



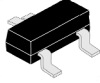
Continental Device India Pvt. Limited

An IATF 16949, ISO9001 and ISO 14001/ISO 45001 Certified Company



NPN SILICON EPITAXIAL TRANSISTORS

CMBT3903
CMBT3904



SOT-23

SOT-23
SMD Package
RoHS compliant

FEATURE

1. Marking

CMBT3903 = 1Y

CMBT3904 = 1A

2. 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.

ABSOLUTE MAXIMUM RATINGS (Ta = 25 °C Unless otherwise specified)

PARAMETER	SYMBOL	VALUE	UNIT
Collector–base voltage (open emitter)	V _{CBO}	MAX 60	V
Collector–emitter voltage (open base)	V _{CEO}	MAX 40	V
Emitter–base voltage (open collector)	V _{EBO}	MAX 6	V
Collector current (DC)	I _C	MAX 200	mA
Total power dissipation up to T _{amb} = 25°C	P _{tot}	MAX 250	mW
D.C. current gain CMBT3903 at I _C = 10mA; V _{CE} = 1V	h _{FE}	MAX	50
		MIN	150
D.C. current gain CMBT3904 at I _C = 10mA; V _{CE} = 1V	h _{FE}	MAX	100
		MIN	300
Transition frequency at f = 35MHz I _C = 10mA; V _{CE} = 20V	f _T	MAX 300	MHz
Total power dissipation up to T _{amb} = 25 °C	P _{tot}	MAX 250	mW
Storage temperature	T _{stg}	-55 to +150	°C
Junction temperature	T _j	MAX 150	°C

THERMAL RESISTANCE $T_j = P (R_{th\ j-t} + R_{th\ t-s} + R_{th\ s-a}) + T_{amb}$

from junction to ambient	R _{th j-a}	500	K/W
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CMBT3903_04
Rev02_28112022E



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ELECTRICAL CHARACTERISTICS at (Ta = 25 °C Unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITION	VALUE		UNIT	
Collector–emitter breakdown voltage	$V_{(BR)CEO}$	$I_C = 1\text{mA}; I_B = 0$	MIN	40	V	
Collector–base breakdown voltage	$V_{(BR)CBO}$	$I_C = 10\mu\text{A}; I_E = 0$	MIN	60	V	
Emitter–base breakdown voltage	$V_{(BR)EBO}$	$I_E = 10\mu\text{A}; I_C = 0$	MIN	6	V	
Collector cut–off current	I_{CEX}	$V_{CE} = 30\text{V}; V_{EB} = 3\text{V}$	MAX	50	nA	
Output capacitance at f = 1 MHz	C_c	$I_E = 0; V_{CB} = 5\text{V}$	MAX	4	pF	
Input capacitance at f = 1 MHz	C_e	$I_C = 0; V_{BE} = 0,5\text{V}$	MAX	8	pF	
Base current with reverse biased emitter junction	I_{BEX}	$V_{EB} = 3\text{V}; V_{CE} = 30\text{V}$	MAX	50	nA	
Saturation voltages	V_{CEsat}	$I_C = 10\text{mA}; I_B = 1\text{mA}$	MAX	0.2	V	
	V_{CEsat}	$I_C = 50\text{mA}; I_B = 5\text{mA}$	MAX	0.3	V	
	V_{BEsat}	$I_C = 10\text{mA}; I_B = 1\text{mA}$	MIN	0.65	V	
			MAX	0.85	V	
	V_{BEsat}	$I_C = 50\text{mA}; I_B = 5\text{mA}$	MAX	0.95	V	
				CMBT3903	CMBT3904	
D.C. current gain	h_{FE}	$I_C = 0,1\text{mA}; V_{CE} = 1\text{V}$	MAX	20	40	
		$I_C = 1\text{mA}; V_{CE} = 1\text{V}$	MAX	35	70	
		$I_C = 10\text{mA}; V_{CE} = 1\text{V}$	MAX	50	100	
			MIN	150	300	
		$I_C = 50\text{mA}; V_{CE} = 1\text{V}$	MAX	30	60	
$I_C = 100\text{mA}; V_{CE} = 1\text{V}$	MAX	15	30			
Transition frequency at f = 100 MHz	f_T	$I_C = 10\text{mA}; V_{CE} = 20\text{V}$	MIN	250	300	MHz
Noise figure at $R_S = 1\text{k}\Omega$	F	$I_C = 100\text{mA}; V_{CE} = 5\text{V}$ $f = 10\text{Hz to } 15,7\text{kHz}$	MAX	6	5	dB
Small Signal Current Gain	h_{fe}	$V_{CE} = 10\text{V}; I_C = 1\text{mA};$ $f = 1\text{KHz}$	MIN	50	100	
			MAX	200	400	

