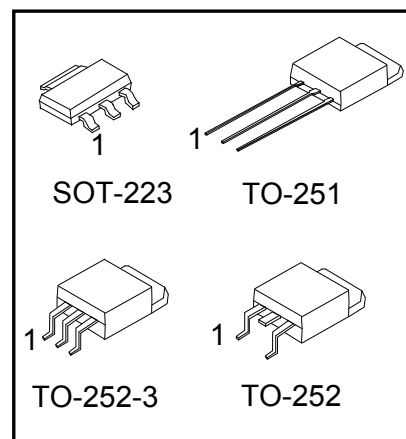


### Features

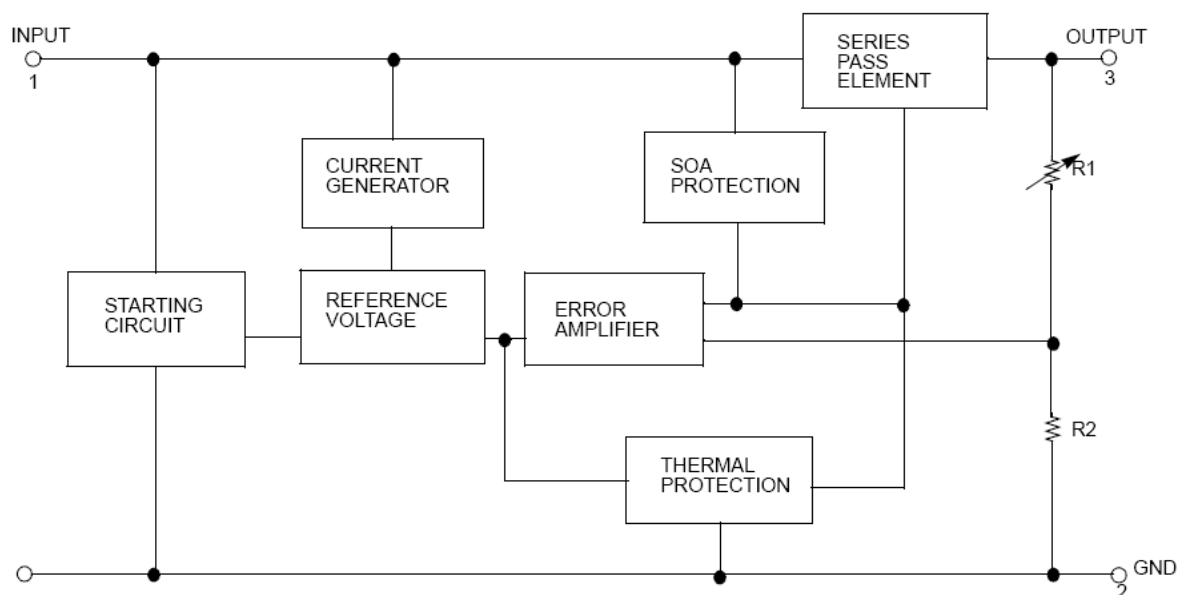
- Output Current up to 1A
- Output Voltages of 5, 6, 8, 9, 12, 15, 18, 24V
- Thermal Overload Protection Short Circuit Protection
- Output Transistor Safe Operating area (SOA)Protection

### Description

The 78MXX three-terminal positive regulators are available in the TO-252 package with several fixed output voltages making it useful in a wide range of applications.



### Internal Block Diagram



### Absolute Maximum Ratings

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	$V_{IN}$	35	V
Output Current	$I_{OUT}$	1	A
Power Dissipation ( $T_C=25^{\circ}C$ )	SOT-223	1	W
	TO-251/TO-252	2	
	TO-252-3		
Operating Junction Temperature	$T_J$	-20 ~ 125	
Storage Temperature	$T_{STG}$	-55 ~ +150	

**Thermal Data**

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Case	SOT-223	$\theta_{JC}$	15	°C/W
	TO-251/TO-252		12.5	
	TO-252-3			

**Electrical Characteristics (78M05)**

(Refer to the test circuits,  $0 < T_J < +125^\circ\text{C}$ ,  $I_O=350\text{mA}$ ,  $V_I=10\text{V}$ , unless otherwise specified,  $C_I = 0.33\mu\text{F}$ ,  $C_O=0.1\mu\text{F}$ )

