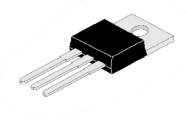
3-Terminal Positive Adjustable Regulator

LM317



TO-220

TO-220
Plastic Package
RoHS compliant

GENERAL DISCRIPTIONS:

The LM317 is an adjustable 3-terminal positive voltage regulator capable of supplying in excess of 1.5A over an output voltage range of 1.2V to 37V.This voltage regulator is exceptionally easy to use and requires only two external resistors to set the output voltage.Further, it employs internal current limiting, thermal shutdown and safe area compensation, making it essentially blow-out proof.

FEATURE:

1. Output current in excess of 1.5 ampere
2. Output adjustable between 1.2V and 37V
3. Internal thermal overload protection
4. Internal short-circuit current limitingconstant with temperature
6. Output transistor safe-area compensation
7. Floating operation for high voltage applications
8. Eliminates stocking many fixed voltages

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

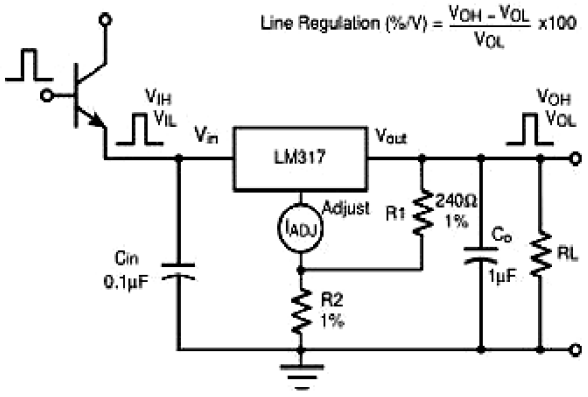
PARAMETER	SYMBOL	VALUE	UNIT
Input-Output Voltage Differential	V_I -V_O	40	V
Junction-to-Case Thermal Resistance	$R_{\theta JC}$	3.0	°C
Power Dissipation, 25°C Case Temperature	P_D	15	W
Operating Junction Temperature Range	T_J	0 to +125	°C
Storage Junction Temperature Range	T_{stg}	-65 to +150	°C

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Line Regulation $3.0V \le V_I - V_o \le 40V$	REG_{line}	T_A = 25°C	--	0.01	0.04	$\%V_o/V$
		T_J = 0°C thru 125°C	--	0.02	0.07	
Load Regulation T_J = 25°C, 10mA ≤ Io ≤ 1.5A	REG_{load}	Vo ≤ 5.0	--	5	25	mV
		Vo ≥ 5.0	--	0.1	0.5	$\%V_o$
Load Regulation T_J = 25°C, 10mA ≤ Io ≤ 1.5A	REG_{load}	Vo ≤ 5.0	--	20	70	mV
		Vo ≥ 5.0	--	0.3	1.5	$\%V_o$
Thermal Regulation	REG_{therm}	T_J=25°C, 20ms Pulse	--	0.03	0.07	$\%V_o/W$
Adjustment Pin Current	I_{Adj}		--	50	100	µA
Adjustment Pin Current Change	ΔI_{Adj}	10mA ≤ I_L ≤ 1.5A $2.5V \le V_I - V_o \le 40V$	--	0.2	5	µA
Reference Voltage	V_{ref}	10mA ≤ I_o ≤ 1.5A $3V \le V_I - V_o \le 40V$	1.2	1.25	1.3	V
Temperature Stability	TS	$T_{low} \le T_J \le T_{high}$	--	1	--	$\%V_o$
Min. Load Current to Maintain Regulation	I_{Lmin}	$V_I - V_o$ = 40V	--	3.5	10	mA
Maximum Output Current	I_{max}	$V_I - V_o \le 15V$	1.5	2.2	--	A
		$V_I - V_o$ = 40V,	0.15	0.4	--	
RMS Noise, % of Vo	N	T_J = 25°C, 10HZ ≤ f ≤ 10KHZ	--	0.003	--	$\%V_o$
Ripple Rejection	R_R	V_o = 10V, f = 120HZ	--	65	--	dB
			66	80	--	
Long-Term Stability	S	T_J=25°C for Endpoint Measurements	--	0.3	1.0	%
Thermal Resistance Junction to Case	$R_{\theta JC}$	Tlow ≤ T_J ≤ Thigh	--	5.0	--	°C/W

