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CT350

2.5A MOSFET/IGBT Gate Driver Optocoupler

Features

- Peak Output Current: IOP = ±2.5A (max)
- Threshold Input Current: IFLH = 5 mA (max)
- Common mode transient immunity : ±25kV/μs (min）
- Under voltage lock out (UVLO) protection with hysteresis
- RoHS and REACH Compliance
- MSL class 1
- Regulatory Approvals
  - ✓ UL - UL1577 (E364000)
  - ✓ VDE - EN60747-5-5(VDE0884-5)
  - ✓ CQC – GB4943.1, GB8898 (14001104999)
  - ✓ IEC62368 (FI/41119)

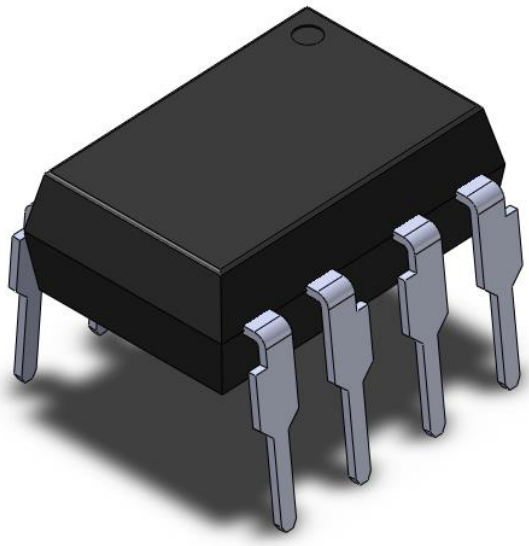
Description

The CT350 consists of a LED optically coupled to an integrated circuit with a power output stage. This optocoupler is ideally suited for driving power IGBTs and MOSFETs used in motor control inverter applications. The high operating voltage range of the output stage provides the drive voltages required by gate-controlled devices.

Applications

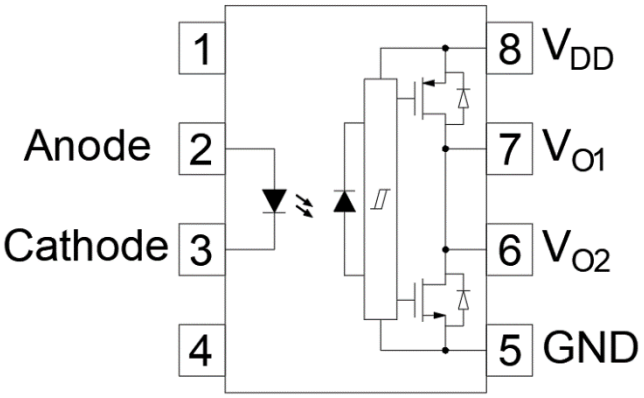
- Isolated IGBT/Power MOSFET gate drive
- Industrial Inverter
- AC brushless and DC motor drives
- Induction Heating

Package Outline



Note: Different lead forming options available. See package dimension.

Schematic



Truth Table

LED	V_{CC}-V_{EE} Positive Going	V_{CC}-V_{EE} Negative Going	Output
Off	0 to 30 V	0 to 30V	Low
On	0 to 11.0V	0 to 9.5V	Low
On	11.0 to 13.5V	9.5 to 12V	Transition
On	13.5 to 30V	12 to 30V	High

Absolute Maximum Ratings T_A = 25°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_{ISO}	Isolation voltage (AC, 1 minute, 40 ~ 60% R.H.)	5000	V_{RMS}	1
T_{OPR}	Operating temperature	-40 ~ +110	^{0}C	
T_{STG}	Storage temperature	-55 ~ +125	^{0}C	
T_{SOL}	Soldering temperature (For 10 seconds)	260	^{0}C	2
P_T	Total Power Dissipation	300	mW	
Emitter				
I_F	Forward current	25	mA	
I_{FP}	Peak forward current (50% duty, 1ms P.W)	1	A	
V_R	Reverse voltage	5	V	
Detector				
P_D	Power dissipation	250	mW	
$V_{O(PEAK)}$	Peak Output Voltage	0 to 30	V	3
I_{OPH}	Output High Peak Current	2.5	A	4
I_{OPL}	Output Low Peak Current	2.5		
V_{CC}	Supply voltage	0 to 30	V	

Notes

1. AC for 1 minute, RH = 40 ~ 60%.
2. For 10 second peak
3. The $V_{O(PEAK)}$ voltage CAN NOT BE high than V_{CC}.
4. The I_O maximum pulse width = 10 μs, maximum duty cycle = 0.2%.

Electrical Characteristics

Over recommended operating conditions TA = –40 to 110 °C.

Typical values are measured at V_{CC}=30V, V_{EE}= GND, T_A = 25^{0}C (unless otherwise stated)

Emitter Characteristics

Symbol	*Parameters*	*Test Conditions*	*Min*	*Typ*	*Max*	*Units*	*Notes*
V_F	Forward voltage	IF = 10mA	-	1.45	1.8	V	
V_R	Reverse Voltage	IR = 10μA	5.0	-	-	V	
$\Delta V_F/\Delta T_A$	Temperature coefficient of forward voltage	IF =10mA	-	-1.8	-	mV/°C	

Detector Characteristics

Symbol	*Parameters*	*Test Conditions*	*Min*	*Typ*	*Max*	*Units*	*Notes*
I_{CCL}	Logic Low Supply Current	V_F = 0 to 0.8V, V_O= Open	-	1.5	5	mA	
I_{CCH}	Logic High Supply Current	I_F= 7mA to 10mA, V_O= Open	-	1.5	5		

