



# 2.5A MOSFET/IGBT Gate Driver Optocoupler

[www.ct-micro.com](http://www.ct-micro.com)

## 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)

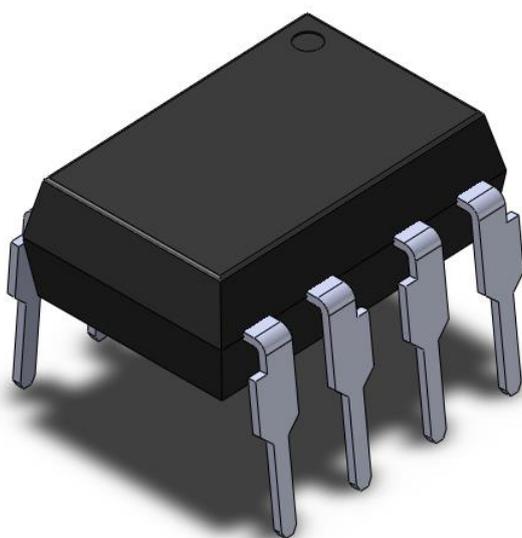
## Description

The CT3120 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

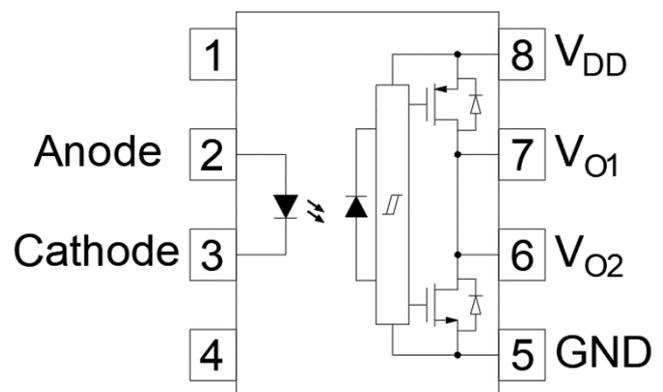
- Isolated IGBT/Power MOSFET gate drive
- Industrial Inverter
- AC brushless and DC motor drives
- Induction Heating

## Package Outline



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

## Schematic



### Truth Table

LED	V <sub>CC</sub> -V <sub>EE</sub> Positive Going	V <sub>CC</sub> -V <sub>EE</sub> 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



## 2.5A MOSFET/IGBT Gate Driver Optocoupler

[www.ct-micro.com](http://www.ct-micro.com)**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>	1
T <sub>OPR</sub>	Operating temperature	-40 ~ +110	°C	
T <sub>STG</sub>	Storage temperature	-55 ~ +125	°C	
T <sub>SOL</sub>	Soldering temperature (For 10 seconds)	260	°C	2
P <sub>T</sub>	Total Power Dissipation	300	mW	
<b>Emitter</b>				
I <sub>F</sub>	Forward current	25	mA	
I <sub>FP</sub>	Peak forward current (50% duty, 1ms P.W)	1	A	
V <sub>R</sub>	Reverse voltage	5	V	
<b>Detector</b>				
P <sub>D</sub>	Power dissipation	250	mW	
V <sub>O(PEAK)</sub>	Peak Output Voltage	0 to 30	V	3
I <sub>OPH</sub>	Output High Peak Current	2.5	A	4
I <sub>OPL</sub>	Output Low Peak Current	2.5		
V <sub>CC</sub>	Supply voltage	0 to 30	V	

## Notes

1. AC for 1 minute, RH = 40 ~ 60%.
2. For 10 second peak
3. The V<sub>O(PEAK)</sub> voltage CAN NOT BE high than V<sub>CC</sub>.
4. The I<sub>O</sub> maximum pulse width = 10 μs, maximum duty cycle = 0.2%.



## Electrical Characteristics

Over recommended operating conditions  $T_A = -40$  to  $110$  °C.

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

### Emitter Characteristics

Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes
$V_F$	Forward voltage	$I_F = 10mA$	-	1.45	1.8	V	
$V_R$	Reverse Voltage	$I_R = 10\mu A$	5.0	-	-	V	
$\Delta V_F / \Delta T_A$	Temperature coefficient of forward voltage	$I_F = 10mA$	-	-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 $0.8V$ , $V_O = \text{Open}$	-	1.5	5	mA	
$I_{CCH}$	Logic High Supply Current	$I_F = 7mA$ to $10mA$ , $V_O = \text{Open}$	-	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

- The  $I_O$  maximum pulse width = 10  $\mu s$ , maximum duty cycle = 0.2%.



## Electrical Characteristics

Over recommended operating conditions  $T_A = -40$  to  $110$  °C.

