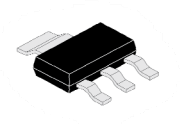
SOT-223 LOW DROPOUT LINEAR REGULATOR

LM1117XX



SOT-223

SOT-223
Surface Mount
Plastic Package
RoHS compliant

FEATURES:

1. Low Dropout Voltage: 1.15V at 1A Output Current
2. Trimmed Current Limit
3. On-chip Thermal Shutdown
4. Three-terminal Adjustable or Fixed 1.2V, 1.5V, 1.8V, 2.5V, 3.3V, 5.0V
5. Operation Junction Temperature: -40 to 125°C
6. This product is available in AEC-Q101 Compliant and PPAP Capable also.

Note: For AEC-Q101 compliant products, please use suffix -AQ in the part number while ordering.

APPLICATION:

1. PC Motherboard
2. LCD Monitor
3. Graphic Card
4. DVD-video Player
5. NIC/Switch
6. Telecommunication Equipment
7. ADSL Modem
8. Printer and other Peripheral Equipment

ABSOLUTE MAXIMUM RATINGS (Ta = 25 ℃ Unless otherwise specified)

PARAMETER	SYMBOL	MIN	MAX	UNIT
Input Voltage	V_{IN}	--	20	V
Maximum Junction Temperature	T_J	--	150	°C
Storage Temperature	T_S	-65	150	°C
Lead Temperature (Soldering, 10sec)	T_{LEAD}	--	300	°C
ESD (Machine Model)	ESD	--	600	V

Recommended Operating Conditions

Input Voltage	V_{IN}		15	V
Operating Junction Temperature Range	T_J	-40	120	°C

Note:

1. Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS at (Ta = 25 ℃ Unless otherwise specified)

LM1117-ADJ Electrical Characteristics

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Reference Voltage	V_{REF}	I_{OUT} = 10mA, V_{IN}-V_{OUT} = 2V	1.238	1.250	1.262	V
		10mA≤I_{OUT} ≤ 1A,1.4V≤ V_{IN}-V_{OUT} ≤8V, P≤ Maximum Power Dissipation	1.225	1.250	1.270	
Line Regulation	ΔV_{OUT}	I_{OUT} = 10mA, 1.5V≤ V_{IN}-V_{OUT} ≤ 10V	--	0.035	0.20	%
Load Regulation	ΔV_{OUT}	V_{IN} -V_{OUT} = 2V, 10mA≤ I_{OUT} ≤ 1A	--	0.2	0.4	%
Dropout Voltage		ΔV_{REF} = 1%, I_{OUT} = 0.1A	--	1.00	1.1	V
		ΔV_{REF} = 1%, I_{OUT} = 0.5A	--	1.08	1.18	
		ΔV_{REF} = 1%, I_{OUT} = 1.0A	--	1.15	1.25	
Current Limit	I_{LIMIT}	V_{IN}-V_{OUT} = 2V	1.25	1.35	--	A
Adjust Pin Current			--	60	120.0	µA
Adjust Pin Current Charge		1.4V≤V_{IN}-V_{OUT}≤ 10V,10mA ≤ I_{OUT} 1A	--	0.2	5	µA
Minimum Load Current (ADJ)		1.5V≤ V_{IN}-V_{OUT} ≤ 10V (ADJ only)	--	1.7	5	mA
Quiescent Current		V_{IN}=V_{OUT} +1.25V	--	5	10	mA
Ripple Rejection		I_O= 1.0A, f = 120Hz, T_J = 25°C V_{in} - V_O = 3V, V_{ripple} = 1 V_{PP}	60	75	--	dB
Temperature Stability			--	0.5	--	%
Long -Term Stability		T_A=125°C, 1000hrs	--	0.3	--	%
RMS Output Noise(%of V_{OUT})		T_A=25°C, 10Hz ≤ f ≤ 10kHz	--	0.003	--	%
Thermal Resistance,Junction to Case	θ_{JC}		--	15	--	°C/W
Thermal Shutdown		Junction Temperature	--	150	--	°C
Thermal Shutdown Hysteresis			--	25	--	°C

