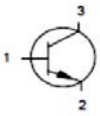
NPN SMALL SIGNAL TRANSISTOR

CMBT4401



SOT-23



SOT-23
SMD Package
RoHS compliant

Device marking

CMBT4403 = **2X**

GENERAL DESCRIPTION:

This device is designed for use as a general purpose amplifier and switch requiring collector currents to 500 mA

FEATURES:

1. Epitaxial Planar Die Construction
2. Complementary PNP Type Available (CMBT4403)
3. Ideal for Medium Power Amplification and Switching
4. This product is available in AEC-Q101 Compliant and PPAP Capable also.

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

APPLICATIONS:

Switching and General purpose amplifier applications.

ABSOLUTE MAXIMUM RATINGS (T_a = 25 °C)

Parameter	Symbol	Value	Unit
Collector-base voltage (open emitter)	V_{CBO}	60	V
Collector emitter voltage (open base)	V_{CEO}	40	V
Emitter base voltage (open collector)	V_{EBO}	6.0	V
Collector current (dc.)	I_C	600	mA
Total power dissipation up to T_{amb} = 25 °C	P_{TOT} [1]	250	mW
Storage Temperature Range	T_{stg}	-55 to 150	°C
Junction Temperature	T_j	150	°C
THERMAL RESISTANCE			
From junction to ambient	$R_{\theta ja}$	500	K/W

ELECTRICAL CHARACTERISTICS (T_j = 25 °C Unless Otherwise Specified)

Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
Collector Emitter Breakdown Voltage	BV_{CEO}	Ic=1mA, Ib=0	40	--	--	V
Collector Base Break down Voltage	BV_{CBO}	I_C = 100uA; I_E = 0	60	--	--	V
Emitter Base Break down Voltage	BV_{EBO}	I_C = 0; I_E = 100uA	6.0	--	--	V
Base cut–off current	I_{EBX}	V_{CE}=35V, V_{EB} =0.4V	--	--	0.1	µA
Collector cut–off current	I_{CEX}	V_{CE}=35V, V_{EB} =0.4V	--	--	0.1	µA
D.C. current gain	h_{FE}	I_C = 0.1 mA; V_{CE} = 1 V	20	--	--	
		I_C = 1 mA; V_{CE} = 1 V	40	--	--	
		I_C = 10 mA; V_{CE} = 1 V	80	--	--	
		I_C = 150 mA; V_{CE} = 2 V	100	--	300	
		I_C = 500 mA; V_{CE} = 2 V	40	--	--	
Saturation Voltages	V_{CESat}	I_C= 150mA , I_B= 15mA	--	--	0.4	V
	V_{BESat}		0.75	--	0.95	V
	V_{CESat}	I_C= 500mA , I_B= 50mA	--	--	0.75	V
	V_{BESat}		--	--	1.2	V
Current - Gain - Bandwidth Product	f_T	V_{CE} = 10 V, I_C = 20 mA, f = 100 MHz	200	--	--	MHz
Collector–base capacitance	C_{ob}	I_E =0, V_{CB} = 10V, f=100 KHz	--	--	8.0	pF
Emitter–base capacitance	C_{eb}	I_E =0, V_{CB} = 3.5V, f=100 KHz	--	--	30	pF
Input impedance	h_{ie}	I_C=1 mA; V_{CE} =10 V, f=1 KHz	1.0	--	8.0	KΩ
Voltage feed–back ratio	h_{re}	I_C=1 mA; V_{CE} =10 V, f=1 KHz	0.1×10^{-4}	--	30×10^{-4}	
Small–signal current gain	h_{fe}	I_C=1 mA; V_{CE} =10 V, f=1 KHz	40	--	500	
Output admittance	h_{oe}	I_C=1 mA; V_{CE} =10 V, f=1 KHz	1	--	30	µS
Switching times (resistive load)						
Turn–on time						
Delay time	t_d	I_C = 150 mA; I_{B1} = 15 mA; V_{CC} = 30 V; V_{EB} = 2 V	--	--	15	ns
Rise time	t_r		--	--	30	ns
Turn–off time						
Storage time	t_s	I_C = 150 mA; V_{CC} = 30 V; $-I_B1 = +I_B2$ = 15 mA	--	--	225	ns
Fall time	t_f		--	--	30	ns

