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# 4N29, 4N30, 4N31, 4N32, 4N33

## DC Input 6-Pin DMC-Isolator®

### Photodarlington Optocoupler

#### Features

- High isolation 5000 VRMS
- Patented coplanar structure DMC-Isolator®
- DC input with Transistor output
- Operating Temperature range - 55 °C to 100 °C
- External Creepage  $\geq 7.4\text{mm}$
- Distance Through Isolation  $\geq 0.4\text{mm}$
- Clearance Distance  $\geq 7.5\text{mm}$  (S/SL Type)
- Clearance Distance  $\geq 8.0\text{mm}$  (M/SLM Type)
- RoHS and REACH Compliance
- Halogen Free Compliance (Optional)
- MSL class 1
- Regulatory Approvals
  - ✓ UL - UL1577 (E364000)
  - ✓ VDE - EN60747-5-5(VDE0884-5)
  - ✓ CQC – GB4943.1, GB8898 (14001105802)
  - ✓ IEC62368 (FI/41119)

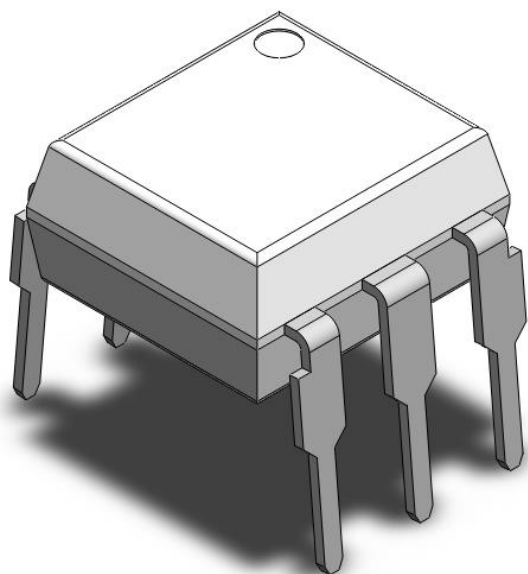
#### Description

The 4N29, 4N30, 4N31, 4N32, and 4N33 series consist of a photodarlington transistor optically coupled to an Infrared-emitting diode in a 6-lead DIP DMC-Isolator® package with different lead forming options.

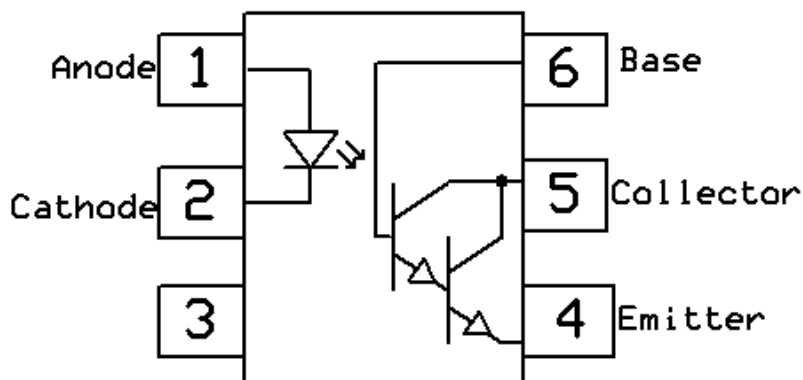
#### Applications

- Switch mode power supplies
- Computer peripheral interface
- Microprocessor system interface

#### Package Outline



#### Schematic



*Note: Different bending options available. See package dimension.*



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#### Absolute Maximum Ratings $T_A = 25^\circ\text{C}$ , unless otherwise specified

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of this document. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameters	Ratings	Units	Notes
V <sub>ISO</sub>	Isolation voltage (AC, 1 minute, 40 ~ 60% R.H.)	5000	V <sub>RMS</sub>	
T <sub>OPR</sub>	Operating temperature	-55 ~ +100	°C	
T <sub>STG</sub>	Storage temperature	-55 ~ +150	°C	
T <sub>SOL</sub>	Soldering temperature (For 10 seconds)	260	°C	
<b>Emitter</b>				
I <sub>F</sub>	Forward current	60	mA	
I <sub>F(TRANS)</sub>	Peak transient current (≤1μs P.W,300pps)	1	A	
V <sub>R</sub>	Reverse voltage	6	V	
P <sub>D</sub>	Power dissipation	120	mW	
<b>Detector</b>				
P <sub>D</sub>	Power dissipation	150	mW	
B <sub>VCEO</sub>	Collector-Emitter Breakdown Voltage	55	V	
B <sub>VCBO</sub>	Collector-Base Breakdown Voltage	55	V	
B <sub>VECO</sub>	Emitter-Collector Breakdown Voltage	7	V	
B <sub>VEBO</sub>	Emitter-Base Breakdown Voltage	7	V	



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#### Electrical Characteristics $T_A = 25^\circ\text{C}$ , unless otherwise specified