Typical values are measured at  $V_{CC}=30V$ ,  $V_{EE}=GND$ ,  $T_A = 25^\circ C$  (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 $16mA$ , $C_L = 10nF$ , $R_L = 10\Omega$ , $f = 10kHz$ , Duty = 50%, $T_A = 25^\circ C$	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		$\mu s$	
$t_{UVLO(OFF)}$	UVLO Turn Off Delay	$I_F = 10mA$ , $V_O < 5V$		3		$\mu s$	
$ CM_H $	Common Mode Transient High	$V_{CC} = 30V$ , $T_A = 25^\circ C$ , $I_F = 7$ to $16mA$	25			$kV/\mu s$	
$ CM_L $	Common Mode Transient Low	$V_{CM} = 1.5kV$ , $I_F = 0mA$	25			$kV/\mu s$	



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

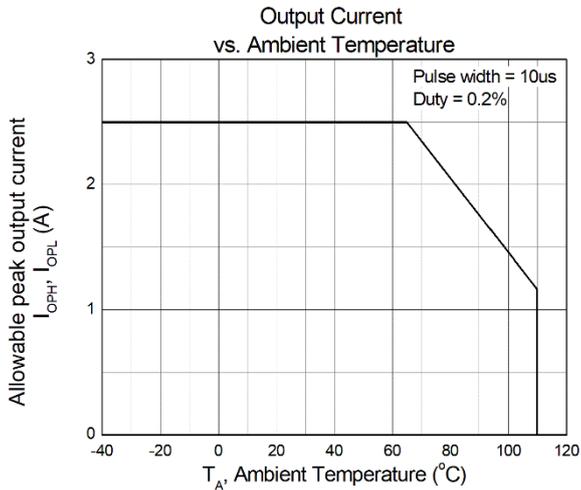


Figure 1

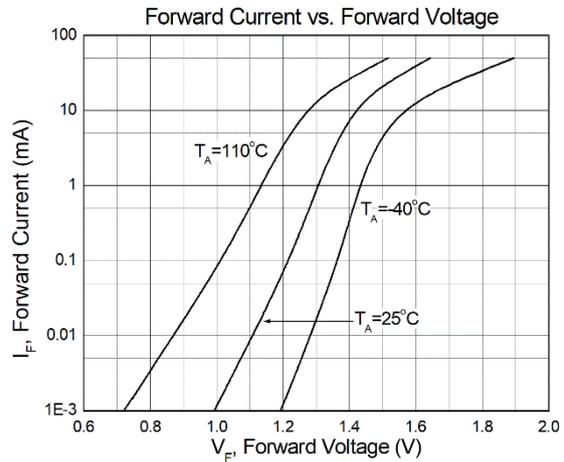


Figure 2

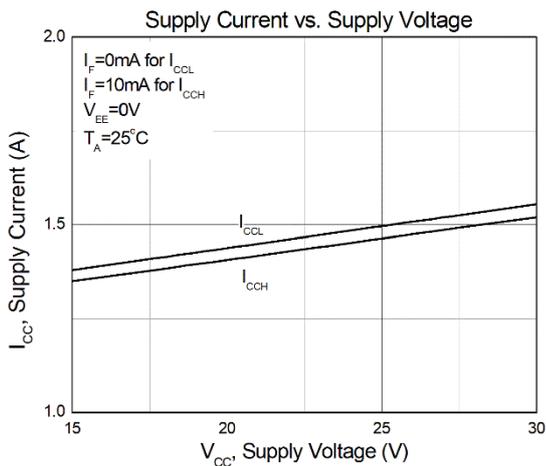


Figure 3