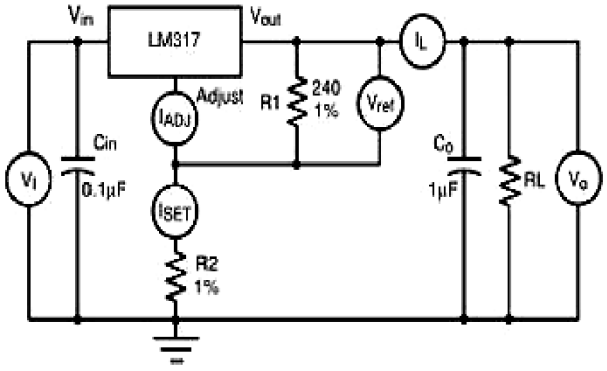
TEST CIRCUIT AND DIAGRAMS

1. Line Regulator Test Circuit



Pulse Testing Required:
1% Duty Cycle is Suggested

2. Standard Test Circuit



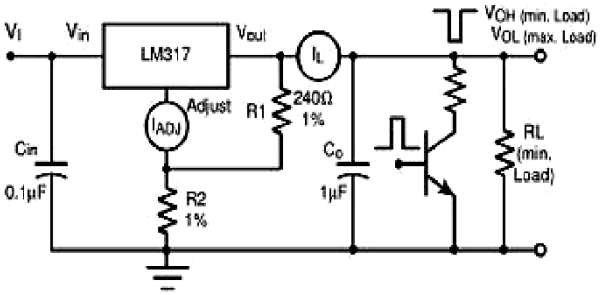
Pulse Testing Required:
1% Duty Cycle is Suggested

To Calculate R2:
$V_O = I_{SET} R2 + 1.250V$
Assume $I_{SET} = 5.25mA$

3. Load Regulator and ΔI_{adj} / Load Test Circuit

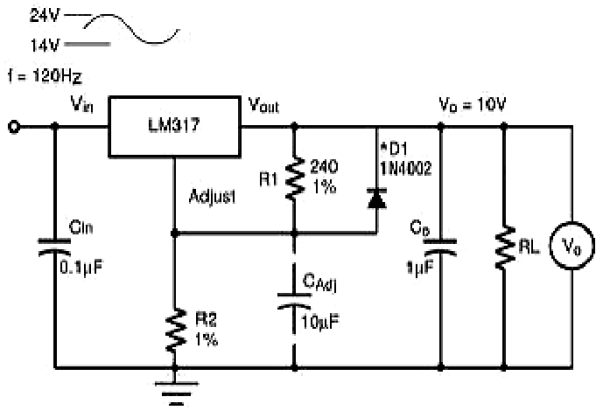
Load Regulator (mV) = Vo(min. Load) – Vo(max. Load)