Transfer Characteristics

Symbol	*Parameters*	*Test Conditions*	*Min*	*Typ*	*Max*	*Units*	*Notes*
V_{OH}	High Level Output Voltage	I_F= 10mA, I_O= -2.5A	V_{CC} - 6	-	-	V	
		I_F= 10mA, I_O= -100mA	V_{CC} - 4	-	-		
V_{OL}	Low Level Output Voltage	I_F= 0mA, I_O= 2.5A	-	-	V_{EE} + 6	V	
		I_F= 0mA, I_O= 100mA	-	-	V_{EE} + 4		
I_{OPH}	High Level Output Current	V_O= V_{CC}-3V	-	-	-1	A	1
		V_O= V_{CC}-6V	-	-	-2		1
I_{OPL}	Low Level Output Current	V_O= V_{EE}+3V	1	-	-	A	1
		V_O= V_{EE}+6V	2	-	-		1
I_{FLH}	Input Threshold Current	I_O= 0mA, V_O> 5V	-	1.4	5.0	mA	
V_{FHL}	Input Threshold Voltage	I_O= 0mA, V_O< 5V	0.8	-	-	V	
V_{UVLO+}	Under Voltage Lockout Threshold	I_O= 10mA, V_O> 5V	11	-	13.5	V	
V_{UVLO-}		I_O= 10mA, V_O< 5V	9.5	-	12.0		

Notes

1. The I_O maximum pulse width = 10 μs, maximum duty cycle = 0.2%.

Electrical Characteristics

Over recommended operating conditions TA = –40 to 110 °C.

Typical values are measured at V_{CC}=30V, V_{EE}= GND, T_A = 25^{0}C (unless otherwise stated)

Switching Characteristics

Symbol	*Parameters*	*Test Conditions*		*Min*	*Typ*	*Max*	*Units*	*Notes*
T_{PHL}	High to Low Propagation Delay	I_F= 7 to 16mA, C_L= 10nF, R_L= 10Ω, f= 10kHz, Duty = 50%, T_A= 25 ^{0}C		100	180	500	ns	
T_{PLH}	Low to High Propagation Delay			100	140	500	ns	
P_{WD}	Pulse Width Distortion				40	300	ns	
t_{PSK}	Propagation Delay Skew					40	ns	
t_r	Rise Time				20		ns	
t_f	Fall Time				20		ns	
$t_{UVLO(ON)}$	UVLO Turn On Delay	I_F= 10mA, V_O> 5V			3.5		µs	
$t_{UVLO(OFF)}$	UVLO Turn Off Delay	I_F= 10mA, V_O< 5V			3		µs	
$\|CM_H\|$	Common Mode Transient High	V_{CC}= 30V, T_A= 25 ^{0}C, V_{CM}= 1.5kV	I_F= 7 to 16mA	25			kV/µs	
$\|CM_L\|$	Common Mode Transient Low		I_F= 0mA	25			kV/µs	

