

3 Description

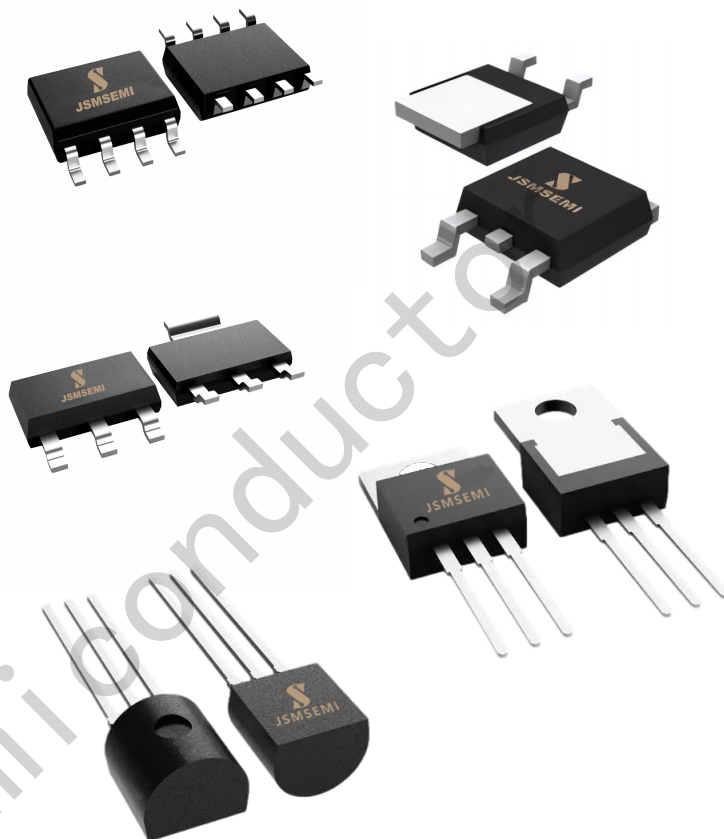
The LM337 is adjustable 3-terminal negative voltage regulators capable of supplying -1.5 A or more currents over an output voltage range of -1.25 V to -37 V . It requires only two external resistors to set the output voltage and one output capacitor for frequency compensation. The circuit design has been optimized for excellent regulation and low thermal transients. Further, the LM337 features internal current limiting, thermal shutdown and safe-area compensation, making it virtually blowout-proof against overloads.

1 Features

- 1.5-A Output Current
- Line Regulation 0.01%/V (Typical)
- Load Regulation 0.3% (Typical)
- 77-dB Ripple Rejection
- 50 ppm/°C Temperature Coefficient
- Thermal Overload Protection
- Internal Short-Circuit Current Limiting Protections

2 Applications

- Industrial Power Supplies
- Factory Automation Systems
- Building Automation Systems
- PLC Systems
- Instrumentation
- IGBT Drive Negative Gate Supplies
- Networking
- Set-Top Boxes

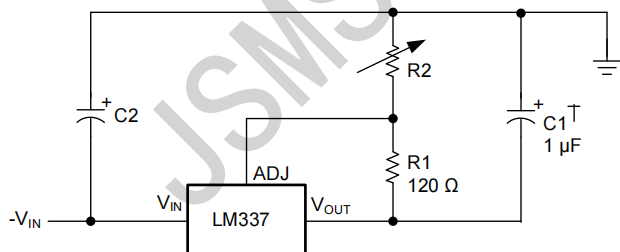


Device Information⁽¹⁾

Order number	Package	MSL Grade	Ship, Quantity	Green
LM337T	TO-220	3	1000	Rohs
LM337LZ	TO-92	3	1000	Rohs
LM337LMX	SOP-8	3	T&R, 2500	Rohs
LM337KTTR	TO-263-3	3	T&R, 1000	Rohs
LM337KVUR	TO-252-2	3	T&R, 2500	Rohs
LM337IMPX	SOT-223	3	T&R, 2500	Rohs

(1) For all available packages, see the orderable addendum at the end of the data sheet.