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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

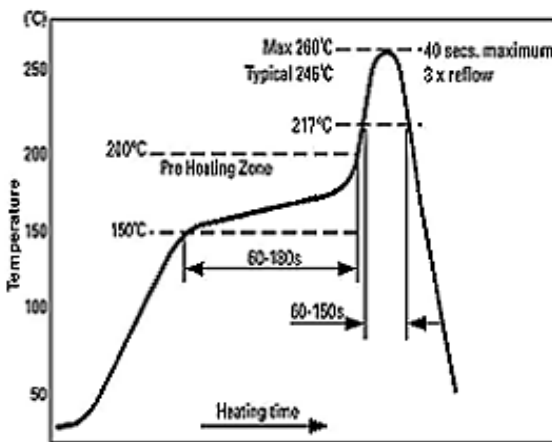
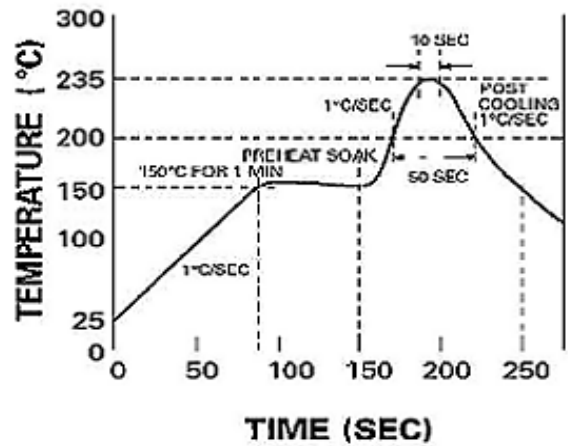


Figure 2

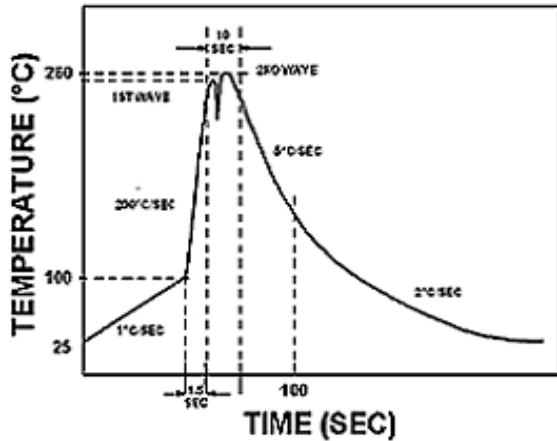


Reflow profiles in tabular form

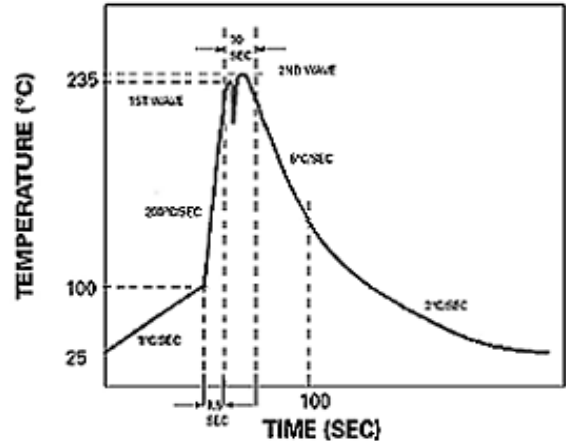
Profile Feature	Sn-Pb System	Pb-Free System
Average Ramp-Up Rate	~3°C/second	~3°C/second
Preheat		
– Temperature Range	150-170°C	150-200°C
– Time	60-180 seconds	60-180 seconds
Time maintained above:		
– Temperature	200°C	217°C
– Time	30-50 seconds	60-150 seconds
Peak Temperature	235°C	260°C max.
Time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