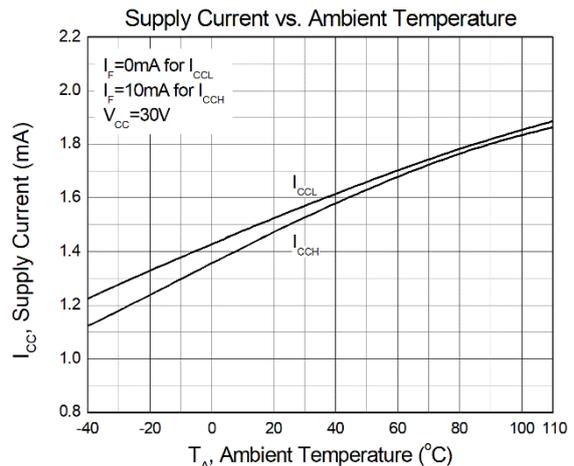


Figure 4

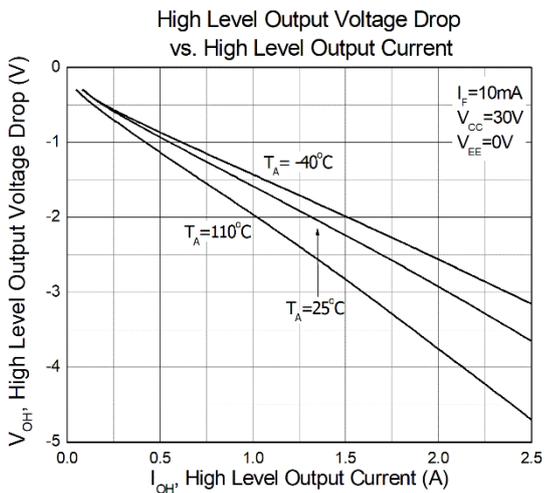


Figure 5

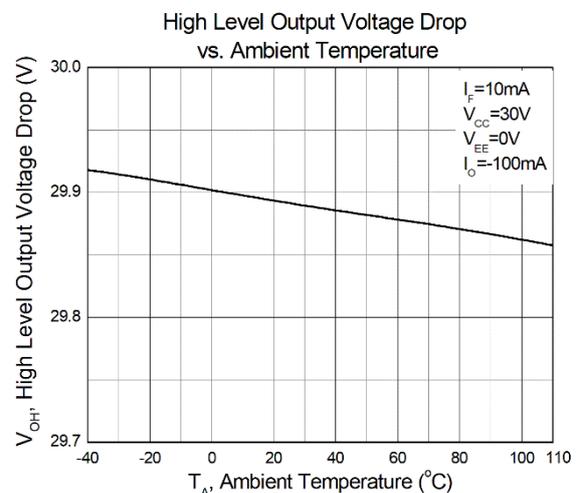


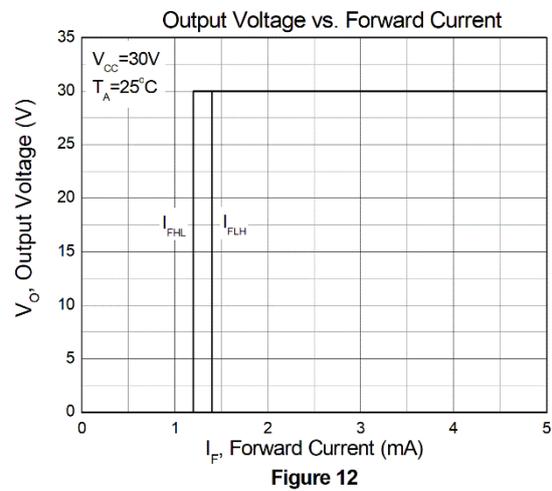
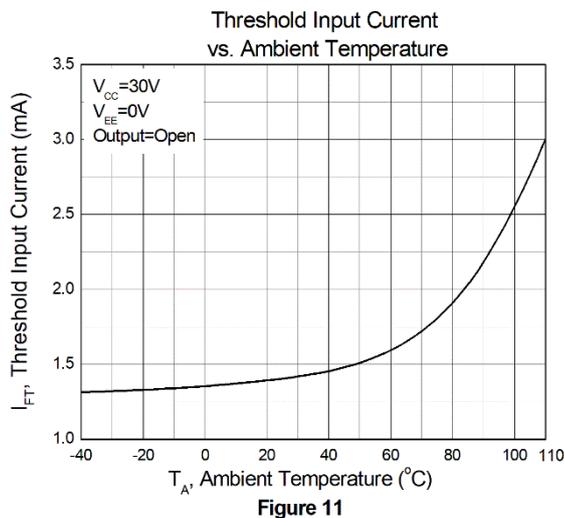
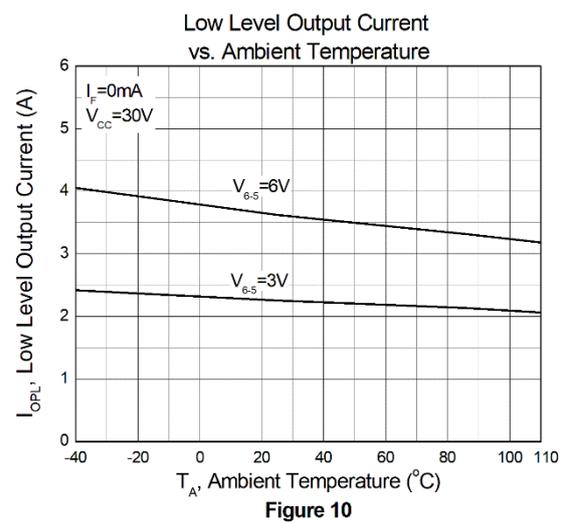
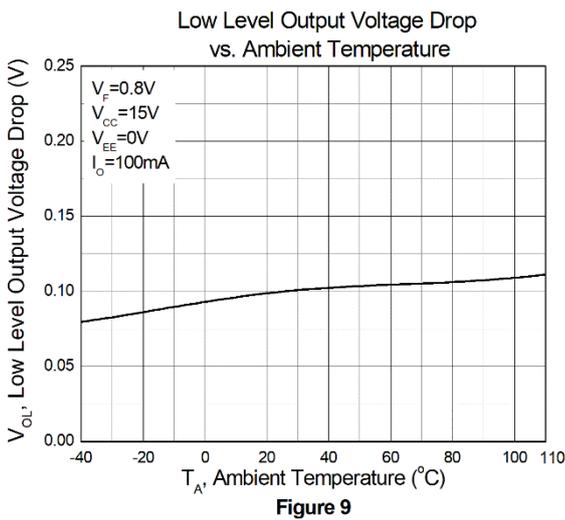
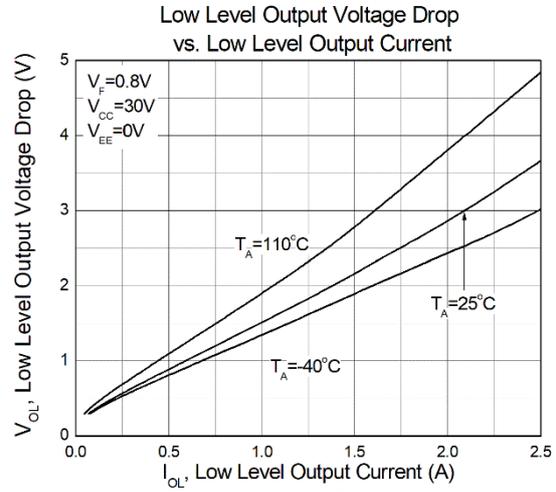
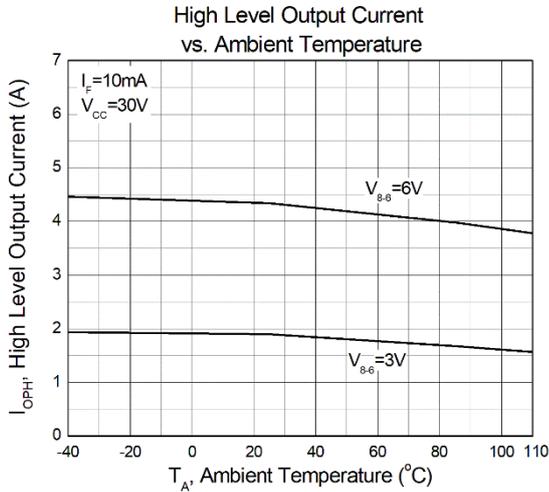
Figure 6