Adjustable Negative Voltage Regulator



Full output current not available at high input-output voltages

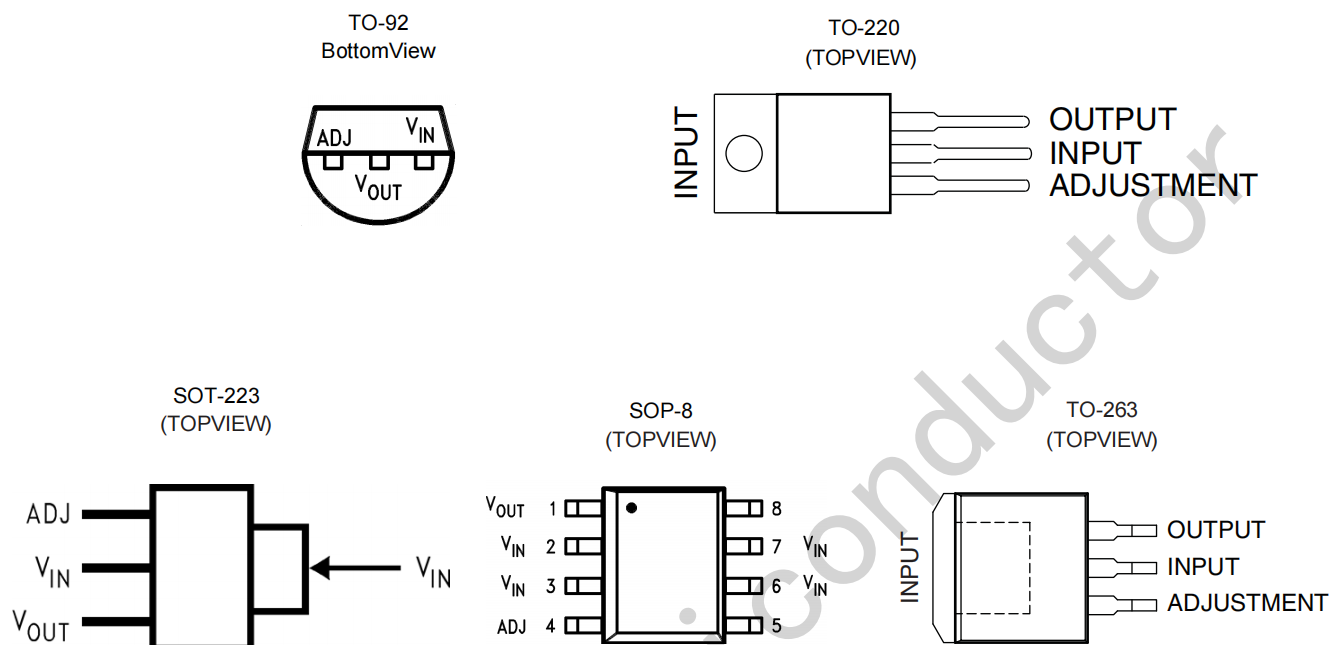
$$-V_{OUT} = -1.25V \left(1 + \frac{R2}{120} \right) + (-I_{ADJ} \times R2)$$

†C1 = 1-μF solid tantalum or 10-μF aluminum electrolytic required for stability

*C2 = 1-μF solid tantalum is required only if regulator is more than 4" from power-supply filter capacitor

Output capacitors in the range of 1-μF to 1000-μF of aluminum or tantalum electrolytic are commonly used to provide improved output impedance and rejection of transients

4 Pin Configuration and Functions



Pin Functions

NAME	PIN						I/O	DESCRIPTION
	TO-92	SOIC	TO-92	TO-92	TO-92	TO-92		
ADJ	1	4			1		—	Adjust pin
NC	—	5, 8			—		—	No connection
V_{IN}	3	2, 3, 6, 7			2,4		Input	Input voltage pin for the regulator
V_{OUT}	2	1			3		Output	Output voltage pin for the regulator

