

## General Description

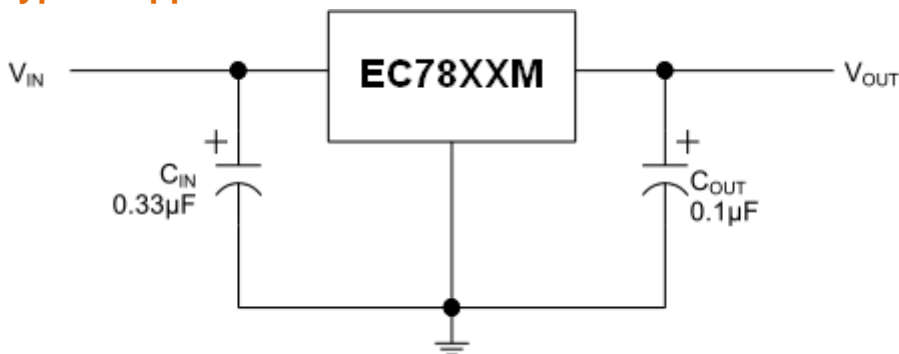
EC78XXM series of three-terminal positive voltage regulators employ built-in current limiting, thermal shutdown, and safe-operating area protection which makes them virtually immune to damage from output overloads.

With adequate heat sink, they can deliver in excess of 0.5A output current. Typical applications would include local (on-card) regulators which can eliminate the noise and degraded performance associated with single-point regulation.

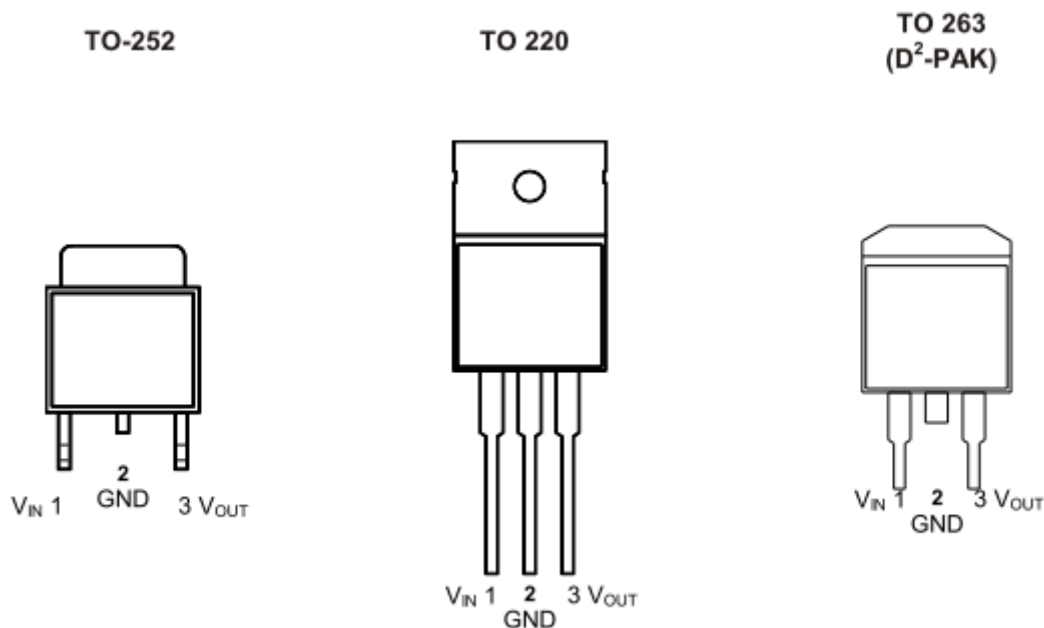
## Features

- ◆ Maximum output current up to 500mA
- ◆ Fixed output voltage options: 5V, 6V, 8V, 9V, 10V, 12V, 15V, 18V and 24V
- ◆ No external components required
- ◆ Internal thermal overload protection
- ◆ Internal short circuit current limiting
- ◆ Available in TO-252, TO220 and TO263 packages