Typical Characteristic Curves *T_A = 25°C, unless otherwise specified*

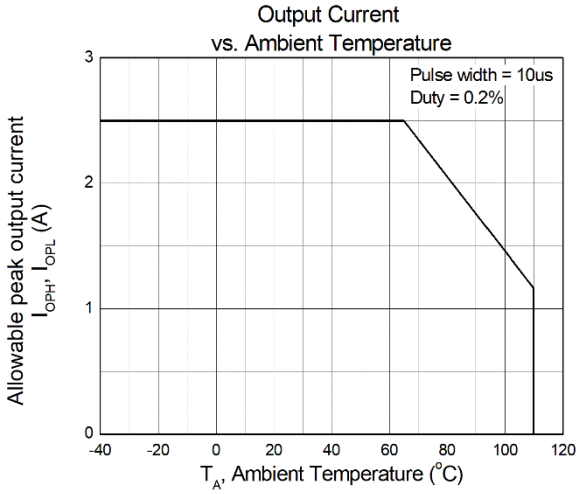


Figure 1

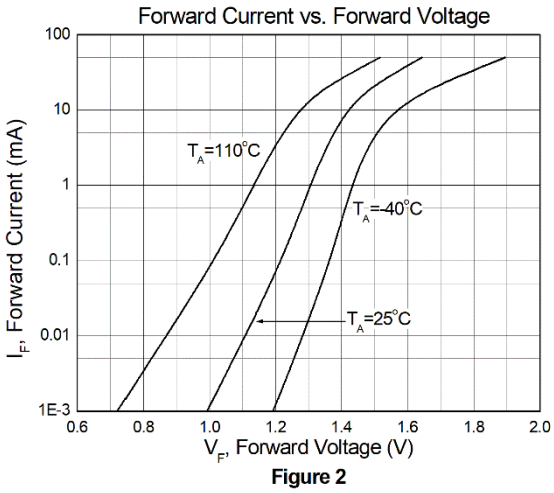


Figure 2

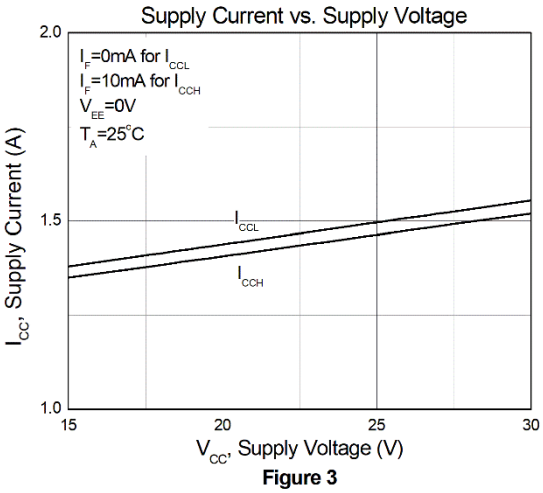
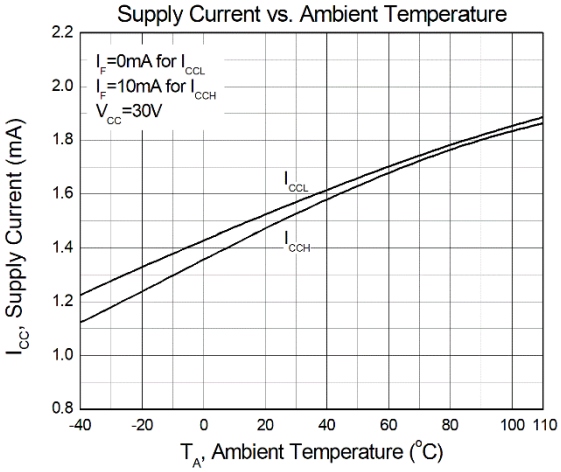


Figure 3



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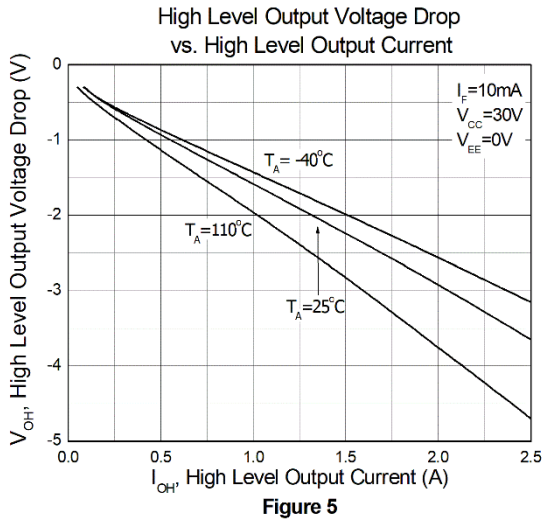


Figure 5

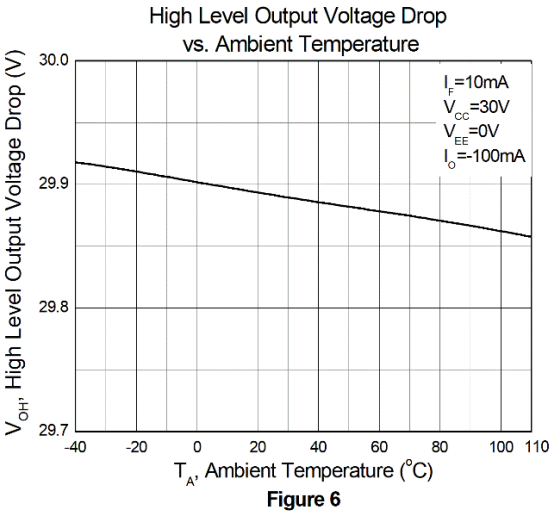
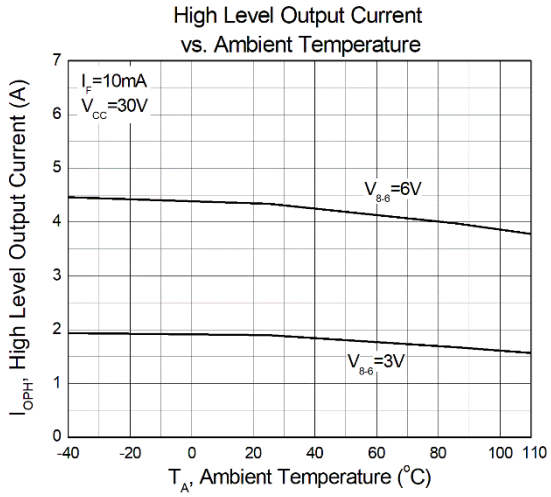


Figure 6

Typical Characteristic Curves *T_A = 25°C, unless otherwise specified*



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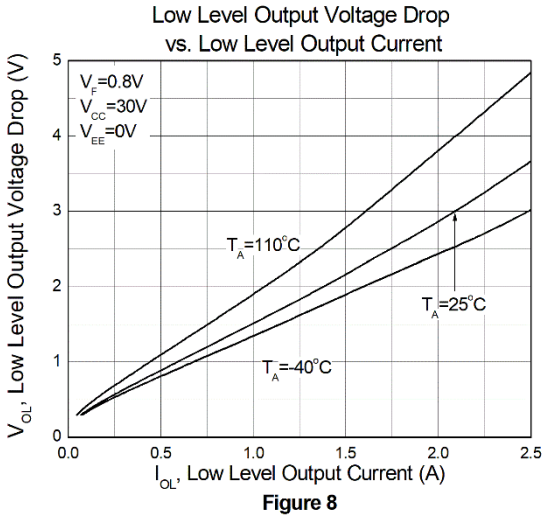

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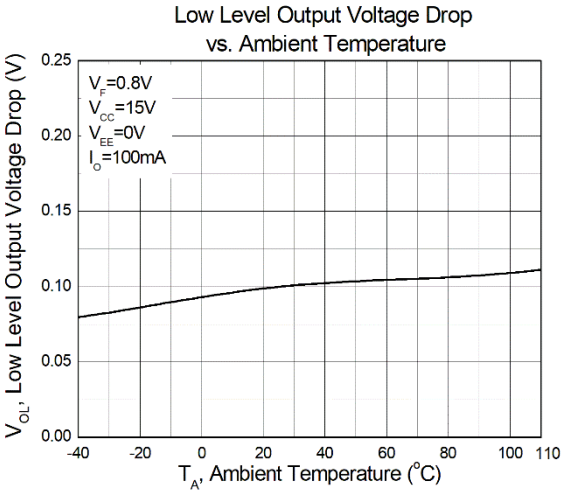

