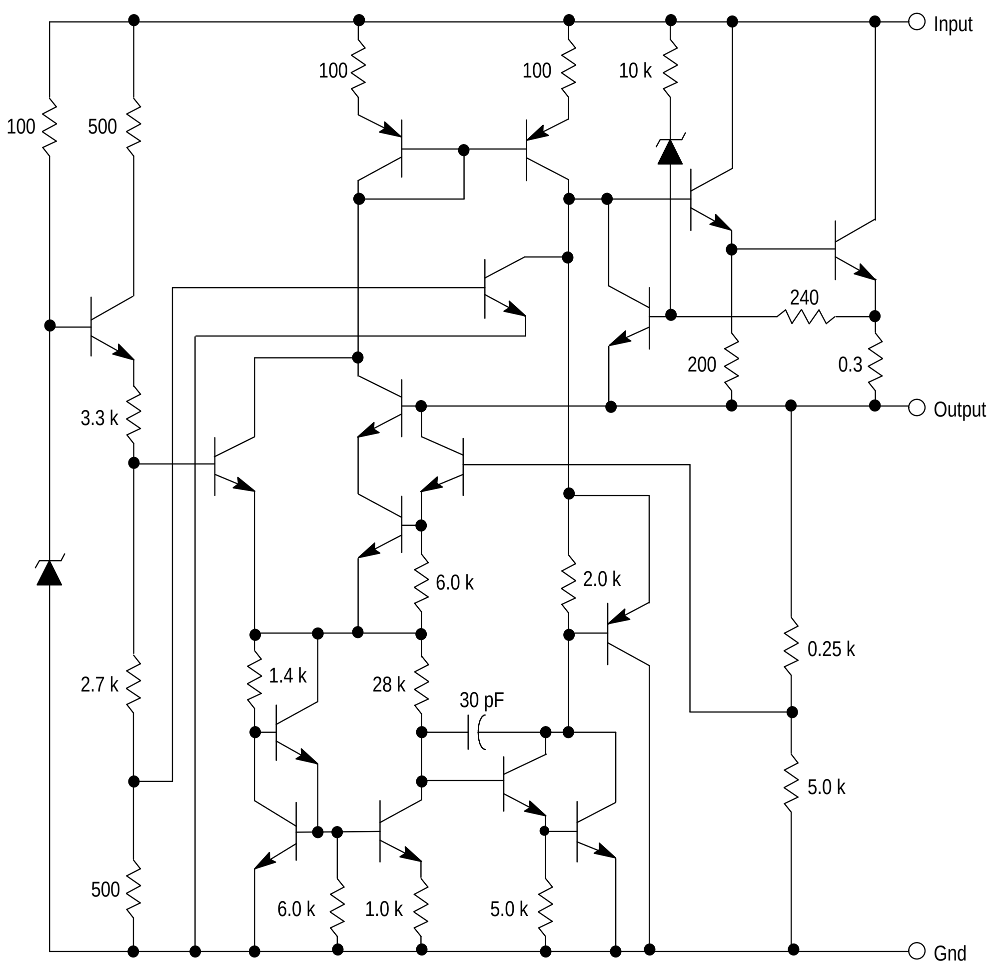
* C_{in} is required if regulator is located an appreciable distance from power supply filter.

** Some C_O is recommended for stability; it does improve transient response. Values less than 0.1 µF could cause instability.

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

Rating	Symbol	Value	Unit
Input Voltage	V_I	35	Vdc
Power Dissipation			
Case 221A			
T_A = +25°C	P_D	Internally Limited	W
Thermal Resistance, Junction-to-Ambient	θ_{JA}	65	°C/W
Thermal Resistance, Junction-to-Case	θ_{JC}	5.0	°C/W
Case 936 (D^2PAK)			
T_A = +25°C	P_D	Internally Limited	W
Thermal Resistance, Junction-to-Ambient	θ_{JA}	70	°C/W
Thermal Resistance, Junction-to-Case	θ_{JC}	5.0	°C/W
Storage Junction Temperature Range	T_{stg}	– 65 to +150	°C
Operating Junction Temperature	T_J	+150	°C

Representative Schematic Diagram



This device contains 19 active transistors.

