



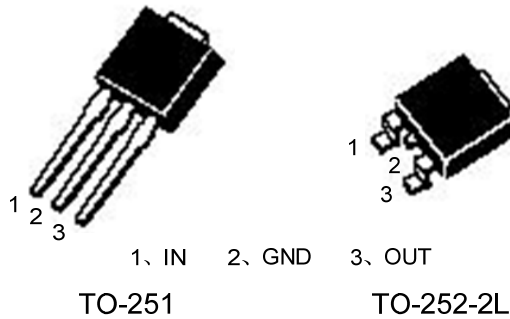
Three-terminal positive voltage regulator

- Features

Maximum Output current I_{OM} : 0.5 A

Output voltage V_o : 5V, 9V, 12V, 15V

- Pin Configurations



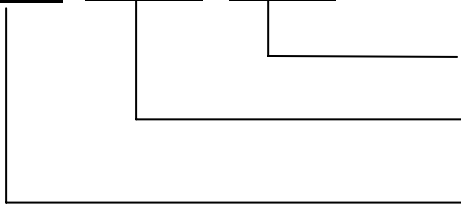
- Absolute Maximum Ratings

@ $T_A=25^\circ\text{C}$ unless otherwise noted

Parameter	Symbol	Ratings	Unit
Input Voltage	V_i	35	V
Operating Junction Temperature Range	T_{OPR}	0-+125	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-65-+150	$^\circ\text{C}$

- Ordering information

FS78M - □ □ □ □



Package type

T1=TO251; T2=TO252;

Output Voltage

... 05=5.0V 09=9.0V 12=12V ...

Indicates the product number



● **Electrical Characteristics** (Unless otherwise specified: $V_{IN} = 10V$, $C_{IN} = 0.33 \mu F$, $C_O = 0.1 \mu F$) **FS78M05**

Symbol	Parameter	Conditions	Min	Typ	Max	Units
V_O	Output Voltage	$I_L = 500 \text{ mA}$	4.8	5.0	5.2	V
		$5 \text{ mA} \leq I_L \leq 500 \text{ mA}$ $P_D \leq 7.5W, 7.5V \leq V_{IN} \leq 20V$	4.75	5.0	5.25	
$V_{R\text{ LINE}}$	Line Regulation	$7.2V \leq V_{IN} \leq 25V$	$I_L = 100 \text{ mA}$		50	mV
			$I_L = 500 \text{ mA}$		100	
$V_{R\text{ LOAD}}$	Load Regulation	$5 \text{ mA} \leq I_L \leq 500 \text{ mA}$			100	
I_Q	Quiescent Current	$I_L = 500 \text{ mA}$		4	10.0	mA
ΔI_Q	Quiescent Current Change	$5 \text{ mA} \leq I_L \leq 500 \text{ mA}$			0.5	
		$7.5V \leq V_{IN} \leq 25V, I_L = 500 \text{ mA}$			1.0	
V_n	Output Noise Voltage	$f = 10 \text{ Hz to } 100 \text{ kHz}$		40		μV
$\frac{\Delta V_{IN}}{\Delta V_O}$	Ripple Rejection	$f = 120 \text{ Hz}, I_L = 500 \text{ mA}$		78		dB
V_{IN}	Input Voltage Required to Maintain Line Regulation	$I_L = 500 \text{ mA}$	7.2			V
ΔV_O	Long Term Stability	$I_L = 500 \text{ mA}$			20	mV/khrs

($V_i=16V, I_o=350mA, 0 < T_j < 125, C_i=0.33\mu F, C_o=0.1\mu F$, unless otherwise specified) **FS78M09**