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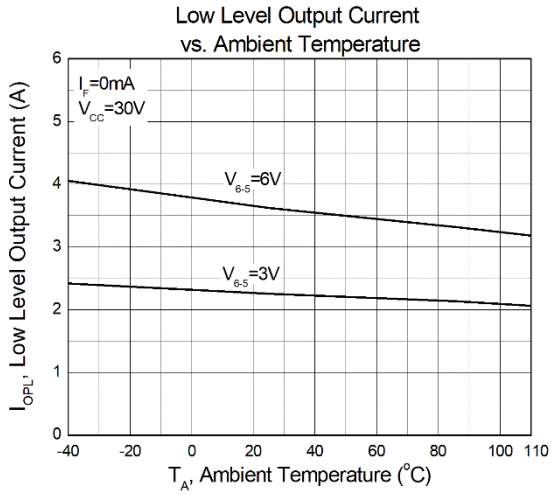

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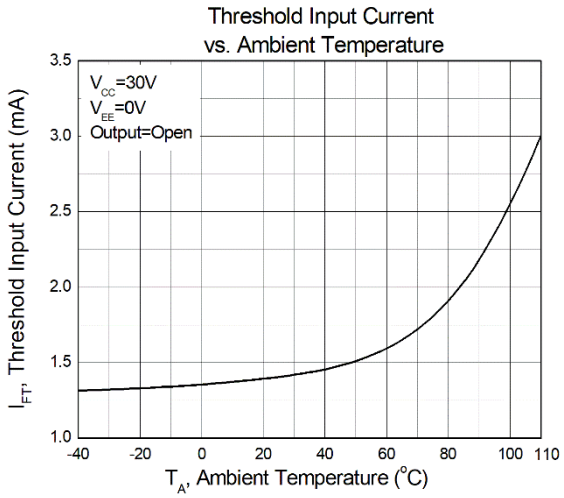

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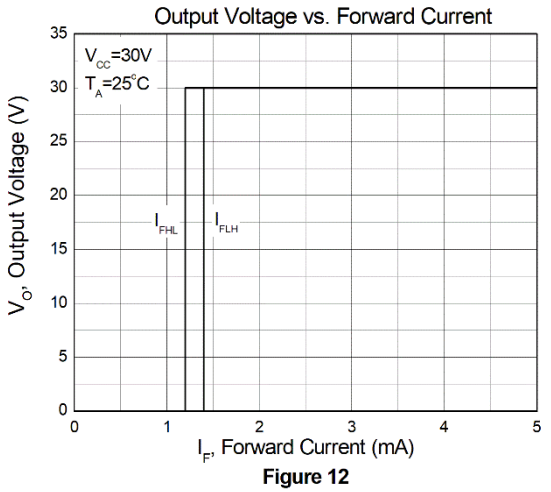
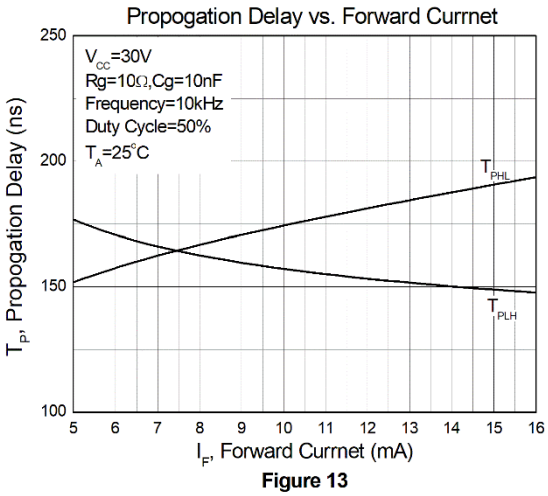


Figure 12

Typical Characteristic Curves *T_A = 25°C, unless otherwise specified*



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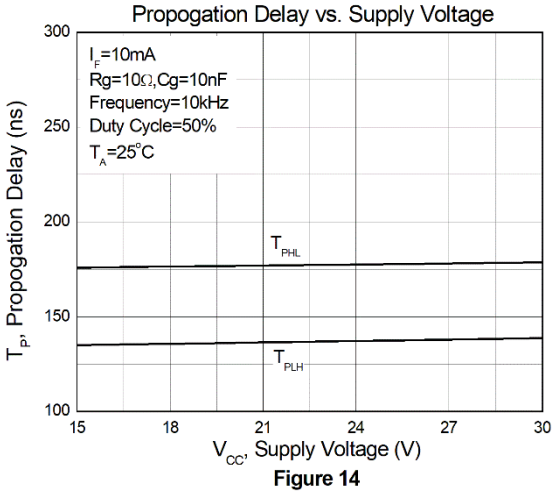