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

Characteristics	Symbol	MCT7805B			MCT7805C			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_O ≤15 W)	V_O							Vdc
7.0 Vdc ≤ V_{in} ≤ 20 Vdc		—	—	—	4.75	5.0	5.25	
8.0 Vdc ≤ V_{in} ≤ 20 Vdc		4.75	5.0	5.25	—	—	—	
Line Regulation, T_J = +25°C (Note 2)	Reg_{line}							mV
7.0 Vdc ≤ V_{in} ≤ 25 Vdc		—	7.0	100	—	7.0	100	
8.0 Vdc ≤ V_{in} ≤ 12 Vdc		—	2.0	50	—	2.0	50	
Load Regulation, T_J = +25°C (Note 2)	Reg_{load}							mV
5.0 mA ≤ V_{in} ≤ 1.5 A		—	2.0	100	—	2.0	100	
250 mA ≤ V_{in} ≤ 750 mA		—	1.5	50	—	1.5	50	
Quiescent Current (T_J = +25°C)	I_B	—	5.5	8.0	—	5.5	8.0	mA
Quiescent Current Change	ΔI_B							mA
7.0 Vdc ≤ V_{in} ≤ 25 Vdc		—	—	—	—	—	1.3	
8.0 Vdc ≤ V_{in} ≤ 25 Vdc		—	—	1.3	—	—	—	
5.0 mA ≤ I_O ≤ 1.0 A		—	—	0.5	—	—	0.5	
Ripple Rejection	RR							dB
8.0 Vdc ≤ V_{in} ≤ 18 Vdc, f = 120 Hz		—	65	—	—	65	—	
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							µV/V_O
10 Hz ≤ f ≤ 100 kHz		—	10	—	—	10	—	
Output Resistance f = 1.0 kHz	r_O	—	1.3	—	—	1.3	—	mΩ
Short Circuit Current Limit (T_A = +25°C)	I_{SC}							A
V_{in} = 35 Vdc		—	0.2	—	—	0.2	—	
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

ELECTRICAL CHARACTERISTICS (V_{in} = 11 V, I_O = 500 mA, T_J = T_{low} to T_{high} [Note 1], unless otherwise noted.)

Characteristics	Symbol	MCT7806B			MCT7806C			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_O ≤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 2)	Reg_{line}							mV
8.0 Vdc ≤ V_{in} ≤ 25 Vdc		—	7.0	120	—	7.0	120	
9.0 Vdc ≤ V_{in} ≤ 13 Vdc		—	2.0	60	—	2.0	60	
Load Regulation, T_J = +25°C (Note 2)	Reg_{load}							mV
5.0 mA ≤ V_{in} ≤ 1.5 A		—	2.0	120	—	2.0	120	
250 mA ≤ V_{in} ≤ 750 mA		—	1.5	60	—	1.5	60	
Quiescent Current (T_J = +25°C)	I_B	—	5.5	8.0	—	5.5	8.0	mA
Quiescent Current Change	ΔI_B							mA
8.0 Vdc ≤ V_{in} ≤ 25 Vdc		—	—	—	—	—	1.3	
9.0 Vdc ≤ V_{in} ≤ 25 Vdc		—	—	1.3	—	—	—	
5.0 mA ≤ I_O ≤ 1.0 A		—	—	0.5	—	—	0.5	
Ripple Rejection	RR							dB
9.0 Vdc ≤ V_{in} ≤ 19 Vdc, f = 120 Hz		—	65	—	—	65	—	

NOTES: 1. T_{low} = 0°C for MCT78XXC, = – 40°C for MCT78XXB; T_{high} = +125°C for MCT78XXB, C. When the junction temperature exceeds +125°C, internal current limiting will reduce the output current to less than 1.0 A at a V_I–V_O of 15 V or greater. The MC7800 die will supply more current under the same conditions.

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 (continued) (V_{in} = 11 V, I_O = 500 mA, T_J = T_{low} to T_{high} [Note 1], unless otherwise noted.)

Characteristics	Symbol	MCT7806B Min	MCT7806B Typ	MCT7806B Max	MCT7806C Min	MCT7806C Typ	MCT7806C Max	Unit
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	—	1.3	—	—	1.3	—	mΩ
Short Circuit Current Limit (T_A = +25°C) V_{in} = 35 Vdc	I_{SC}	—	0.2	—	—	0.2	—	A
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

ELECTRICAL CHARACTERISTICS (V_{in} = 14 V, I_O = 500 mA, T_J = T_{low} to T_{high} [Note 1], unless otherwise noted.)