Typical Characteristic curves

Fig 1:Typical Pulsed Current Gain vs Collector Current

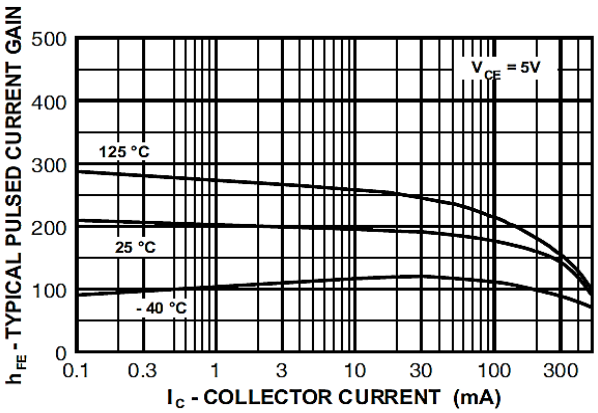


Fig 2:Collector-Emitter Saturation Voltage vs Collector Current

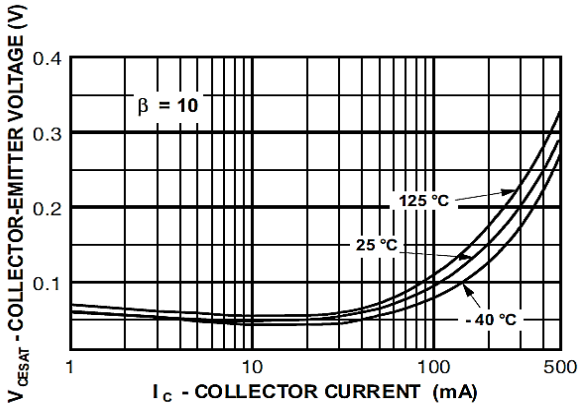


Fig 3:Base-Emitter Saturation Voltage vs Collector Current

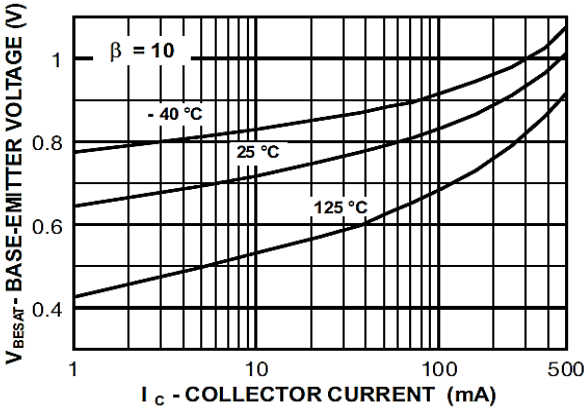


Fig 4:Base Emitter ON Voltage vs Collector Current

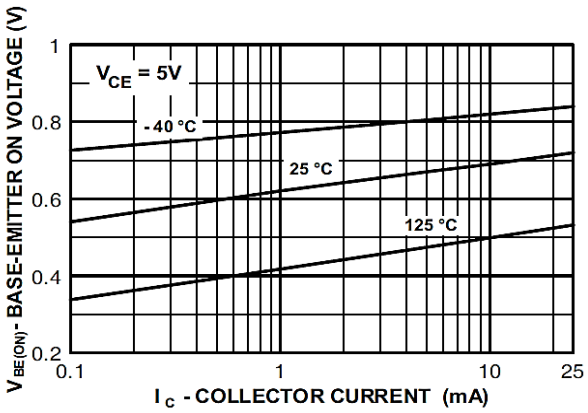


Fig 5:Collector-Cutoff Current vs Ambient Temperature

