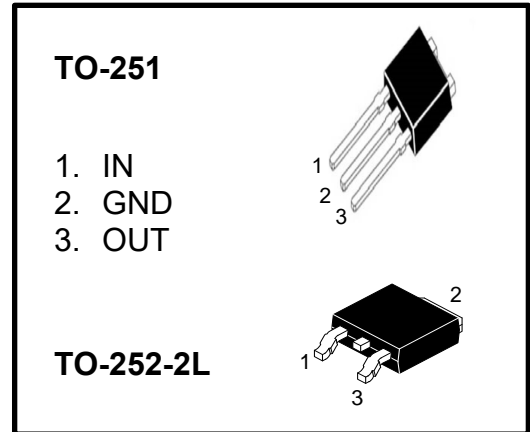


Description

The 78MXXseriesof three-terminal positive regulators are available in TO-251 or TO-252 package.Each type employs internal current limiting, thermal shut-down and safe area protection, making it essentially indestructible. If adequate heat sinking is provided ,It can deliver over 0.5A output current, Although designed as fixed voltage regulators, It can be used with external components to obtain adjustable voltage and currents.



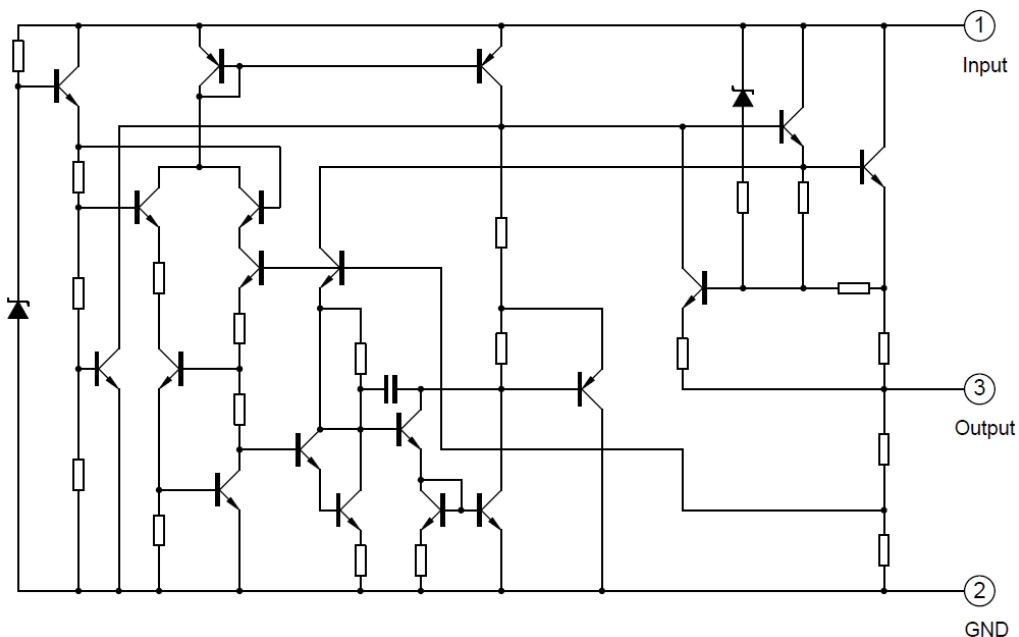
Features

- Output current up to 0.5A
- Thermal overload protection
- Short circuit protection
- Output transistor SOA protection
- Continuous total dissipation
PD: 1.25 W (Ta = 25 °C)

Applications

- ◆ Post Regulator for switching DC/DC Converter
- ◆ High Efficiency Linear Regulator
- ◆ Battery Chargers
- ◆ PC Add on Card
- ◆ Motherboard clock supplies
- ◆ LCD Monitor
- ◆ Set-top Box

Block Diagram



ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	Value	Unit
DC input voltage ($V_o=5V$ to $18V$) ($V_o=20$ to $24V$)	V_i	35 40	V
Output current	I_o	Internally Limited	mA
Power dissipation	P_d	Internally Limited	mW
Storage temperature range	T_{stg}	-65~+150	°C
Operating junction temperature range	T_{opr}	-20~+125	°C