## 2.5A MOSFET/IGBT Gate Driver Optocoupler

www.ct-micro.com

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



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



# 2.5A MOSFET/IGBT Gate Driver Optocoupler

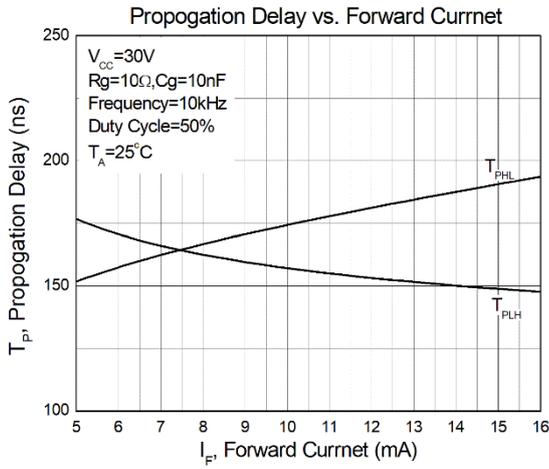


Figure 13

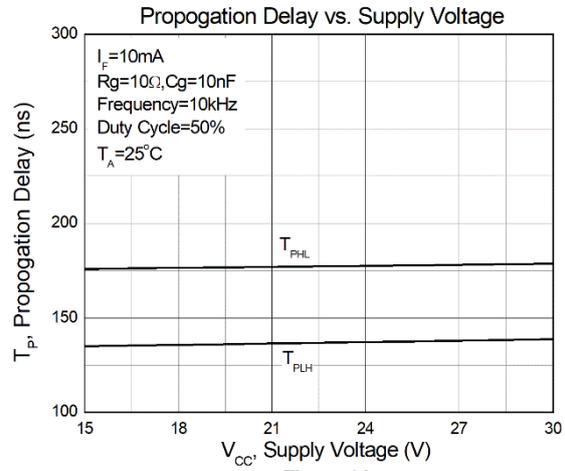


Figure 14

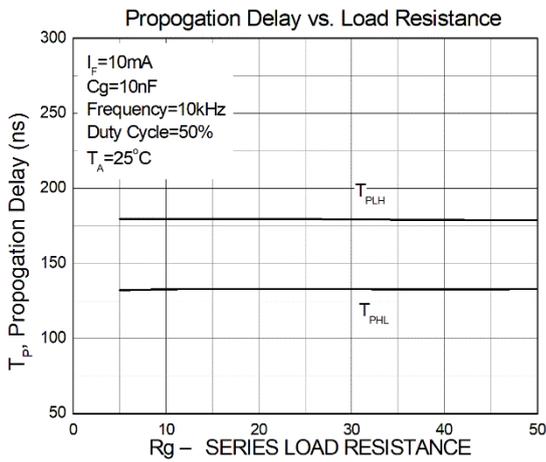


Figure 15

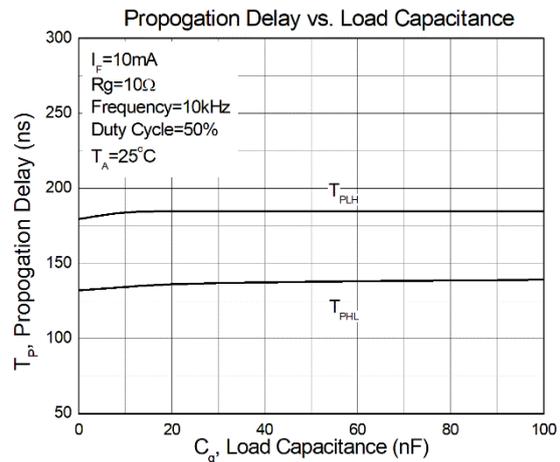


Figure 16

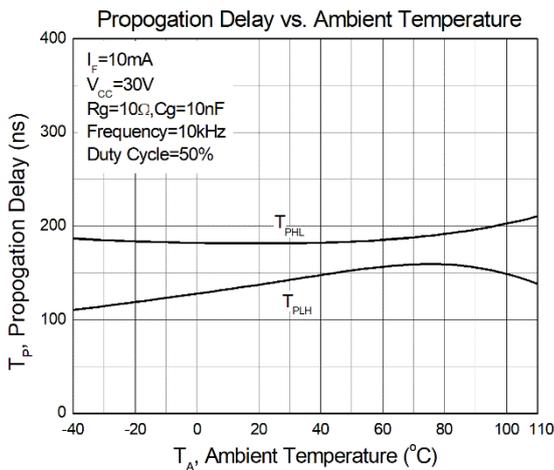
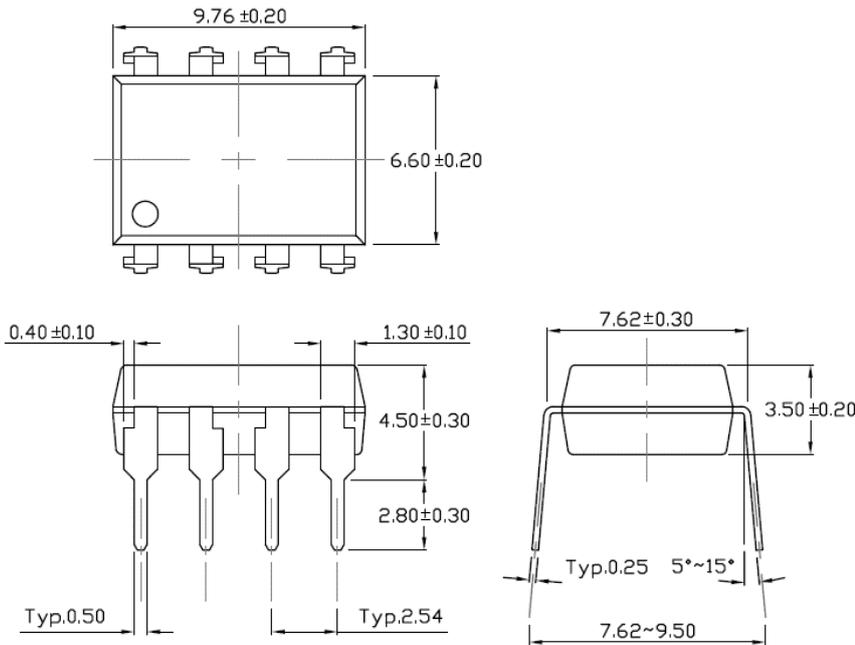