Characteristics	Symbol	MCT7808B Min	MCT7808B Typ	MCT7808B Max	MCT7808C Min	MCT7808C Typ	MCT7808C Max	Unit
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_O ≤15 W) 10.5 Vdc ≤ V_{in} ≤ 23 Vdc 11.5 Vdc ≤ V_{in} ≤ 23 Vdc	V_O	— 7.6	— 8.0	— 8.4	7.6 —	8.0 —	8.4 —	Vdc
Line Regulation, T_J = +25°C (Note 2) 10.5 Vdc ≤ V_{in} ≤ 25 Vdc 11 Vdc ≤ V_{in} ≤ 17 Vdc	Reg_{line}	— —	7.0 2.0	160 80	— —	7.0 2.0	160 80	mV
Load Regulation, T_J = +25°C (Note 2) 5.0 mA ≤ I_O ≤ 1.5 A 250 mA ≤ I_O ≤ 750 mA	Reg_{load}	— —	2.0 1.5	160 80	— —	2.0 1.5	160 80	mV
Quiescent Current (T_J = +25°C)	I_B	—	5.5	8.0	—	5.5	8.0	mA
Quiescent Current Change 10.5 Vdc ≤ V_{in} ≤ 25 Vdc 11.5 Vdc ≤ V_{in} ≤ 25 Vdc 5.0 mA ≤ I_O ≤ 1.0 A	ΔI_B	— — —	— — —	— 1.0 0.5	— — —	— — —	1.0 — 0.5	mA
Ripple Rejection 11.5 Vdc ≤ V_{in} ≤ 21.5 Vdc, f = 120 Hz	RR	—	63	—	—	63	—	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	—	18	—	—	18	—	mΩ
Short Circuit Current Limit (T_A = +25°C) V_{in} = 35 Vdc	I_{SC}	—	0.2	—	—	0.2	—	A
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

NOTES: 1. T_{low} = 0°C for MCT78XXC
= – 40°C for MCT78XXB
T_{high} = +125°C for MCT78XXB, C. When the junction temperature exceeds +125°C, internal current limiting will reduce the output current to less than 1.0 A at a V_I–V_O of 15 V or greater. The MC7800 die will supply more current under the same conditions.

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} = 15 V, I_O = 500 mA, T_J = T_{low} to T_{high} [Note 1], unless otherwise noted.)

Characteristics	Symbol	MCT7809B			MCT7809C			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_O ≤15 W) 11.5 Vdc ≤ V_{in} ≤ 24 Vdc 12.5 Vdc ≤ V_{in} ≤ 24 Vdc	V_O	 — 8.55	 — 9.0	 — 9.45	 8.55 —	 9.0 —	 9.45 —	Vdc
Line Regulation, T_J = +25°C (Note 2) 11.5 Vdc ≤ V_{in} ≤ 26 Vdc 11.5 Vdc ≤ V_{in} ≤ 17 Vdc	Reg_{line}	 — —	 8.0 4.0	 50 25	 — —	 8.0 4.0	 50 25	mV
Load Regulation, T_J = +25°C (Note 2) 5.0 mA ≤ I_O ≤ 1.5 A 250 mA ≤ I_O ≤ 750 mA	Reg_{load}	 — —	 3.0 2.0	 50 25	 — —	 3.0 2.0	 50 25	mV
Quiescent Current (T_J = +25°C)	I_B	—	5.5	8.0	—	5.5	8.0	mA
Quiescent Current Change 11.5 Vdc ≤ V_{in} ≤ 26 Vdc 12.5 Vdc ≤ V_{in} ≤ 26 Vdc 5.0 mA ≤ I_O ≤ 1.0 A	ΔI_B	 — — —	 — — —	 — 1.0 0.5	 — — —	 — — —	 1.0 — 0.5	mA
Ripple Rejection 11.5 Vdc ≤ V_{in} ≤ 21.5 Vdc, f = 120 Hz	RR	 —	 62	 —	 —	 62	 —	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	—	18	—	—	18	—	mΩ
Short Circuit Current Limit (T_A = +25°C) V_{in} = 35 Vdc	I_{SC}	 —	 0.2	 —	 —	 0.2	 —	A
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

ELECTRICAL CHARACTERISTICS (V_{in} = 19 V, I_O = 500 mA, T_J = T_{low} to T_{high} [Note 1], unless otherwise noted.)