78M05 ELECTRICAL CHARACTERISTICS

(Refer to test circuits, $T_j=25^\circ\text{C}$, $I_o=350\text{mA}$, $V_i=10\text{V}$, $C_i=0.33\mu\text{F}$, $C_o=0.1\mu\text{F}$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage			4.8	5.0	5.2	V
Output voltage	V_o	$I_o=5$ to 350mA , $V_i=7$ to 20V	4.75	5.0	5.2	V
Line regulation	ΔV_o	$V_i=7$ to 25V , $I_o=200\text{mA}$			100	mV
		$V_i=8$ to 25V , $I_o=200\text{mA}$			50	mV
Load regulation	ΔV_o	$I_o=5$ to 500mA , $T_j=25^\circ\text{C}$			100	mV
		$I_o=5$ to 200mA , $T_j=25^\circ\text{C}$			50	mV
Quiescent current	I_q				6	mA
Quiescent current change	ΔI_q	$I_o=5$ to 350mA			0.5	mA
		$V_i=8\text{V}$ to 25V , $I_o=200\text{mA}$			0.8	mA
Output voltage drift	$\Delta V_o/\Delta T$	$I_o=5\text{mA}$, $T_j=0$ to 125°C		0.5		mV/°C
Supply voltage rejection	SVR	$V_i=8$ to 18V , $f=120\text{Hz}$, $I_o=300\text{mA}$	62			dB
Output noise voltage	V_N	$f=10\text{Hz}$ to 100kHz		40		μV
Dropout voltage	V_D			2		V
Short circuit current	I_{sc}	$V_i=35\text{V}$		200		mA

78M06 ELECTRICAL CHARACTERISTICS

(Refer to test circuits, $T_j=25^\circ\text{C}$, $I_o=350\text{mA}$, $V_i=11\text{V}$, $C_i=0.33\mu\text{F}$, $C_o=0.1\mu\text{F}$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage			5.75	6.0	6.25	V
Output voltage	V_o	$I_o=5$ to 350mA , $V_i=8$ to 21V	5.7	6.0	6.3	V
Line regulation	ΔV_o	$V_i=8$ to 25V , $I_o=200\text{mA}$			120	mV
		$V_i=9$ to 25V , $I_o=200\text{mA}$			60	mV
Load regulation	ΔV_o	$I_o=5$ to 500mA , $T_j=25^\circ\text{C}$			120	mV
		$I_o=5$ to 200mA , $T_j=25^\circ\text{C}$			60	mV
Quiescent current	I_q				6	mA
Quiescent current change	ΔI_q	$I_o=5$ to 350mA			0.5	mA
		$V_i=9\text{V}$ to 25V , $I_o=200\text{mA}$			0.8	mA
Output voltage drift	$\Delta V_o/\Delta T$	$I_o=5\text{mA}$, $T_j=0$ to 125°C		0.6		mV/ $^\circ\text{C}$
Supply voltage rejection	SVR	$V_i=9$ to 19V , $f=120\text{Hz}$, $I_o=300\text{mA}$	59			dB
Output noise voltage	V_N	$f=10\text{Hz}$ to 100kHz		45		μV
Dropout voltage	V_D			2		V
Short circuit current	I_{sc}	$V_i=35\text{V}$		200		mA

78M08 ELECTRICAL CHARACTERISTICS

(Refer to test circuits, $T_j=25^\circ\text{C}$, $I_o=350\text{mA}$, $V_i=14\text{V}$, $C_i=0.33\mu\text{F}$, $C_o=0.1\mu\text{F}$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage			7.7	8.0	8.3	V
Output voltage	V_o	$I_o=5$ to 350mA , $V_i=10.5$ to 23V	7.6	8.0	8.4	V
Line regulation	ΔV_o	$V_i=10.5$ to 25V , $I_o=200\text{mA}$			160	mV
		$V_i=11$ to 25V , $I_o=200\text{mA}$			80	mV
Load regulation	ΔV_o	$I_o=5$ to 500mA , $T_j=25^\circ\text{C}$			160	mV
		$I_o=5$ to 200mA , $T_j=25^\circ\text{C}$			80	mV
Quiescent current	I_Q				6	mA
Quiescent current change	ΔI_Q	$I_o=5$ to 350mA			0.5	mA
		$V_i=10.5\text{V}$ to 25V , $I_o=200\text{mA}$			0.8	mA
Output voltage drift	$\Delta V_o/\Delta T$	$I_o=5\text{mA}$, $T_j=0$ to 125°C		0.7		mV/ $^\circ\text{C}$
Supply voltage rejection	SVR	$V_i=11.5$ to 21.5V , $f=120\text{Hz}$, $I_o=300\text{mA}$	56			dB
Output noise voltage	V_N	$f=10\text{Hz}$ to 100kHz		52		μV
Dropout voltage	V_D			2		V
Short circuit current	I_{sc}	$V_i=35\text{V}$		200		mA