Figure 14

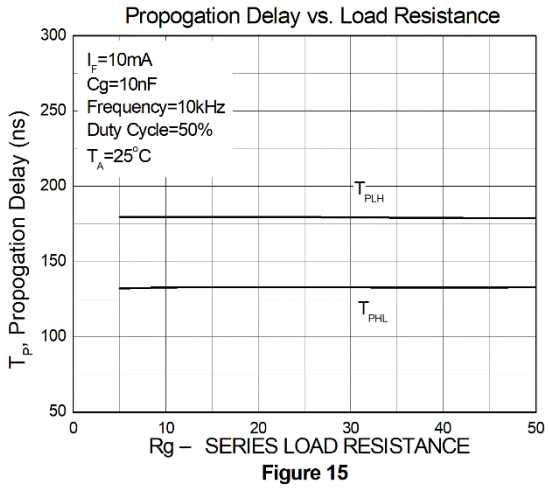


Figure 15

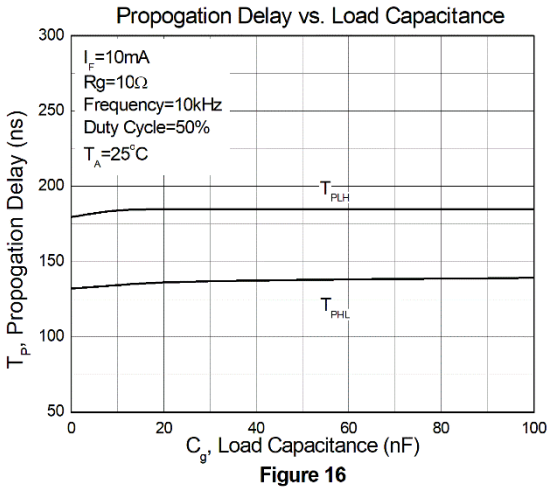


Figure 16

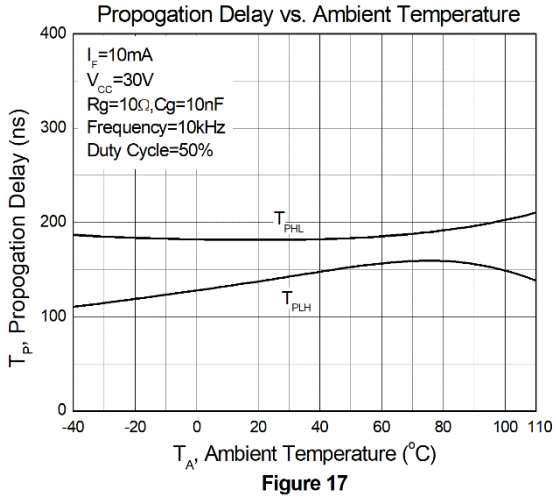
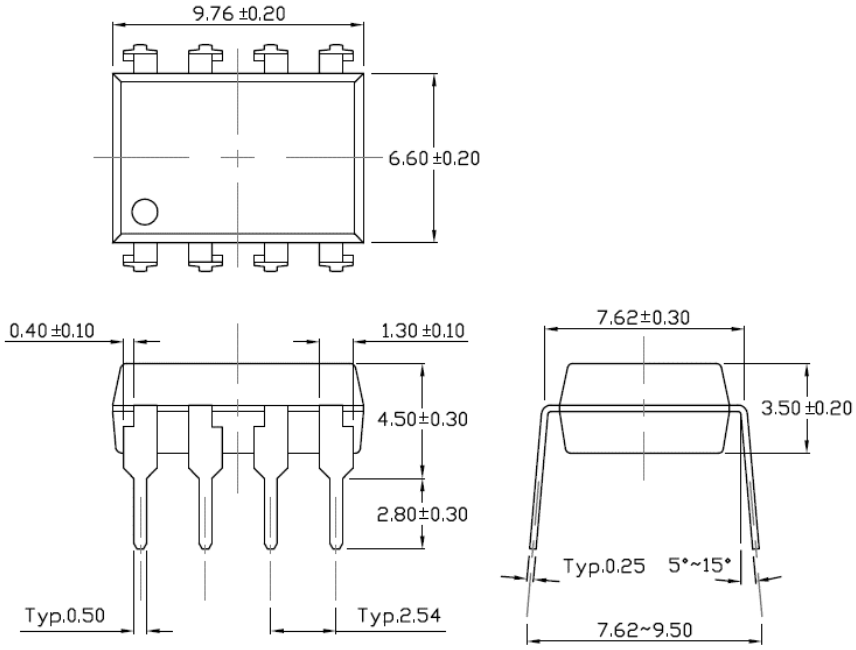


Figure 17

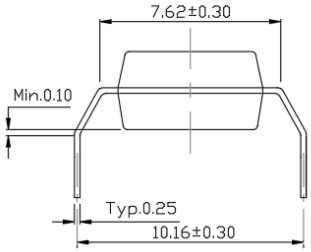
Package Dimension *Dimensions in mm unless otherwise stated*

Standard DIP – Through Hole

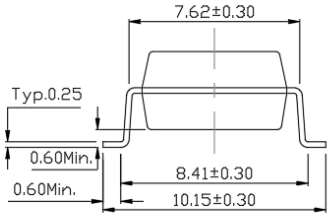


Forming Option *Dimensions in mm unless otherwise stated*

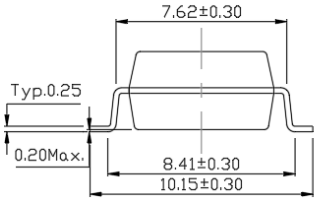
M Type

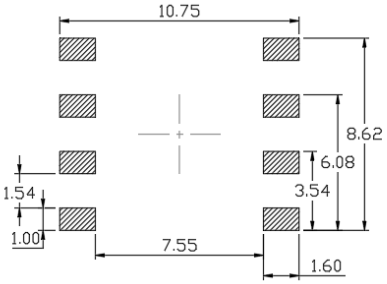


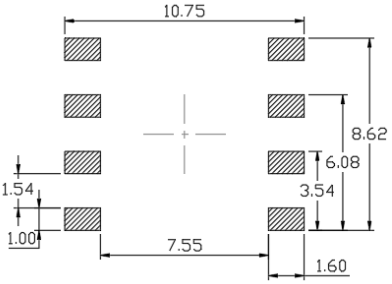
S Type



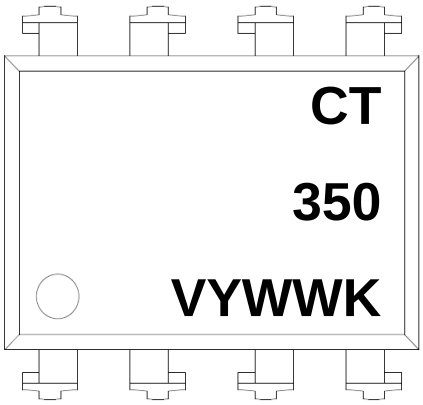
SL Type







Marking Information



Note:

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

Ordering Information

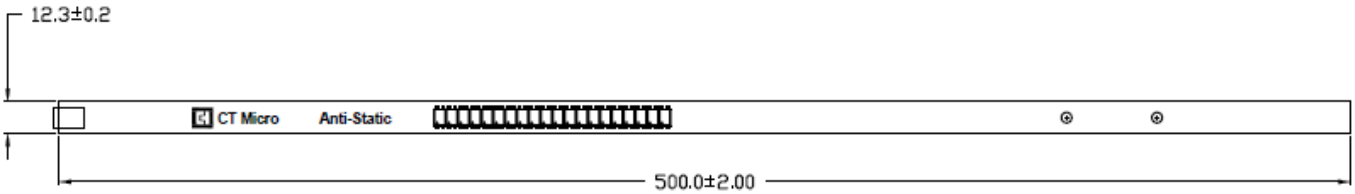
CT350(V)(Y)(Z)

CT = Denotes “CT Micro”
350 = Part Number
V = VDE Safety Mark Option (Blank or V)
Y = Lead Form Option (S, SL, M or Blank)
Z = Tape and Reel Option (Blank, T1 or T2)

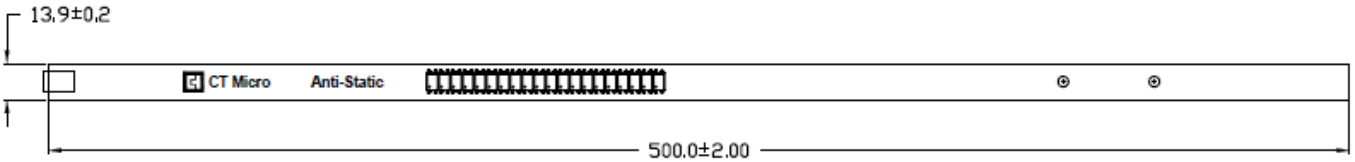
Option	***Description***	***Quantity***
None	Standard 8 Pin Dip	40 Units/Tube
M	Gullwing (400mil) Lead Forming	40 Units/Tube
S(T1)	Surface Mount Lead Forming – With Option 1 Taping	1000 Units/Reel
S(T2)	Surface Mount Lead Forming – With Option 2 Taping	1000 Units/Reel
SL(T1)	Surface Mount (Low Profile) Lead Forming– With Option 1 Taping	1000 Units/Reel
SL(T2)	Surface Mount (Low Profile) Lead Forming – With Option 2 Taping	1000 Units/Reel