Characteristics	Symbol	MCT7812B			MCT7812C			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_O ≤15 W) 14.5 Vdc ≤ V_{in} ≤ 27 Vdc 15.5 Vdc ≤ V_{in} ≤ 27 Vdc	V_O	 — 11.4	 — 12	 — 12.6	 11.4 —	 12 —	 12.6 —	Vdc
Line Regulation, T_J = +25°C (Note 2) 14.5 Vdc ≤ V_{in} ≤ 30 Vdc 16 Vdc ≤ V_{in} ≤ 22 Vdc	Reg_{line}	 — —	 10 5.0	 240 120	 — —	 10 5.0	 240 120	mV
Load Regulation, T_J = +25°C (Note 2) 5.0 mA ≤ I_O ≤ 1.5 A 250 mA ≤ I_O ≤ 750 mA	Reg_{load}	 — —	 3.0 2.0	 240 120	 — —	 3.0 2.0	 240 120	mV
Quiescent Current (T_J = +25°C)	I_B	—	5.5	8.0	—	5.5	8.0	mA
Quiescent Current Change 14.5 Vdc ≤ V_{in} ≤ 30 Vdc 15 Vdc ≤ V_{in} ≤ 30 Vdc 5.0 mA ≤ I_O ≤ 1.0 A	ΔI_B	 — — —	 — — —	 — 1.0 0.5	 — — —	 — — —	 1.0 — 0.5	mA

NOTES: 1. T_{low} = 0°C for MCT78XXC; = – 40°C for MCT78XXB. T_{high} = +125°C for MCT78XXB, C. When the junction temperature exceeds +125°C, internal current limiting will reduce the output current to less than 1.0 A at a V_I–V_O of 15 V or greater. The MC7800 die will supply more current under the same conditions.

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 (continued) (V_{in} = 19 V, I_O = 500 mA, T_J = T_{low} to T_{high} [Note 1], unless otherwise noted.)

Characteristics	Symbol	MCT7812B			MCT7812C			Unit
		Min	Typ	Max	Min	Typ	Max	
Ripple Rejection 15 Vdc ≤ V_{in} ≤ 25 Vdc, f = 120 Hz	RR	—	62	—	—	62	—	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	—	18	—	—	18	—	mΩ
Short Circuit Current Limit (T_A = +25°C) V_{in} = 35 Vdc	I_{SC}	—	0.2	—	—	0.2	—	A
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

ELECTRICAL CHARACTERISTICS (V_{in} = 23 V, I_O = 500 mA, T_J = T_{low} to T_{high} [Note 1], unless otherwise noted.)

Characteristics	Symbol	MCT7815B			MCT7815C			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_O ≤15 W) 17.5 Vdc ≤ V_{in} ≤ 30 Vdc 18.5 Vdc ≤ V_{in} ≤ 30 Vdc	V_O	— 14.25	— 15	— 15.75	14.25 —	15 —	15.75 —	Vdc
Line Regulation, T_J = +25°C (Note 2) 17.5 Vdc ≤ V_{in} ≤ 30 Vdc 20 Vdc ≤ V_{in} ≤ 26 Vdc	Reg_{line}	— —	11 5.0	300 150	— —	11 5.0	300 150	mV
Load Regulation, T_J = +25°C (Note 2) 5.0 mA ≤ V_{in} ≤ 1.5 A 250 mA ≤ V_{in} ≤ 750 mA	Reg_{load}	— —	3.0 2.0	300 150	— —	3.0 2.0	300 150	mV
Quiescent Current (T_J = +25°C)	I_B	—	5.5	8.0	—	5.5	8.0	mA
Quiescent Current Change 17.5 Vdc ≤ V_{in} ≤ 30 Vdc 18.5 Vdc ≤ V_{in} ≤ 30 Vdc 5.0 mA ≤ I_O ≤ 1.0 A	ΔI_B	— — —	— — —	— 1.0 0.5	— — —	— — —	1.0 — 0.5	mA
Ripple Rejection 18.5 Vdc ≤ V_{in} ≤ 28.5 Vdc, f = 120 Hz	RR	—	60	—	—	60	—	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	—	19	—	—	19	—	mΩ
Short Circuit Current Limit (T_A = +25°C) V_{in} = 35 Vdc	I_{SC}	—	0.2	—	—	0.2	—	A
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