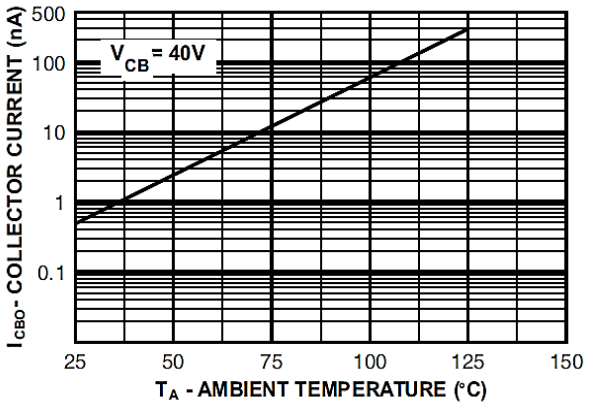
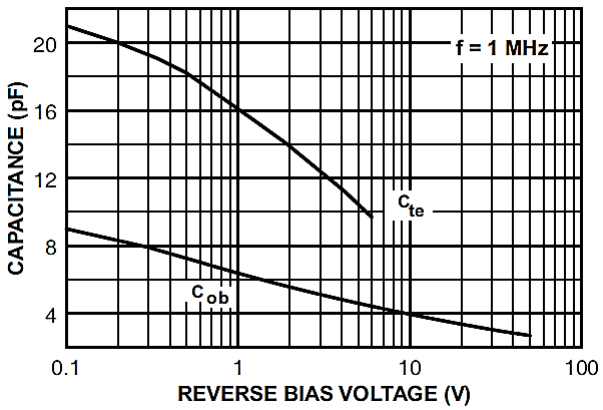
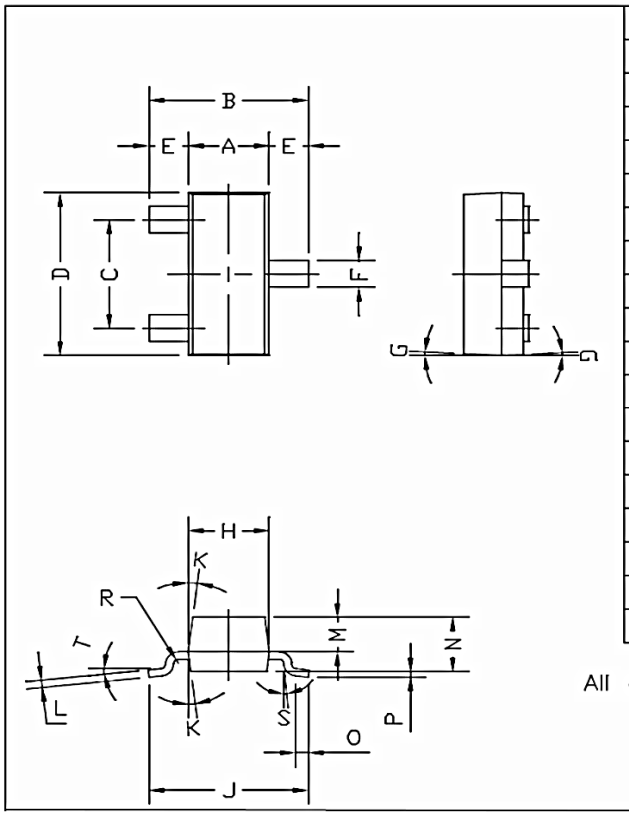


Fig 6:Input and Output Capacitance vs Reverse Bias Voltage



PACKAGE DETAILS

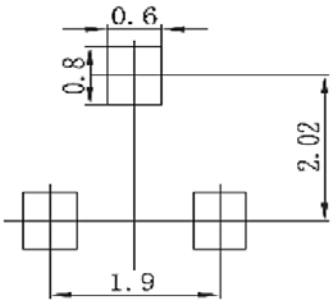
SOT-23 SMD Package



DIM	MIN	MAX
A	1.275	1.325
B	2.40	2.60
C	1.85	1.95
D	2.875	2.925
E	0.54 REF	
F	0.38	0.48
G	3 DEG	
H	–	1.30
J	2.40	2.60
K	7 DEG	
L	0.11	0.13
M	0.58	0.62
N	0.925	0.975
O	0.21	–
P	0.02	0.10
R	–	0.08
S	2 DEG	8 DEG
T	2 DEG	10 DEG