Carrier Specifications *Dimensions in mm unless otherwise stated*

Tube Option Standard DIP

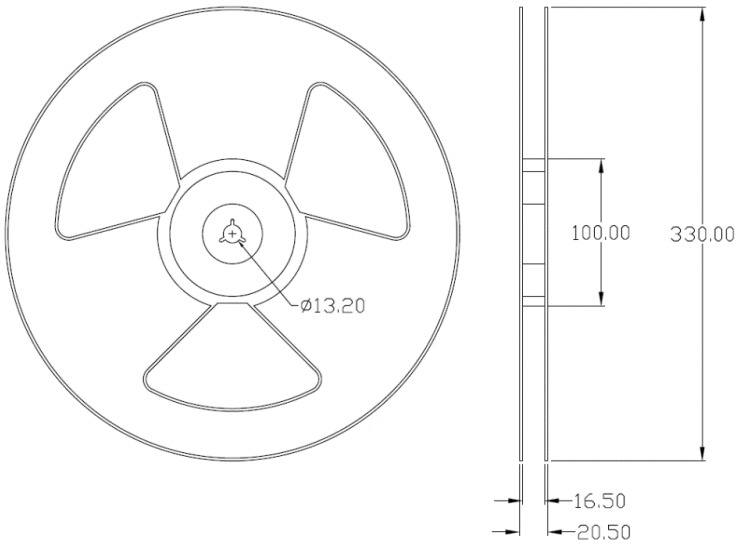


Tube Option M Type



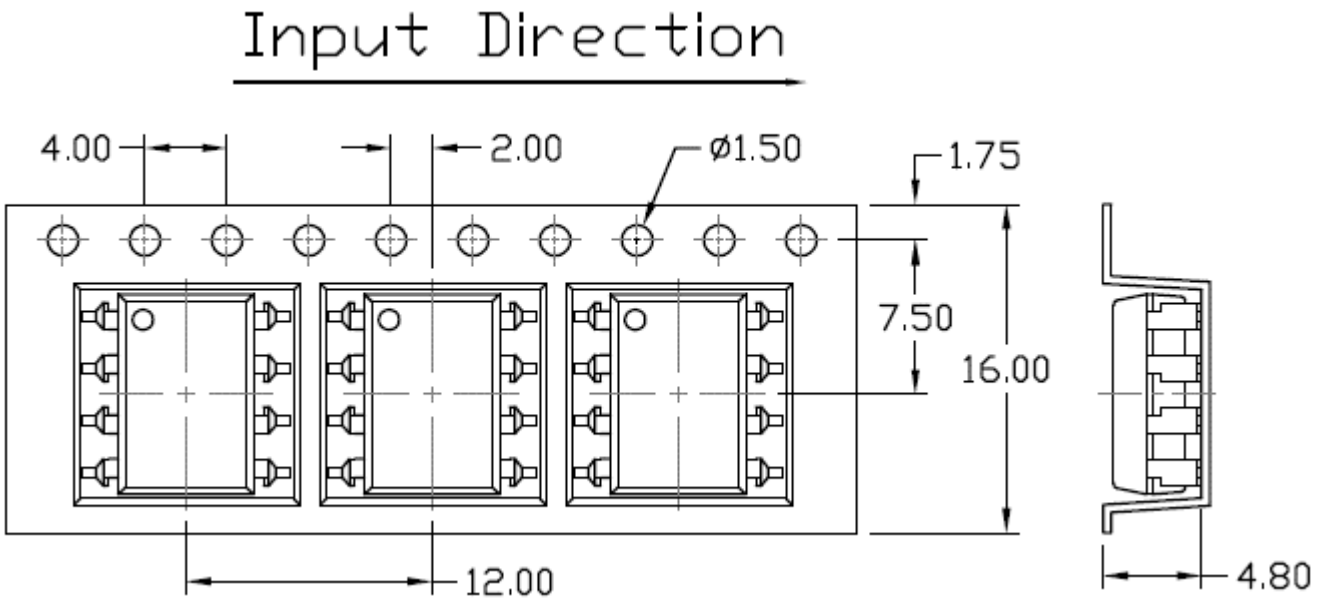
Reel Dimension *All dimensions are in mm, unless otherwise stated*

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

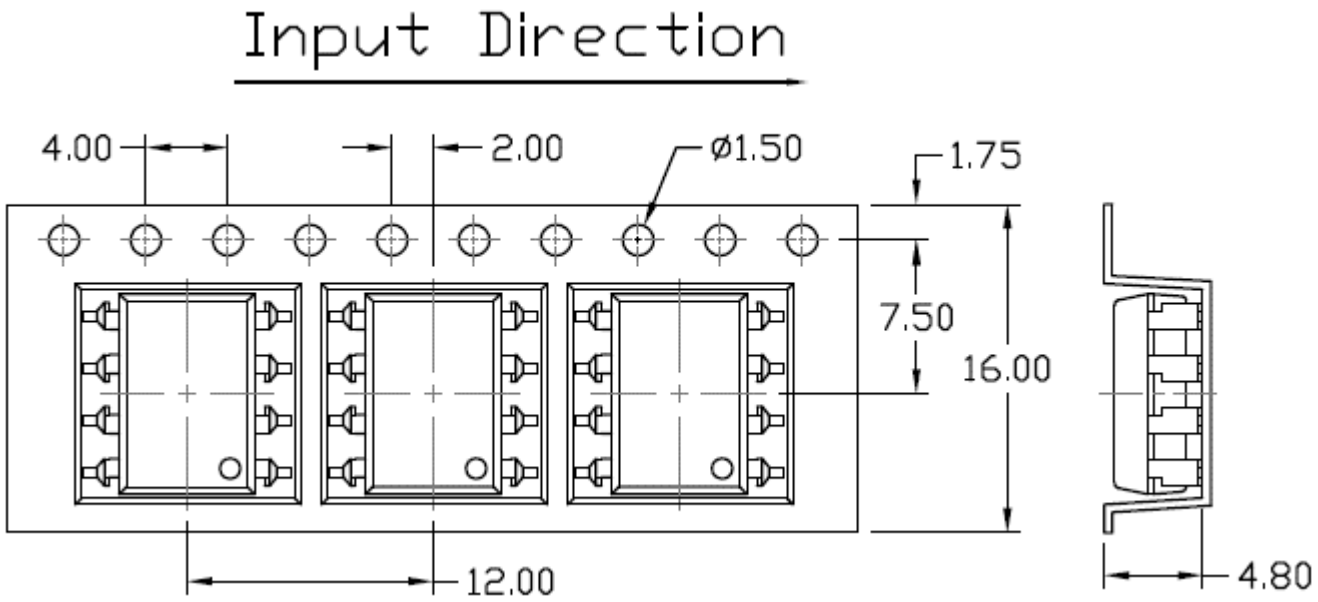


Carrier Tape Specifications *Dimensions in mm unless otherwise stated*

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)

