500 mA Negative Voltage Regulators

The MC79M00 series of fixed output negative voltage regulators are intended as complements to the popular MC78M00 series devices.

Available in fixed output voltage options of -5.0 V, -8.0 V, -12 V and -15 V, these regulators employ current limiting, thermal shutdown, and safe–area compensation, making them remarkably rugged under most operating conditions. With adequate heatsinking they can deliver output currents in excess of 0.5 A.

Features

- No External Components Required
- Internal Thermal Overload Protection
- Internal Short Circuit Current Limiting
- Output Transistor Safe-Area Compensation
- Also Available in Surface Mount DPAK (DT) Package
- Pb-Free Packages are Available

DEVICE TYPE/NOMINAL OUTPUT VOLTAGE

Device	Nominal Output Voltage
MC79M05	−5.0 V
MC79M08	−8.0 V
MC79M12	−12 V
MC79M15	−15 V

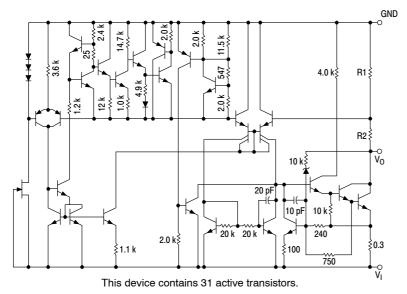


Figure 1. Representative Schematic Diagram

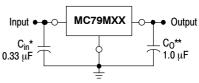


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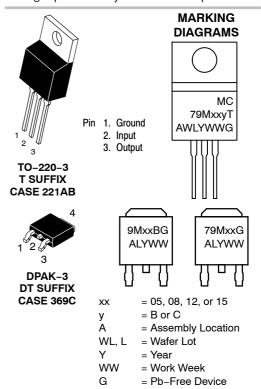
THREE-TERMINAL NEGATIVE FIXED VOLTAGE REGULATORS

STANDARD APPLICATION



A common ground is required between the input and the output voltages. The input voltage must remain typically 1.1 V more negative even during the high point of 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 improve stability and transient response.



ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

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

Rating	Symbol	Value	Unit
Input Voltage	VI	-35	Vdc
Power Dissipation			
Case 221A (TO-220-3)			
T _A = 25°C	P_{D}	Internally Limited	W
Thermal Resistance, Junction-to-Ambient	θ_{JA}	65	°C/W
Thermal Resistance, Junction-to-Case	$\theta_{\sf JC}$	5.0	°C/W
Case 369C (DPAK-3)			
T _A = 25°C	P_{D}	Internally Limited	W
Thermal Resistance, Junction-to-Ambient	θ_{JA}	92	°C/W
Thermal Resistance, Junction-to-Case	$\theta_{\sf JC}$	6.0	°C/W
Storage Junction Temperature	T _{stg}	-65 to +150	°C
Operating Junction Temperature Range	TJ	-40 to +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.

Human Body Model 2000 V per MIL_STD_883, Method 3015

Machine Model Method 200 V

MC79M05B, C **ELECTRICAL CHARACTERISTICS** ($V_I = -10 \text{ V}$, $I_O = 350 \text{ mA}$, T_{low} to T_{high} (Note 2), unless otherwise noted.)

Characteristic	Symbol	Min	Тур	Max	Unit
Output Voltage (T _J = 25°C)	Vo	-4.8	-5.0	-5.2	Vdc
Line Regulation, $T_J = 25^{\circ}C$ (Note 1) $-7.0 \text{ Vdc} \ge V_I \ge -25 \text{ Vdc}$ $-8.0 \text{ Vdc} \ge V_I \ge -18 \text{ Vdc}$	Reg _{line}	- -	7.0 2.0	50 30	mV
Load Regulation, T_J = 25°C (Note 1) 5.0 mA \leq I _O \leq 500 mA	Reg _{load}	-	30	100	mV
Output Voltage $-7.0 \text{ Vdc} \geq V_{I} \geq -25 \text{ Vdc}, 5.0 \text{ mA} \leq I_{O} \leq 350 \text{ mA}$	V _O	-4.75	ı	-5.25	Vdc
Input Bias Current (T _J = 25°C)	I _{IB}	_	4.3	8.0	mA
Input Bias Current Change $-8.0~Vdc \ge V_I \ge -25~Vdc,~I_O = 350~mA \\ 5.0~mA \le I_O \le 350~mA,~V_I = -10~V$	Δl _{IB}	- -	- -	0.4 0.4	mA
Output Noise Voltage, $T_A = 25^{\circ}C$, 10 Hz \leq f \leq 100 kHz	V _n	_	40	-	μV
Ripple Rejection (f = 120 Hz)	RR	54	66	-	dB
Dropout Voltage I _O = 500 mA, T _J = 25°C	V _I –V _O	-	1.1	-	Vdc
Average Temperature Coefficient of Output Voltage $I_O = 5.0$ mA, $0^{\circ}C \le T_J \le 125^{\circ}C$	$\Delta V_{O}/\Delta T$	-	0.2	-	mV/°C