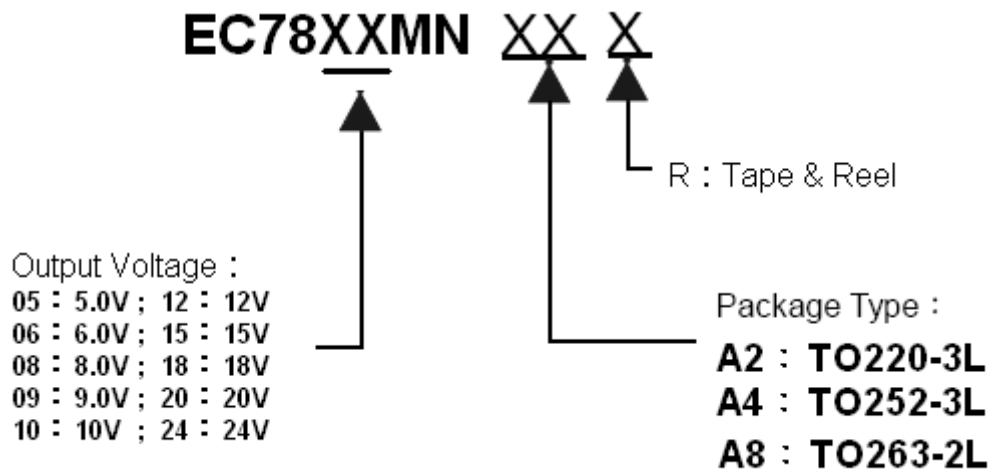
## Typical Application Circuit



## Pin Configuration



**Ordering Information**



Device	Marking Information	Package Type	Remarks
EC78XXMNA2R	78XXM YWLLLLL	TO220-3L	1. XX : Output Voltage(Ex : 05 : 5.0V;24 : 24V) 2. YW : Date Code 3. LLLLL : Lot No
EC78XXMNA4R		TO252-3L	
EC78XXMNA8R		TO263-2L	

**Absolute Maximum Ratings**

Symbol	Parameter	Value	Units
V <sub>I</sub>	Input Voltage	5.0V~20V	V
		24V~27V	
T <sub>A</sub>	Operating Temperature Range	-400~+125	°C
T <sub>STG</sub>	Storage Temperature	-60~+150	°C

**Note : Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent Damage to the device.**

## EC7805M Electrical Characteristics (V<sub>I</sub> = 10V, I<sub>O</sub> = 350mA unless otherwise noted)

Parameter	Test Conditions		Min.	Typ.	Max.	Unit
Output Voltage		25°C	4.8	5.0	5.2	V
	I <sub>O</sub> =5mA to 350mA V <sub>I</sub> =7V to 20V P ≤ 15W(TO220 package)	0°C to 125°C	4.75	5.0	5.25	
Input Regulation	V <sub>I</sub> =7V to 20V, I <sub>O</sub> =200mA	25°C		3	100	mV
	V <sub>I</sub> =8V to 20V, I <sub>O</sub> =200mA			1	50	
Ripple Rejection	V <sub>I</sub> =8V to 18V, f=120KHz	0°C to 125°C	62	78		dB
Output Regulation	I <sub>O</sub> =5mA to 500mA	25°C		15	100	mV
	I <sub>O</sub> =5mA to 200mA			5	50	
Temperature Coefficient of output Voltage	I <sub>O</sub> =5mA	0°C to 125°C		-1.0		mV/°C
Output Noise Voltage	f=10Hz to 100KHz	25°C		40	200	μV
Dropout Voltage		25°C		2.0	2.5	V
Bias Current		25°C		4.2	8	mA
Bias Current Change	V <sub>I</sub> =7V to 25V, I <sub>O</sub> =200mA	0°C to 125°C			0.8	mA
	I <sub>O</sub> =5mA to 350mA				0.5	
Short Circuit Output Current		25°C		300		mA
Peak Output Current		25°C		0.8		A