0.5A Three-terminal positive voltage regulator

78M09 ELECTRICAL CHARACTERISTICS

(Refer to test circuits, $T_j=25^\circ\text{C}$, $I_o=350\text{mA}$, $V_i=15\text{V}$, $C_i=0.33\mu\text{F}$, $C_o=0.1\mu\text{F}$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage			8.65	9.0	9.35	V
Output voltage	V_o	$I_o=5$ to 350mA , $V_i=11.5$ to 24V	8.55	9.0	9.45	V
Line regulation	ΔV_o	$V_i=11.5$ to 25V , $I_o=200\text{mA}$			180	mV
		$V_i=12$ to 25V , $I_o=200\text{mA}$			90	mV
Load regulation	ΔV_o	$I_o=5$ to 500mA , $T_j=25^\circ\text{C}$			180	mV
		$I_o=5$ to 200mA , $T_j=25^\circ\text{C}$			90	mV
Quiescent current	I_q				6	mA
Quiescent current change	ΔI_q	$I_o=5$ to 350mA			0.5	mA
		$V_i=11.5\text{V}$ to 25V , $I_o=200\text{mA}$			0.8	mA
Output voltage drift	$\Delta V_o/\Delta T$	$I_o=5\text{mA}$, $T_j=0$ to 125°C		0.9		mV/ $^\circ\text{C}$
Supply voltage rejection	SVR	$V_i=12.5$ to 23V , $f=120\text{Hz}$, $I_o=300\text{mA}$	56			dB
Output noise voltage	V_N	$f=10\text{Hz}$ to 100kHz		58		μV
Dropout voltage	V_D			2		V
Short circuit current	I_{sc}	$V_i=35\text{V}$		200		mA

78M10 ELECTRICAL CHARACTERISTICS

(Refer to test circuits, $T_j=25^\circ\text{C}$, $I_o=350\text{mA}$, $V_i=17\text{V}$, $C_i=0.33\mu\text{F}$, $C_o=0.1\mu\text{F}$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage			9.6	10.0	10.4	V
Output voltage	V_o	$I_o=5$ to 350mA , $V_i=12.5$ to 25V	9.5	10.0	10.5	V
Line regulation	ΔV_o	$V_i=12.5$ to 28V , $I_o=200\text{mA}$			210	mV
		$V_i=14$ to 20V , $I_o=200\text{mA}$			120	mV
Load regulation	ΔV_o	$I_o=5$ to 500mA , $T_j=25^\circ\text{C}$			210	mV
		$I_o=5$ to 200mA , $T_j=25^\circ\text{C}$			120	mV
Quiescent current	I_q				6	mA
Quiescent current change	ΔI_q	$I_o=5$ to 350mA			0.5	mA
		$V_i=12.5\text{V}$ to 28V , $I_o=200\text{mA}$			0.8	mA
Output voltage drift	$\Delta V_o/\Delta T$	$I_o=5\text{mA}$, $T_j=0$ to 125°C		1.0		mV/ $^\circ\text{C}$
Supply voltage rejection	SVR	$V_i=12.5$ to 28V , $f=120\text{Hz}$, $I_o=300\text{mA}$	55			dB
Output noise voltage	V_N	$f=10\text{Hz}$ to 100kHz		75		μV
Dropout voltage	V_D			2		V
Short circuit current	I_{sc}	$V_i=35\text{V}$		200		mA