Load Regulator (%Vo) = Vo(min. Load) – Vo(max. Load) / Vo(min. Load) x100



Pulse Testing Required:
1% Duty Cycle is Suggested

4. Ripple Rejection Test Circuit



*D1 Discharges C_{ADJ} If
Output Is Shorted to Ground

TYPICAL CHARACTERISTICS CURVES

Fig 1: Load Regulator

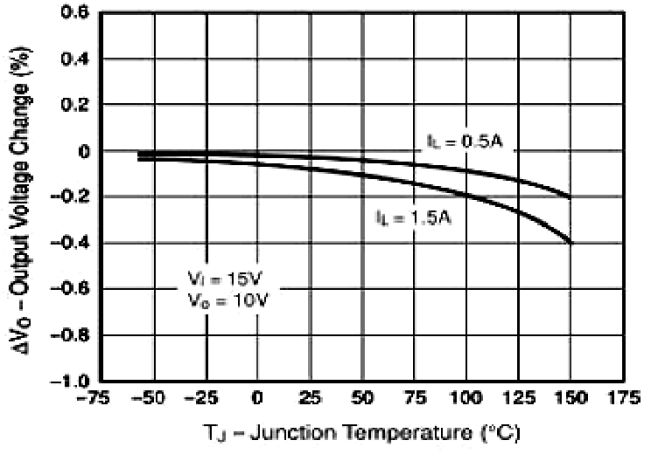


Fig 2: Adjustment Pin Current

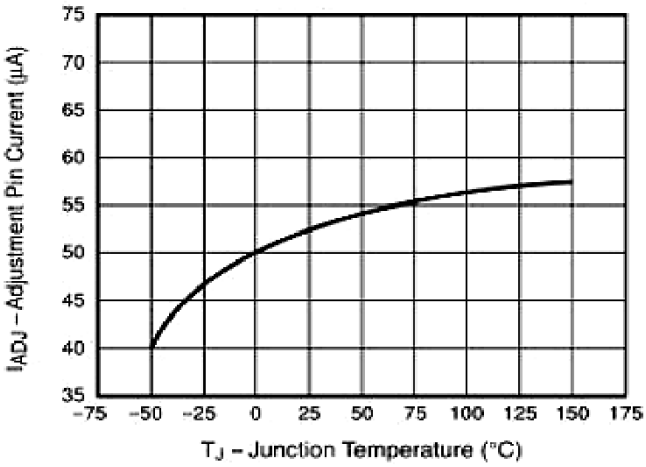


Fig 3: Temperature Stability

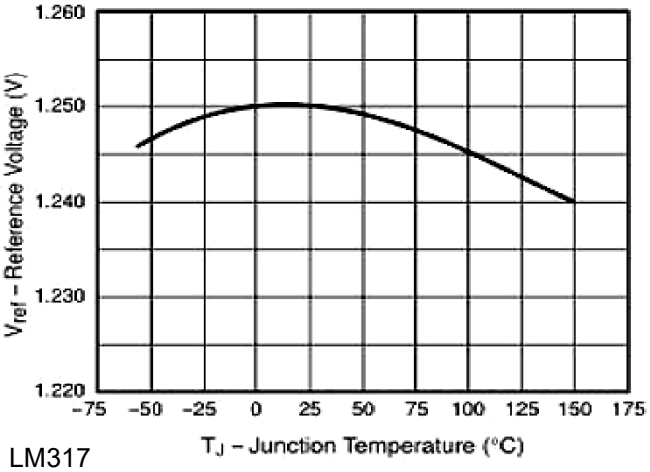


Fig 4: Current Limit

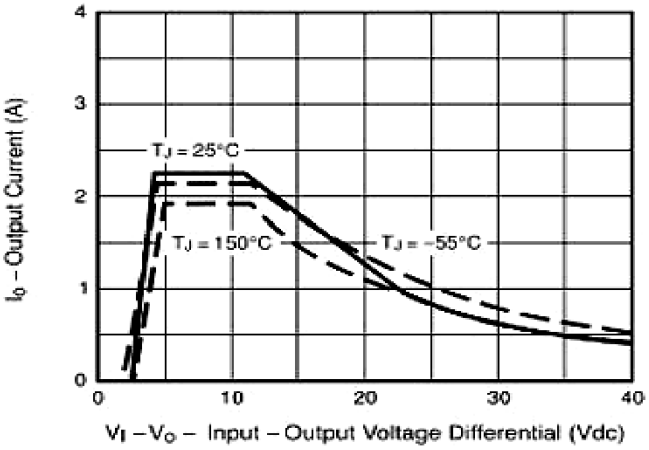


Fig 5: Dropout Voltage

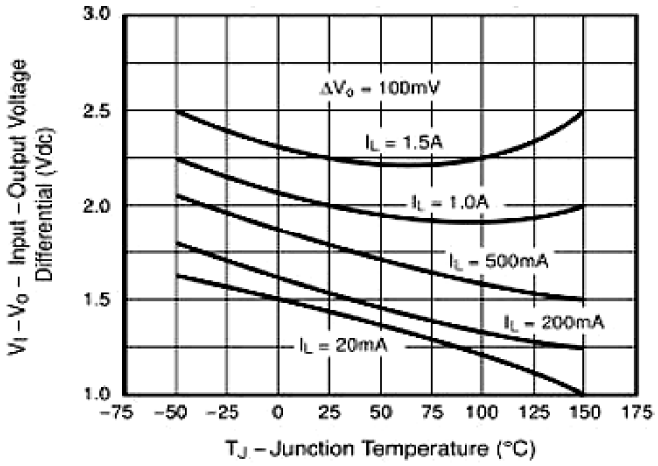
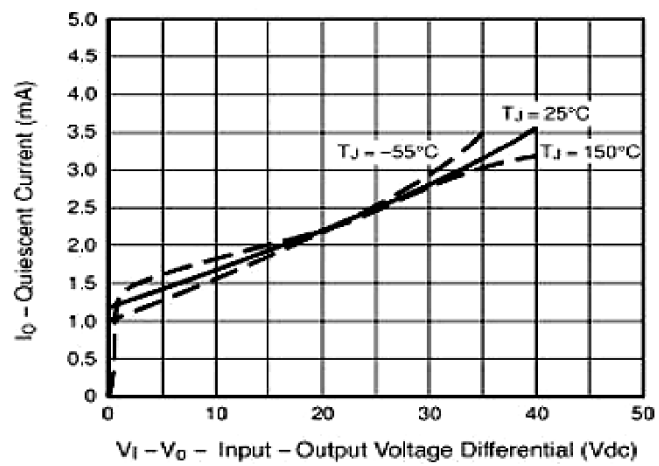