Figure 17



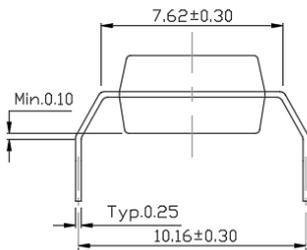
Package Dimension *Dimensions in mm unless otherwise stated*

Standard DIP – Through Hole

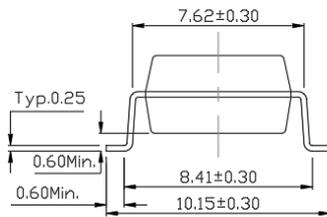


Forming Option *Dimensions in mm unless otherwise stated*

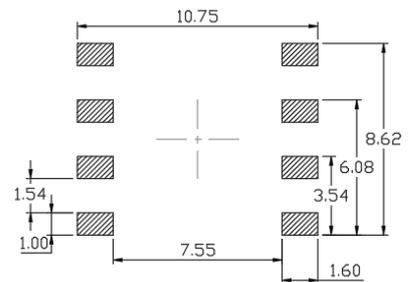
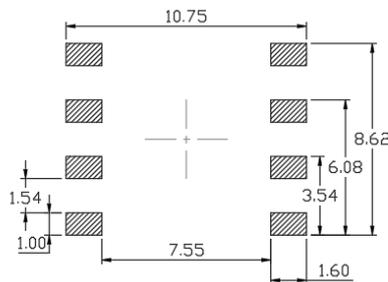
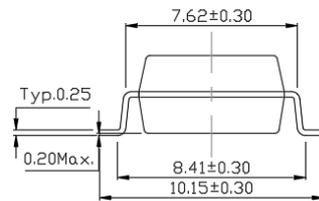
M Type



S Type



SL Type

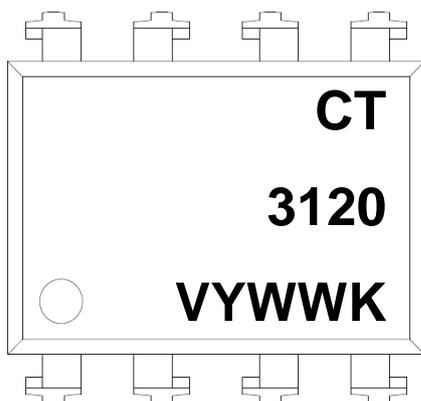




# 2.5A MOSFET/IGBT Gate Driver Optocoupler

[www.ct-micro.com](http://www.ct-micro.com)

## Marking Information



**Note:**

- CT : Denotes “CT Micro”
- 3120 : 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)

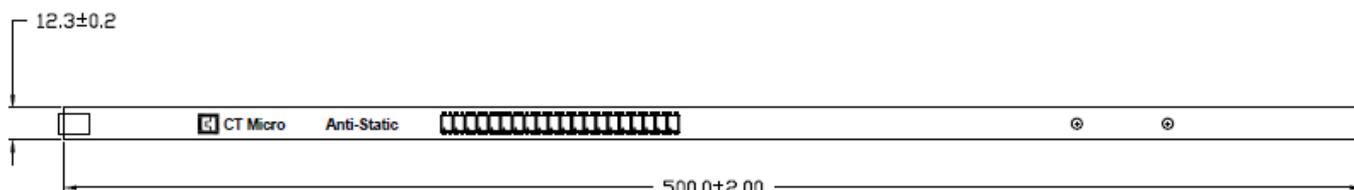
- CT = Denotes “CT Micro”
- 3120 = Part Number
- V = VDE Safety Mark Option (Blank or V)
- Y = Lead Form Option (S, SL, M or Blank)
- Z = Tape and Reel Option (Blank, T1 or T2)

<b>Option</b>	<b>Description</b>	<b>Quantity</b>
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