LM1117-1.2V Electrical Characteristics

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	I_{OUT} = 10mA, V_{IN} = 3.2V	1.176	1.2	1.224	V
		10mA ≤ I_{OUT} ≤ 1A, 3.0V≤ V_{IN}≤ 10V	1.152	1.2	1.248	
Line Regulation	ΔV_{OUT}	I_{OUT} = 10mA, 1.5V≤ V_{IN}-V_{OUT} ≤ 10V	--	1	6	mV
Load Regulation	ΔV_{OUT}	V_{IN} -V_{OUT} = 2V, 10mA≤ I_{OUT} ≤1A	--	1	10	mV
Dropout Voltage		ΔV_{OUT}= 1%, I_{OUT} = 0.1A	--	1.00	1.1	V
		ΔV_{OUT}= 1%, I_{OUT} = 0.5A	--	1.08	1.18	
		ΔV_{OUT} = 1%, I_{OUT} = 1.0A	--	1.15	1.25	
Current Limit	I_{LIMIT}	V_{IN}-V_{OUT} = 2V	1.25	1.35	--	A
Quiescent Current		V_{IN}=V_{OUT} +1.25V	--	5	10	mA
Ripple Rejection		I_O= 1.0A, f = 120Hz, T_J = 25°C V_{in} - V_O = 3V, V_{ripple} = 1 V_{PP}	60	75	--	dB
Temperature Stability			--	0.5	--	%
Long -Term Stability		T_A=125°C, 1000hrs	--	0.3	--	%
RMS Output Noise(%of V_{OUT})		T_A=25°C, 10Hz ≤ f ≤ 10kHz	--	0.003	--	%
Thermal Resistance,Junction to Case	θ_{JC}		--	15	--	°C/W
Thermal Shutdown		Junction Temperature	--	150	--	°C
Thermal Shutdown Hysteresis			--	25	--	°C

LM1117-1.5V Electrical Characteristics

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	I_{OUT} = 10mA, V_{IN} = 3.5V	1.485	1.5	1.515	V
		10mA ≤ I_{OUT} ≤ 1A, 3.0V≤ V_{IN}≤ 10V	1.470	1.5	1.530	
Line Regulation	ΔV_{OUT}	I_{OUT} = 10mA, 1.5V≤ V_{IN}-V_{OUT} ≤ 10V	--	1	6	mV
Load Regulation	ΔV_{OUT}	V_{IN} -V_{OUT} = 2V, 10mA≤ I_{OUT} ≤1A	--	1	10	mV
Dropout Voltage		ΔV_{OUT}= 1%, I_{OUT} = 0.1A	--	1.00	1.1	V
		ΔV_{OUT}= 1%, I_{OUT} = 0.5A	--	1.08	1.18	
		ΔV_{OUT} = 1%, I_{OUT} = 1.0A	--	1.15	1.25	
Current Limit	I_{LIMIT}	V_{IN}-V_{OUT} = 2V	1.25	1.35	--	A
Quiescent Current		V_{IN}=V_{OUT} +1.25V	--	5	10	mA
Ripple Rejection		I_O= 1.0A, f = 120Hz, T_J = 25°C V_{in} - V_O = 3V, V_{ripple} = 1 V_{PP}	60	75	--	dB
Temperature Stability			--	0.5	--	%
Long -Term Stability		T_A=125°C, 1000hrs	--	0.3	--	%
RMS Output Noise(%of V_{OUT})		T_A=25°C, 10Hz ≤ f ≤ 10kHz	--	0.003	--	%
Thermal Resistance,Junction to Case	θ_{JC}		--	15	--	°C/W
Thermal Shutdown		Junction Temperature	--	150	--	°C
Thermal Shutdown Hysteresis			--	25	--	°C

LM1117-1.8V Electrical Characteristics

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	I_{OUT} = 10mA, V_{IN} = 3.8V	1.782	1.8	1.818	V
		10mA ≤ I_{OUT} ≤ 1A, 3.2V≤ V_{IN}≤ 10V	1.746	1.8	1.854	
Line Regulation	ΔV_{OUT}	I_{OUT} = 10mA, 1.5V≤ V_{IN}-V_{OUT} ≤ 10V	--	1	6	mV
Load Regulation	ΔV_{OUT}	V_{IN} -V_{OUT} = 2V, 10mA≤ I_{OUT} ≤1A	--	1	10	mV
Dropout Voltage		ΔV_{OUT}= 1%, I_{OUT} = 0.1A	--	1.00	1.1	V
		ΔV_{OUT}= 1%, I_{OUT} = 0.5A	--	1.08	1.18	
		ΔV_{OUT} = 1%, I_{OUT} = 1.0A	--	1.15	1.25	
Current Limit	I_{LIMIT}	V_{IN}-V_{OUT} = 2V	1.25	1.35	--	A
Quiescent Current		V_{IN}=V_{OUT} +1.25V	--	5	10	mA
Ripple Rejection		I_O= 1.0A, f = 120Hz, T_J = 25°C V_{in} - V_O = 3V, V_{ripple} = 1 V_{PP}	60	75	--	dB
Temperature Stability			--	0.5	--	%
Long -Term Stability		T_A=125°C, 1000hrs	--	0.3	--	%
RMS Output Noise(%of V_{OUT})		T_A=25°C, 10Hz ≤ f ≤ 10kHz	--	0.003	--	%
Thermal Resistance,Junction to Case	θ_{JC}		--	15	--	°C/W
Thermal Shutdown		Junction Temperature	--	150	--	°C
Thermal Shutdown Hysteresis			--	25	--	°C