## EC7806M Electrical Characteristics (V<sub>I</sub> = 11V, I<sub>O</sub> = 350mA unless otherwise noted)

Parameter	Test Conditions		Min.	Typ.	Max.	Unit
Output Voltage		25°C	5.75	6	6.25	V
	I <sub>O</sub> =5mA to 350mA V <sub>I</sub> =8V to 21V P ≤ 15W(TO220 package)	0°C to 125°C	5.7	6.0	6.3	
Input Regulation	V <sub>I</sub> =8V to 25V, I <sub>O</sub> =200mA	25°C		5	150	mV
	V <sub>I</sub> =9V to 25V, I <sub>O</sub> =200mA			1.5	50	
Ripple Rejection	V <sub>I</sub> =9V to 19V, f=120KHz	0°C to 125°C	59	76		dB
Output Regulation	I <sub>O</sub> =5mA to 500mA	25°C		18	120	mV
	I <sub>O</sub> =5mA to 200mA			10	60	
Temperature Coefficient of output Voltage	I <sub>O</sub> =5mA	0°C to 125°C		-1.0		mV/°C
Output Noise Voltage	f=10Hz to 100KHz	25°C		45		uV
Dropout Voltage		25°C		2.0		V
Bias Current		25°C		4.3	8	mA
Bias Current Change	V <sub>I</sub> =8V to 25V, I <sub>O</sub> =200mA	0°C to 125°C			0.8	mA
	I <sub>O</sub> =5mA to 350mA				0.5	
Short Circuit Output Current		25°C		270		mA
Peak Output Current		25°C		0.8		A

## EC7808M Electrical Characteristics ( $V_I = 14V$ , $I_O = 350mA$ unless otherwise noted)

Parameter	Test Conditions		Min.	Typ.	Max.	Unit
Output Voltage		25°C	7.7	8	8.3	V
	$I_O=5mA$ to 350mA $V_I=10.5V$ to 23V $P \leq 15W$ (TO220 package)	0°C to 125°C	7.6	8.0	8.4	
Input Regulation	$V_I=10.5V$ to 25V, $I_O=200mA$	25°C		6	160	mV
	$V_I=11V$ to 25V, $I_O=200mA$			2	80	
Ripple Rejection	$V_I=11.5V$ to 21.5V, $f=120KHz$	0°C to 125°C	55	72		dB
Output Regulation	$I_O=5mA$ to 500mA	25°C		20	160	mV
	$I_O=5mA$ to 200mA			10	80	
Temperature Coefficient of output Voltage	$I_O=5mA$	0°C to 125°C		-1.0		mV/°C
Output Noise Voltage	$f=10Hz$ to 100KHz	25°C		52		uV
Dropout Voltage		25°C		2.0		V
Bias Current		25°C		4.5	8	mA
Bias Current Change	$V_I=10.5V$ to 25V, $I_O=200mA$	0°C to 125°C			0.8	mA
	$I_O=5mA$ to 350mA				0.5	
Short Circuit Output Current		25°C		250		mA
Peak Output Current		25°C		0.8		A

## EC7809M Electrical Characteristics (V<sub>I</sub> = 16V, I<sub>O</sub> = 350mA unless otherwise noted)

Parameter	Test Conditions	Min.	Typ.	Max.	Unit	
Output Voltage		25°C	8.65	9	9.35	V
	I <sub>O</sub> =5mA to 350mA V <sub>I</sub> =11.5V to 24V P ≤ 15W(TO220 package)	0°C to 125°C	8.55	9.0	9.45	
Input Regulation	V <sub>I</sub> =11V to 27V, I <sub>O</sub> =200mA	25°C		7	180	mV
	V <sub>I</sub> =13V to 27V, I <sub>O</sub> =200mA			2	90	
Ripple Rejection	V <sub>I</sub> =12V to 22V, f=120KHz	0°C to 125°C	55	70		dB
Output Regulation	I <sub>O</sub> =5mA to 500mA	25°C		20	180	mV
	I <sub>O</sub> =5mA to 200mA			10	90	
Temperature Coefficient of output Voltage	I <sub>O</sub> =5mA	0°C to 125°C		-1.0		mV/°C
Output Noise Voltage	f=10Hz to 100KHz	25°C		60		uV
Dropout Voltage		25°C		2.0		V
Bias Current		25°C		4.6	8	mA
Bias Current Change	V <sub>I</sub> =11.5V to 27V, I <sub>O</sub> =200mA	0°C to 125°C			0.8	mA
	I <sub>O</sub> =5mA to 350mA				0.5	
Short Circuit Output Current		25°C		250		mA
Peak Output Current		25°C		0.8		A