5 Specifications

5.1 Absolute Maximum Ratings

	MIN	MAX	UNIT
Power dissipation	Internally Limited		
Input-output voltage differential	-0.3	40	V
Operating junction temperature	0	125	°C
Storage temperature, T_{stg}	-65	150	°C

5.2 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)

		MIN	MAX	UNIT
Operating junction temperature	LM337	0	125	°C

5.3 Electrical Characteristics

Unless otherwise specified, these specifications apply $0^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C}$ for the LM337; $V_{IN} - V_{OUT} = 5\text{ V}$; and $I_{OUT} = 0.1\text{ A}$ for the TO package and $I_{OUT} = 0.5\text{ A}$ for the SOT-223 and TO-220 packages. Although power dissipation is internally limited, these specifications are applicable for power dissipations of 2 W for the TO and SOT-223, and 20 W for the TO-220. I_{MAX} is 1.5 A for the SOT-223 and TO-220 packages, and 0.2 A for the TO package.

PARAMETER	TEST CONDITIONS		LM337			UNIT
			MIN	TYP	MAX	
Line regulation	$T_J = 25^{\circ}\text{C}$, $3\text{ V} \leq V_{\text{IN}} - V_{\text{OUT}} \leq 40\text{ V}^{(1)}$ $I_L = 10\text{ mA}$			0.01	0.04	%/V
Load regulation	$T_J = 25^{\circ}\text{C}$, $10\text{ mA} \leq I_{\text{OUT}} \leq I_{\text{MAX}}$			0.3%	1%	
Thermal regulation	$T_J = 25^{\circ}\text{C}$, 10-ms Pulse			0.003	0.04	%/W
Adjustment pin current				65	100	μA
Adjustment pin current charge	$10\text{ mA} \leq I_L \leq I_{\text{MAX}}$ $3\text{ V} \leq V_{\text{IN}} - V_{\text{OUT}} \leq 40\text{ V}$, $T_A = 25^{\circ}\text{C}$			2	5	μA
Reference voltage	$3\text{ V} \leq V_{\text{IN}} - V_{\text{OUT}} \leq 40\text{ V}$, ⁽²⁾	$T_J = 25^{\circ}\text{C}$ ⁽²⁾	-1.213	-1.25	-1.287	V
	$10\text{ mA} \leq I_{\text{OUT}} \leq I_{\text{MAX}}$, $P \leq P_{\text{MAX}}$	$-55^{\circ}\text{C} \leq T_J \leq 150^{\circ}\text{C}$	-1.2	-1.25	-1.3	V
Line regulation	$3\text{ V} \leq V_{\text{IN}} - V_{\text{OUT}} \leq 40\text{ V}$, ⁽¹⁾			0.02	0.07	%/V
Load regulation	$10\text{ mA} \leq I_{\text{OUT}} \leq I_{\text{MAX}}$, ⁽¹⁾			0.3%	1.5%	
Temperature stability	$I_{\text{MIN}} \leq I_L \leq I_{\text{MAX}}$			0.6%		
Minimum load current	$ V_{\text{IN}} - V_{\text{OUT}} \leq 40\text{ V}$			2.5	10	mA
	$ V_{\text{IN}} - V_{\text{OUT}} \leq 10\text{ V}$			1.5	6	mA
Current limit	$ V_{\text{IN}} - V_{\text{OUT}} \leq 15\text{ V}$	K, DCY and NDE package	1.5	2.2	3.7	A
		NDT package	0.5	0.8	1.9	A
	$ V_{\text{IN}} - V_{\text{OUT}} = 40\text{ V}$, $T_J = 25^{\circ}\text{C}$	K, DCY and NDE package	0.15	0.4		A
		NDT package	0.1	0.17		A
RMS output noise, % of V_{OUT}	$T_J = 25^{\circ}\text{C}$, $10\text{ Hz} \leq f \leq 10\text{ kHz}$			0.003%		
Ripple rejection ratio	$V_{\text{OUT}} = -10\text{ V}$, $f = 120\text{ Hz}$			60		dB
	$C_{\text{ADJ}} = 10\text{ }\mu\text{F}$			66	77	dB
Long-term stability	$T_J = 125^{\circ}\text{C}$, 1000 Hours			0.3%	1%	

- (1) Regulation is measured at constant junction temperature, using pulse testing with a low duty cycle. Changes in output voltage due to heating effects are covered under the specification for thermal regulation. Load regulation is measured on the output pin at a point $\frac{1}{2}$ in. below the base of the TO packages.
- (2) Selected devices with tightened tolerance reference voltage available.