Parameter	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output voltage	V_o	$T_j=25$	8.65	9	9.35	V
		$11.5 \leq V_i \leq 24V, I_o=5mA-350mA, P_o \leq 15W$	8.55	9	9.45	V
Load Regulation	ΔV_o	$T_j=25, I_o=5mA-500mA$		20	180	mV
		$T_j=25, I_o=5mA-200mA$		10	90	mV
Line regulation	ΔV_o	$11.5V \leq V_i \leq 26V, I_o=200mA$		6	100	mV
		$12V \leq V_i \leq 26V, I_o=200mA$		2	50	mV
Quiescent Current	I_q	$T_j=25$		4.6	6	mA
Quiescent Current Change	ΔI_q	$11.5V \leq V_i \leq 26V, I_o=200mA$			0.8	mA
	ΔI_q	$5mA \leq I_o \leq 350mA$			0.5	mA
Output Noise Voltage	V_N	$10Hz \leq f \leq 100KHz$		60		μV
Ripple Rejection	RR	$13 \leq V_i \leq 23V, f=120Hz, I_o=300mA, T_j=25$		56	80	dB
Dropout Voltage	V_d	$T_j=25, I_o=350mA$		2		V
Short Circuit Current	I_{sc}	$V_i=16V, T_a=25$		250		mA
Peak Current	I_{pk}	$T_j=25$		0.7		A



(Unless otherwise specified: VIN = 19V, CIN = 0.33 μF, CO = 0.1 μF) **FS78M12**

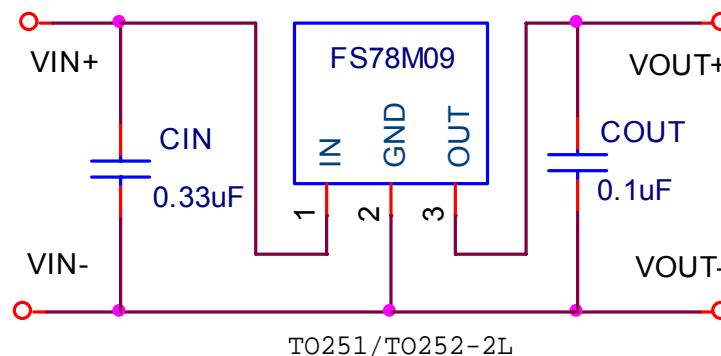
Symbol	Parameter	Conditions	Min	Typ	Max	Units
V _O	Output Voltage	I _L = 500 mA	11.5	12	12.5	V
		5 mA ≤ I _L ≤ 500 mA P _D ≤ 7.5W, 14.8V ≤ V _{IN} ≤ 27V	11.4	12	12.6	
V _{R LINE}	Line Regulation	14.5V ≤ V _{IN} ≤ 30V	I _L = 100 mA		120	mV
			I _L = 500 mA		240	
V _{R LOAD}	Load Regulation	5 mA ≤ I _L ≤ 500 mA			240	
I _Q	Quiescent Current	I _L = 500 mA		4	10.0	mA
ΔI _Q	Quiescent Current Change	5 mA ≤ I _L ≤ 500 mA			0.5	
		14.8V ≤ V _{IN} ≤ 30V, I _L = 500 mA			1.0	
V _n	Output Noise Voltage	f = 10 Hz to 100 kHz		75		μV
$\frac{\Delta V_{IN}}{\Delta V_O}$	Ripple Rejection	f = 120 Hz, I _L = 500 mA		71		dB
V _{IN}	Input Voltage Required to Maintain Line Regulation	I _L = 500 mA	14.5			V
ΔV _O	Long Term Stability	I _L = 500 mA			48	mV/khrs

(Unless otherwise specified: VIN = 23V, CIN = 0.33 μF, CO = 0.1 μF) **FS78M15**

Symbol	Parameter	Conditions	Min	Typ	Max	Units
V _O	Output Voltage	I _L = 500 mA	14.4	15	15.6	V
		5 mA ≤ I _L ≤ 500 mA P _D ≤ 7.5W, 18V ≤ V _{IN} ≤ 30V	14.25	15	15.75	
V _{R LINE}	Line Regulation	17.6V ≤ V _{IN} ≤ 30V	I _L = 100 mA		150	mV
			I _L = 500 mA		300	
V _{R LOAD}	Load Regulation	5 mA ≤ I _L ≤ 500 mA			300	
I _Q	Quiescent Current	I _L = 500 mA		4	10.0	mA
ΔI _Q	Quiescent Current Change	5 mA ≤ I _L ≤ 500 mA			0.5	
		18V ≤ V _{IN} ≤ 30V, I _L = 500 mA			1.0	
V _n	Output Noise Voltage	f = 10 Hz to 100 kHz		90		μV
$\frac{\Delta V_{IN}}{\Delta V_O}$	Ripple Rejection	f = 120 Hz, I _L = 500 mA		69		dB
V _{IN}	Input Voltage Required to Maintain Line Regulation	I _L = 500 mA	17.6			V
ΔV _O	Long Term Stability	I _L = 500 mA			60	mV/khrs