## EC7810M Electrical Characteristics (V<sub>I</sub> = 17V, I<sub>O</sub> = 350mA unless otherwise noted)

Parameter	Test Conditions		Min.	Typ.	Max.	Unit
Output Voltage		25°C	9.6	10	10.4	V
	I <sub>O</sub> =5mA to 350mA V <sub>I</sub> =12.5V to 25V P ≤ 15W(TO220 package)	0°C to 125°C	9.5	10	10.5	
Input Regulation	V <sub>I</sub> =12.5V to 28V, I <sub>O</sub> =200mA	25°C		7	200	mV
	V <sub>I</sub> =14V to 27V, I <sub>O</sub> =200mA			2	100	
Ripple Rejection	V <sub>I</sub> =13V to 23V, f=120KHz	0°C to 125°C	55	71		dB
Output Regulation	I <sub>O</sub> =5mA to 500mA	25°C		20	200	mV
	I <sub>O</sub> =5mA to 200mA			10	100	
Temperature Coefficient of output Voltage	I <sub>O</sub> =5mA	0°C to 125°C		-1.0		mV/°C
Output Noise Voltage	f=10Hz to 100KHz	25°C		70		uV
Dropout Voltage		25°C		2.0		V
Bias Current		25°C		4.6	8	mA
Bias Current Change	V <sub>I</sub> =12.5V to 28V, I <sub>O</sub> =200mA	0°C to 125°C			0.8	mA
	I <sub>O</sub> =5mA to 350mA				0.5	
Short Circuit Output Current		25°C		250		mA
Peak Output Current		25°C		0.8		A

## EC7812M Electrical Characteristics ( $V_I = 19V$ , $I_O = 350mA$ unless otherwise noted)

Parameter	Test Conditions		Min.	Typ.	Max.	Unit
Output Voltage		25°C	11.5	12	12.5	V
	$I_O=5mA$ to 350mA $V_I=14.5V$ to 27V $P \leq 15W$ (TO220 package)	0°C to 125°C	11.4	12	12.6	
Input Regulation	$V_I=14.5V$ to 30V, $I_O=200mA$	25°C		10	240	mV
	$V_I=16V$ to 30V, $I_O=200mA$			3	120	
Ripple Rejection	$V_I=15V$ to 25V, $f=120KHz$	0°C to 125°C	55	71		dB
Output Regulation	$I_O=5mA$ to 500mA	25°C		25	240	mV
	$I_O=5mA$ to 200mA			10	120	
Temperature Coefficient of output Voltage	$I_O=5mA$	0°C to 125°C		-1.0		mV/°C
Output Noise Voltage	$f=10Hz$ to 100KHz	25°C		75		uV
Dropout Voltage		25°C		2.0		V
Bias Current		25°C		4.6	8	mA
Bias Current Change	$V_I=14.5V$ to 30V, $I_O=200mA$	0°C to 125°C			0.8	mA
	$I_O=5mA$ to 350mA				0.5	
Short Circuit Output Current		25°C		240		mA
Peak Output Current		25°C		0.8		A