##### Emitter Characteristics

Symbol	Parameters		Test Conditions	Min	Typ	Max	Units	Notes
$V_F$	Forward voltage	4N29	$I_F = 10\text{mA}$	-	1.24	1.4	V	
		4N30						
		4N31						
		4N32						
		4N33						
$I_R$	Reverse Current		$V_R = 6\text{V}$	-	-	5	$\mu\text{A}$	
$C_{IN}$	Input Capacitance		$f = 1\text{MHz}$	-	45	-	pF	

##### Detector Characteristics

Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes
$B_{V_{CEO}}$	Collector-Emitter Breakdown	$I_C = 100\mu\text{A}$	55	-	-	V	
$B_{V_{ECO}}$	Emitter-Collector Breakdown	$I_E = 100\mu\text{A}$	7	-	-	V	
$B_{V_{CBO}}$	Collector-Base Breakdown	$I_C = 100\mu\text{A}$	55	-	-	V	
$I_{CEO}$	Collector-Emitter Dark Current	$V_{CE} = 10\text{V}$ , $I_F = 0\text{mA}$	-	-	100	nA	



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#### Electrical Characteristics $T_A = 25^\circ\text{C}$ , unless otherwise specified (Continued)

##### Transfer Characteristics

Symbol	Parameters		Test Conditions	Min	Typ	Max	Units	Notes
CTR	Current Transfer Ratio	4N29, 4N30	$I_F = 10\text{mA}$ , $V_{CE} = 10\text{V}$	100	-	-	%	
		4N31		50	-	-		
		4N32, 4N33		500	-	-		
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	4N29, 4N30, 4N32, 4N33	$I_F = 8\text{mA}$ , $I_C = 2\text{mA}$	-	-	1.0	V	
		4N31	$I_F = 8\text{mA}$ , $I_C = 2\text{mA}$	-	-	1.2		
$R_{IO}$	Isolation Resistance		$V_{IO} = 500\text{V}_{DC}$	$1 \times 10^{11}$	-	-	$\Omega$	
$C_{IO}$	Isolation Capacitance		$f = 1\text{MHz}$	-	0.25	-	pF	

##### Switching Characteristics

Symbol	Parameters		Test Conditions	Min	Typ	Max	Units	Notes
$T_{ON}$	Turn On Time	4N29, 4N30, 4N31, 4N32, 4N33	$I_F = 200\text{mA}$ , $I_C = 50\text{mA}$ , $R_L = 100\Omega$	-	-	4.7	$\mu\text{s}$	
$T_{OFF}$	Turn Off Time	4N29, 4N30, 4N31	$I_F = 200\text{mA}$ , $I_C = 50\text{mA}$ , $R_L = 100\Omega$	-	-	30	$\mu\text{s}$	
		4N32, 4N33		-	-	90		



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#### Typical Characteristic Curves $T_A = 25^\circ\text{C}$ , unless otherwise specified