All dimensions are in mm

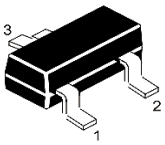
Recommended foot print

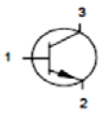


Note:
1.Controlling dimension:In millimeters.
2.General tolerance:± 0.05mm.
3.The pad layout is for reference purposes only.

Pin Configuration

1. BASE
2. EMITTER
3. COLLECTOR

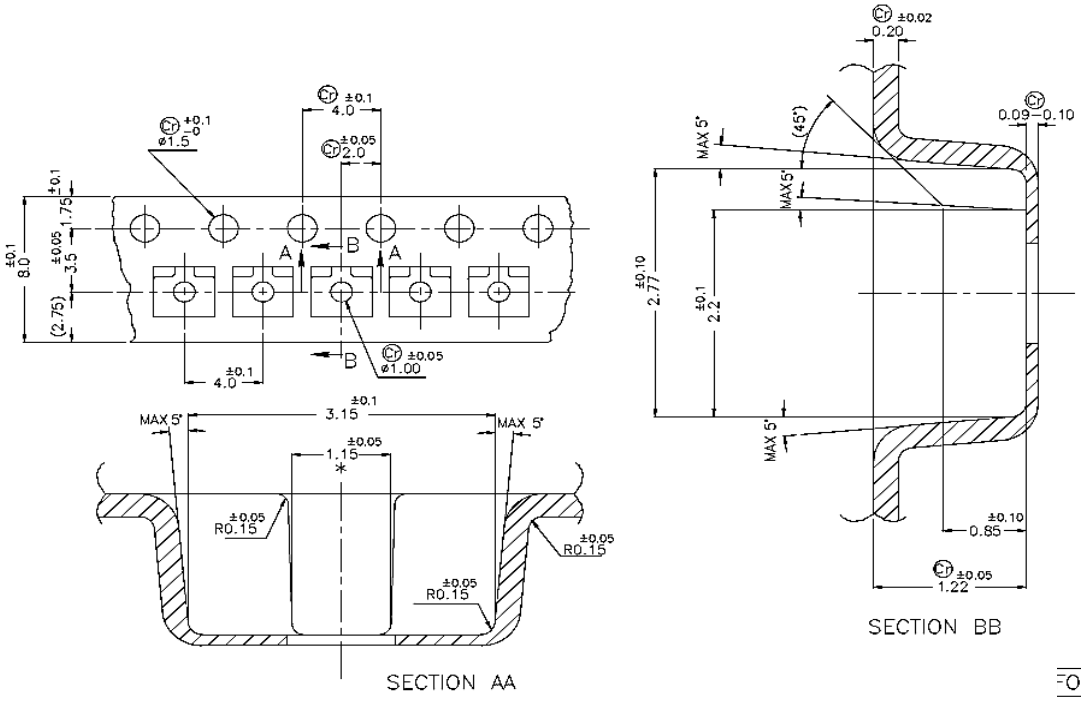




CMBT4401
Rev01_15112025M/SW/JS

PACKING INFORMATION

EMBOSSED PLASTIC CARRIER TAPE FOR SOT-23



NOTES:

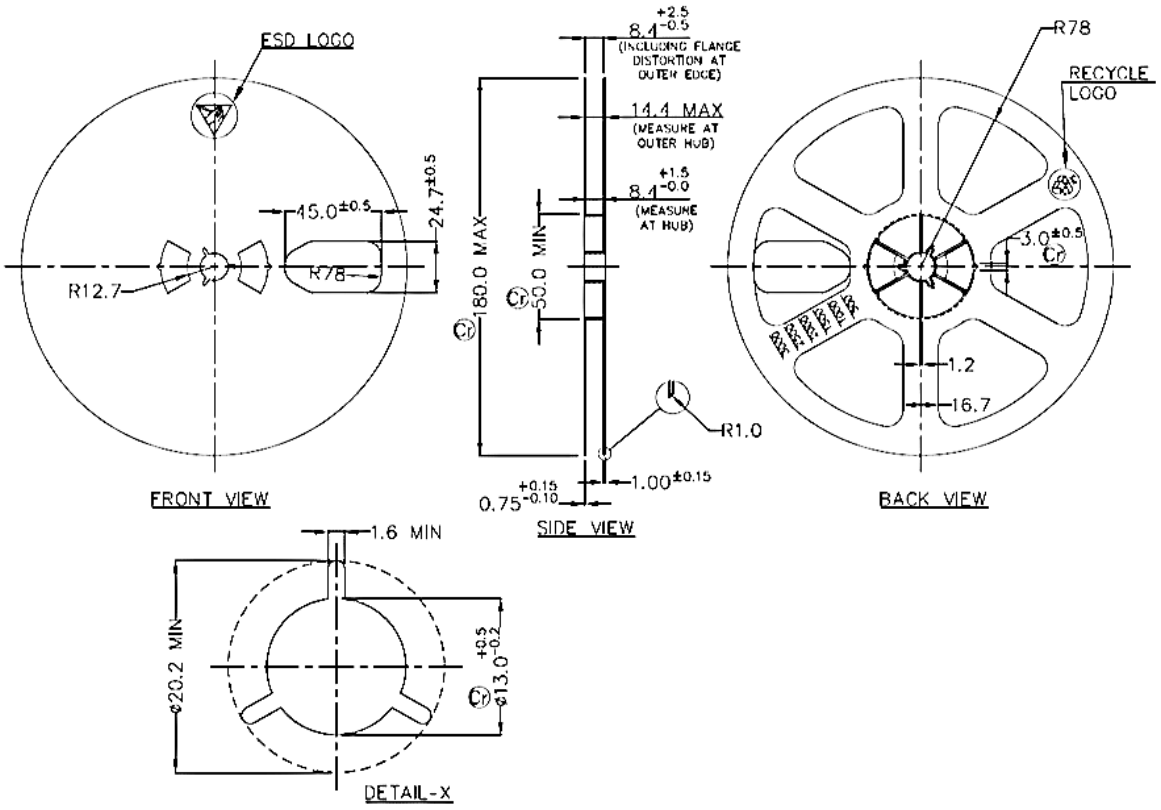
1. The bandoier of 330mm reel contains at least 10,000 device.
2. The bandoier of 180mm reel contains at least 3,000 device.
3. No more than 0.5% missing device/reel 50 empty compartments for 330mm reel. 15 empty compartments for 180mm reel.
4. Three consecutive empty places might be found provided this gap is followed by 6 consecutive devices.
5. The carrier tape (leader) starts with at least 75 empty positions (equivalent to 330 mm). In order to fix the carrier tape a self adhesive tape of 20 to 50 mm is applied. At the end of the bandolier at least 40 empty positions (equivalent to 160 mm) are there.

Mechanical Data

1. Package Material: Molded Plastic. UL Flammability Classification Rating 94V-0
2. Polarity: Pls. see pin configuration
3 Weight: 0.008 grams (Approximate)

PACKING INFORMATION

SOT-23 Tape and Reel



All dimensions are in mm

Note: 13" Reel is also available.