Fig 6: Minimum Operating Current



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TYPICAL CHARACTERISTICS CURVES

Fig 7: Ripple Rejection vs Output Voltage

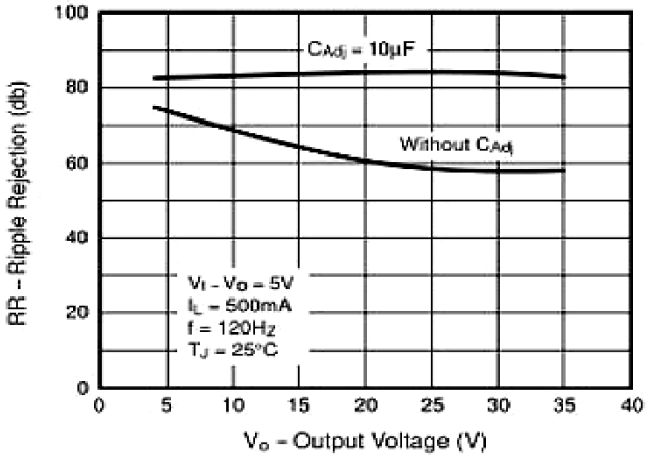


Fig 8: Ripple Rejection vs Frequency

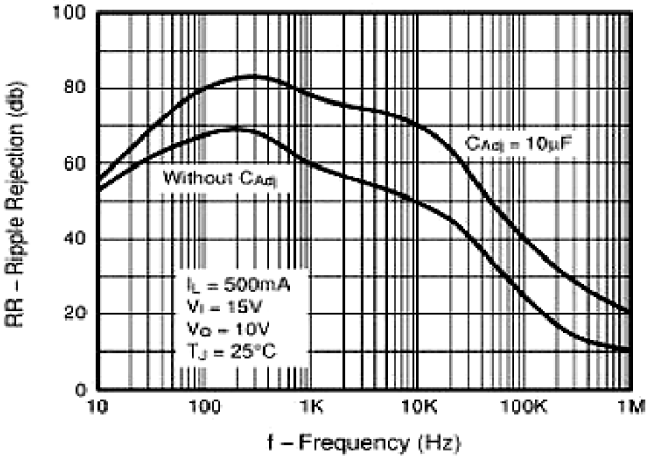


Fig 9: Line Transient Response

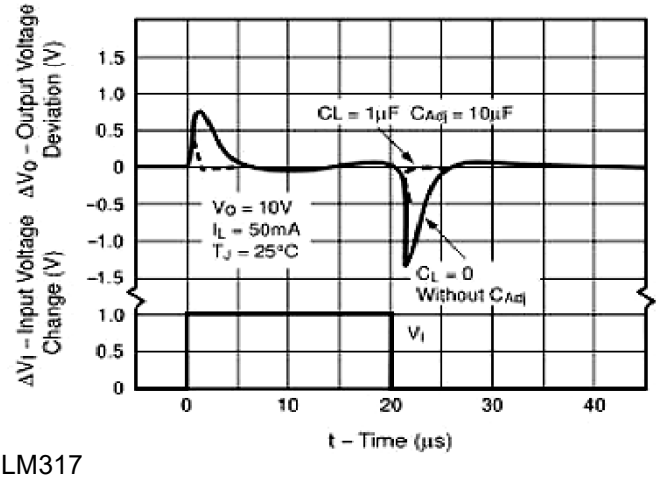