## EC7815M Electrical Characteristics ( $V_I = 23V$ , $I_O = 350mA$ unless otherwise noted)

Parameter	Test Conditions	Min.	Typ.	Max.	Unit	
Output Voltage		25°C	14.4	15	15.6	V
	$I_O = 5mA$ to 350mA $V_I = 17.5V$ to 30V $P \leq 15W$ (TO220 package)	0°C to 125°C	14.25	15	15.75	
Input Regulation	$V_I = 17.5V$ to 30V, $I_O = 200mA$	25°C		12	300	mV
	$V_I = 20V$ to 30V, $I_O = 200mA$			3	150	
Ripple Rejection	$V_I = 18V$ to 28.5V, $f = 120KHz$	0°C to 125°C	53	70		dB
Output Regulation	$I_O = 5mA$ to 500mA	25°C		25	300	mV
	$I_O = 5mA$ to 200mA			10	150	
Temperature Coefficient of output Voltage	$I_O = 5mA$	0°C to 125°C		-1.0		mV/°C
Output Noise Voltage	$f = 10Hz$ to 100KHz	25°C		90		uV
Dropout Voltage		25°C		2.0		V
Bias Current		25°C		4.7	8	mA
Bias Current Change	$V_I = 17.5V$ to 30V, $I_O = 200mA$	0°C to 125°C			0.8	mA
	$I_O = 5mA$ to 350mA				0.5	
Short Circuit Output Current		25°C		240		mA
Peak Output Current		25°C		0.8		A

## EC7818M Electrical Characteristics (V<sub>I</sub> = 27V, I<sub>O</sub> = 350mA unless otherwise noted)

Parameter	Test Conditions		Min.	Typ.	Max.	Unit
Output Voltage		25°C	17.3	18	18.7	V
	I <sub>O</sub> =5mA to 350mA V <sub>I</sub> =17.5V to 30V P ≤ 15W(TO220 package)	0°C to 125°C	17.1	18	18.9	
Input Regulation	V <sub>I</sub> =21V to 33V, I <sub>O</sub> =200mA	25°C		15	360	mV
	V <sub>I</sub> =24V to 30V, I <sub>O</sub> =200mA			5	180	
Ripple Rejection	V <sub>I</sub> =22V to 32V, f=120KHz	0°C to 125°C	53	69		dB
Output Regulation	I <sub>O</sub> =5mA to 500mA	25°C		25	360	mV
	I <sub>O</sub> =5mA to 200mA			10	180	
Temperature Coefficient of output Voltage	I <sub>O</sub> =5mA	0°C to 125°C		-1.0		mV/°C
Output Noise Voltage	f=10Hz to 100KHz	25°C		110		uV
Dropout Voltage		25°C		2.0		V
Bias Current		25°C		4.8	8	mA
Bias Current Change	V <sub>I</sub> =21V to 33V, I <sub>O</sub> =200mA	0°C to 125°C			0.8	mA
	I <sub>O</sub> =5mA to 350mA				0.5	
Short Circuit Output Current		25°C		240		mA
Peak Output Current		25°C		0.8		A