NOTES:
1. T_{low} = 0°C for MCT78XXC
   = – 40°C for MCT78XXB
   T_{high} = +125°C for MCT78XXB, C. When the junction temperature exceeds +125°C, internal current limiting will reduce the output current to less than 1.0 A at a $V_I – V_O$ of 15 V or greater. The MC7800 die will supply more current under the same conditions.
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} = 27 V, I_O = 500 mA, $T_J = T_{low}$ to T_{high} [Note 1], unless otherwise noted.)

Characteristics	Symbol	MCT7818B			MCT7818C			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_O ≤15 W) 21 Vdc ≤ V_{in} ≤ 33 Vdc 22 Vdc ≤ V_{in} ≤ 33 Vdc	V_O	 — 17.1	 — 18	 — 18.9	 17.1 —	 18 —	 18.9 —	Vdc
Line Regulation, T_J = +25°C (Note 2) 21 Vdc ≤ V_{in} ≤ 33 Vdc 24 Vdc ≤ V_{in} ≤ 30 Vdc	Reg_{line}	 — —	 11 5.0	 360 180	 — —	 11 5.0	 360 180	mV
Load Regulation, T_J = +25°C (Note 2) 5.0 mA ≤ V_{in} ≤ 1.5 A 250 mA ≤ V_{in} ≤ 750 mA	Reg_{load}	 — —	 4.0 3.0	 360 180	 — —	 4.0 3.0	 360 180	mV
Quiescent Current (T_J = +25°C)	I_B	—	5.5	8.0	—	5.5	8.0	mA
Quiescent Current Change 21 Vdc ≤ V_{in} ≤ 33 Vdc 22 Vdc ≤ V_{in} ≤ 33 Vdc 5.0 mA ≤ I_O ≤ 1.0 A	ΔI_B	 — — —	 — — —	 — 1.0 0.5	 — — —	 — — —	 1.0 — 0.5	mA
Ripple Rejection 22 Vdc ≤ V_{in} ≤ 32 Vdc, f = 120 Hz	RR	 —	 59	 —	 —	 59	 —	dB
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) 10 Hz ≤ f ≤ 100 kHz	V_n	 —	 10	 —	 —	 10	 —	µV/V_O
Output Resistance f = 1.0 kHz	r_O	—	19	—	—	19	—	mΩ
Short Circuit Current Limit (T_A = +25°C) V_{in} = 35 Vdc	I_{SC}	 —	 0.2	 —	 —	 0.2	 —	A
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

ELECTRICAL CHARACTERISTICS (V_{in} = 33 V, I_O = 500 mA, $T_J = T_{low}$ to T_{high} [Note 1], unless otherwise noted.)

Characteristics	Symbol	MCT7824B			MCT7824C			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_O ≤15 W) 27 Vdc ≤ V_{in} ≤ 38 Vdc 28 Vdc ≤ V_{in} ≤ 38 Vdc	V_O	 — 22.8	 — 24	 — 25.2	 22.8 —	 24 —	 25.2 —	Vdc
Line Regulation, T_J = +25°C (Note 2) 27 Vdc ≤ V_{in} ≤ 38 Vdc 30 Vdc ≤ V_{in} ≤ 36 Vdc	Reg_{line}	 — —	 12 6.0	 480 240	 — —	 12 6.0	 480 240	mV
Load Regulation, T_J = +25°C (Note 2) 5.0 mA ≤ I_O ≤ 1.5 A 250 mA ≤ I_O ≤ 750 mA	Reg_{load}	 — —	 5.0 4.0	 480 240	 — —	 5.0 4.0	 480 240	mV
Quiescent Current (T_J = +25°C)	I_B	—	5.5	8.0	—	5.5	8.0	mA
Quiescent Current Change 27 Vdc ≤ V_{in} ≤ 38 Vdc 28 Vdc ≤ V_{in} ≤ 38 Vdc 5.0 mA ≤ I_O ≤ 1.0 A	ΔI_B	 — — —	 — — —	 — 1.0 0.5	 — — —	 — — —	 1.0 — 0.5	mA
Ripple Rejection 28 Vdc ≤ V_{in} ≤ 38 Vdc, f = 120 Hz	RR	 —	 56	 —	 —	 56	 —	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	—	20	—	—	20	—	mΩ
Short Circuit Current Limit (T_A = +25°C) V_{in} = 35 Vdc	I_{SC}	 —	 0.2	 —	 —	 0.2	 —	A
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