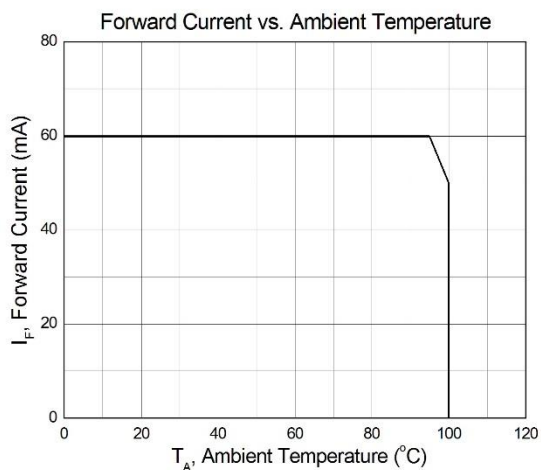


Figure 1

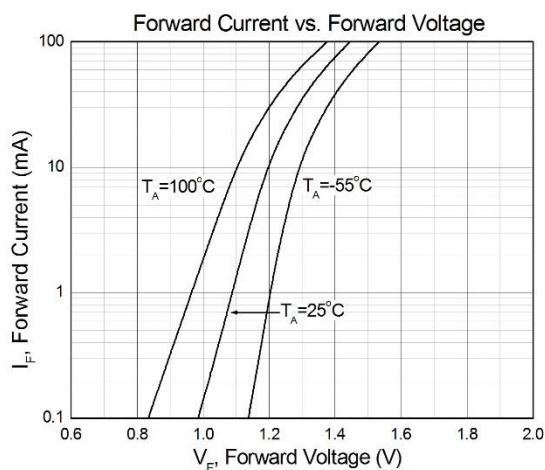


Figure 2

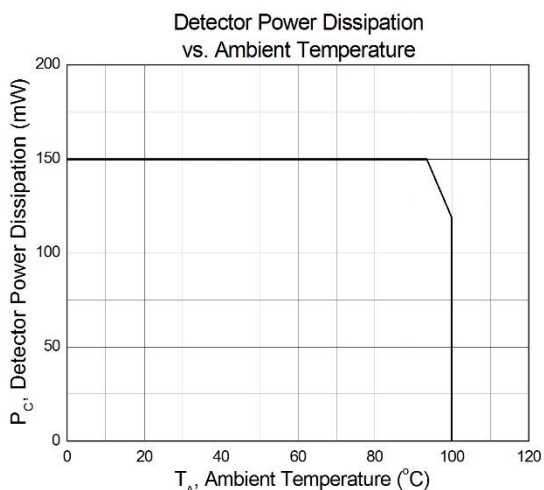


Figure 3

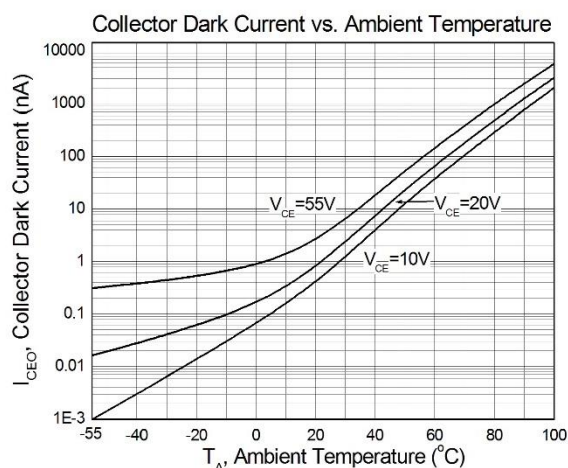


Figure 4

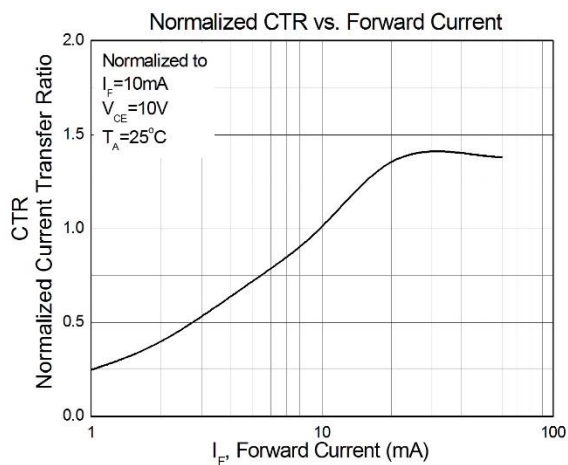


Figure 5

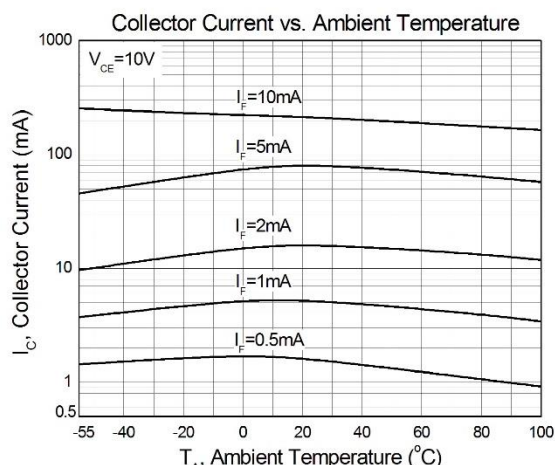
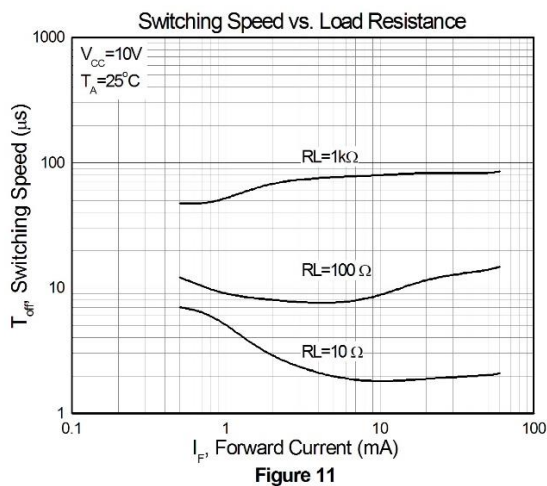
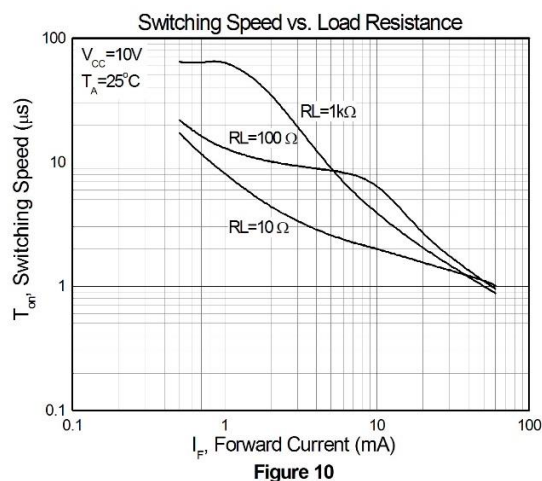
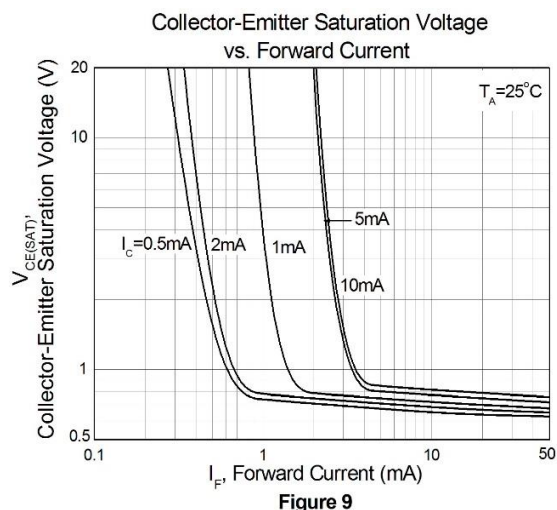
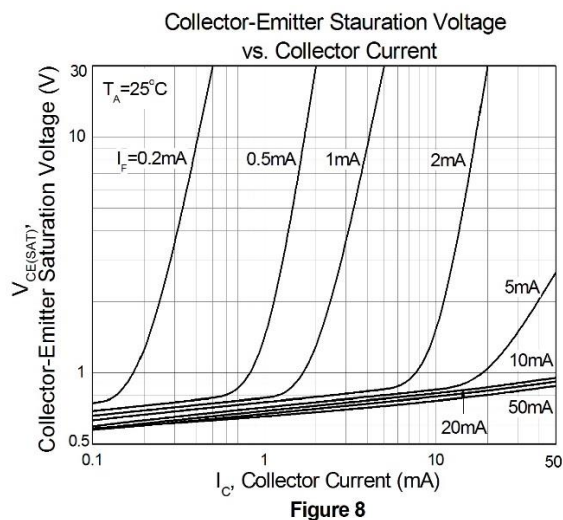
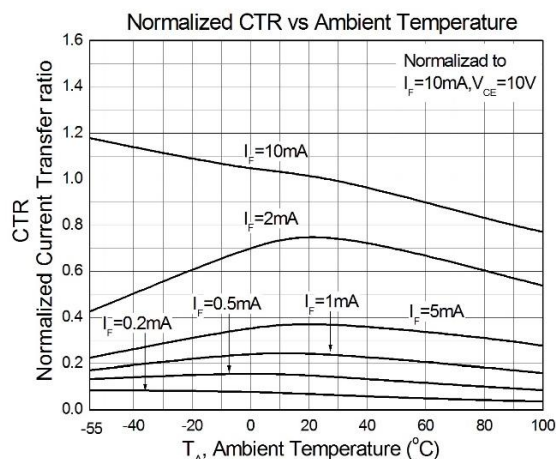