LM1117-2.5V Electrical Characteristics

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	I_{OUT} = 10mA, V_{IN} = 4.5V	2.475	2.5	2.525	V
		10mA ≤ I_{OUT} ≤ 1A, 3.9V≤ V_{IN}≤ 10V	2.450	2.5	2.550	
Line Regulation	ΔV_{OUT}	I_{OUT} = 10mA, 1.5V≤ V_{IN}-V_{OUT} ≤ 10V	--	1	6	mV
Load Regulation	ΔV_{OUT}	V_{IN} -V_{OUT} = 2V, 10mA≤ I_{OUT} ≤1A	--	1	10	mV
Dropout Voltage		ΔV_{OUT}= 1%, I_{OUT} = 0.1A	--	1.00	1.1	V
		ΔV_{OUT}= 1%, I_{OUT} = 0.5A	--	1.08	1.18	
		ΔV_{OUT} = 1%, I_{OUT} = 1.0A	--	1.15	1.25	
Current Limit	I_{LIMIT}	V_{IN}-V_{OUT} = 2V	1.25	1.35	--	A
Quiescent Current		V_{IN}=V_{OUT} +1.25V	--	5	10	mA
Ripple Rejection		I_O= 1.0A, f = 120Hz, T_J = 25°C V_{in} - V_O = 3V, V_{ripple} = 1 V_{PP}	60	75	--	dB
Temperature Stability			--	0.5	--	%
Long -Term Stability		T_A=125°C, 1000hrs	--	0.3	--	%
RMS Output Noise(%of V_{OUT})		T_A=25°C, 10Hz ≤ f ≤ 10kHz	--	0.003	--	%
Thermal Resistance,Junction to Case	θ_{JC}		--	15	--	°C/W
Thermal Shutdown		Junction Temperature	--	150	--	°C
Thermal Shutdown Hysteresis			--	25	--	°C

LM1117-3.3V Electrical Characteristics

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	I_{OUT} = 10mA, V_{IN} = 5.0V	3.267	3.3	3.333	V
		10mA ≤ I_{OUT} ≤ 1A, 4.75V≤ V_{IN}≤ 10V	3.235	3.3	3.365	
Line Regulation	ΔV_{OUT}	I_{OUT} = 10mA, 1.5V≤ V_{IN}-V_{OUT} ≤ 10V	--	1	6	mV
Load Regulation	ΔV_{OUT}	V_{IN} -V_{OUT} = 2V, 10mA≤ I_{OUT} ≤1A	--	1	10	mV
Dropout Voltage		ΔV_{OUT}= 1%, I_{OUT} = 0.1A	--	1.00	1.1	V
		ΔV_{OUT}= 1%, I_{OUT} = 0.5A	--	1.08	1.18	
		ΔV_{OUT} = 1%, I_{OUT} = 1.0A	--	1.15	1.25	
Current Limit	I_{LIMIT}	V_{IN}-V_{OUT} = 2V	1.25	1.35	--	A
Quiescent Current		V_{IN}=V_{OUT} +1.25V	--	5	10	mA
Ripple Rejection		I_O= 1.0A, f = 120Hz, T_J = 25°C V_{in} - V_O = 3V, V_{ripple} = 1 V_{PP}	60	75	--	dB
Temperature Stability			--	0.5	--	%
Long -Term Stability		T_A=125°C, 1000hrs	--	0.3	--	%
RMS Output Noise(%of V_{OUT})		T_A=25°C, 10Hz ≤ f ≤ 10kHz	--	0.003	--	%
Thermal Resistance,Junction to Case	θ_{JC}		--	15	--	°C/W
Thermal Shutdown		Junction Temperature	--	150	--	°C
Thermal Shutdown Hysteresis			--	25	--	°C

LM1117-5.0V Electrical Characteristics

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Output Voltage	V_{OUT}	I_{OUT} = 10mA, V_{IN} = 7.0V	4.950	5.0	5.050	V
		10mA ≤ I_{OUT} ≤ 1A, 6.5V≤ V_{IN}≤ 10V	4.900	5.0	5.100	
Line Regulation	ΔV_{OUT}	I_{OUT} = 10mA, 1.5V≤ V_{IN}-V_{OUT} ≤ 10V	--	1	6	mV
Load Regulation	ΔV_{OUT}	V_{IN} -V_{OUT} = 2V, 10mA≤ I_{OUT} ≤1A	--	1	10	mV
Dropout Voltage		ΔV_{OUT}= 1%, I_{OUT} = 0.1A	--	1.00	1.1	V
		ΔV_{OUT}= 1%, I_{OUT} = 0.5A	--	1.08	1.18	
		ΔV_{OUT} = 1%, I_{OUT} = 1.0A	--	1.15	1.25	
Current Limit	I_{LIMIT}	V_{IN}-V_{OUT} = 2V	1.25	1.35	--	A
Quiescent Current		V_{IN}=V_{OUT} +1.25V	--	5	10	mA
Ripple Rejection		I_O= 1.0A, f = 120Hz, T_J = 25°C V_{in} - V_O = 3V, V_{ripple} = 1 V_{PP}	60	75	--	dB
Temperature Stability			--	0.5	--	%
Long -Term Stability		T_A=125°C, 1000hrs	--	0.3	--	%
RMS Output Noise(%of V_{OUT})		T_A=25°C, 10Hz ≤ f ≤ 10kHz	--	0.003	--	%
Thermal Resistance,Junction to Case	θ_{JC}		--	15	--	°C/W
Thermal Shutdown		Junction Temperature	--	150	--	°C
Thermal Shutdown Hysteresis			--	25	--	°C

Recommended Reflow Solder Profiles

The recommended reflow solder profiles for Pb and Pb-free devices are shown below.