NOTES: 1. T_{low} = 0°C for MCT78XXC
= – 40°C for MCT78XXB
T_{high} = +125°C for MCT78XXB, C. When the junction temperature exceeds +125°C, internal current limiting will reduce the output current to less than 1.0 A at a $V_I – V_O$ of 15 V or greater. The MC7800 die will supply more current under the same conditions.

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.

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

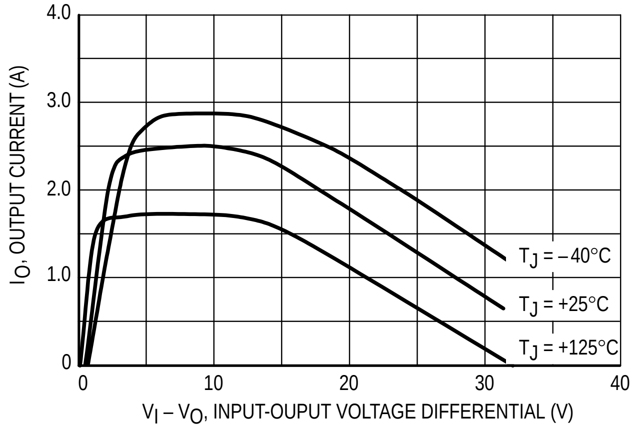


Figure 2. Ripple Rejection as a Function of Output Voltages (MCT78XXC)

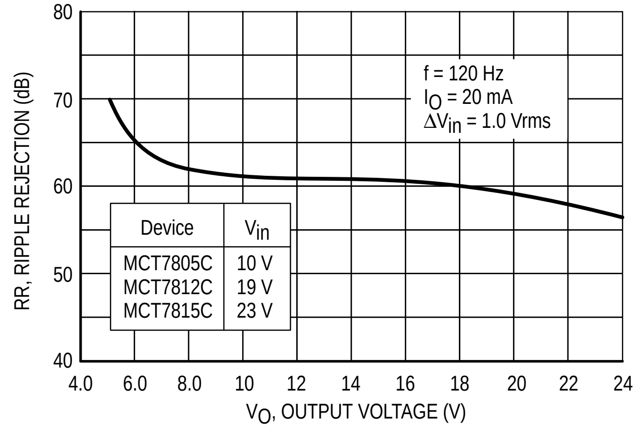


Figure 3. Ripple Rejection as a Function of Frequency (MCT78XXC)

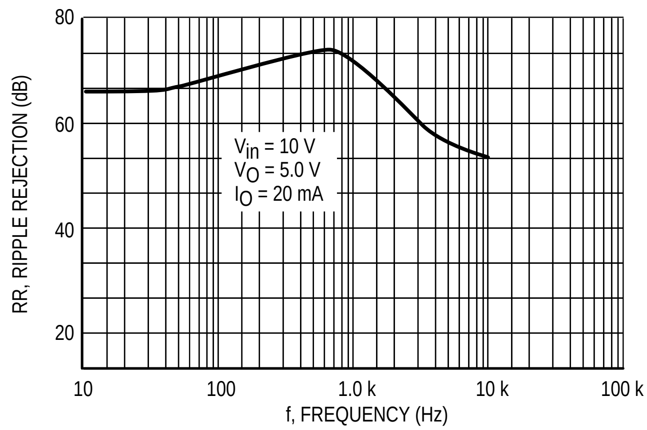


Figure 4. Output Impedance as a Function of Output Voltage (MCT78XXC)