Figure 6



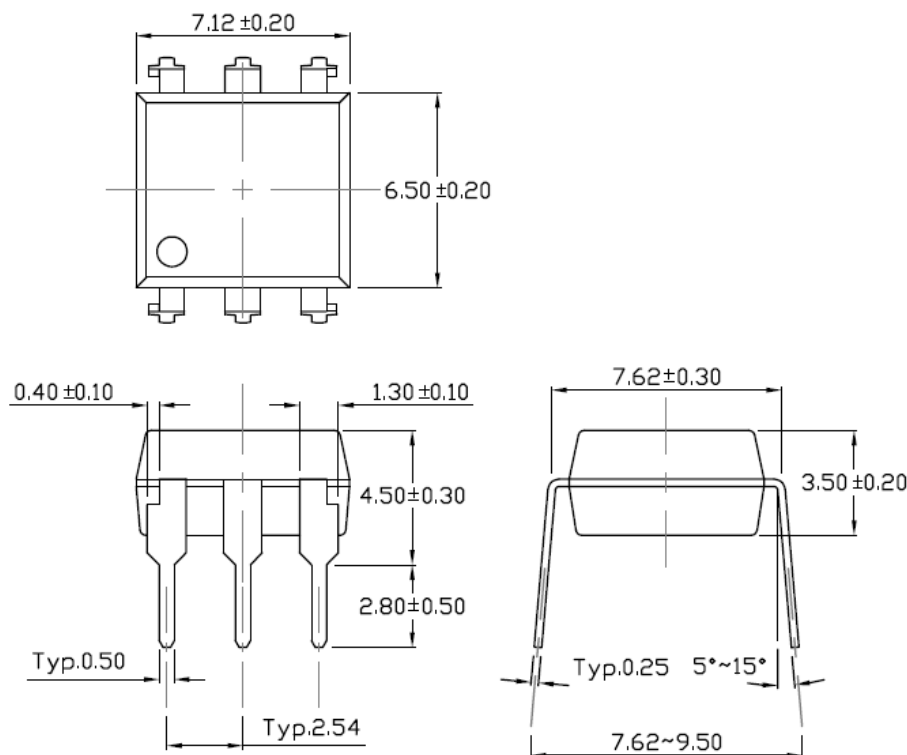
Typical Characteristic Curves  $T_A = 25^\circ\text{C}$ , unless otherwise specified (Continued)