5.4 Typical Characteristics

(NDE Package)

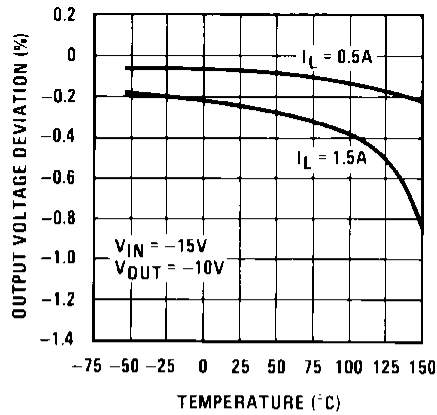


Figure 1. Load Regulation

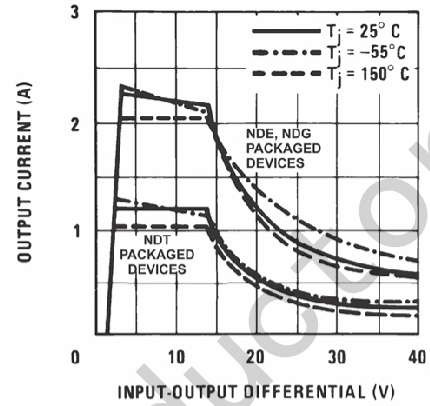


Figure 2. Current Limit

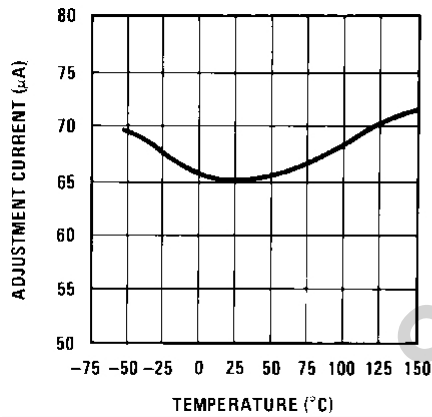


Figure 3. Adjustment Current

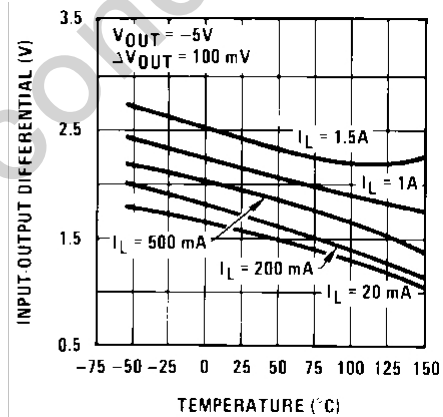


Figure 4. Dropout Voltage

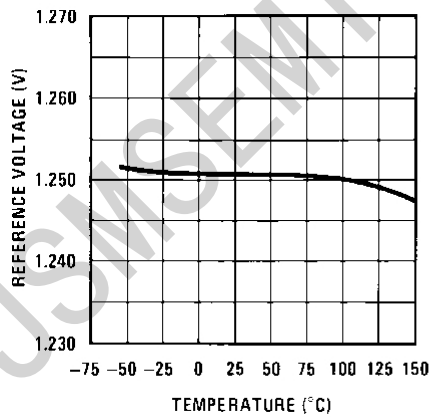


Figure 5. Temperature Stability

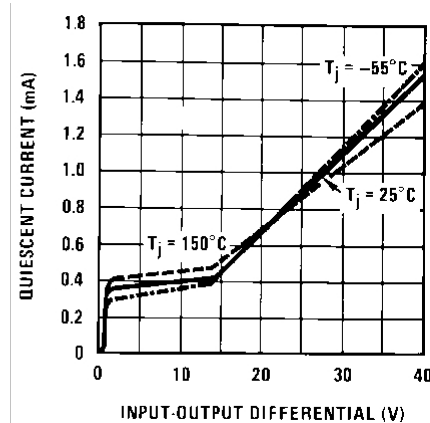


Figure 6. Minimum Operating Current

Typical Characteristics (continued)