Figure 1 shows the recommended solder profile for devices that have Pb-free terminal plating, and where a Pb-free solder is used.

Figure 2 shows the recommended solder profile for devices with Pb-free terminal plating used with leaded solder, or for devices with leaded terminal plating used with a leaded solder.

Figure 1

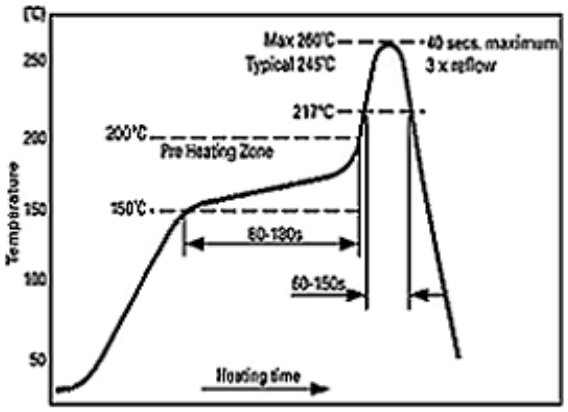
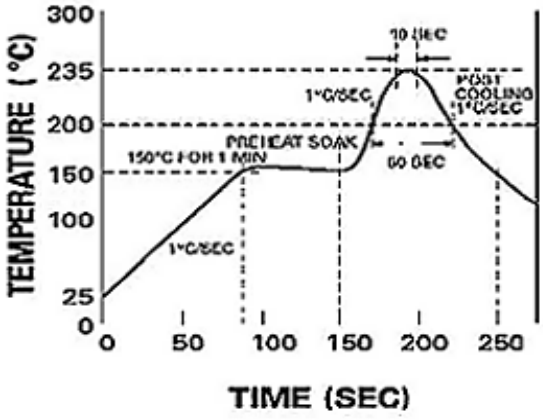


Figure 2

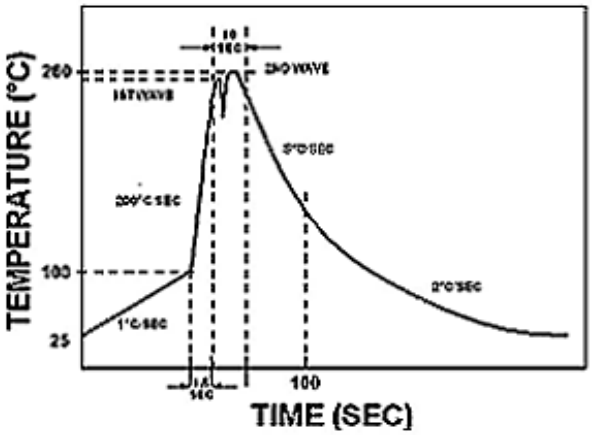


Reflow profiles in tabular form

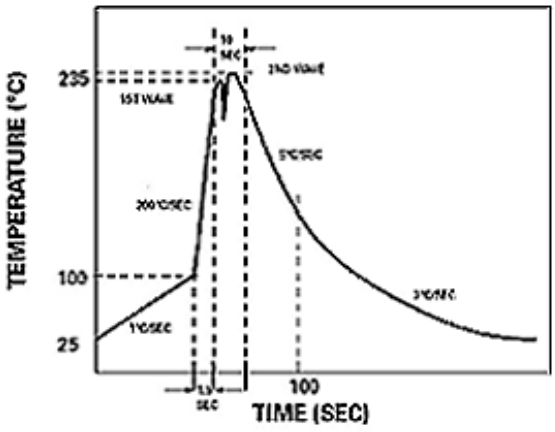
Profile Feature	Sn-Pb System	Pb-Free System
Average Ramp-Up Rate	~3°C/second	~3°C/second
Preheat – Temperature Range – Time	 150-170°C 60-180 seconds	 150-200°C 60-180 seconds
Time maintained above: – Temperature – Time	 200°C 30-50 seconds	 217°C 60-150 seconds
Peak Temperature	235°C	260°C max.
Time within +0 -5°C of actual Peak	10 seconds	40 seconds
Ramp-Down Rate	3°C/second max.	6°C/second max.