Fig 10: Ripple Rejection vs Output Current

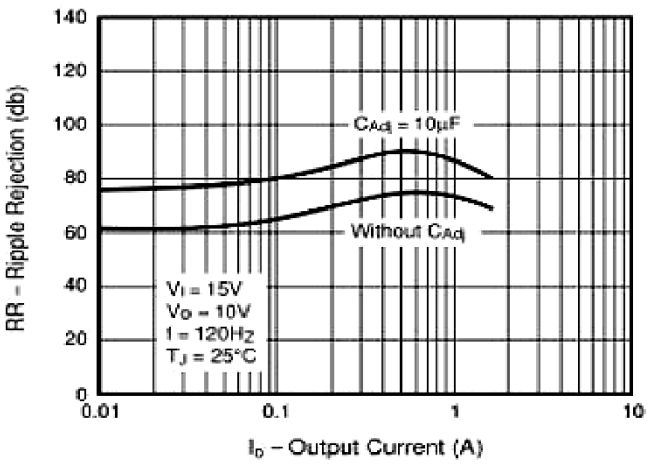


Fig 11: Output Impedance

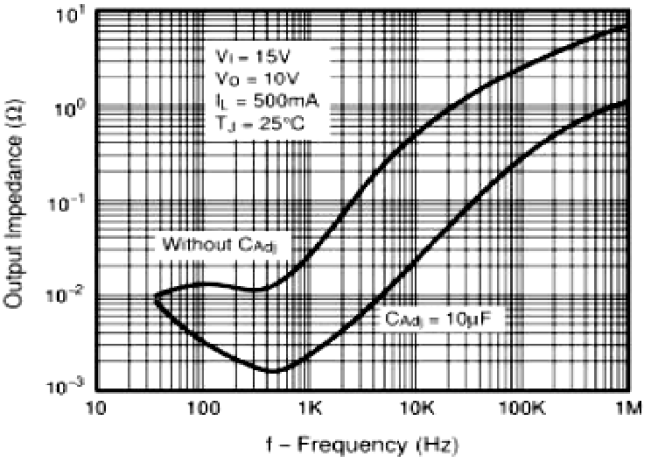
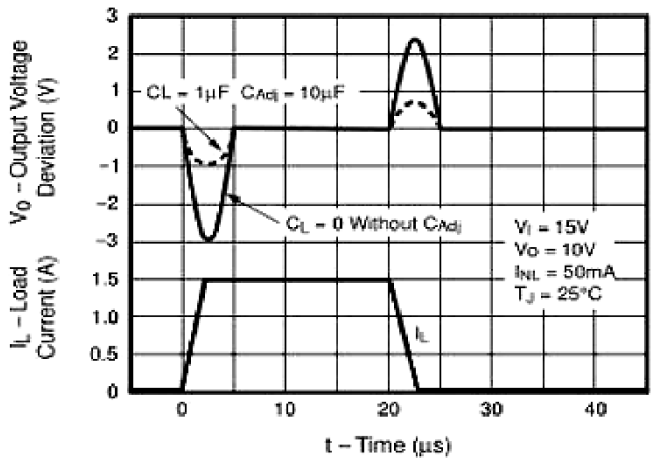


Fig 12: Load Transient Response



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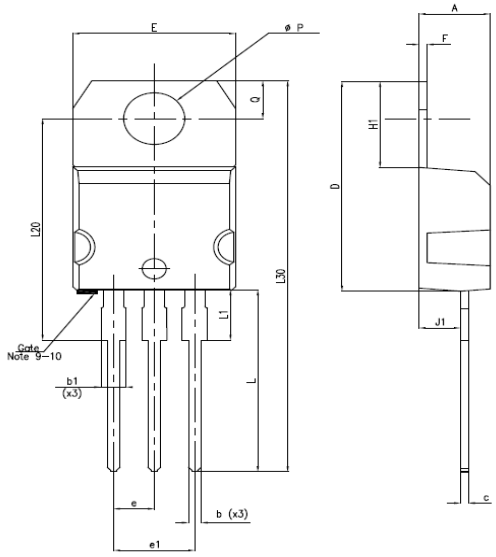
PACKAGE DETAILS