0.5A Three-terminal positive voltage regulator

78M12 ELECTRICAL CHARACTERISTICS

(Refer to test circuits, $T_j=25^\circ\text{C}$, $I_o=350\text{mA}$, $V_i=19\text{V}$, $C_i=0.33\mu\text{F}$, $C_o=0.1\mu\text{F}$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage			11.5	12.0	12.5	V
Output voltage	V_o	$I_o=5$ to 350mA , $V_i=14$ to 27V	11.4	12.0	12.6	V
Line regulation	ΔV_o	$V_i=14.5$ to 30V , $I_o=200\text{mA}$			240	mV
		$V_i=16$ to 30V , $I_o=200\text{mA}$			120	mV
Load regulation	ΔV_o	$I_o=5$ to 500mA , $T_j=25^\circ\text{C}$			240	mV
		$I_o=5$ to 200mA , $T_j=25^\circ\text{C}$			120	mV
Quiescent current	I_q				6	mA
Quiescent current change	ΔI_q	$I_o=5$ to 350mA			0.5	mA
		$V_i=14.5\text{V}$ to 30V , $I_o=200\text{mA}$			0.8	mA
Output voltage drift	$\Delta V_o/\Delta T$	$I_o=5\text{mA}$, $T_j=0$ to 125°C		1.0		mV/ $^\circ\text{C}$
Supply voltage rejection	SVR	$V_i=15$ to 25V , $f=120\text{Hz}$, $I_o=300\text{mA}$	55			dB
Output noise voltage	V_N	$f=10\text{Hz}$ to 100kHz		75		μV
Dropout voltage	V_D			2		V
Short circuit current	I_{sc}	$V_i=35\text{V}$		200		mA

78M15 ELECTRICAL CHARACTERISTICS

(Refer to test circuits, $T_j=25^\circ\text{C}$, $I_o=350\text{mA}$, $V_i=23\text{V}$, $C_i=0.33\mu\text{F}$, $C_o=0.1\mu\text{F}$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage			14.4	15.0	15.6	V
Output voltage	V_o	$I_o=5$ to 350mA , $V_i=17.5$ to 30V	14.25	15.0	14.75	V
Line regulation	ΔV_o	$V_i=17.5$ to 30V , $I_o=200\text{mA}$			300	mV
		$V_i=20$ to 30V , $I_o=200\text{mA}$			150	mV
Load regulation	ΔV_o	$I_o=5$ to 500mA , $T_j=25^\circ\text{C}$			300	mV
		$I_o=5$ to 200mA , $T_j=25^\circ\text{C}$			150	mV
Quiescent current	I_q				6	mA
Quiescent current change	ΔI_q	$I_o=5$ to 350mA			0.5	mA
		$V_i=17.5\text{V}$ to 30V , $I_o=200\text{mA}$			0.8	mA
Output voltage drift	$\Delta V_o/\Delta T$	$I_o=5\text{mA}$, $T_j=0$ to 125°C		1.2		mV/ $^\circ\text{C}$
Supply voltage rejection	SVR	$V_i=18.5$ to 28.5V , $f=120\text{Hz}$, $I_o=300\text{mA}$	53			dB
Output noise voltage	V_N	$f=10\text{Hz}$ to 100kHz		100		μV
Dropout voltage	V_D			2		V
Short circuit current	I_{sc}	$V_i=35\text{V}$		200		mA

0.5A Three-terminal positive voltage regulator

78M18 ELECTRICAL CHARACTERISTICS

(Refer to test circuits, $T_j=25^\circ\text{C}$, $I_o=350\text{mA}$, $V_i=26\text{V}$, $C_i=0.33\mu\text{F}$, $C_o=0.1\mu\text{F}$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage			17.3	18.0	18.7	V
Output voltage	V_o	$I_o=5$ to 350mA , $V_i=20.5$ to 33V	17.1	18.0	18.9	V
Line regulation	ΔV_o	$V_i=21$ to 33V , $I_o=200\text{mA}$			360	mV
		$V_i=24$ to 33V , $I_o=200\text{mA}$			180	mV
Load regulation	ΔV_o	$I_o=5$ to 500mA , $T_j=25^\circ\text{C}$			360	mV
		$I_o=5$ to 200mA , $T_j=25^\circ\text{C}$			180	mV
Quiescent current	I_Q				6	mA
Quiescent current change	ΔI_Q	$I_o=5$ to 350mA			0.5	mA
		$V_i=21\text{V}$ to 33V , $I_o=200\text{mA}$			0.8	mA
Output voltage drift	$\Delta V_o/\Delta T$	$I_o=5\text{mA}$, $T_j=0$ to 125°C		-1.1		mV/ $^\circ\text{C}$
Supply voltage rejection	SVR	$V_i=22$ to 32V , $f=120\text{Hz}$, $I_o=300\text{mA}$	53			dB
Output noise voltage	V_N	$f=10\text{Hz}$ to 100kHz		100		μV
Dropout voltage	VD			2		V
Short circuit current	I_{sc}	$V_i=35\text{V}$		240		mA