## EC7820M Electrical Characteristics (V<sub>I</sub> = 29V, I<sub>O</sub> = 350mA unless otherwise noted)

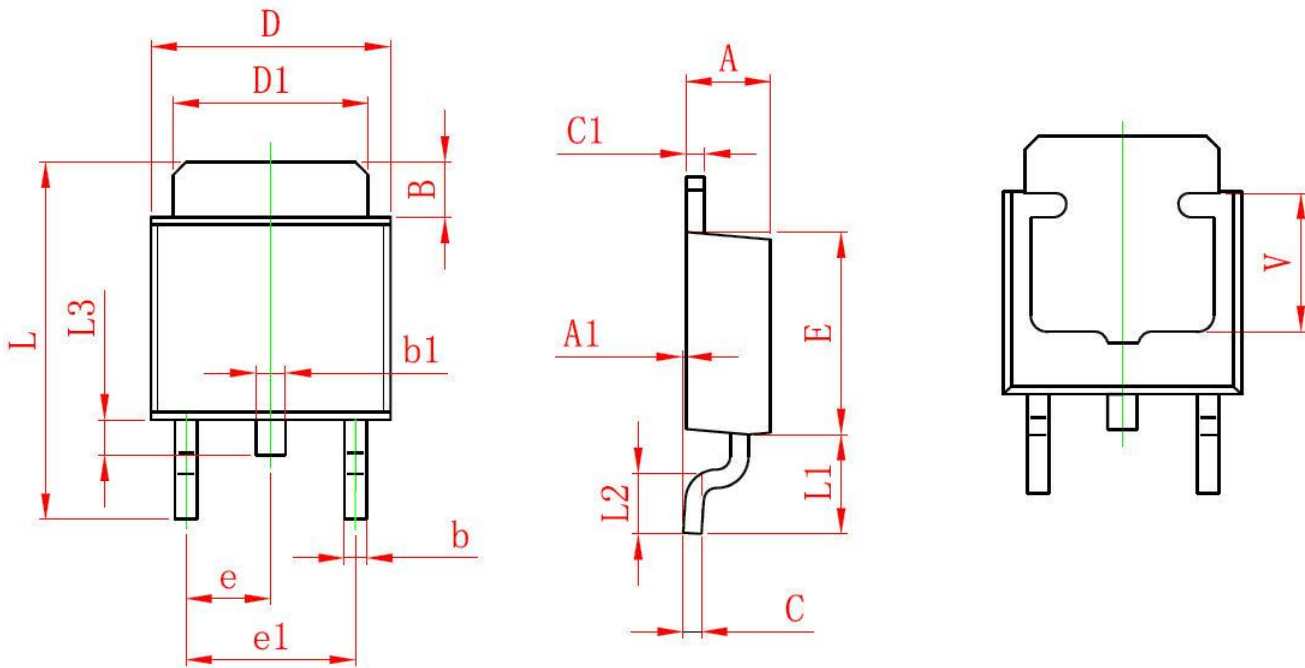
Parameter	Test Conditions		Min.	Typ.	Max.	Unit
Output Voltage		25°C	19.2	20	20.8	V
	I <sub>O</sub> =5mA to 350mA V <sub>I</sub> =23V to 35V P ≤ 15W(TO220 package)	0°C to 125°C	19	20	21	
Input Regulation	V <sub>I</sub> =23V to 35V, I <sub>O</sub> =200mA	25°C		18	400	mV
	V <sub>I</sub> =25V to 35V, I <sub>O</sub> =200mA			7	200	
Ripple Rejection	V <sub>I</sub> =24V to 34V, f=120KHz	0°C to 125°C	51	66		dB
Output Regulation	I <sub>O</sub> =5mA to 500mA	25°C		25	400	mV
	I <sub>O</sub> =5mA to 200mA			7	200	
Temperature Coefficient of output Voltage	I <sub>O</sub> =5mA	0°C to 125°C		-1.0		mV/°C
Output Noise Voltage	f=10Hz to 100KHz	25°C		110		uV
Dropout Voltage		25°C		2.0		V
Bias Current		25°C		4.8	8	mA
Bias Current Change	V <sub>I</sub> =23V to 35V, I <sub>O</sub> =200mA	0°C to 125°C			0.8	mA
	I <sub>O</sub> =5mA to 350mA				0.5	
Short Circuit Output Current		25°C		240		mA
Peak Output Current		25°C		0.8		A

## EC7824M Electrical Characteristics (V<sub>I</sub> = 33V, I<sub>O</sub> = 350mA unless otherwise noted)

Parameter	Test Conditions		Min.	Typ.	Max.	Unit
Output Voltage		25°C	23	24	25	V
	I <sub>O</sub> =5mA to 350mA V <sub>I</sub> =27V to 38V P ≤ 15W(TO220 package)	0°C to 125°C	22.8	24	25.2	
Input Regulation	V <sub>I</sub> =27V to 38V, I <sub>O</sub> =200mA	25°C		20	480	mV
	V <sub>I</sub> =28V to 38V, I <sub>O</sub> =200mA			10	240	
Ripple Rejection	V <sub>I</sub> =28V to 38V, f=120KHz	0°C to 125°C	50	66		dB
Output Regulation	I <sub>O</sub> =5mA to 500mA	25°C		25	480	mV
	I <sub>O</sub> =5mA to 200mA			10	240	
Temperature Coefficient of output Voltage	I <sub>O</sub> =5mA	0°C to 125°C		-1.0		mV/°C
Output Noise Voltage	f=10Hz to 100KHz	25°C		110		uV
Dropout Voltage		25°C		2.0		V
Bias Current		25°C		5.0	8	mA
Bias Current Change	V <sub>I</sub> =27V to 38V, I <sub>O</sub> =200mA	0°C to 125°C			0.8	mA
	I <sub>O</sub> =5mA to 350mA				0.5	
Short Circuit Output Current		25°C		240		mA
Peak Output Current		25°C		0.8		A