TO-220 Plastic Package



Dimension	Values (mm)		
	Min	Typ.	Max
A	4.20	--	4.40
b	0.75	--	0.99
b1	1.14	--	1.70
c	0.38	--	0.70
D	15.25	--	15.75
E	10.00	--	10.40
e	2.40	--	2.70
e1	4.95	--	5.15
F	1.15	--	1.35
H1	6.20	--	6.60
J1	2.40	--	2.72
L	13.00	--	14.00
L1	3.50	--	3.93
L20	--	16.40	--
L30	--	28.90	--
ΦP	3.60	--	3.85
Q	2.65	--	2.95

PIN CONFIGURATION

1. Adj
2. Output
3. Input

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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

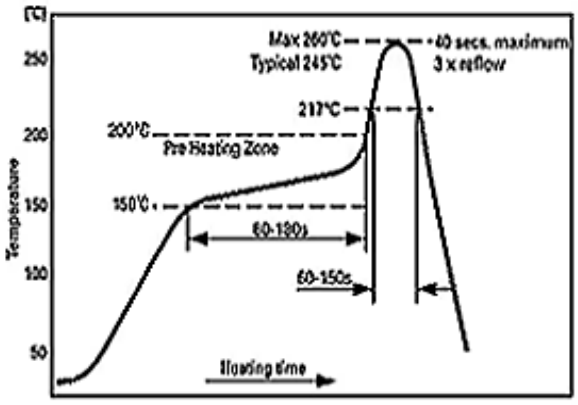
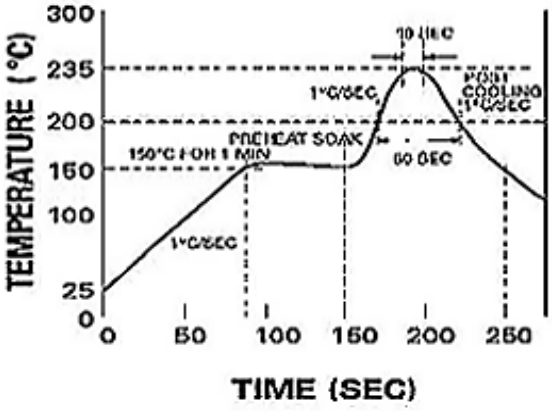


Figure 2

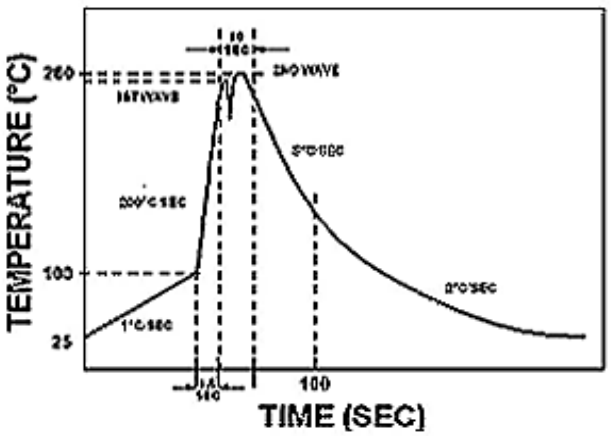


Reflow profiles in tabular form

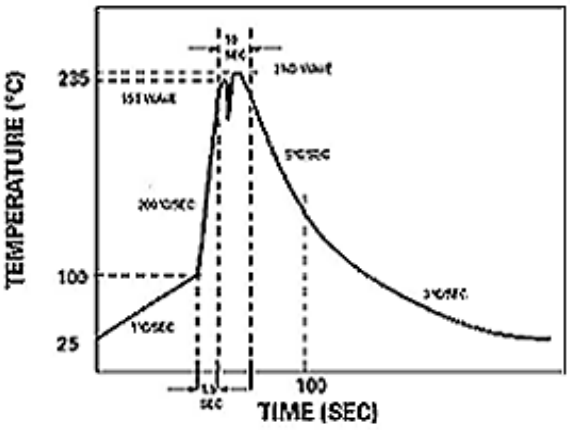
Profile Feature	Sn-Pb System	Pb-Free System
Average Ramp-Up Rate	~3°C/second	~3°C/second
Preheat – Temperature Range – Time	 150-170°C 60-180 seconds	 150-200°C 60-180 seconds
Time maintained above: – Temperature – Time	 200°C 30-50 seconds	 217°C 60-150 seconds
Peak Temperature	235°C	260°C max.
Time 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

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).

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