Size of Tape	8mm	8mm
Size of reel	330mm (13")	180mm (7")
No. of Device	10,000 Pcs	3,000 Pcs

Packing Detail

SOT 23						
Package	Standard Pack		Inner Carton Box		Outer Box	
	Details	Net Weight/Qty	Size	Qty	Size	Qty
SOT 23 T&R	3K/reel	110 gm/3K pcs	7.5" x 7.5" x 3"	18 K	18" x 9" x 9"	150 K
			9" x 9" x 9"	60 K	18" x 12" x 9"	180 K
					18" x 15" x 9"	240 K
					19" x 19" x 20"	480 K
	10K/reel	370 gm/10Kpcs	13.5" x 13.5" x 1"	20 K	13.5" x 13.5" x 6"	100 K

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

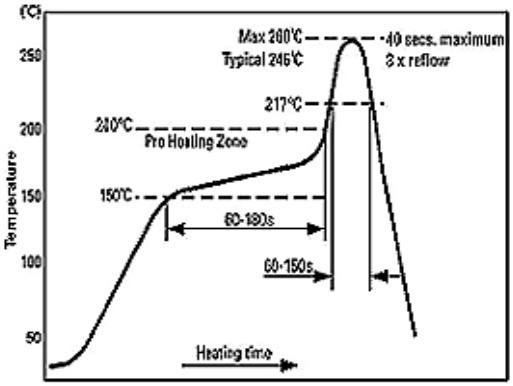
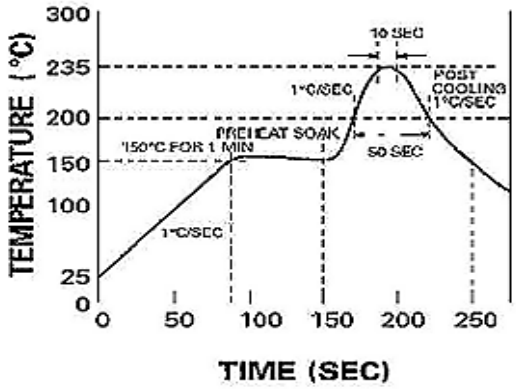


Figure 2

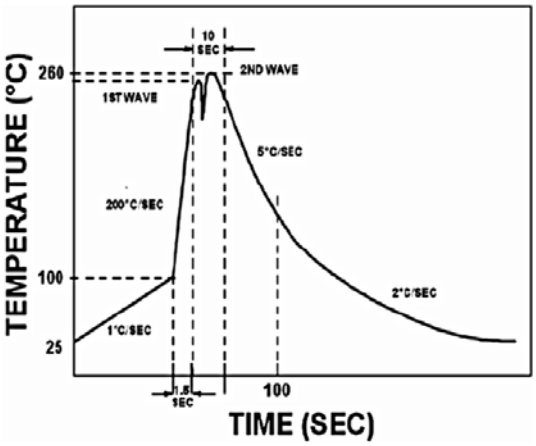


Reflow profiles in tabular form

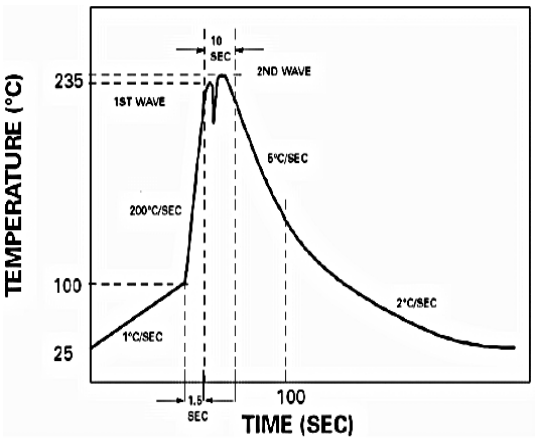
Profile Feature	Sn-Pb System	Pb-Free System
Average Ramp-Up Rate	~3°C/second	~3°C/second
Preheat – Temperature Range – Time	 150-170°C 60-180 seconds	 150-200°C 60-180 seconds
Time maintained above: – Temperature – Time	 200°C 30-50 seconds	 217°C 60-150 seconds
Peak Temperature	235°C	260°C max.
Time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