78M24 ELECTRICAL CHARACTERISTICS

(Refer to test circuits, $T_j=25^\circ\text{C}$, $I_o=350\text{mA}$, $V_i=33\text{V}$, $C_i=0.33\mu\text{F}$, $C_o=0.1\mu\text{F}$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage			23.0	24.0	25.0	V
Output voltage	V_o	$I_o=5$ to 350mA , $V_i=27$ to 38V	22.8	24.0	25.2	V
Line regulation	ΔV_o	$V_i=27$ to 38V , $I_o=200\text{mA}$			480	mV
		$V_i=28$ to 38V , $I_o=200\text{mA}$			240	mV
Load regulation	ΔV_o	$I_o=5$ to 500mA , $T_j=25^\circ\text{C}$			480	mV
		$I_o=5$ to 200mA , $T_j=25^\circ\text{C}$			240	mV
Quiescent current	I_Q				6	mA
Quiescent current change	ΔI_Q	$I_o=5$ to 350mA			0.5	mA
		$V_i=27\text{V}$ to 38V , $I_o=200\text{mA}$			0.8	mA
Output voltage drift	$\Delta V_o/\Delta T$	$I_o=5\text{mA}$, $T_j=0$ to 125°C		-1.2		mV/ $^\circ\text{C}$
Supply voltage rejection	SVR	$V_i=28$ to 38V , $f=120\text{Hz}$, $I_o=300\text{mA}$	50			dB
Output noise voltage	V_N	$f=10\text{Hz}$ to 100kHz		170		μV
Dropout voltage	VD			2		V
Short circuit current	I_{sc}	$V_i=35\text{V}$		240		mA

78M75 ELECTRICAL CHARACTERISTICS

(Refer to test circuits, $T_j=25^\circ\text{C}$, $I_o=350\text{mA}$, $V_i=14\text{V}$, $C_i=0.33\mu\text{F}$, $C_o=0.1\mu\text{F}$, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage			7.3	7.5	7.8	V
Output voltage	V_o	$I_o=5$ to 350mA , $V_i=10.5$ to 23V	7.3	7.5	7.8	V
Line regulation	ΔV_o	$V_i=10$ to 24.5V , $I_o=200\text{mA}$			160	mV
		$V_i=10.5$ to 24.5V , $I_o=200\text{mA}$			80	mV
Load regulation	ΔV_o	$I_o=5$ to 500mA , $T_j=25^\circ\text{C}$			160	mV
		$I_o=5$ to 200mA , $T_j=25^\circ\text{C}$			80	mV
Quiescent current	I_q				6	mA
Quiescent current change	ΔI_q	$I_o=5$ to 350mA			0.5	mA
		$V_i=10\text{V}$ to 24.5V , $I_o=200\text{mA}$			0.8	mA
Output voltage drift	$\Delta V_o/\Delta T$	$I_o=5\text{mA}$, $T_j=0$ to 125°C		-0.8		mV/ $^\circ\text{C}$
Supply voltage rejection	SVR	$V_i=11$ to 21V , $f=120\text{Hz}$, $I_o=300\text{mA}$	57			dB
Output noise voltage	V_N	$f=10\text{Hz}$ to 100kHz		52		μV
Dropout voltage	V_D			2		V
Short circuit current	I_{sc}	$V_i=35\text{V}$		50		mA