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	$V_O$	$I_O = 5\text{mA} \sim 350\text{mA}$ $V_I = 7 \sim 20\text{V}$	4.75	5	5.25	V
Line Regulation(Note)	$\Delta V_O$	$I_O = 200\text{mA}$ $T_J = 25^\circ\text{C}$	$V_I = 7\text{V} \sim 25\text{V}$		100	mV
			$V_I = 8\text{V} \sim 25\text{V}$		50	
Load Regulation(Note)	$\Delta V_O$	$T_J = 25^\circ\text{C}$	$I_O = 5\text{mA} \sim 500\text{mA}$		100	mV
			$I_O = 5\text{mA} \sim 200\text{mA}$		50	
Quiescent Current	$I_Q$	$T_J = 25^\circ\text{C}$			6.0	mA
Quiescent Current Change	$\Delta I_Q$	$I_O = 5\text{mA} \sim 350\text{mA}$			0.5	mA
		$I_O = 200\text{mA}$ , $V_I = 8 \sim 25\text{V}$			0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_O = 5\text{mA}$ , $T_J = 0 \sim 125^\circ\text{C}$		-0.5		mV/°C
Output Noise Voltage	$V_N$	$f = 10\text{Hz} \sim 100\text{KHz}$		40		$\mu\text{V}$
Ripple Rejection	RR	$f = 120\text{Hz}$ , $V_I = 8 \sim 18\text{V}$		80		dB
Dropout Voltage	$V_D$	$T_J = 25^\circ\text{C}$ , $I_O = 500\text{mA}$		2		V
Short Circuit Current	$I_{SC}$	$T_J = 25^\circ\text{C}$ , $V_I = 35\text{V}$		800		mA
Peak Current	$I_{PK}$	$T_J = 25^\circ\text{C}$		900		mA

**Notes:**

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

## Electrical Characteristics (78M06)

(Refer to the test circuits,  $0 < T_j < +125^{\circ}\text{C}$ ,  $I_o=350\text{mA}$ ,  $V_i=11\text{V}$ , unless otherwise specified,  $C_i = 0.33\mu\text{F}$ ,  $C_o=0.1\mu\text{F}$ )

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	$V_o$	$I_o = 5\text{mA} \sim 350\text{mA}$ $V_i = 8 \sim 21\text{V}$	5.7	6	6.3	V
Line Regulation(Note)	$\Delta V_o$	$I_o = 200\text{mA}$ $T_j = 25^{\circ}\text{C}$	$V_i = 8\text{V} \sim 25\text{V}$		100	mV
			$V_i = 9\text{V} \sim 25\text{V}$		50	
Load Regulation(Note)	$\Delta V_o$	$T_j = 25^{\circ}\text{C}$	$I_o = 5\text{mA} \sim 500\text{mA}$		120	mV
			$I_o = 5\text{mA} \sim 200\text{mA}$		60	
Quiescent Current	$I_Q$	$T_j = 25^{\circ}\text{C}$			6.0	mA
Quiescent Current Change	$\Delta I_Q$	$I_o = 5\text{mA} \sim 350\text{mA}$			0.5	mA
		$I_o = 200\text{mA}$ , $V_i = 9 \sim 25\text{V}$			0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_o = 5\text{mA}$ , $T_j = 0 \sim 125^{\circ}\text{C}$		-0.5		mV/ $^{\circ}\text{C}$
Output Noise Voltage	$V_N$	$f = 10\text{Hz} \sim 100\text{KHz}$		45		$\mu\text{V}$
Ripple Rejection	RR	$f = 120\text{Hz}$ , $V_i = 9 \sim 19\text{V}$		80		dB
Dropout Voltage	$V_D$	$T_j = 25^{\circ}\text{C}$ , $I_o = 500\text{mA}$		2		V
Short Circuit Current	$I_{SC}$	$T_j = 25^{\circ}\text{C}$ , $V_i = 35\text{V}$		800		mA
Peak Current	$I_{PK}$	$T_j = 25^{\circ}\text{C}$		900		mA

### Notes:

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

## Electrical Characteristics (78M08)

(Refer to the test circuits,  $0 < T_j < +125^{\circ}\text{C}$ ,  $I_o=350\text{mA}$ ,  $V_i=14\text{V}$ , unless otherwise specified,  $C_i = 0.33\mu\text{F}$ ,  $C_o=0.1\mu\text{F}$ )