Package Outline Information

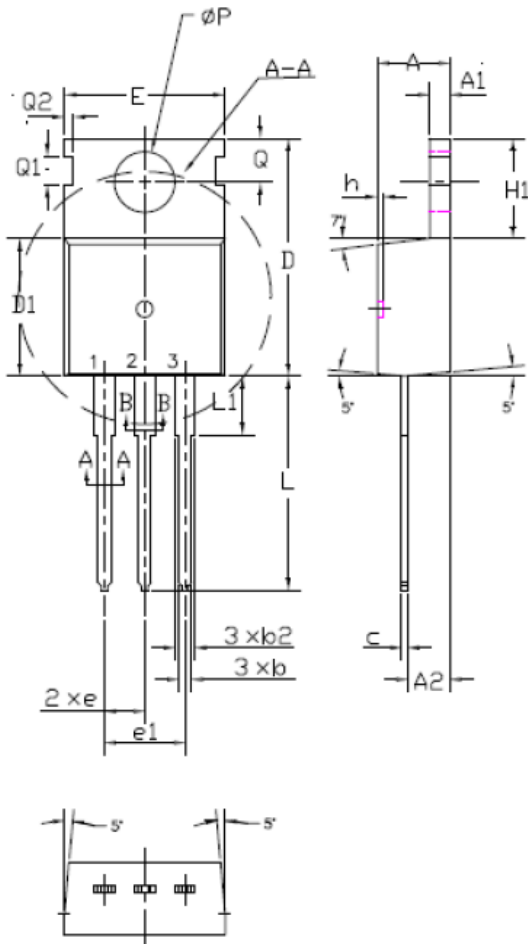
Outline Drawing For TO252-3L



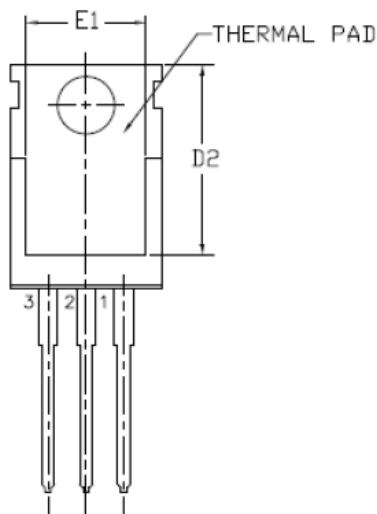
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
B	1.350	1.650	0.053	0.065
b	0.450	0.750	0.018	0.030
b1	0.600	1.000	0.024	0.040
c	0.430	0.580	0.017	0.023
c1	0.430	0.580	0.017	0.023
D	6.300	6.700	0.249	0.264
D1	5.100	5.500	0.201	0.217
E	5.400	5.700	0.213	0.224
e	2.150	2.450	0.085	0.097
e1	4.450	4.750	0.175	0.187
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	1.000	0.024	0.040
V	3.400	3.800	0.134	0.150