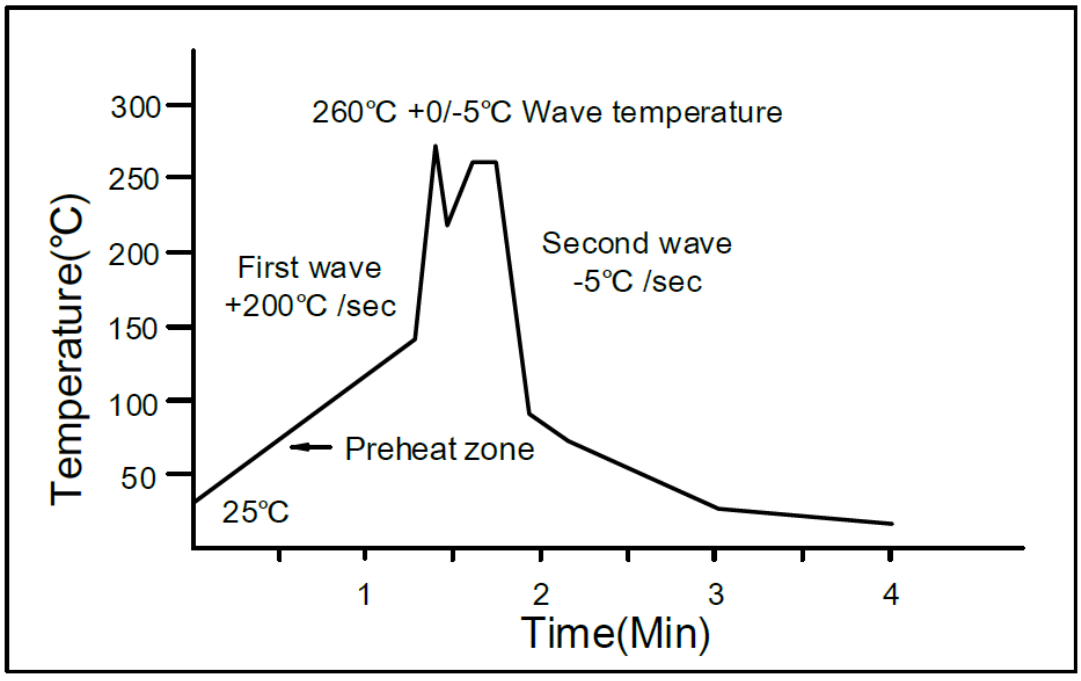
One time soldering is recommended within the condition of temperature.

Temperature: 260+0/-5˚C.

Time: 10 sec.

Preheat temperature: 25 to 140˚C.

Preheat time: 30 to 80 sec.



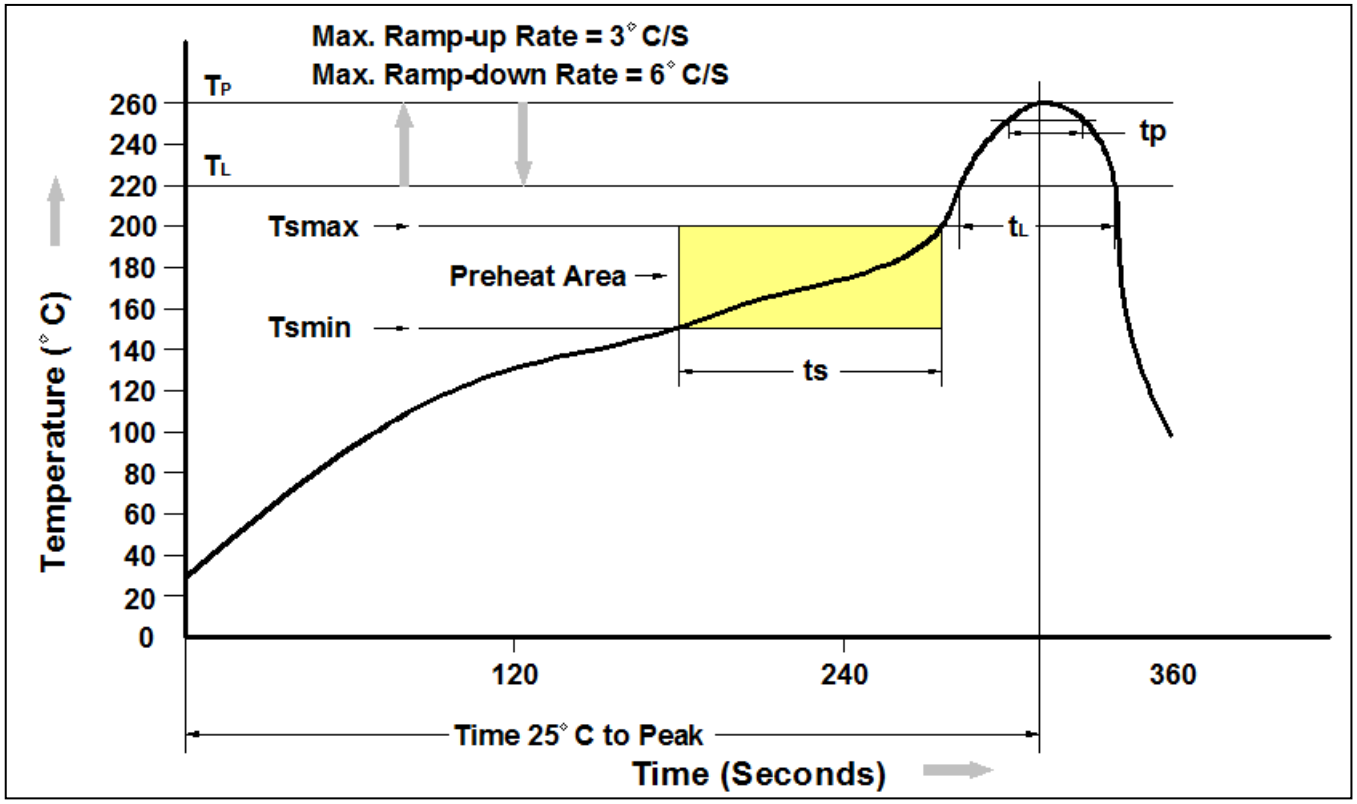
Iron soldering (Follow the standard MIL-STD 202G, Method 210F)

Allow single lead soldering in every single process.

One time soldering is recommended. Temperature: 350±10˚C

Time: 5 sec max.

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 (t_L to t_P)	3°C/second max.
Liquidous Temperature (T_L)	217°C
Time (t_L) Maintained Above (T_L)	60 – 150 seconds
Peak Body Package Temperature	260°C +0°C / -5°C
Time (t_P) within 5°C of 260°C	30 seconds
Ramp-down Rate (T_P to T_L)	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.*