TEST CIRCUITS

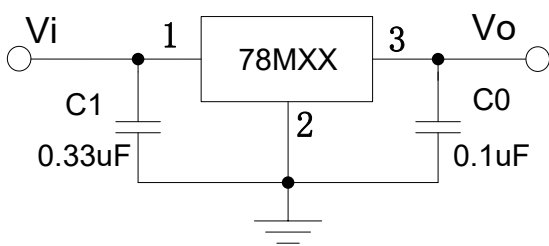


Fig.1 DC PARAMETERS

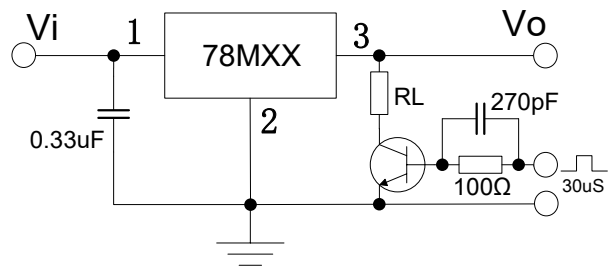


Fig.2 LOAD REGULATION

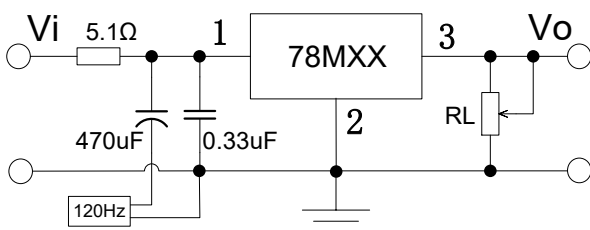


Fig.3 RIPPLE REJECTION

APPLICATION CIRCUITS

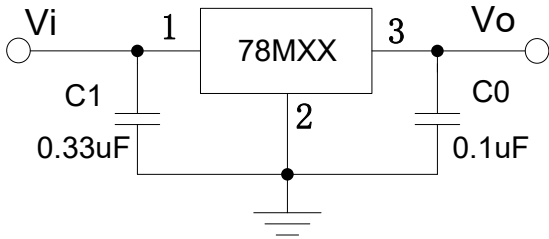


Fig.4 Fixed output regulator

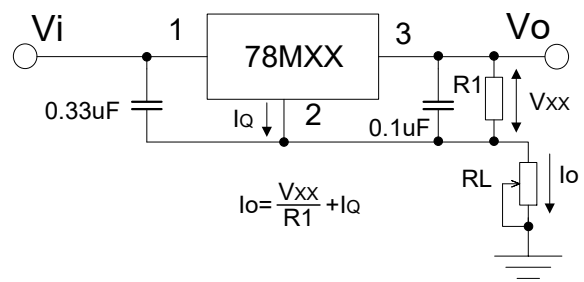


Fig.5 Constant current regulator

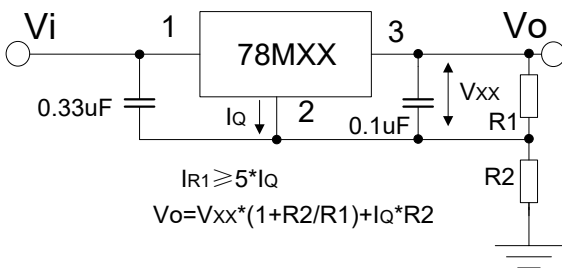


Fig.6 Circuit for increasing Regulator output voltage

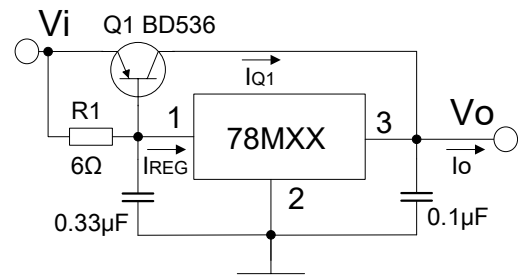


Fig.7 High current with voltage regulator