(NDE Package)

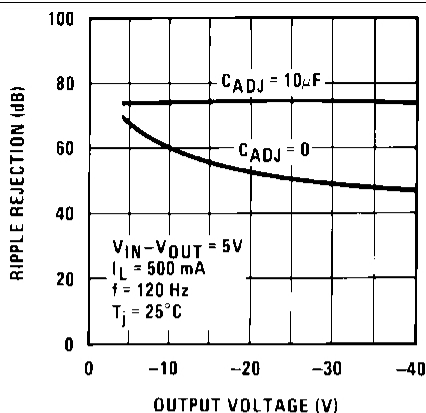


Figure 7. Ripple Rejection

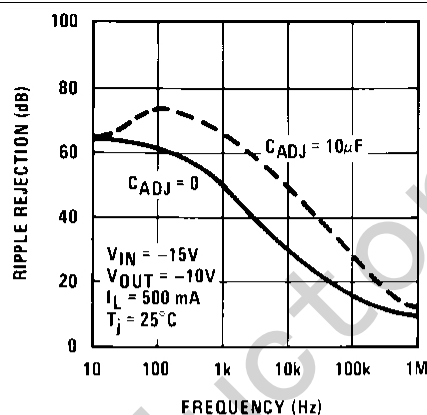


Figure 8. Ripple Rejection

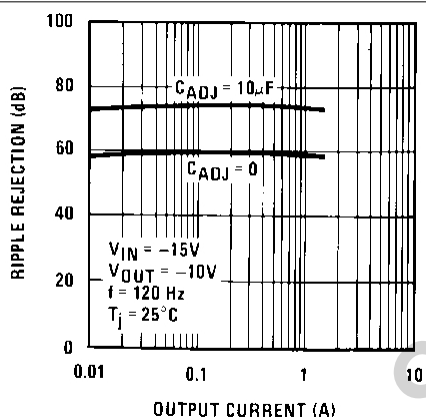


Figure 9. Ripple Rejection