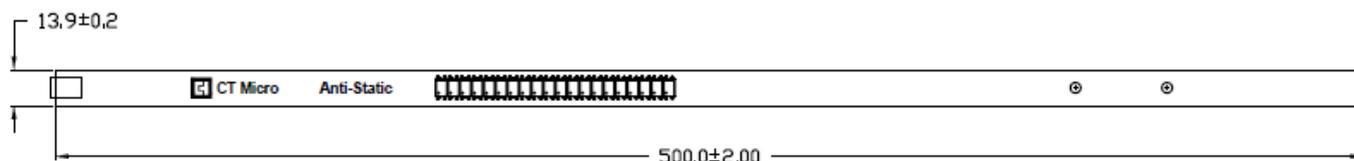


**Carrier Specifications** *Dimensions in mm unless otherwise stated*

**Tube Option Standard DIP**

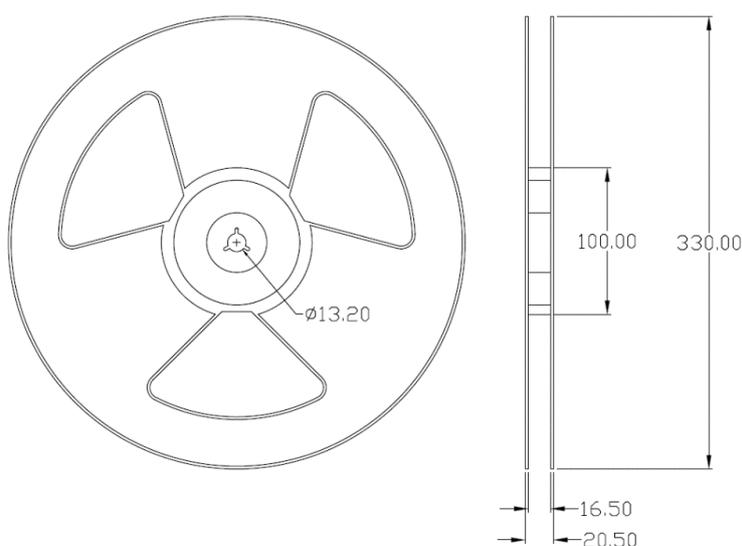


**Tube Option M Type**



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

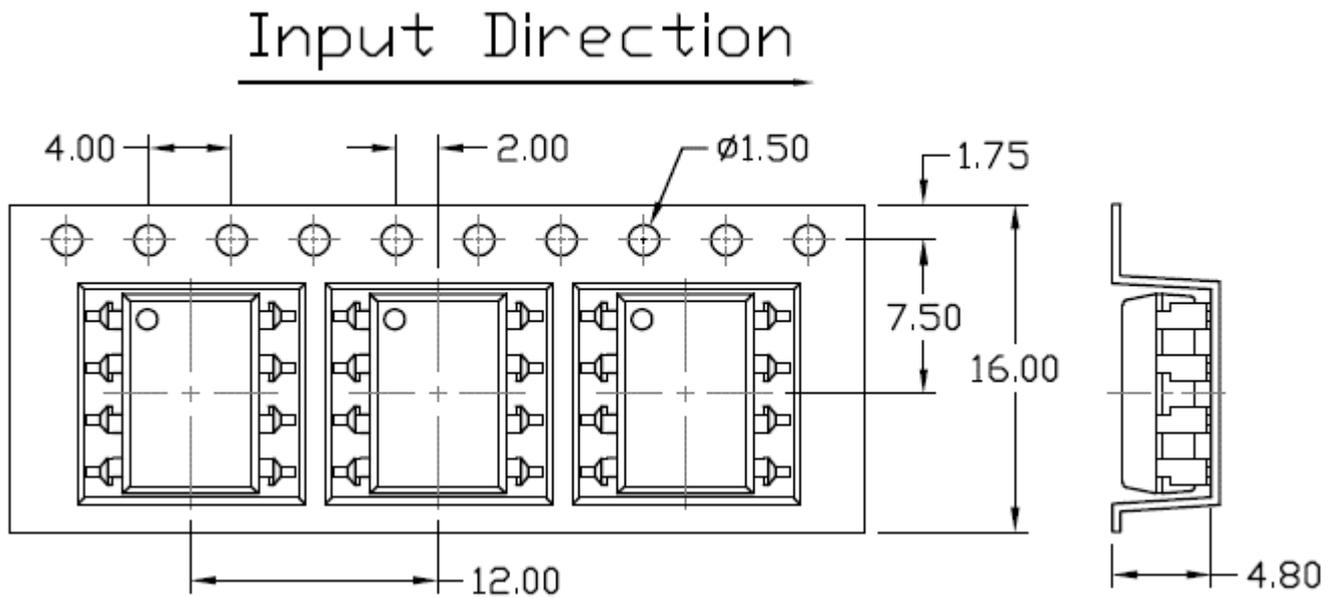
**Option S(T1/T2) & SL(T1/T2)**



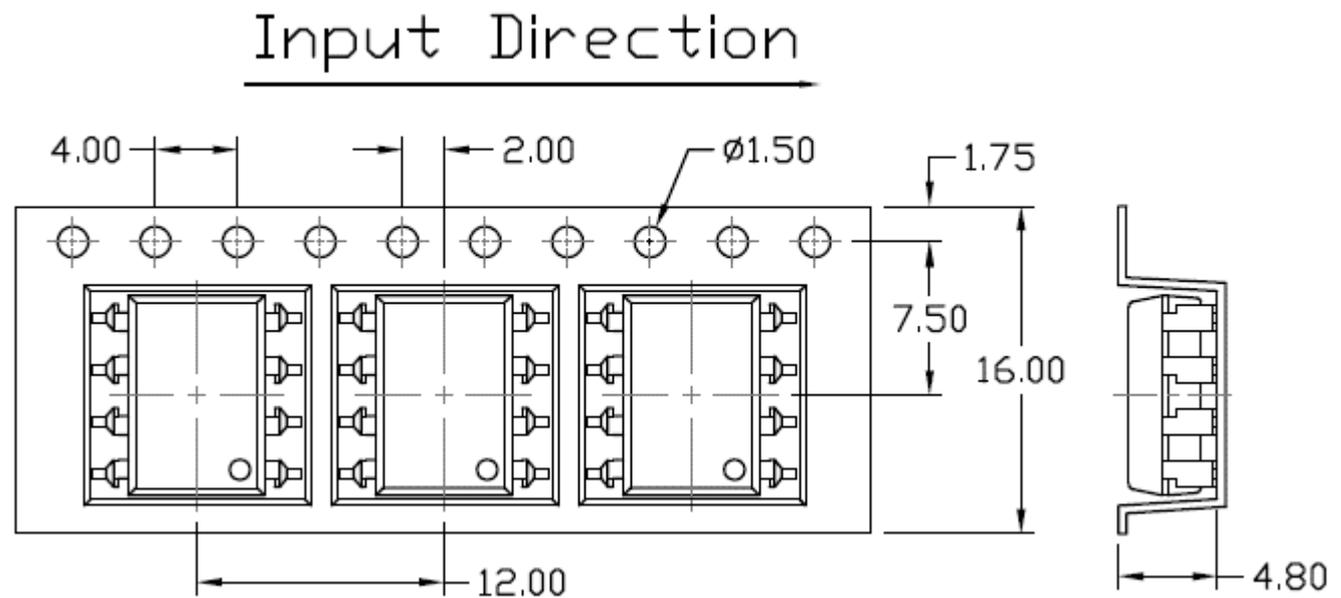