Load and line regulation are specified at constant temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.
 B = T_{low} to T_{high}, -40°C < T_J < 125°C C = T_{low} to T_{high}, 0°C < T_J < 125°C.

^{*}This device series contains ESD protection and exceeds the following tests:

MC79M08B, C **ELECTRICAL CHARACTERISTICS** ($V_I = -10 \text{ V}$, $I_O = 350 \text{ mA}$, T_{low} to T_{high} (Note 4), unless otherwise noted.)

Characteristic	Symbol	Min	Тур	Max	Unit
Output Voltage (T _J = 25°C)	Vo	-7.7	-8.0	-8.3	Vdc
Line Regulation, $T_J = 25^{\circ}C$ (Note 3) -10.5 Vdc \geq V $_I \geq$ -25 Vdc -11 Vdc \geq V $_I \geq$ -21 Vdc	Reg _{line}	- -	5.0 3.0	80 50	mV
Load Regulation, $T_J = 25^{\circ}C$ (Note 3) $5.0 \text{ mA} \le I_O \le 500 \text{ mA}$	Reg _{load}	-	30	100	mV
Output Voltage $-10.5 \text{ Vdc} \ge V_I \ge -25 \text{ Vdc}, 5.0 \text{ mA} \le I_O \le 350 \text{ mA}$	Vo	-7.6	-8.0	-8.4	Vdc
Input Bias Current (T _J = 25°C)	I _{IB}	-	-	8.0	mA
Input Bias Current Change -10.5 Vdc \geq V $_{I}$ \geq -25 Vdc, I $_{O}$ = 350 mA 5.0 mA \leq I $_{O}$ \leq 350 mA, V $_{I}$ = -10 V	ΔI_{IB}	- -	_ _	0.4 0.4	mA
Output Noise Voltage, T _A = 25°C, 10 Hz ≤ f ≤ 100 kHz	V _n	-	60	-	μV
Ripple Rejection (f = 120 Hz)	RR	54	63	-	dB
Dropout Voltage I _O = 500 mA, T _J = 25°C	V _I –V _O	-	1.1	-	Vdc
Average Temperature Coefficient of Output Voltage $I_O = 5.0 \text{ mA}, 0^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C}$	$\Delta V_{O}/\Delta T$	-	0.4	-	mV/°C

^{3.} Load and line regulation are specified at constant temperature. Change in V_O due to heating effects must be taken into account separately.

MC79M12B, C **ELECTRICAL CHARACTERISTICS** ($V_I = -19 \text{ V}$, $I_O = 350 \text{ mA}$, T_{low} to T_{high} (Note 6), unless otherwise noted.)

Characteristic	Symbol	Min	Тур	Max	Unit
Output Voltage (T _J = 25°C)	V _O	-11.5	-12	-12.5	Vdc
Line Regulation, $T_J = 25^{\circ}C$ (Note 5) $-14.5 \text{ Vdc} \ge V_l \ge -30 \text{ Vdc}$ $-15 \text{ Vdc} \ge V_l \ge -25 \text{ Vdc}$		- -	5.0 3.0	80 50	mV
Load Regulation, T_J = 25°C (Note 5) 5.0 mA \leq I _O \leq 500 mA	Reg _{load}	-	30	240	mV
Output Voltage $-14.5 \text{ Vdc} \geq V_{I} \geq -30 \text{ Vdc}, 5.0 \text{ mA} \leq I_{O} \leq 350 \text{ mA}$	V _O	-11.4	-	-12.6	Vdc
Input Bias Current (T _J = 25°C)	I _{IB}	-	4.4	8.0	mA
Input Bias Current Change -14.5 Vdc \geq V _I \geq -30 Vdc, I _O = 350 mA 5.0 mA \leq I _O \leq 350 mA, V _I = -19 V	$\Delta I_{ m IB}$	- -	- -	0.4 0.4	mA
Output Noise Voltage, $T_A = 25^{\circ}C$, 10 Hz \leq f \leq 100 kHz	V _n	-	75	-	μV
Ripple Rejection (f = 120 Hz)	RR	54	60	-	dB
Dropout Voltage I _O = 500 mA, T _J = 25°C	V _I –V _O	-	1.1	-	Vdc
Average Temperature Coefficient of Output Voltage $I_O = 5.0$ mA, $0^{\circ}C \leq T_J \leq 125^{\circ}C$	$\Delta V_{O}/\Delta T$	_	-0.8	-	mV/°C