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	$V_o$	$I_o = 5\text{mA} \sim 350\text{mA}$ $V_i = 10.5 \sim 23\text{V}$	7.6	8	8.4	V
Line Regulation(Note)	$\Delta V_o$	$I_o = 200\text{mA}$ $T_j = 25^{\circ}\text{C}$	$V_i = 10.5\text{V} \sim 25\text{V}$		100	mV
			$V_i = 11\text{V} \sim 25\text{V}$		50	
Load Regulation(Note)	$\Delta V_o$	$T_j = 25^{\circ}\text{C}$	$I_o = 5\text{mA} \sim 500\text{mA}$		160	mV
			$I_o = 5\text{mA} \sim 200\text{mA}$		80	
Quiescent Current	$I_q$	$T_j = 25^{\circ}\text{C}$			6.0	mA
Quiescent Current Change	$\Delta I_q$	$I_o = 5\text{mA} \sim 350\text{mA}$			0.5	mA
		$I_o = 200\text{mA}$ , $V_i = 10.5 \sim 25\text{V}$			0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_o = 5\text{mA}$ , $T_j = 0 \sim 125^{\circ}\text{C}$		-0.8		mV/ $^{\circ}\text{C}$
Output Noise Voltage	$V_N$	$f = 10\text{Hz} \sim 100\text{KHz}$		52		$\mu\text{V}$
Ripple Rejection	RR	$f = 120\text{Hz}$ , $V_i = 11.5 \sim 21.5\text{V}$		80		dB
Dropout Voltage	$V_D$	$T_j = 25^{\circ}\text{C}$ , $I_o = 500\text{mA}$		2		V
Short Circuit Current	$I_{SC}$	$T_j = 25$ , $V_i = 35\text{V}$		800		mA
Peak Current	$I_{PK}$	$T_j = 25^{\circ}\text{C}$		900		mA

### Notes:

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

## Electrical Characteristics (78M09)

(Refer to the test circuits,  $0 < T_j < +125^{\circ}\text{C}$ ,  $I_o=350\text{mA}$ ,  $V_i=15\text{V}$ , unless otherwise specified,  $C_i = 0.33\mu\text{F}$ ,  $C_o=0.1\mu\text{F}$ )

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	$V_o$	$I_o = 5\text{mA} \sim 350\text{mA}$ $V_i = 11.5 \sim 24\text{V}$	8.45	9	9.55	V
Line Regulation(Note)	$\Delta V_o$	$I_o = 200\text{mA}$ $T_j = 25^{\circ}\text{C}$	$V_i = 11.5\text{V} \sim 25\text{V}$		100	mV
			$V_i = 12\text{V} \sim 25\text{V}$		50	
Load Regulation(Note)	$\Delta V_o$	$T_j = 25^{\circ}\text{C}$	$I_o = 5\text{mA} \sim 500\text{mA}$		180	mV
			$I_o = 5\text{mA} \sim 200\text{mA}$		90	
Quiescent Current	$I_q$	$T_j = 25^{\circ}\text{C}$			6.0	mA
Quiescent Current Change	$\Delta I_q$	$I_o = 5\text{mA} \sim 350\text{mA}$			0.5	mA
		$I_o = 200\text{mA}$ , $V_i = 11.5 \sim 25\text{V}$			0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_o = 5\text{mA}$ , $T_j = 0 \sim 125^{\circ}\text{C}$		-0.8		mV/ $^{\circ}\text{C}$
Output Noise Voltage	$V_N$	$f = 10\text{Hz} \sim 100\text{KHz}$		52		$\mu\text{V}$
Ripple Rejection	RR	$f = 120\text{Hz}$ , $V_i = 12.5 \sim 22.5\text{V}$		80		dB
Dropout Voltage	$V_D$	$T_j = 25^{\circ}\text{C}$ , $I_o = 500\text{mA}$		2		V
Short Circuit Current	$I_{SC}$	$T_j = 25$ , $V_i = 35\text{V}$		800		mA
Peak Current	$I_{PK}$	$T_j = 25^{\circ}\text{C}$		900		mA

### Notes:

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

## Electrical Characteristics (78M12)

(Refer to the test circuits,  $0 < T_j < +125^{\circ}\text{C}$ ,  $I_o=350\text{mA}$ ,  $V_i=19\text{V}$ , unless otherwise specified,  $C_i = 0.33\mu\text{F}$ ,  $C_o=0.1\mu\text{F}$ )