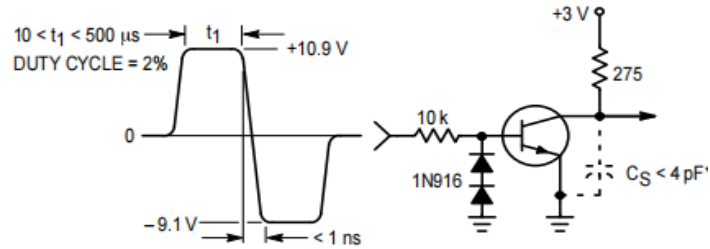
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TEST CIRCUIT AND DIAGRAMS

Delay and Rise Time Equivalent Test Circuit



Typical Characteristic Curves

Fig 1: Capacitance

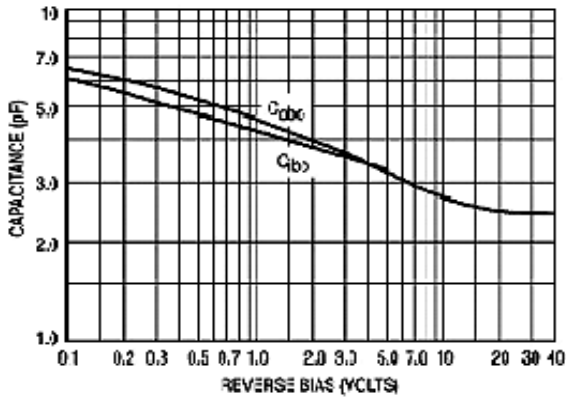


Fig 4: Charge Data

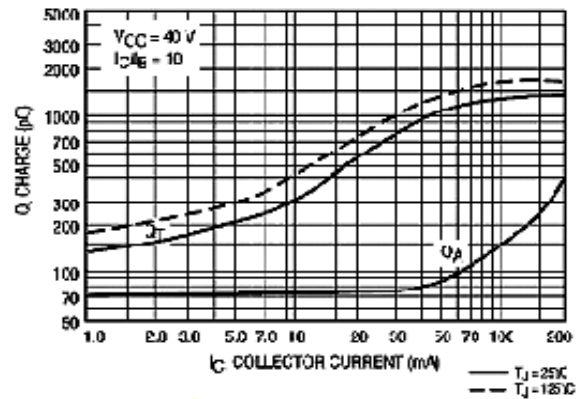


Fig 2: Turn-On Time

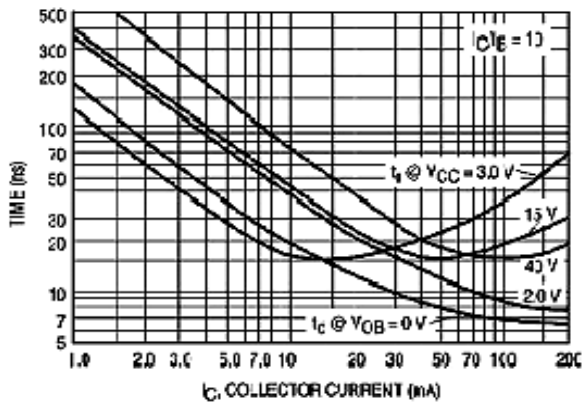


Fig 5: Fall Time

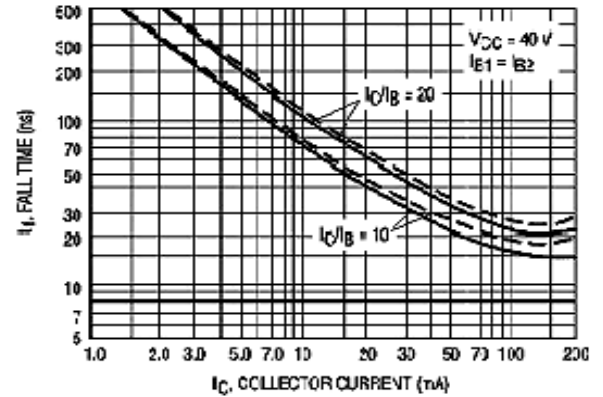


Figure 3: "ON" Voltages

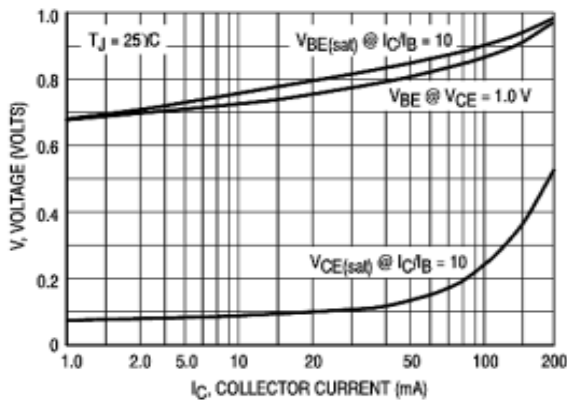
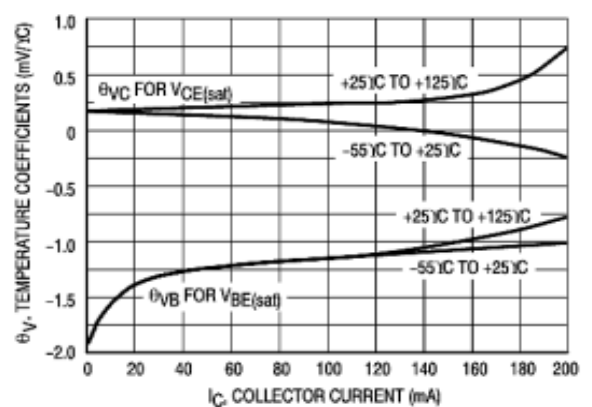


Figure 6: Temperature Coefficients





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Typical Characteristic Curves