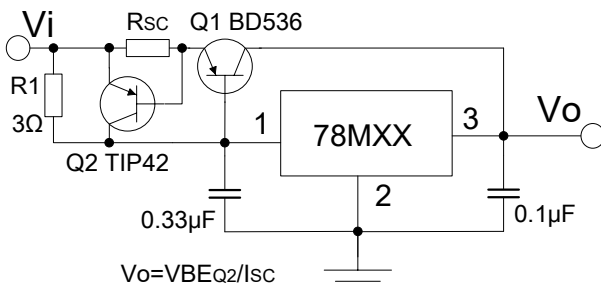


Fig.8 High output 8urrent short circuit protection

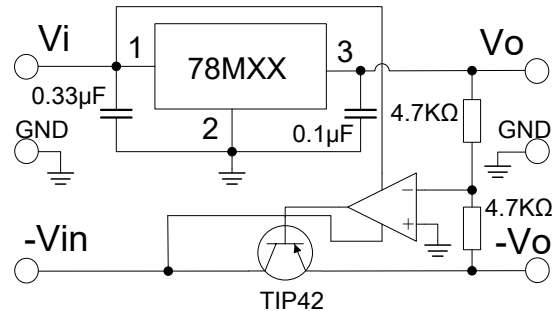


Fig.9 Tracking voltage regulator

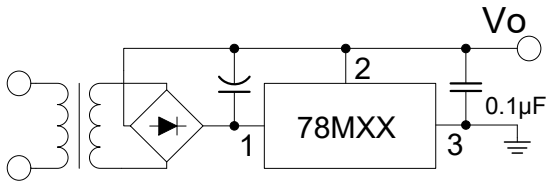


Fig.10 Negative output voltage circuit

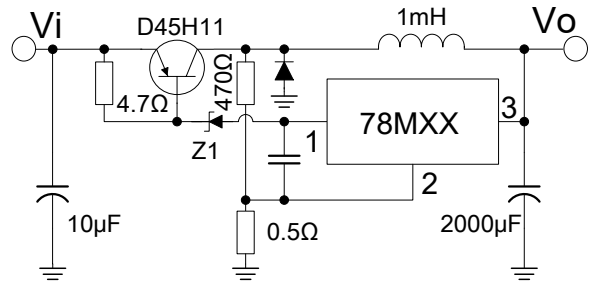


Fig.11 switching regulator

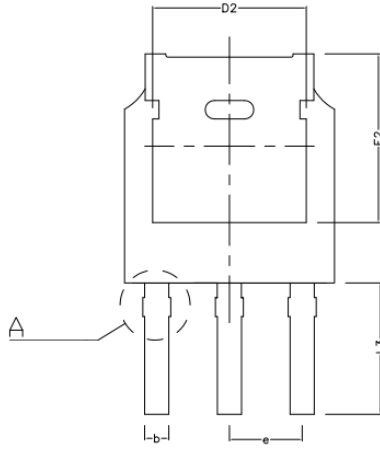
ELECTROSTATIC DISCHARGE CAUTION



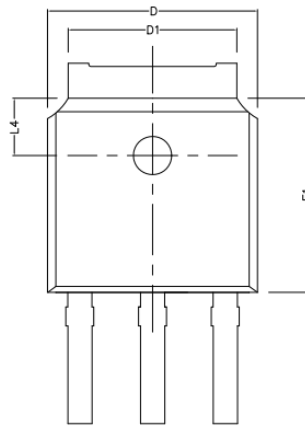
These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage handing to prevent electrostatic damage to the device.