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	$V_o$	$I_o = 5\text{mA} \sim 350\text{mA}$ $V_i = 14.5 \sim 27\text{V}$	11.4	12	12.6	V
Line Regulation(Note)	$\Delta V_o$	$I_o = 200\text{mA}$ $T_j = 25^{\circ}\text{C}$	$V_i = 14.5\text{V} \sim 30\text{V}$		100	mV
			$V_i = 16\text{V} \sim 30\text{V}$		50	
Load Regulation(Note)	$\Delta V_o$	$T_j = 25^{\circ}\text{C}$	$I_o = 5\text{mA} \sim 500\text{mA}$		240	mV
			$I_o = 5\text{mA} \sim 200\text{mA}$		120	
Quiescent Current	$I_Q$	$T_j = 25^{\circ}\text{C}$			6.0	mA
Quiescent Current Change	$\Delta I_Q$	$I_o = 5\text{mA} \sim 350\text{mA}$			0.5	mA
		$I_o = 200\text{mA}$ , $V_i = 14.5 \sim 30\text{V}$			0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_o = 5\text{mA}$ , $T_j = 0 \sim 125^{\circ}\text{C}$		-0.8		mV/ $^{\circ}\text{C}$
Output Noise Voltage	$V_N$	$f = 10\text{Hz} \sim 100\text{KHz}$		75		$\mu\text{V}$
Ripple Rejection	RR	$f = 120\text{Hz}$ , $V_i = 15 \sim 25\text{V}$		80		dB
Dropout Voltage	$V_D$	$T_j = 25^{\circ}\text{C}$ , $I_o = 500\text{mA}$		2		V
Short Circuit Current	$I_{SC}$	$T_j = 25$ , $V_i = 35\text{V}$		800		mA
Peak Current	$I_{PK}$	$T_j = 25^{\circ}\text{C}$		900		mA

### Notes:

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

## Electrical Characteristics (78M15)

(Refer to the test circuits,  $0 < T_j < +125^{\circ}\text{C}$ ,  $I_o=350\text{mA}$ ,  $V_i=23\text{V}$ , unless otherwise specified,  $C_i = 0.33\mu\text{F}$ ,  $C_o=0.1\mu\text{F}$ )

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	$V_o$	$I_o = 5\text{mA} \sim 350\text{mA}$ $V_i = 17.5 \sim 30\text{V}$	14.25	15	15.75	V
Line Regulation(Note)	$\Delta V_o$	$I_o = 200\text{mA}$ $T_j = 25^{\circ}\text{C}$	$V_i = 17.5\text{V} \sim 30\text{V}$		100	mV
			$V_i = 20\text{V} \sim 30\text{V}$		50	
Load Regulation(Note)	$\Delta V_o$	$T_j = 25^{\circ}\text{C}$	$I_o = 5\text{mA} \sim 500\text{mA}$		300	mV
			$I_o = 5\text{mA} \sim 200\text{mA}$		150	
Quiescent Current	$I_q$	$T_j = 25^{\circ}\text{C}$			6.0	mA
Quiescent Current Change	$\Delta I_q$	$I_o = 5\text{mA} \sim 350\text{mA}$			0.5	mA
		$I_o = 200\text{mA}$ , $V_i = 17.5 \sim 30\text{V}$			0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_o = 5\text{mA}$ , $T_j = 0 \sim 125^{\circ}\text{C}$		-1.0		mV/ $^{\circ}\text{C}$
Output Noise Voltage	$V_N$	$f = 10\text{Hz} \sim 100\text{KHz}$		100		$\mu\text{V}$
Ripple Rejection	RR	$f = 120\text{Hz}$ , $V_i = 18.5 \sim 28.5\text{V}$		70		dB
Dropout Voltage	$V_D$	$T_j = 25^{\circ}\text{C}$ , $I_o = 500\text{mA}$		2		V
Short Circuit Current	$I_{SC}$	$T_j = 25^{\circ}\text{C}$ , $V_i = 35\text{V}$		800		mA
Peak Current	$I_{PK}$	$T_j = 25^{\circ}\text{C}$		900		mA

### Notes:

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

## Electrical Characteristics (78M18)

(Refer to the test circuits,  $0 < T_j < +125^{\circ}\text{C}$ ,  $I_o=350\text{mA}$ ,  $V_i=26\text{V}$ , unless otherwise specified,  $C_i = 0.33\mu\text{F}$ ,  $C_o=0.1\mu\text{F}$ )