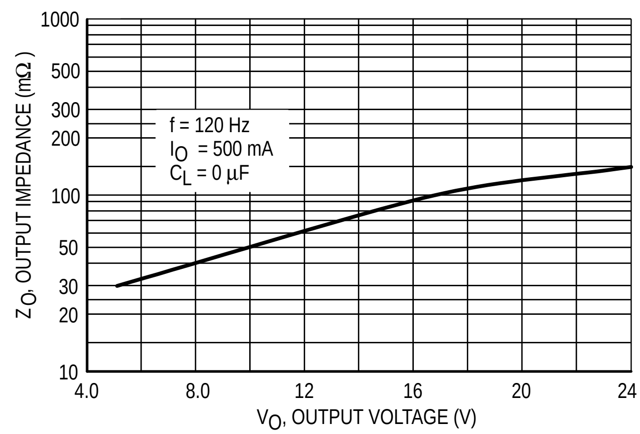
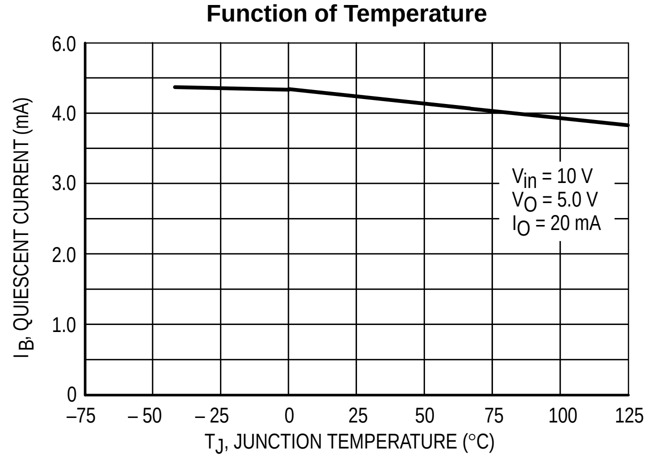


Figure 5. Quiescent Current as a Function of Temperature



APPLICATIONS INFORMATION

Design Considerations

The MCT7800 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.

Figure 6. Worst Case Power Dissipation versus Ambient Temperature (Case 221A)

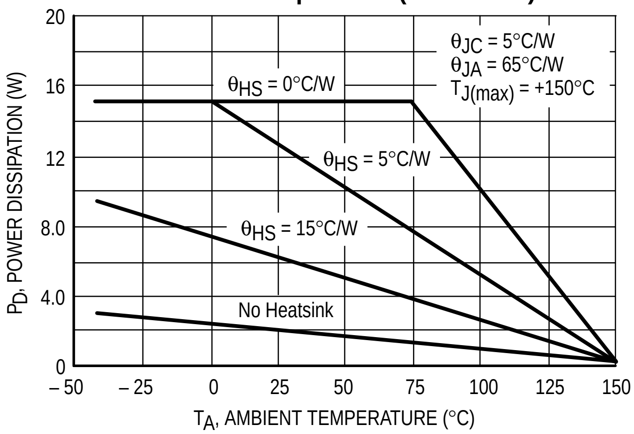


Figure 7. Input Output Differential as a Function of Junction Temperature

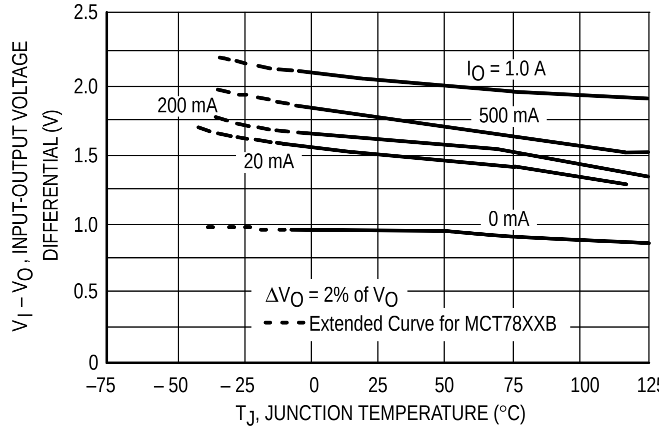
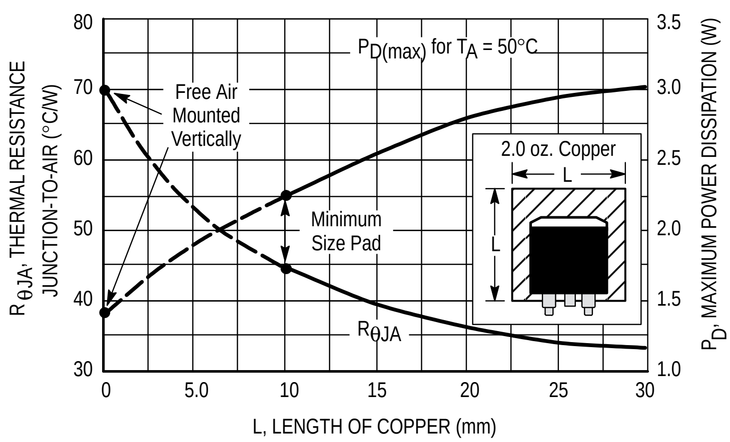