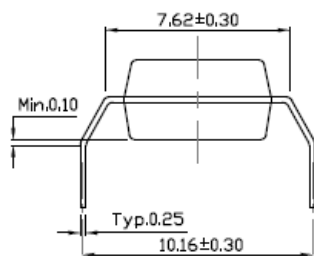
**Package Dimension** *Dimensions in mm unless otherwise stated*

**Standard DIP – Through Hole**

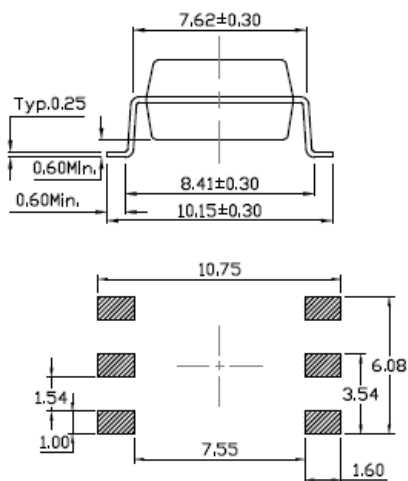


**Forming Option**

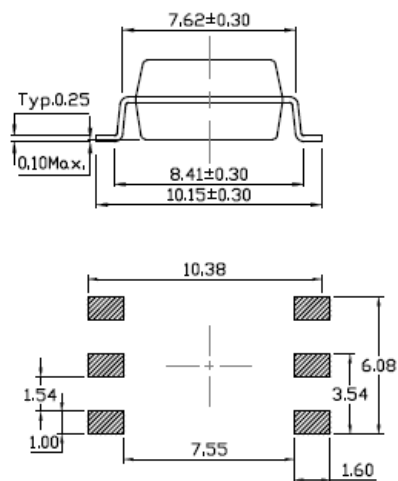
**M Type**



**S Type**



**SL Type**



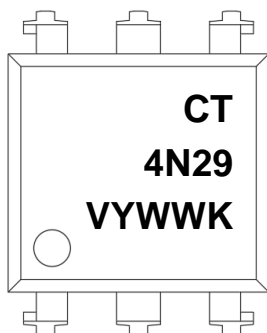


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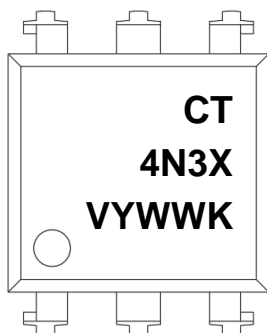
### Photodarlington Optocoupler

## Marking Information



### Note:

CT : Denotes "CT Micro"  
4N29 : Part Number  
V : VDE Safety Mark Option (Blank or V)  
Y : One Digit Year Code  
WW : Two Digit Work Week  
K : Manufacturing Code



### Note:

CT : Denotes "CT Micro"  
4N3X : Part Number (X=0,1,2 or 3)  
V : VDE Safety Mark Option (Blank or V)  
Y : One Digit Year Code  
WW : Two Digit Work Week  
K : Manufacturing Code





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## DC Input 6-Pin DMC-Isolator®

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## Ordering Information

### 4N29(V)(Y)(Z)-G

- 29 = Part Number
- V = VDE Safety Mark Option (Blank or V)
- Y = Lead Form Option (Blank, M, S or SL)
- Z = Tape and Reel Option (Blank, T1 or T2)
- G = Material Option (G: Halogen Free, Blank: Non-Halogen Free)

### 4N3X(V)(Y)(Z)-G

- X = Part Number (0, 1, 2, 3 for 4N3X series)
- V = VDE Safety Mark Option (Blank or V)
- Y = Lead Form Option (Blank, M, S or SL)
- Z = Tape and Reel Option (Blank, T1 or T2)
- G = Material Option (G: Halogen Free, Blank: Non-Halogen Free)

<b>Option</b>	<b>Description</b>	<b>Quantity</b>
None	Standard 6 Pin Dip	50Units/Tube
M	Wide Lead Forming	50Units/Tube
S(T1)	Surface Mount Lead Forming – With Option 1 Taping	1000 Units/Reel
S(T2)	Surface Mount Lead Forming – With Option 2 Taping	1000 Units/Reel
SL(T1)	Surface Mount Lead Forming (Low Profile) – With Option 1 Taping	1000 Units/Reel
SL(T2)	Surface Mount Lead Forming (Low Profile) – With Option 2 Taping	1000 Units/Reel



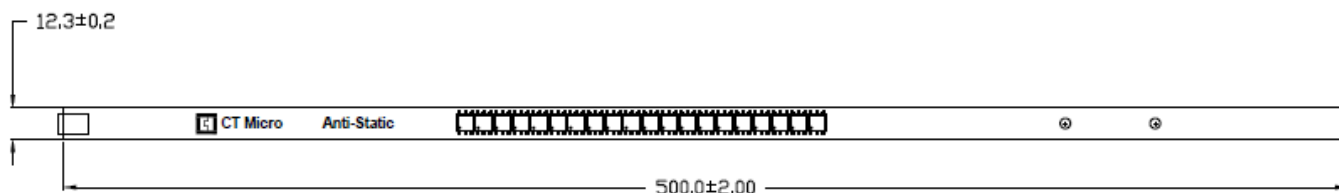
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#### Carrier Specifications *Dimensions in mm unless otherwise stated*