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	$V_o$	$I_o = 5\text{mA} \sim 350\text{mA}$ $V_i = 20.5 \sim 33\text{V}$	17.1	18	18.9	V
Line Regulation(Note)	$\Delta V_o$	$I_o = 200\text{mA}$ $T_j = 25^{\circ}\text{C}$	$V_i = 21\text{V} \sim 33\text{V}$		100	mV
			$V_i = 24\text{V} \sim 33\text{V}$		50	
Load Regulation(Note)	$\Delta V_o$	$T_j = 25^{\circ}\text{C}$	$I_o = 5\text{mA} \sim 500\text{mA}$		360	mV
			$I_o = 5\text{mA} \sim 200\text{mA}$		180	
Quiescent Current	$I_q$	$T_j = 25^{\circ}\text{C}$			6.0	mA
Quiescent Current Change	$\Delta I_q$	$I_o = 5\text{mA} \sim 350\text{mA}$			0.5	mA
		$I_o = 200\text{mA}$ , $V_i = 21 \sim 33\text{V}$			0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_o = 5\text{mA}$ , $T_j = 0 \sim 125^{\circ}\text{C}$		-1.2		mV/ $^{\circ}\text{C}$
Output Noise Voltage	$V_N$	$f = 10\text{Hz} \sim 100\text{KHz}$		100		$\mu\text{V}$
Ripple Rejection	RR	$f = 120\text{Hz}$ , $V_i = 22 \sim 32\text{V}$		70		dB
Dropout Voltage	$V_D$	$T_j = 25^{\circ}\text{C}$ , $I_o = 500\text{mA}$		2		V
Short Circuit Current	$I_{SC}$	$T_j = 25$ , $V_i = 35\text{V}$		800		mA
Peak Current	$I_{PK}$	$T_j = 25^{\circ}\text{C}$		900		mA

### Notes:

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



## Electrical Characteristics (78M24)

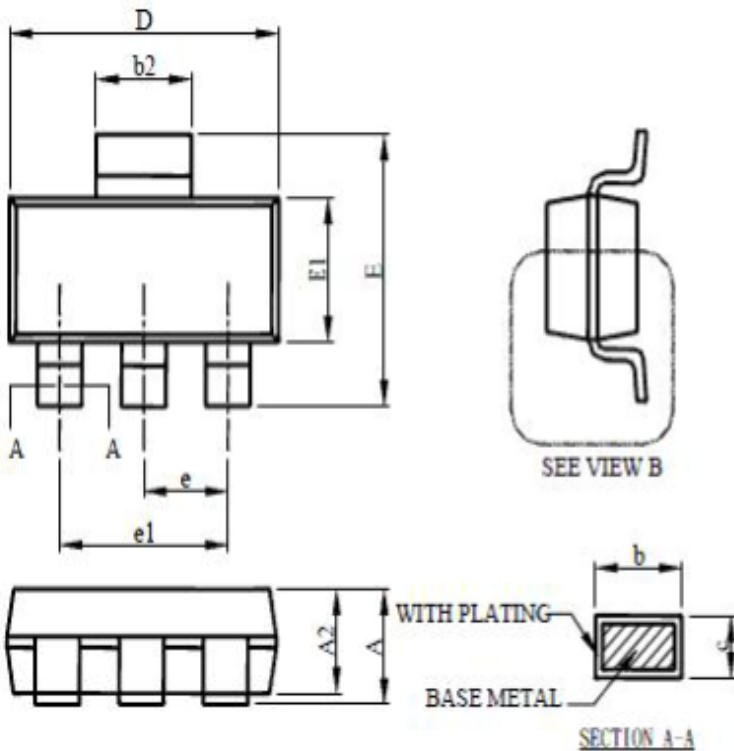
(Refer to the test circuits,  $0 < T_j < +125^{\circ}\text{C}$ ,  $I_o=350\text{mA}$ ,  $V_i=33\text{V}$ , unless otherwise specified,  $C_i = 0.33\mu\text{F}$ ,  $C_o=0.1\mu\text{F}$ )