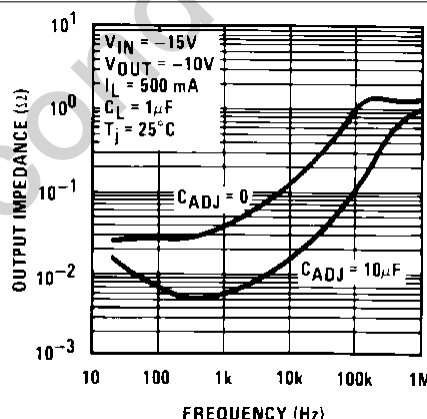


Figure 10. Output Impedance

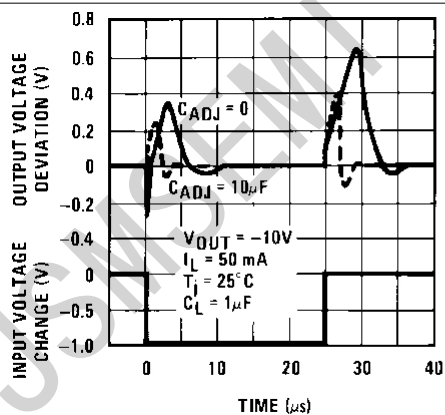


Figure 11. Line Transient Response

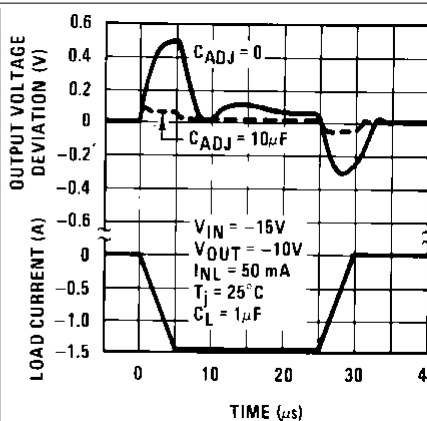
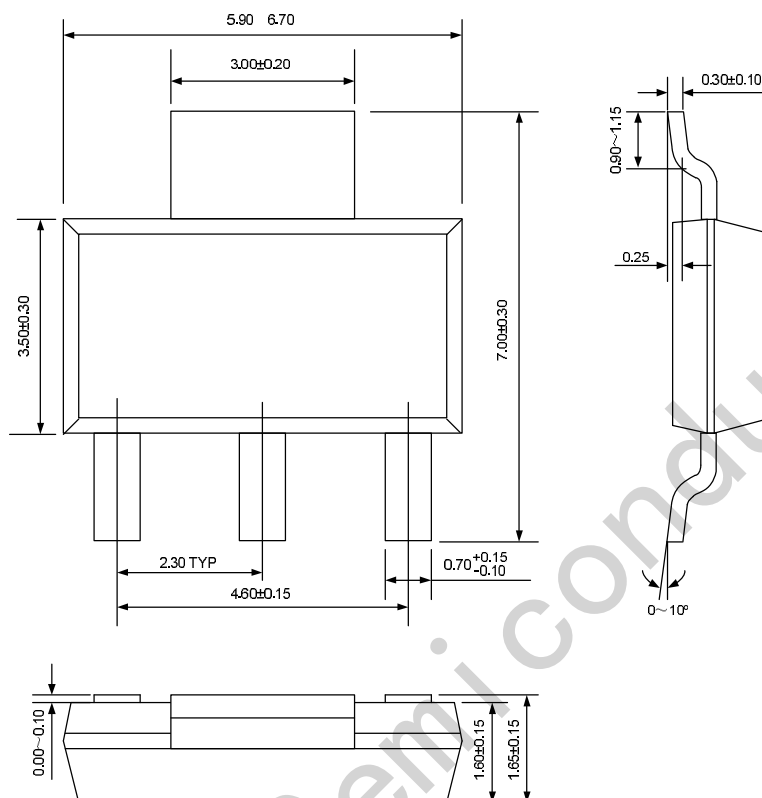