##### Tube Option Standard DIP

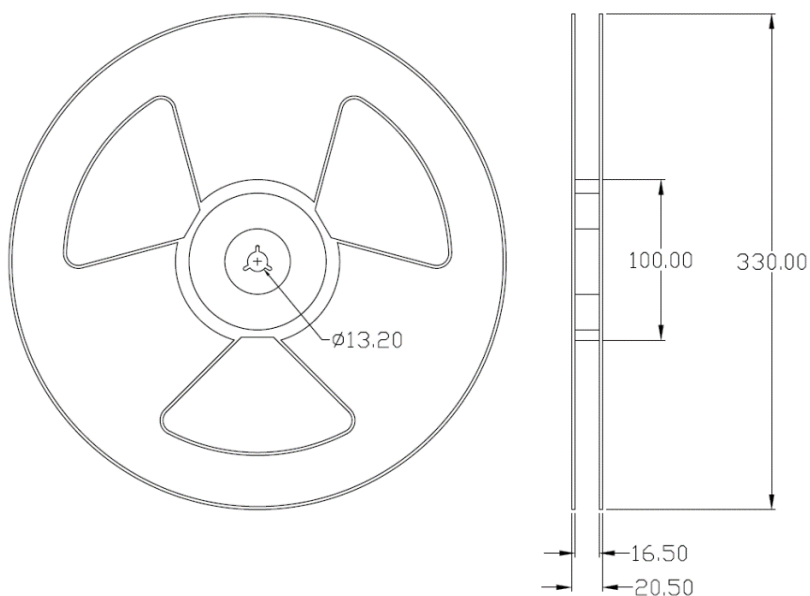


##### Tube Option M Type



#### Reel Dimension *All dimensions are in mm, unless otherwise stated*

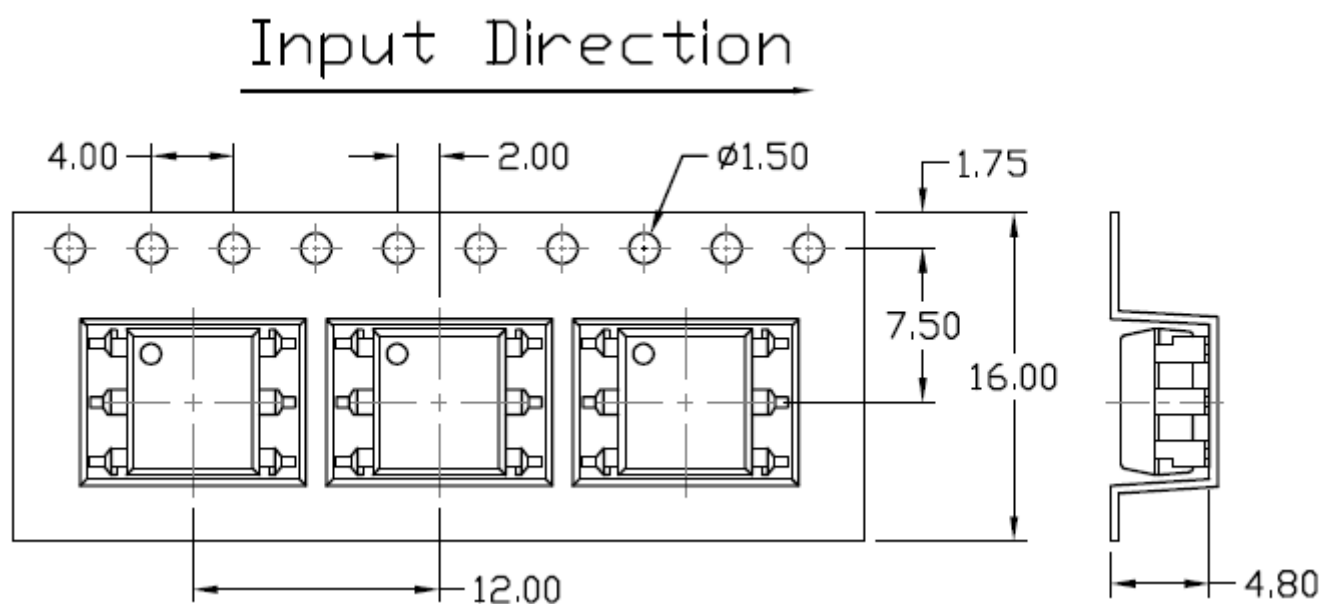
##### Option S(T1/T2) & SL(T1/T2)