Figure 8. D²PAK Thermal Resistance and Maximum Power Dissipation versus P.C.B. Copper Length



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.

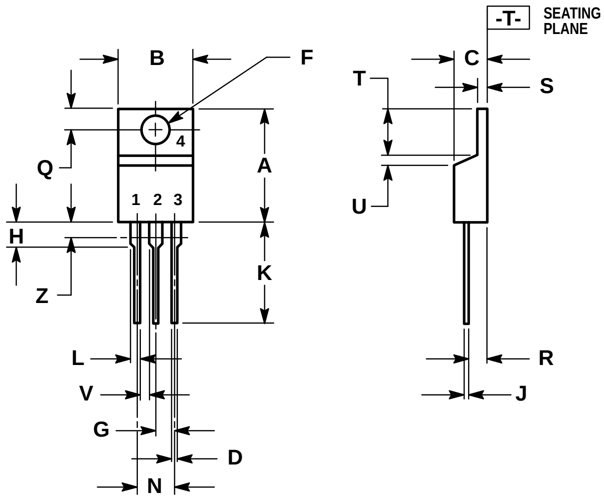
Quiescent Current — That part of the input current that is not delivered to the load.

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.

OUTLINE DIMENSIONS

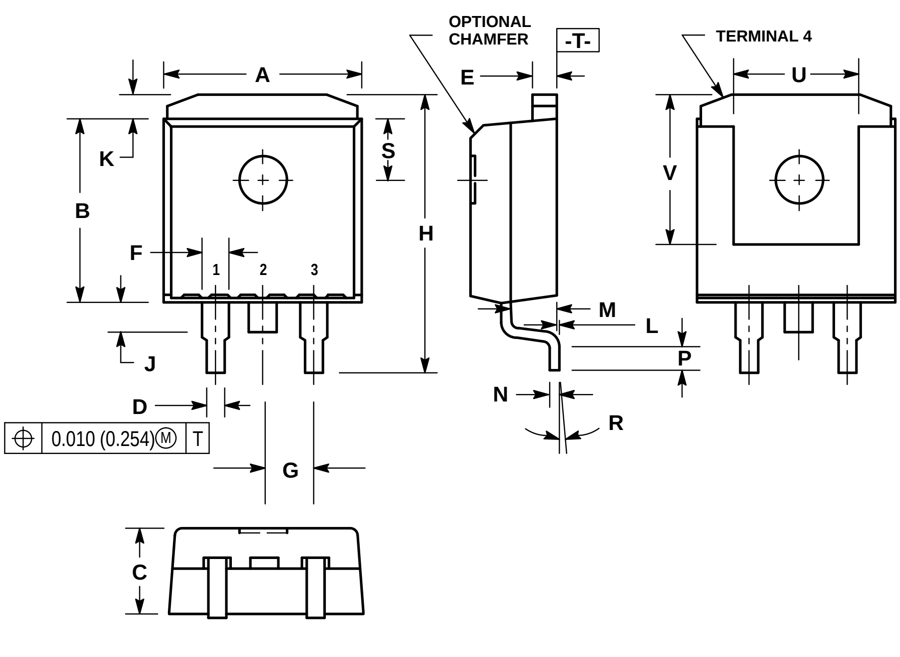
T SUFFIX
PLASTIC PACKAGE
CASE 221A-06



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

DIM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS 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

D2T SUFFIX
PLASTIC PACKAGE
CASE 936-03
(D^2PAK)



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.

DIM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS 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	

NOTES

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