 ^{5.} Load and line regulation are specified at constant temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.
 6. B = T_{low} to T_{high}, -40°C < T_J < 125°C C = T_{low} to T_{high}, 0°C < T_J < 125°C

Pulse testing with low duty cycle is used.

4. B = T_{low} to T_{high}, -40°C < T_J < 125°C
C = T_{low} to T_{high}, 0°C < T_J < 125°C

MC79M15B, C ELECTRICAL CHARACTERISTICS ($V_I = -23 \text{ V}$, $I_O = 350 \text{ mA}$, T_{low} to T_{high} (Note 8), unless otherwise noted.)

Characteristic	Symbol	Min	Тур	Max	Unit
Output Voltage (T _J = 25°C)	V _O	-14.4	-15	-15.6	Vdc
Line Regulation, $T_J = 25^{\circ}C$ (Note 7) -17.5 Vdc \geq V $_I \geq$ -30 Vdc -18 Vdc \geq V $_I \geq$ -28 Vdc	Reg _{line}	<u>-</u>	5.0 3.0	80 50	mV
Load Regulation, $T_J = 25^{\circ}C$ (Note 7) 5.0 mA $\leq I_O \leq 500$ mA	Reg _{load}	_	30	240	mV
Output Voltage $-17.5 \text{ Vdc} \ge V_{\text{I}} \ge -30 \text{ Vdc}, 5.0 \text{ mA} \le I_{\text{O}} \le 350 \text{ mA}$	Vo	-14.25	-	-15.75	Vdc
Input Bias Current (T _J = 25°C)	I _{IB}	-	4.4	8.0	mA
Input Bias Current Change -17.5 Vdc \geq V $_{I} \geq$ -30 Vdc, I $_{O}$ = 350 mA 5.0 mA \leq I $_{O} \leq$ 350 mA, V $_{I}$ = -23 V	ΔI_{IB}	- -	- -	0.4 0.4	mA
Output Noise Voltage, T _A = 25°C, 10 Hz ≤ f ≤ 100 kHz	V _n	-	90	-	μV
Ripple Rejection (f = 120 Hz)	RR	54	60	-	dB
Dropout Voltage $I_O = 500 \text{ mA}, T_J = 25^{\circ}\text{C}$	V _I –V _O	-	1.1	-	Vdc
Average Temperature Coefficient of Output Voltage $I_O = 5.0 \text{ mA}, 0^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C}$	$\Delta V_{O}/\Delta T$	-	-1.0	-	mV/°C

Load and line regulation are specified at constant temperature. Change in V_O due to heating effects must be taken into account separately.
 Pulse testing with low duty cycle is used.

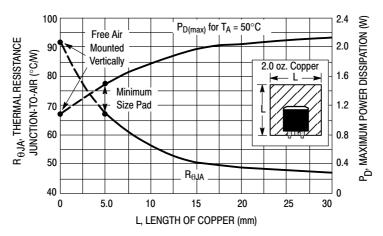


Figure 1. DPAK-3 Thermal Resistance and Maximum Power Dissipation versus P.C.B. Copper Length

Pulse testing with low duty cycle is used.

8. B = T_{low} to T_{high}, -40°C < T_J < 125°C
C = T_{low} to T_{high}, 0°C < T_J < 125°C

Protection Diodes

When external capacitors are used with MC79M00 series regulator it is sometimes necessary to add protection diodes to prevent the capacitors from discharging through low current points into the regulator or from output polarity reversals. Generally, no protection diode is required for values of output capacitance less then $10\mu F$. Figure 2 shows the MC79M15 with the recommended protection diodes.