Note : Electrical specifications do not apply when operating the device outside of its rated operating conditions.

● **TYPICAL APPLICATION** (for 9V out, same to others)





● Typical Performance Characteristics

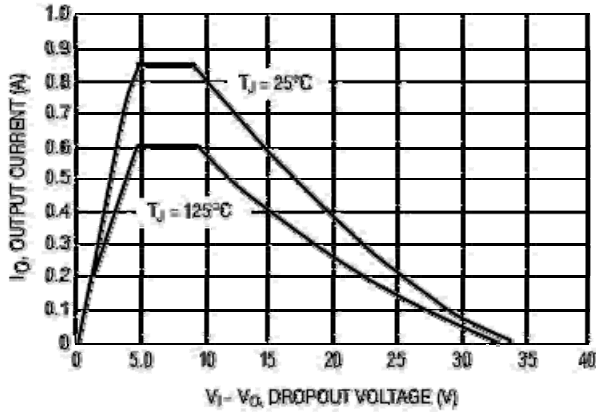


Figure 1. Peak Output Current versus Dropout Voltage

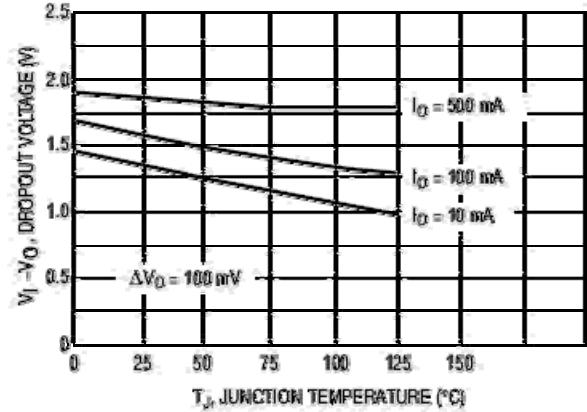