PACKAGE DESCRIPTION

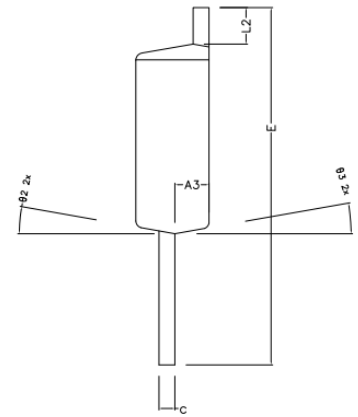
TO-251 PACKAGE OUTLINE DIMENSIONS



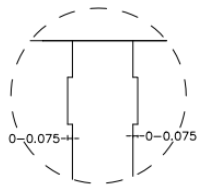
BOTTOM VIEW



TOP VIEW



SIDE VIEW



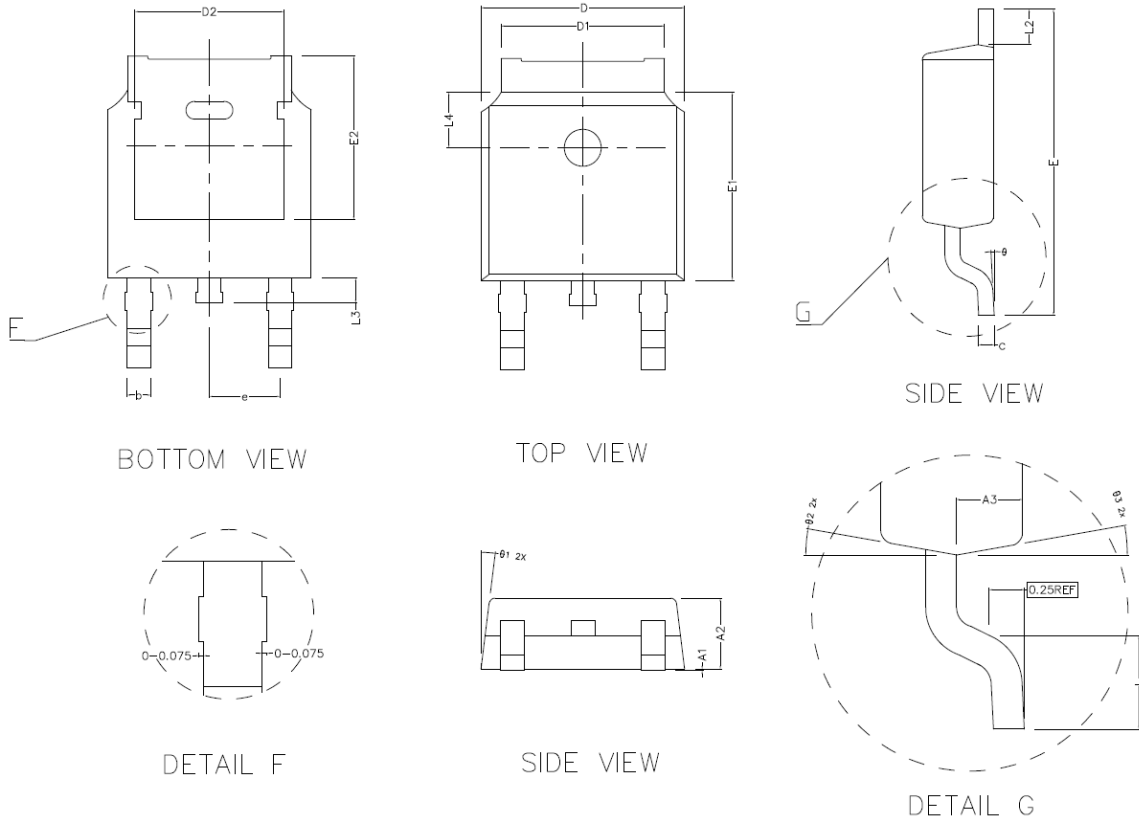
DETAIL A



SIDE VIEW

COMMON DIMENSIONS (UNITS OF MEASURE IS mm)			
	MIN	NORMAL	MAX
A2	2.200	2.300	2.400
A3	1.020	1.070	1.120
b	0.710	0.760	0.810
c	0.460	0.508	0.550
D	6.500	6.600	6.700
D1	5.330REF		
D2	4.830REF		
E	9.900	10.100	10.300
E1	6.000	6.100	6.200
E2	5.60REF		
e	2.286TYPE		
L2	1.10REF		
L3	3.60REF		
L4	1.80REF		
θ1	7° TYPE		
θ2	10° TYPE		
θ3	10° TYPE		

TO-252-2L PACKAGE OUTLINE DIMENSIONS



COMMON DIMENSIONS (UNITS OF MEASURE IS mm)			
	MIN	NORMAL	MAX
A1	0.000	0.100	0.150
A2	2.200	2.300	2.400
A3	1.020	1.070	1.120
b	0.710	0.760	0.810
c	0.460	0.508	0.550
D	6.500	6.600	6.700
D1	5.330REF		
D2	4.830REF		
E	9.900	10.100	10.300
E1	6.000	6.100	6.200
E2	5.600REF		
e	2.286TYPE		
L	1.400	1.550	1.700
L2	1.10REF		
L3	0.80REF		
L4	1.80REF		
θ	0~8°		
θ_1	7° TYPE		
θ_2	10° TYPE		
θ_3	10° TYPE		