• Opposite Polarity Protection

Diode D1 protects the regulator from output polarity reversals during startup, power off and short-circuit operation.

• Reverse-bias Protection

Diode D2 prevents output capacitor from discharging thru the MC79M15 during an input short circuit or fast switch off of power supply.

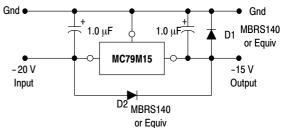


Figure 2. Protection Diodes

ORDERING INFORMATION

Device	Output Voltage Tolerance	Operating Temperature Range	Package	Shipping [†]
MC79M05BDT			DPAK	75 Units / Rail
MC79M05BDTG			DPAK (Pb-Free)	75 Units / Rail
MC79M05BDTRK			DPAK	2500 Units / Reel
MC79M05BDTRKG		$T_{J} = -40^{\circ}\text{C to } +125^{\circ}\text{C}$	DPAK (Pb-Free)	2500 Units / Reel
MC79M05BT			TO-220	50 Units / Rail
MC79M05BTG			TO-220 (Pb-Free)	50 Units / Rail
MC79M05CDT			DPAK	75 Units / Rail
MC79M05CDTG			DPAK (Pb-Free)	75 Units / Rail
MC79M05CDTRK			DPAK	2500 Units / Reel
MC79M05CDTRKG		$T_J = 0$ °C to +125°C	DPAK (Pb-Free)	2500 Units / Reel
MC79M05CT			TO-220	50 Units / Rail
MC79M05CTG			TO-220 (Pb-Free)	50 Units / Rail
MC79M08BDT			DPAK	75 Units / Rail
MC79M08BDTRK			DPAK	2500 Units / Reel
MC79M08BDTRKG		T _J = -40°C to +125°C	DPAK (Pb-Free)	2500 Units / Reel
MC79M08BT			TO-220	50 Units / Rail
MC79M08BTG			TO-220 (Pb-Free)	50 Units / Rail
MC79M08CDT	4.0%	4.0%	DPAK	75 Units / Rail
MC79M08CDTG	,		DPAK (Pb-Free)	75 Units / Rail
MC79M08CDTRK			DPAK	2500 Units / Reel
MC79M08CDTRKG		$T_{J} = 0^{\circ}\text{C to } +125^{\circ}\text{C}$	DPAK (Pb-Free)	2500 Units / Reel
MC79M08CT			TO-220	50 Units / Rail
MC79M08CTG			TO-220 (Pb-Free)	50 Units / Rail
MC79M12BDT			DPAK	75 Units / Rail
MC79M12BDTG			DPAK (Pb-Free)	75 Units / Rail
MC79M12BDTRK			DPAK	2500 Units / Reel
MC79M12BDTRKG		$T_J = -40^{\circ}\text{C to } +125^{\circ}\text{C}$	DPAK (Pb-Free)	2500 Units / Reel
MC79M12BT			TO-220	50 Units / Rail
MC79M12BTG			TO-220 (Pb-Free)	50 Units / Rail
MC79M12CDT			DPAK	75 Units / Rail
MC79M12CDTG			DPAK (Pb-Free)	75 Units / Rail
MC79M12CDTRK			DPAK	2500 Units / Reel
MC79M12CDTRKG		$T_J = 0$ °C to +125°C	DPAK (Pb-Free)	2500 Units / Reel
MC79M12CT			TO-220	50 Units / Rail
			TO-220	

[†]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.

ORDERING INFORMATION

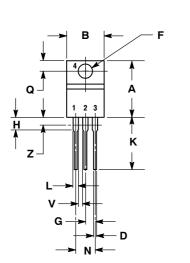
Device	Output Voltage Tolerance	Operating Temperature Range	Package	Shipping†
MC79M15BDT			DPAK	75 Units / Rail
MC79M15BDTG			DPAK (Pb-Free)	75 Units / Rail
MC79M15BDTRK	1		DPAK	2500 Units / Reel
MC79M15BDTRKG		$T_{J} = -40^{\circ}\text{C to } +125^{\circ}\text{C}$	DPAK (Pb-Free)	2500 Units / Reel
MC79M15BT			TO-220	50 Units / Rail
MC79M15BTG			TO-220 (Pb-Free)	50 Units / Rail
MC79M15CDT	4.0%		DPAK	75 Units / Rail
MC79M15CDTG			DPAK (Pb-Free)	75 Units / Rail
MC79M15CDTRK]		DPAK	2500 Units / Reel
MC79M15CDTRKG		T _J = 0°C to +125°C	DPAK (Pb-Free)	2500 Units / Reel
MC79M15CT			TO-220	50 Units / Rail
MC79M15CTG			TO-220 (Pb-Free)	50 Units / Rail