Figure 2. Dropout Voltage versus Junction Temperature

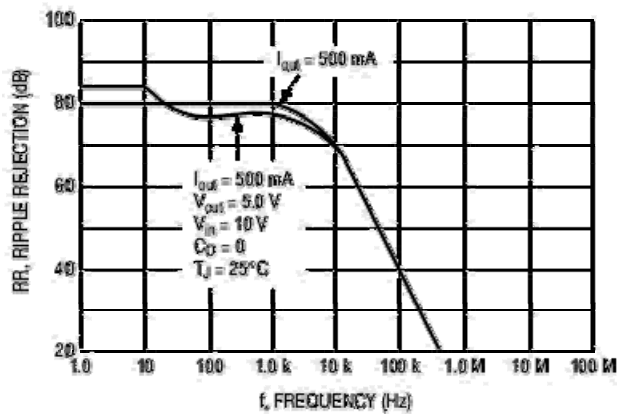


Figure 3. Ripple Rejection versus Frequency

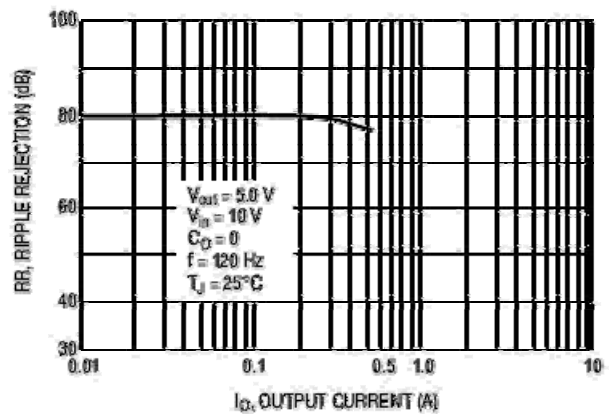


Figure 4. Ripple Rejection versus Output Current

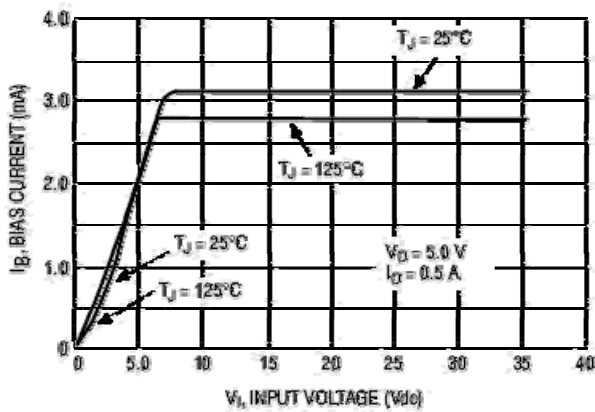


Figure 5. Bias Current versus Input Voltage

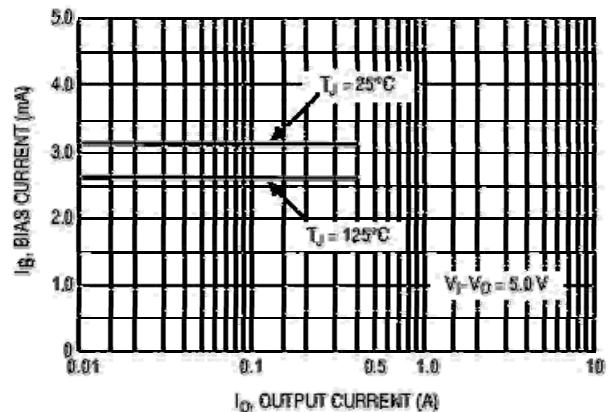
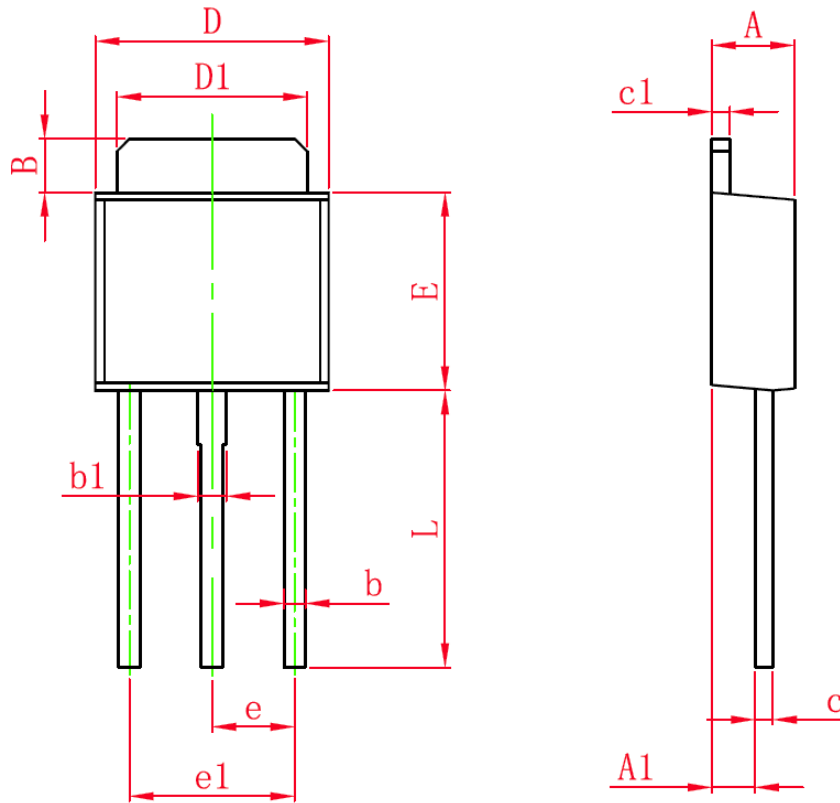