Recommended Wave Solder Profiles

The Recommended solder Profile For Devices with Pb-free terminal plating where a Pb-free solder is used



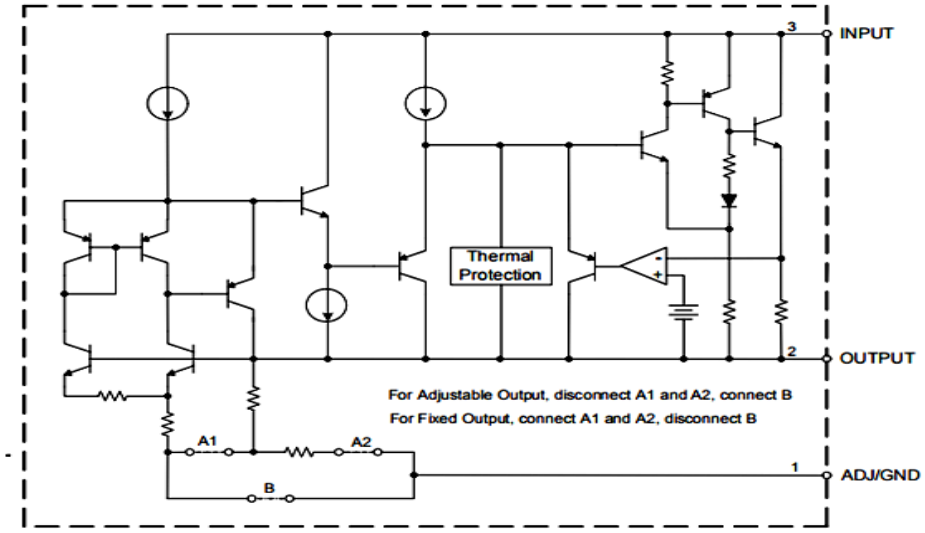
The Recommended solder Profile For Devices with Pb-free terminal plating used with leaded solder, or for devices with leaded terminal plating used with leaded solder



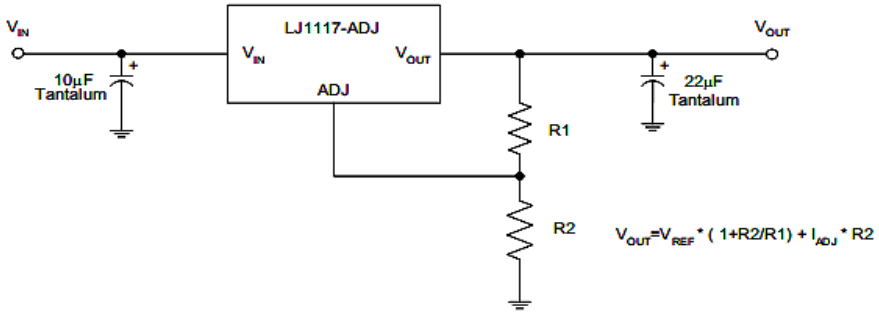
Wave Profiles in Tabular Form

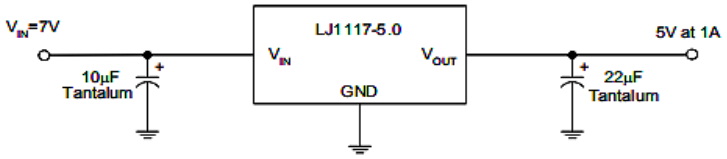
Profile Feature	Sn-Pb System	Pb-Free System
Average Ramp-Up Rate	~200°C/second	~200°C/second
Heating rate during preheat	Typical 1-2, Max 4°C/sec	Typical 1-2, Max 4°C/Sec
Final preheat Temperature	Within 125°C of Solder Temp	Within 125°C of Solder Temp
Peak Temperature	235°C	260°C max.
Time within +0 -5°C of actual Peak	10 seconds	10 seconds
Ramp-Down Rate	5°C/second max.	5°C/second max