Package Outline Information

Outline Drawing For TO220-3L

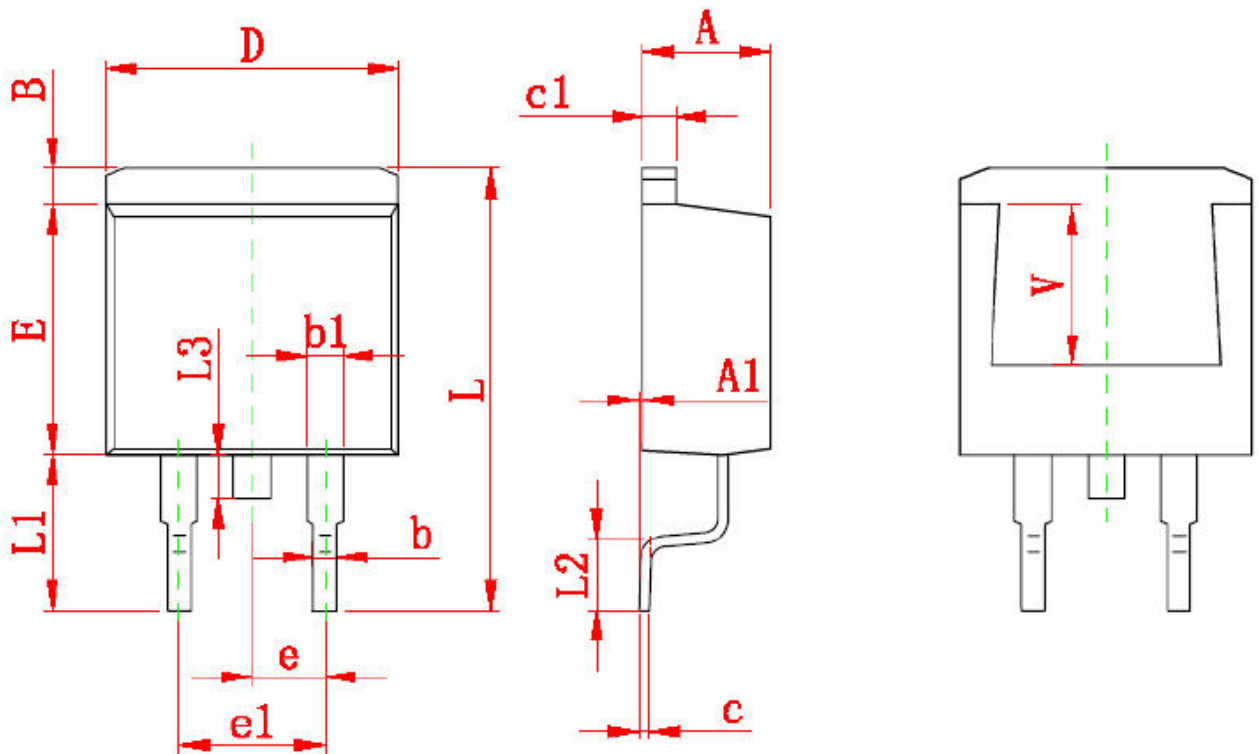


SYMBOL	VARIATION			
	TO-220 3L			
	Millimeters		Inches	
	Min	Max	Min	Max
A	4.40	4.60	0.173	0.181
A1	1.20	1.40	0.047	0.055
A2	2.23	2.53	0.088	0.100
b	0.70	0.90	0.028	0.035
b2	1.17	1.55	0.046	0.061
c	0.40	0.60	0.016	0.024
D	15.55	15.95	0.612	0.628
D1	8.95	9.45	0.352	0.372
D2	13.20	13.60	0.520	0.535
E	9.85	10.15	0.388	0.400
E1	7.85	8.15	0.309	0.321
e	2.54REF		0.100REF	
e1	5.08REF		0.200REF	
H1	6.35	6.55	0.250	0.258
h	0.00	0.30	0.000	0.012
L	12.70	13.65	0.500	0.537
L1	2.85REF		0.112	
Q	2.70	2.90	0.106	0.114
Q1	1.62	1.82	0.064	0.072
Q2	0.55	0.75	0.022	0.030
ΦP	3.60	3.75	0.142	0.148



**Package Outline Information**

Outline Drawing For TO263-2L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.470	4.670	0.176	0.184
A1	0.000	0.150	0.000	0.006
B	1.170	1.370	0.046	0.054
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.310	0.530	0.012	0.021
c1	1.170	1.370	0.046	0.054
D	10.010	10.310	0.394	0.406
E	8.500	8.900	0.335	0.350
e	2.540 TYP		0.100 TYP	
e1	4.980	5.180	0.196	0.204
L	15.050	15.450	0.593	0.608
L1	5.080	5.480	0.200	0.216
L2	2.340	2.740	0.092	0.108
L3	1.300	1.700	0.051	0.067
V	5.600 REF		0.220 REF	