Figure 6. Bias Current versus Output Current



● Package Information

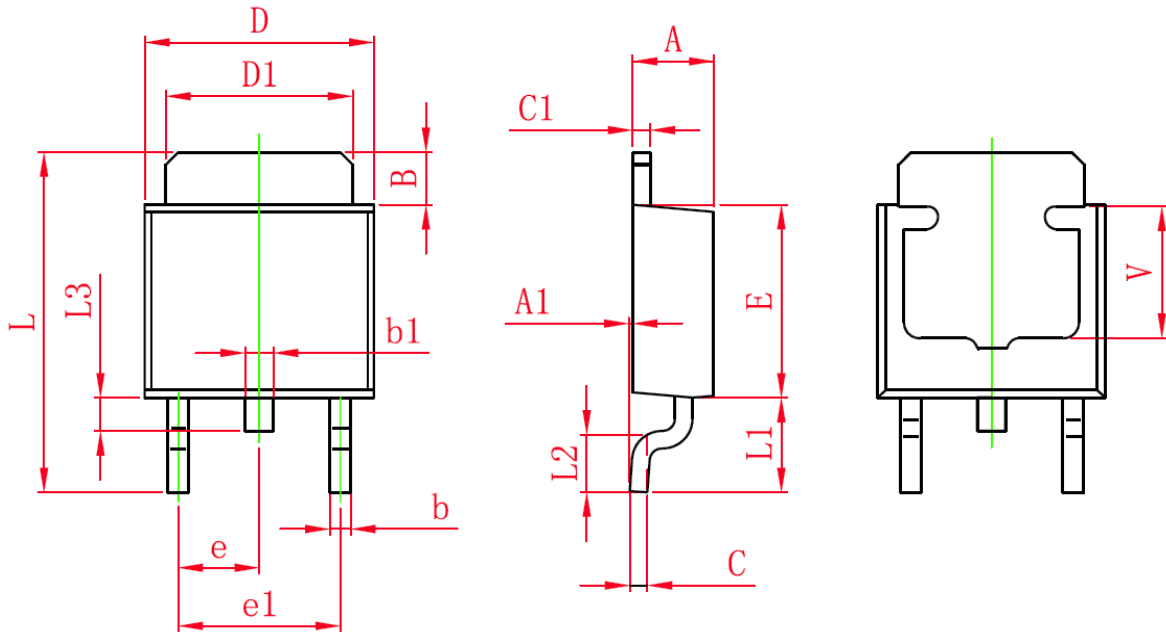
TO-251 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	2.200	2.400	0.087	0.094
A1	1.020	1.270	0.040	0.050
B	1.350	1.650	0.053	0.065
b	0.500	0.700	0.020	0.028
b1	0.700	0.900	0.028	0.035
c	0.430	0.580	0.017	0.023
c1	0.430	0.580	0.017	0.023
D	6.350	6.650	0.250	0.262
D1	5.200	5.400	0.205	0.213
E	5.400	5.700	0.213	0.224
e	2.300 TYP		0.091 TYP	
e1	4.500	4.700	0.177	0.185
L	7.500	7.900	0.295	0.311



TO-252-2L PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
B	1.350	1.650	0.053	0.065
b	0.500	0.700	0.020	0.028
b1	0.700	0.900	0.028	0.035
c	0.430	0.580	0.017	0.023
c1	0.430	0.580	0.017	0.023
D	6.350	6.650	0.250	0.262
D1	5.200	5.400	0.205	0.213
E	5.400	5.700	0.213	0.224
e	2.300 TYP.		0.091 TYP.	
e1	4.500	4.700	0.177	0.185
L	9.500	9.900	0.374	0.390
L1	2.550	2.900	0.100	0.114
L2	1.400	1.780	0.055	0.070
L3	0.600	0.900	0.024	0.035
V	3.800 REF.		0.150 REF.	