Functional Block Diagram of LM1117



Typical Applications of LM1117





TYPICAL CHARACTERISTICS CURVES

Fig 1: Dropout Voltage vs Output Current

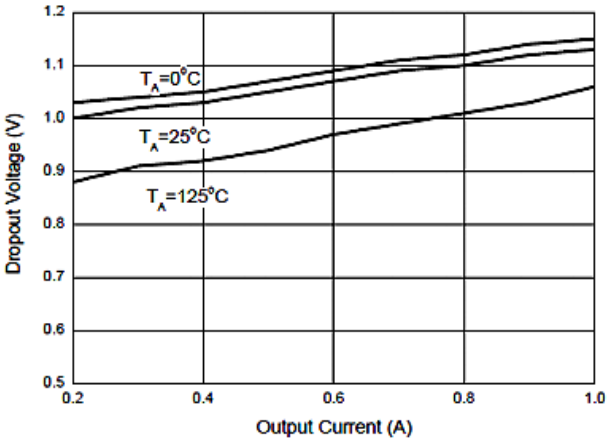


Fig 2: Reference Voltage vs Junction Temperature

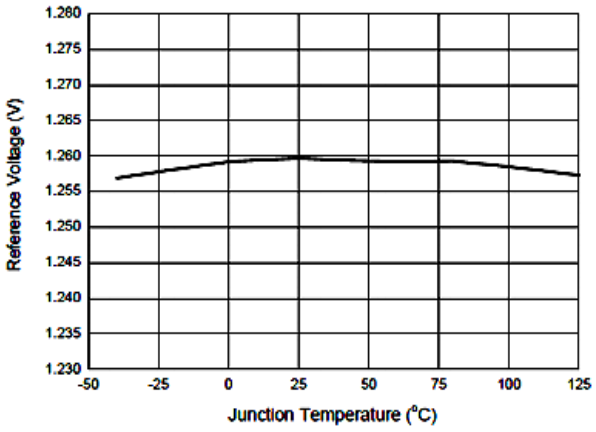


Fig 3: Minimum Load Current vs. Junction Temperature

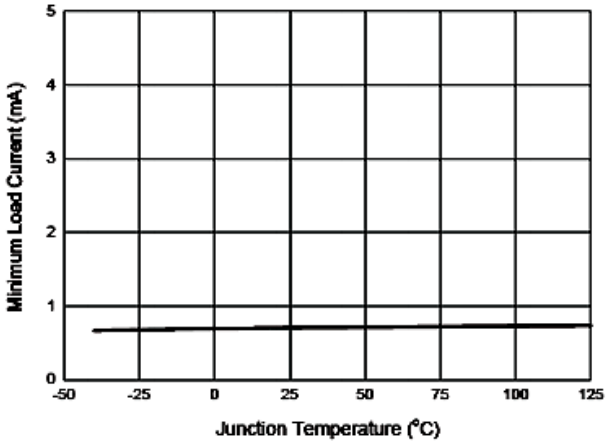


Fig 4: Load Regulation vs Junction Temperature

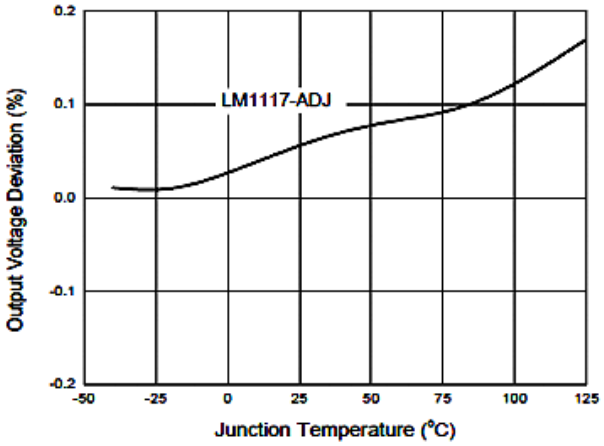


Fig 5: Output Voltage vs Junction Temperature