Figure 7. DC Current Gain

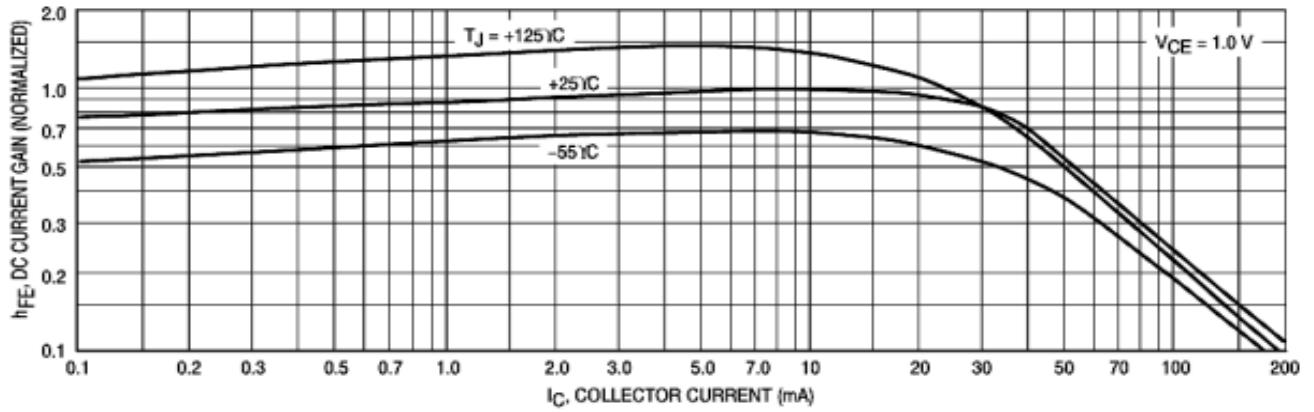
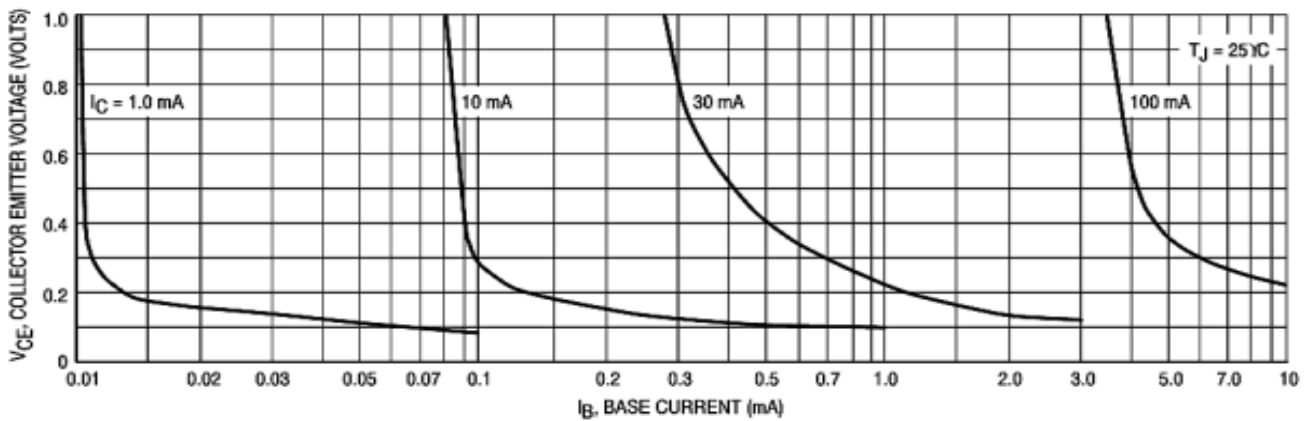
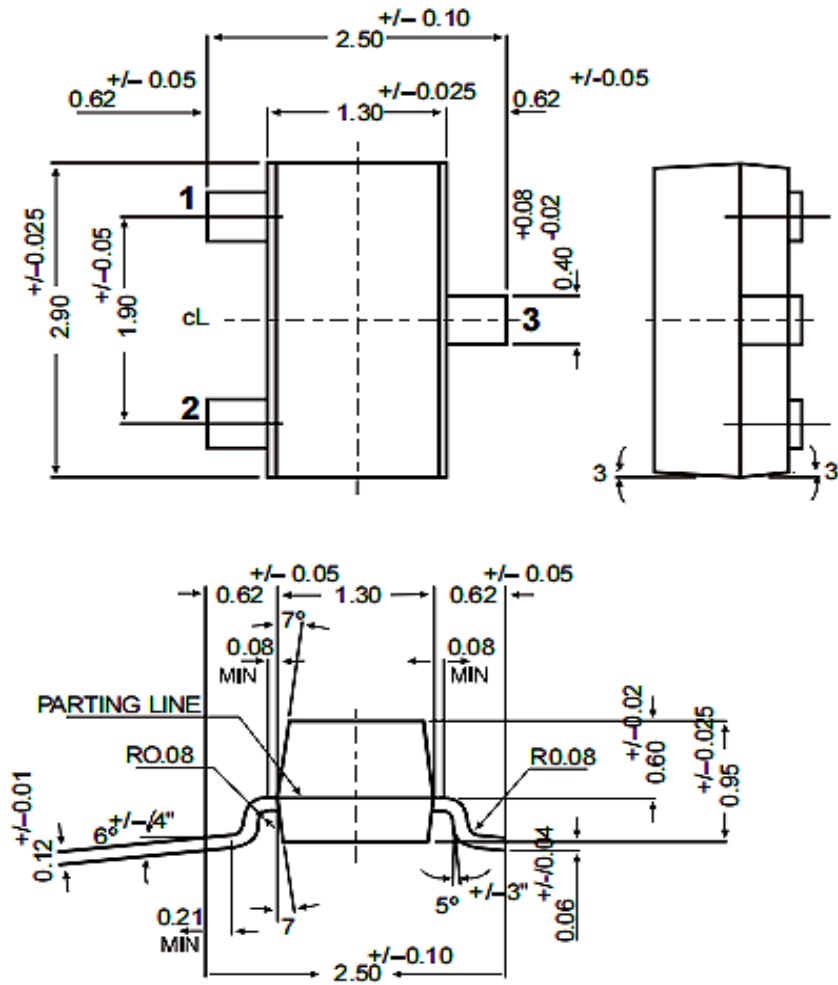


Figure 8. Collector Saturation Region



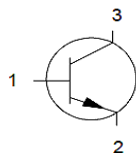
PACKAGE DETAILS

SOT-23 Formed SMD Package



Pin configuration

- 1. BASE
- 2. EMITTER
- 3. COLLECTOR





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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



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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.



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CIN No. U32109DL1964PTC004291

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