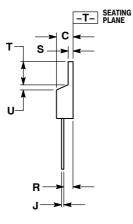
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

PACKAGE DIMENSIONS

TO-220, SINGLE GAUGE

CASE 221AB ISSUE A



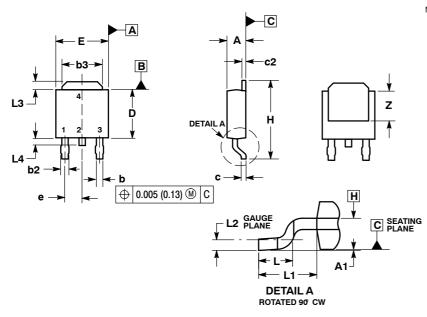


- NOTES:
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCHES.
 3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.
 4. PRODUCT SHIPPED PRIOR TO 2008 HAD DIMENSIONS S = 0.045 0.055 INCHES (1.143 1.397 MM)

	INC	INCHES		IETERS
DIM	MIN	MAX	MIN	MAX
Α	0.570	0.620	14.48	15.75
В	0.380	0.405	9.66	10.28
С	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
Н	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	0.024	0.508	0.61
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
٧	0.045		1.15	
Z		0.080		2.04

PACKAGE DIMENSIONS

DPAK-3 DT SUFFIX CASE 369C ISSUE D

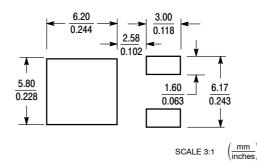


NOTES:

- DIMENSIONING AND TOLERANCING PER ASME
 TOLERANCING PER ASME
- Y14.5M, 1994. CONTROLLING DIMENSION: INCHES.
- 3. THERMAL PAD CONTOUR OPTIONAL WITHIN DI-MENSIONS b3, L3 and Z.
- DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
- 5. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
- 6. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.

	INCHES		MILLIMETERS		
DIM	MIN	MAX	MIN	MAX	
Α	0.086	0.094	2.18	2.38	
A1	0.000	0.005	0.00	0.13	
b	0.025	0.035	0.63	0.89	
b2	0.030	0.045	0.76	1.14	
b3	0.180	0.215	4.57	5.46	
С	0.018	0.024	0.46	0.61	
c2	0.018	0.024	0.46	0.61	
D	0.235	0.245	5.97	6.22	
E	0.250	0.265	6.35	6.73	
е	0.090	BSC	2.29	BSC	
Н	0.370	0.410	9.40	10.41	
L	0.055	0.070	1.40	1.78	
L1	0.108	REF	2.74 REF		
L2	0.020	BSC	0.51 BSC		
L3	0.035	0.050	0.89	1.27	
L4		0.040	1.01		
Z	0.155		3.93		

SOLDERING FOOTPRINT*



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

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MC79M05BD	MC79M05BDTG	MC79M05BDTRK	MC79M05BDTRKG	MC79M05BT	MC79M05BTG
MC79M05CDT	MC79M05CDTG	MC79M05CDTRK	MC79M05CDTRKG	MC79M05CT	MC79M05CTG
MC79M08BDT	MC79M08BDTG	MC79M08BDTRK	MC79M08BDTRKG	MC79M08BT	MC79M08BTG
MC79M08CDT	MC79M08CDTG	MC79M08CDTRK	MC79M08CDTRKG	MC79M08CT	MC79M08CTG
MC79M12BDT	MC79M12BDTG	MC79M12BDTRK	MC79M12BDTRKG	MC79M12BT	MC79M12BTG
MC79M12CDT	MC79M12CDTG	MC79M12CDTRK	MC79M12CDTRKG	MC79M12CT	MC79M12CTG
MC79M15BDT	MC79M15BDTG	MC79M15BDTRK	MC79M15BDTRKG	MC79M15BT	MC79M15BTG
MC79M15CDT	MC79M15CDTG	MC79M15CDTRK	MC79M15CDTRKG	MC79M15CT	MC79M15CTG