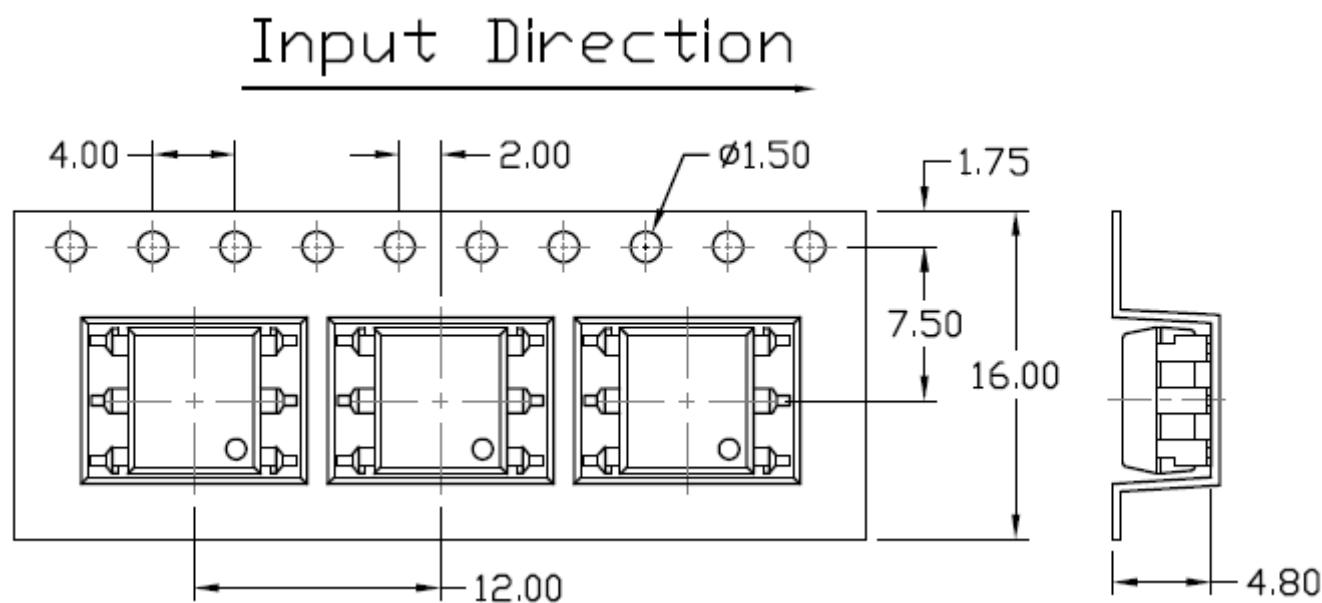


**Carrier Tape Specifications** *Dimensions in mm unless otherwise stated*

**Option S (T1) & SL (T1)**



**Option S (T2) & SL (T2)**





### Solderability spec (follow the JEDEC standard JESD22-B102)

Reflow Soldering: Immersed surface, other than the end of pin as cut-surface, must be covered by solder.

Solder-Bath: More than 95% of the electrode must be covered with solder.

### Wave soldering (follow the JEDEC standard JESD22-A111)

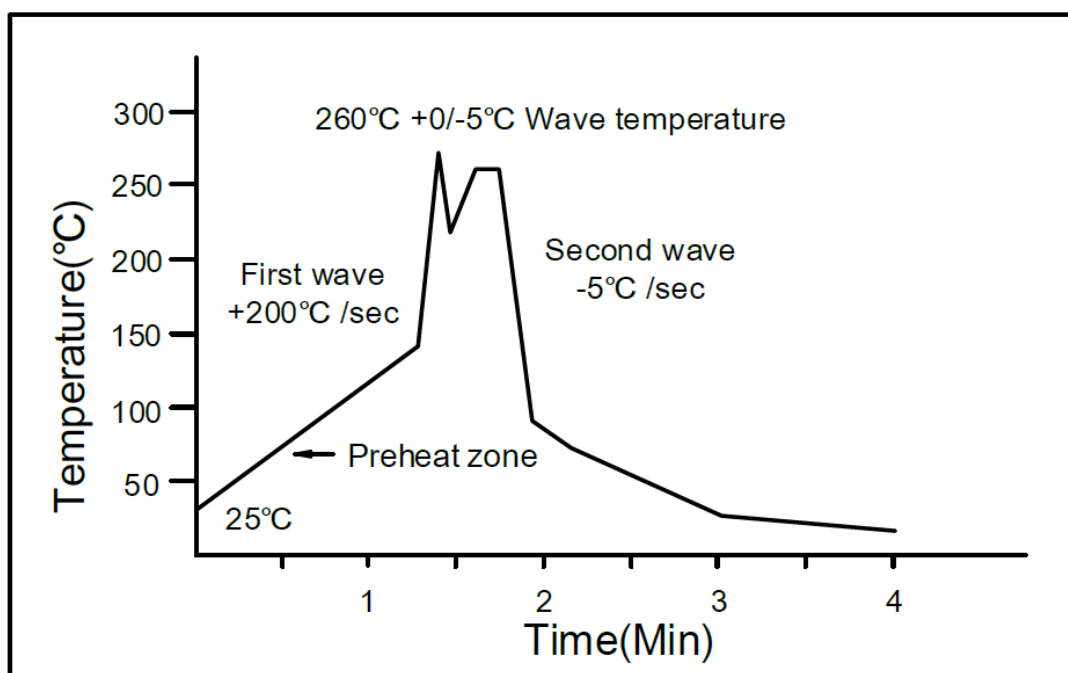
One time soldering is recommended within the condition of temperature.