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	
Output Voltage	$V_o$	$I_o = 5\text{mA} \sim 350\text{mA}$ $V_i = 27 \sim 38\text{V}$	22.8	24	25.2	V
Line Regulation(Note)	$\Delta V_o$	$I_o = 200\text{mA}$ $T_j = 25^{\circ}\text{C}$	$V_i = 27\text{V} \sim 38\text{V}$		100	mV
			$V_i = 28\text{V} \sim 38\text{V}$		50	
Load Regulation(Note)	$\Delta V_o$	$T_j = 25^{\circ}\text{C}$	$I_o = 5\text{mA} \sim 500\text{mA}$		480	mV
			$I_o = 5\text{mA} \sim 200\text{mA}$		240	
Quiescent Current	$I_q$	$T_j = 25^{\circ}\text{C}$			6.0	mA
Quiescent Current Change	$\Delta I_q$	$I_o = 5\text{mA} \sim 350\text{mA}$			0.5	mA
		$I_o = 200\text{mA}$ , $V_i = 27 \sim 38\text{V}$			0.8	
Output Voltage Drift	$\Delta V / \Delta T$	$I_o = 5\text{mA}$ , $T_j = 0 \sim 125^{\circ}\text{C}$		-1.2		mV/ $^{\circ}\text{C}$
Output Noise Voltage	$V_N$	$f = 10\text{Hz} \sim 100\text{KHz}$		170		$\mu\text{V}$
Ripple Rejection	RR	$f = 120\text{Hz}$ , $V_i = 28 \sim 38\text{V}$		70		dB
Dropout Voltage	$V_D$	$T_j = 25^{\circ}\text{C}$ , $I_o = 500\text{mA}$		2		V
Short Circuit Current	$I_{SC}$	$T_j = 25$ , $V_i = 35\text{V}$		800		mA
Peak Current	$I_{PK}$	$T_j = 25^{\circ}\text{C}$		900		mA

### Notes:

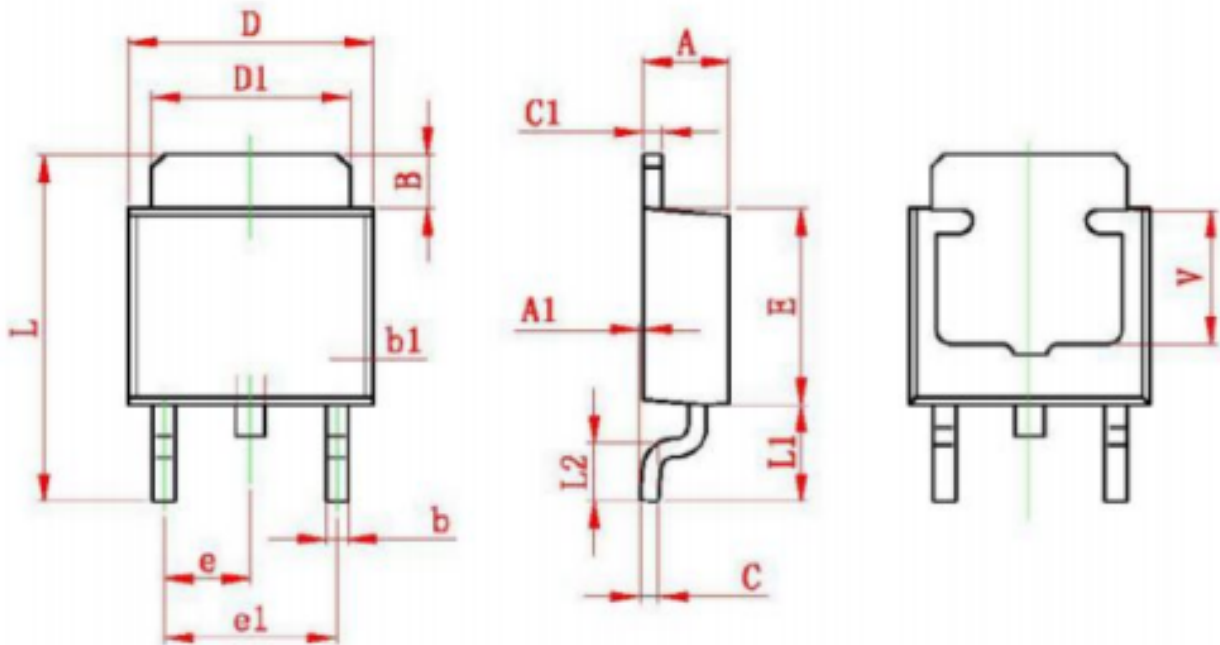
Load and line regulation are specified at constant junction temperature. Change in  $V_o$  due to heating effects must be taken into account separately. Pulse testing with low duty is used.

### SOT-223 Package Information



SYMBOL	SOT-223	
	MILLIMETERS	
	MIN.	MAX.
A		1.80
A1	0.02	0.10
A2	1.55	1.65
b	0.68	0.84
b2	2.90	3.10
c	0.23	0.33
D	6.30	6.70
E	6.70	7.30
E1	3.30	3.70
e	2.30 BSC	
e1	4.60 BSC	
L	0.90	
$\theta$	0°	8°

TO-252 Package Information



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
V	3.80 REF		0.150 REF	