Figure 12. Load Transient Response

PACKAGE OUTLINE

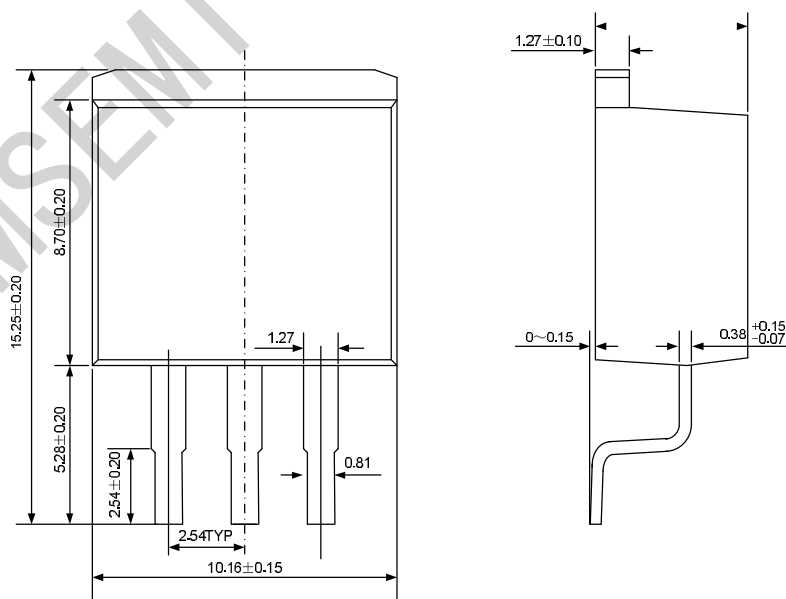
SOT-223-3L

Unit: mm



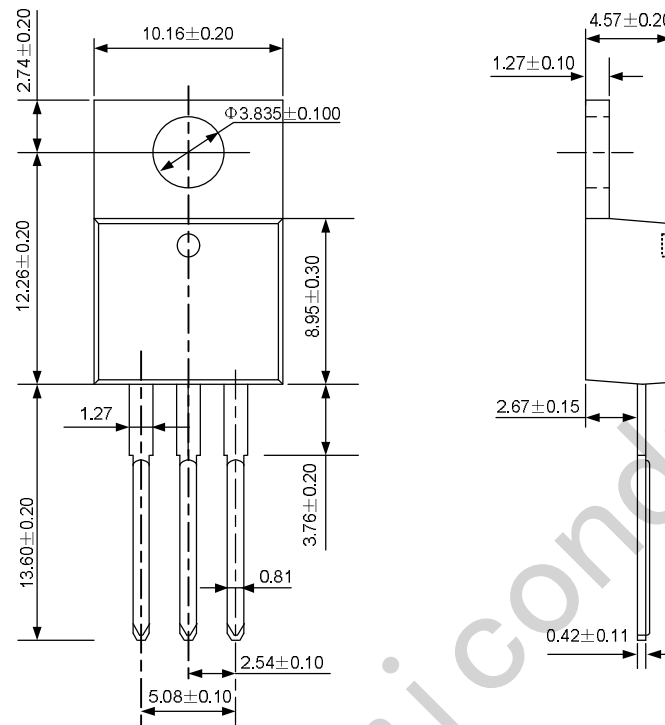
TO-263-3L

Unit: mm



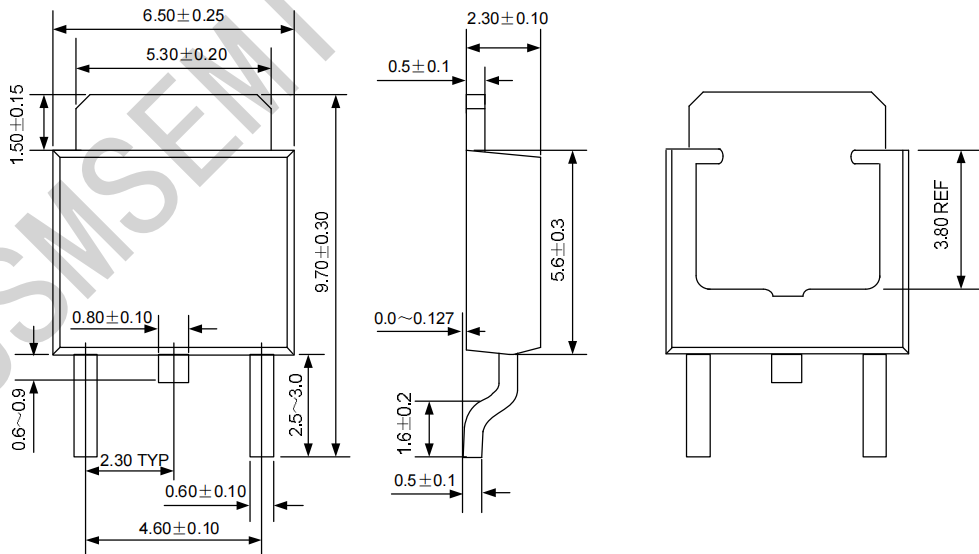
TO-220-3L

Unit: mm

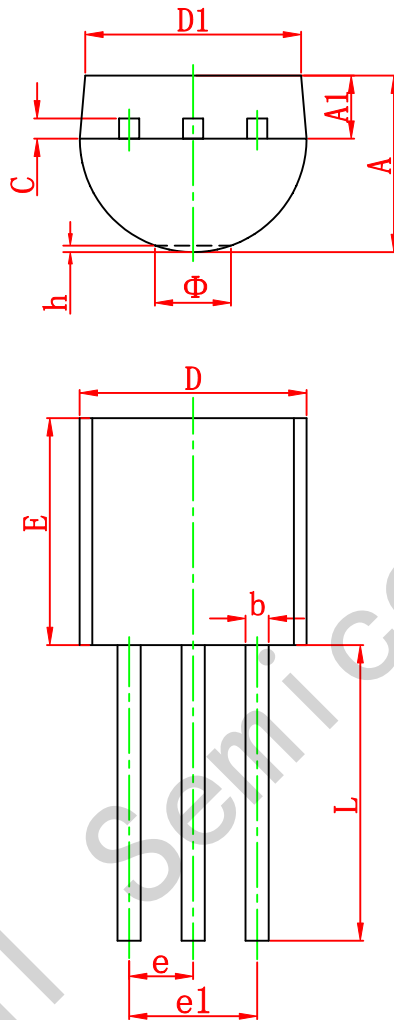


TO-252-2L

Unit: mm

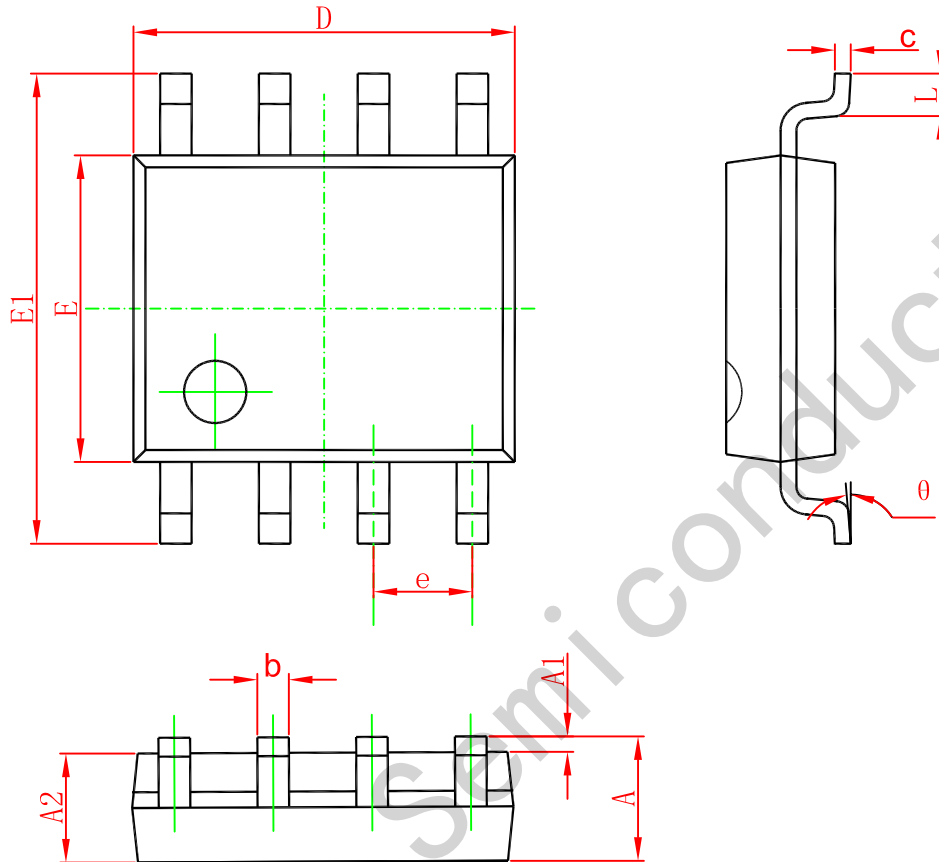


TO-92



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.300	3.700	0.130	0.146
A1	1.100	1.400	0.043	0.055
b	0.380	0.550	0.015	0.022
c	0.360	0.510	0.014	0.020
D	4.400	4.700	0.173	0.185
D1	3.430		0.135	
E	4.300	4.700	0.169	0.185
e	1.270 TYP		0.050 TYP	
e1	2.440	2.640	0.096	0.104
L	14.100	14.500	0.555	0.571
Φ		1.600		0.063
h	0.000	0.380	0.000	0.015

SOP-8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°