Temperature:  $260 \pm 0/-5^{\circ}\text{C}$ .

Time: 10 sec.

Preheat temperature: 25 to  $140^{\circ}\text{C}$ .

Preheat time: 30 to 80 sec.



### Iron Soldering (follow the standard MIL-STD 202G, Method 210F)

Allow single lead soldering in every single process.

One time soldering is recommended.

Temperature:  $350 \pm 10^{\circ}\text{C}$

Time: 5 sec max.

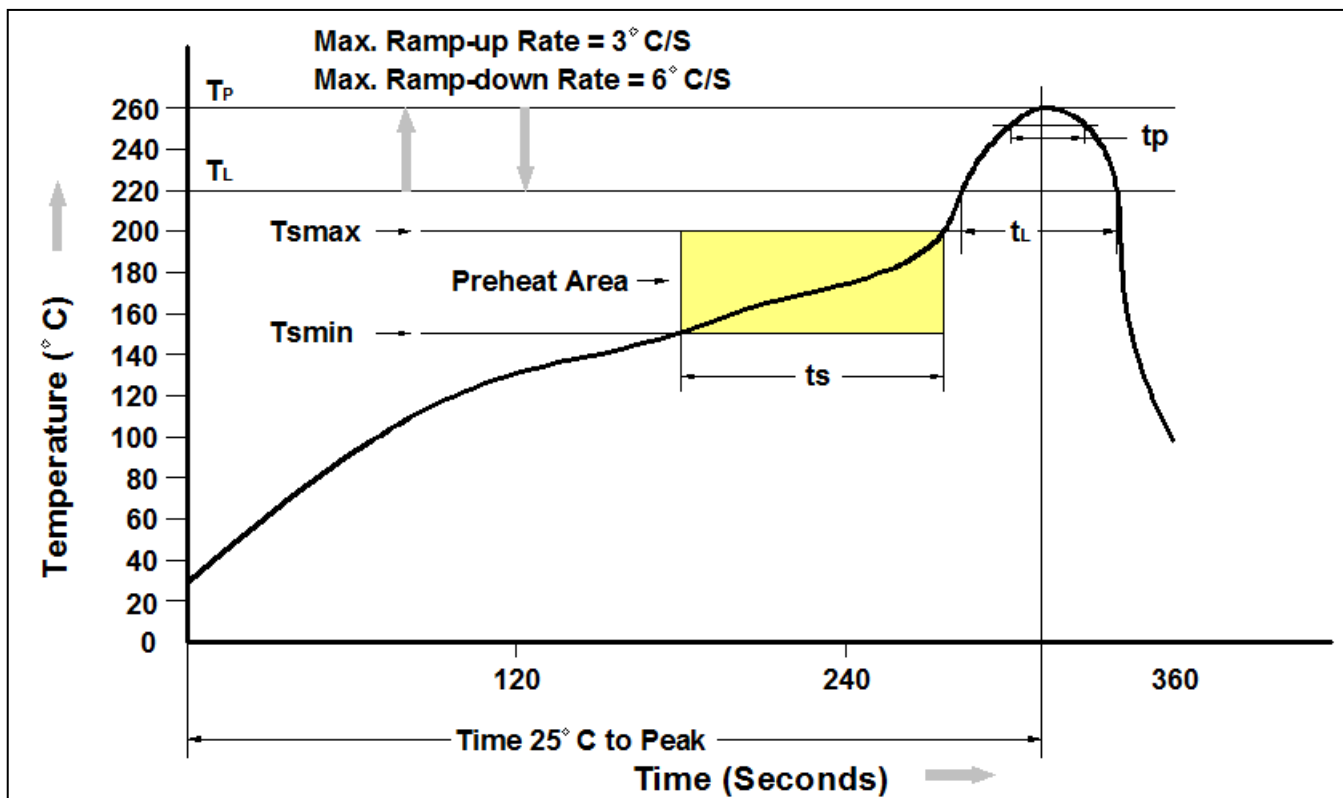


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#### Reflow Profile (follow the JEDEC standard J-STD-020)



Profile Feature	Pb-Free Assembly Profile
Temperature Min. (Tsmin)	150°C
Temperature Max. (Tsmax)	200°C
Time (ts) from (Tsmin to Tsmax)	60-120 seconds
Ramp-up Rate (tL to tP)	3°C/second max.
Liquidous Temperature (TL)	217°C
Time (tL) Maintained Above (TL)	60 – 150 seconds
Peak Body Package Temperature	260°C +0°C / -5°C
Time (tP) within 5°C of 260°C	30 seconds
Ramp-down Rate (TP to TL)	6°C/second max
Time 25°C to Peak Temperature	8 minutes max.



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- 2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.*