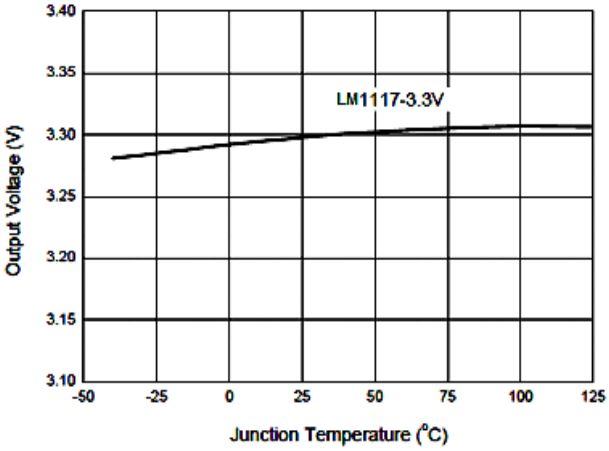


Fig 6: Adjust Pin Current vs. Temperature

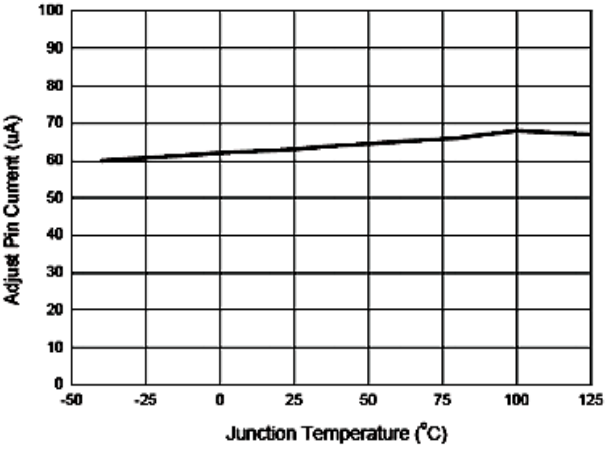


Fig 7: Short-Circuit Current vs. Junction Temperature

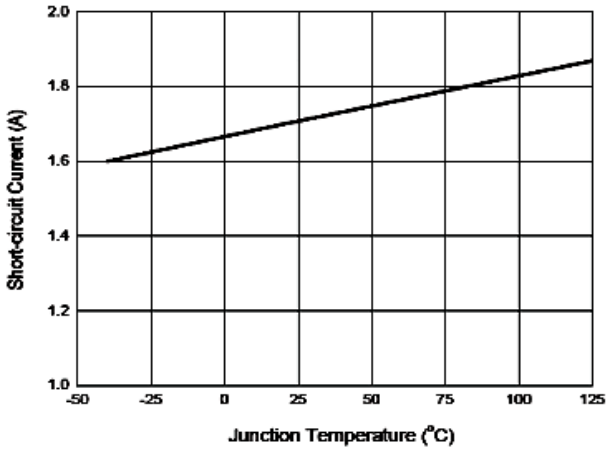


Fig 10: Maximum Power Dissipation

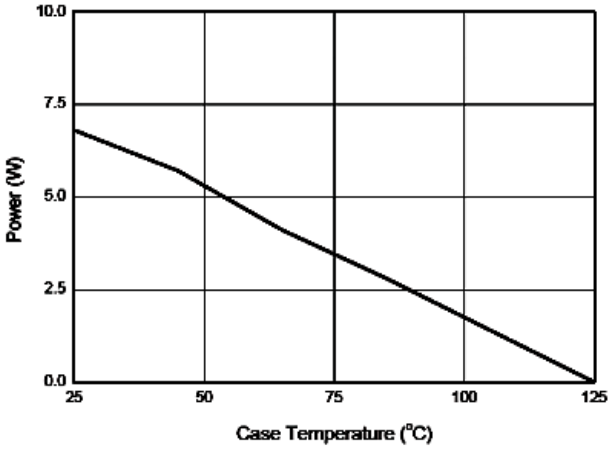


Fig 8: Line Transient Response

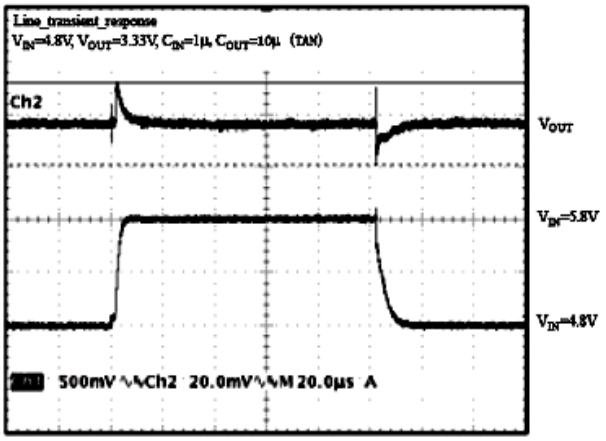


Fig 11: Load Transient Response

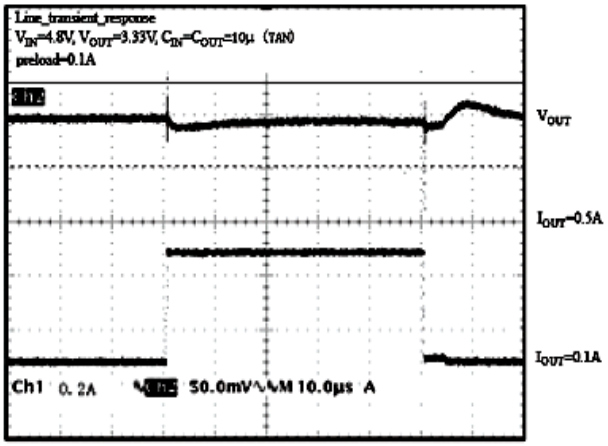
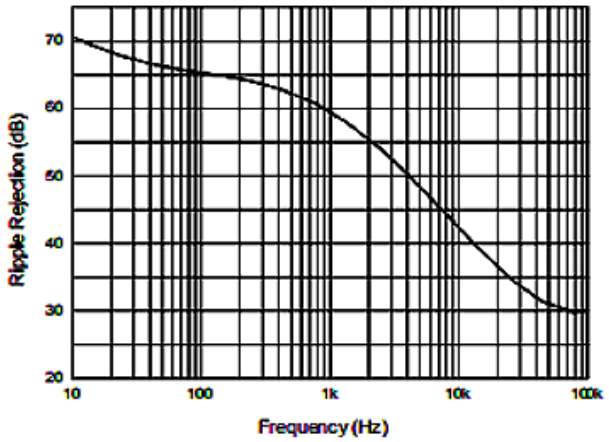
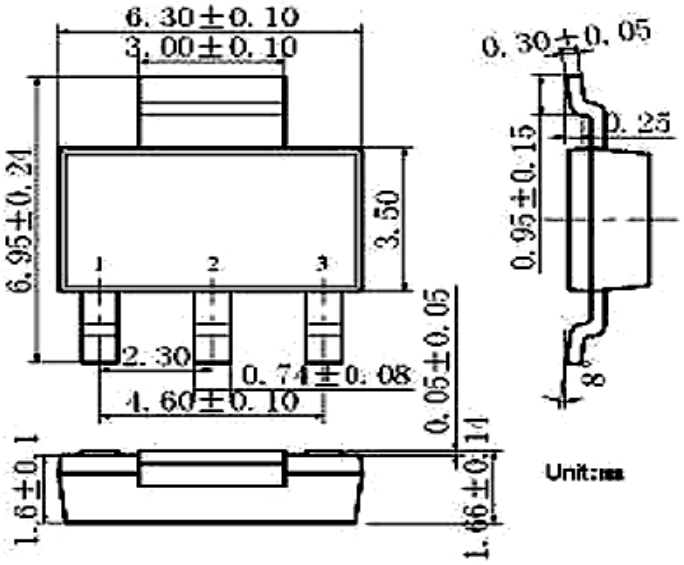


Fig 9: Ripple Rejection vs. Frequency



PACKAGE DETAILS

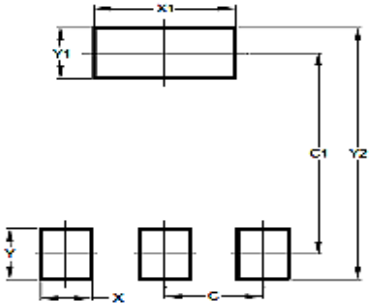
SOT-223 Surface Mount Plastic Package



Pin Conflagration

1. ADJ/GND
2. OUTPUT
3. INPUT

Suggested Pad Layout



Dimensions	Value (in mm)
C	2.30
C1	6.40
X	1.20
X1	3.30
Y	1.60
Y1	1.60
Y2	8.00

Note: The suggested land pattern dimensions have been provided for reference only, as actual pad layouts may vary depending on application.These dimensions may be modified based on user equipment capability or fabrication criteria. A more robust pattern may be desired for wave soldering

Recommended Product Storage Environment for Discrete Semiconductor Devices

This storage environment assumes that the Diodes and transistors are packed properly inside the original packing supplied by CDIL.

- Temperature 5 °C to 30 °C
- Humidity between 40 to 70 %RH
- Air should be clean.
- Avoid harmful gas or dust.
- Avoid outdoor exposure or storage in areas subject to rain or water spraying .
- Avoid storage in areas subject to corrosive gas or dust. Product shall not be stored in areas exposed to direct sunlight.
- Avoid rapid change of temperature.
- Avoid condensation.
- Mechanical stress such as vibration and impact shall be avoided.
- The product shall not be placed directly on the floor.
- The product shall be stored on a plane area. They should not be turned upside down. They should not be placed against the wall.

Shelf Life of CDIL Products

The shelf life of products is the period from product manufacture to shipment to customers. The product can be unconditionally shipped within this period. The period is defined as 2 years.
If products are stored longer than the shelf life of 2 years the products shall be subjected to quality check as per CDIL quality procedure.
The products are further warranted for another one year after the date of shipment subject to the above conditions in CDIL original packing.

Floor Life of CDIL Products and MSL Level

When the products are opened from the original packing, the floor life will start.
For this, the following JEDEC table may be referred:

JEDEC MSL Level		
Level	**Time**	**Condition**
1	Unlimited	≤30 °C / 85% RH
2	1 Year	≤30 °C / 60% RH
2a	4 Weeks	≤30 °C / 60% RH
3	168 Hours	≤30 °C / 60% RH
4	72 Hours	≤30 °C / 60% RH
5	48 Hours	≤30 °C / 60% RH
5a	24 Hours	≤30 °C / 60% RH
6	Time on Label(TOL)	≤30 °C / 60% RH

Customer Notes

Component Disposal Instructions

1. CDIL Semiconductor Devices are RoHS compliant, customers are requested to please dispose as per prevailing Environmental Legislation of their Country.
2. In Europe, please dispose as per EU Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE).

Disclaimer

The product information and the selection guides facilitate selection of the CDIL's Semiconductor Device(s) best suited for application in your product(s) as per your requirement. It is recommended that you completely review our Data Sheet(s) so as to confirm that the Device(s) meet functionality parameters for your application. The information furnished in the Data Sheet and on the CDIL Web Site/CD are believed to be accurate and reliable. CDIL however, does not assume responsibility for inaccuracies or incomplete information. Furthermore, CDIL does not assume liability whatsoever, arising out of the application or use of any CDIL product; neither does it convey any license under its patent rights nor rights of others. These products are not designed for use in life saving/support appliances or systems. CDIL customers selling these products (either as individual Semiconductor Devices or incorporated in their end products), in any life saving/support appliances or systems or applications do so at their own risk and CDIL will not be responsible for any damages resulting from such sale(s).

CDIL strives for continuous improvement and reserves the right to change the specifications of its products without prior notice.

CDIL is a registered trademark of
Continental Device India Pvt. Limited
C-120 Naraina Industrial Area, New Delhi 110 028, India.
Telephone +91-11-2579 6150, 4141 1112 Fax +91-11-2579 5290, 4141 1119
email@cdil.com www.cdil.com
CIN No. U32109DL1964PTC004291