**Carrier Tape Specifications** *Dimensions in mm unless otherwise stated*

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



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





## 2.5A MOSFET/IGBT Gate Driver Optocoupler

[www.ct-micro.com](http://www.ct-micro.com)

### 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)

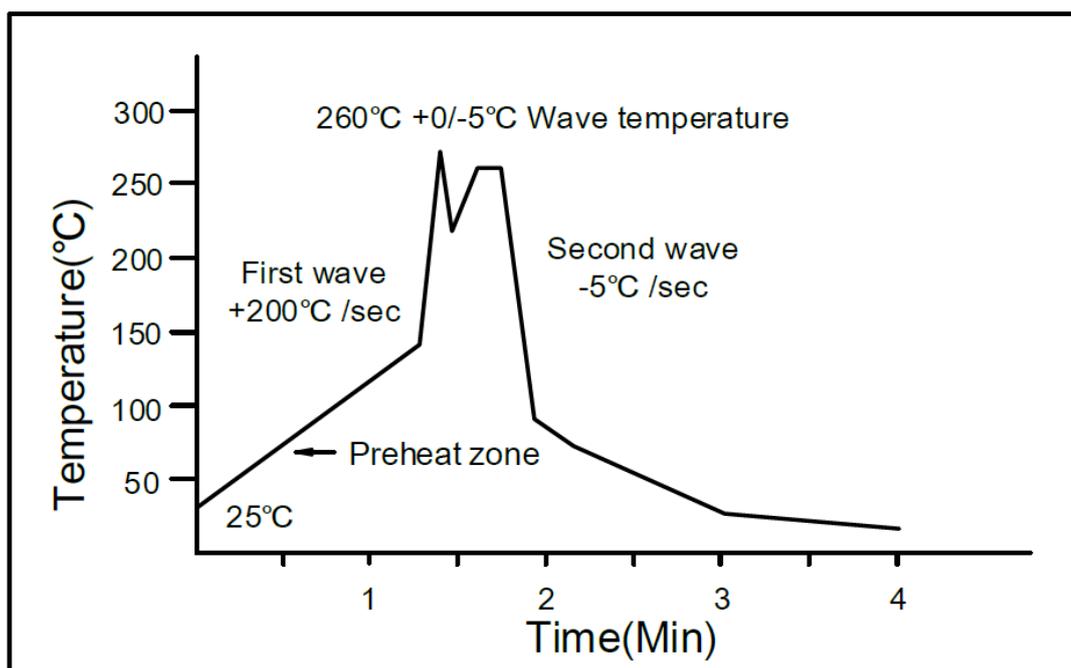
One time soldering is recommended within the condition of temperature.

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.

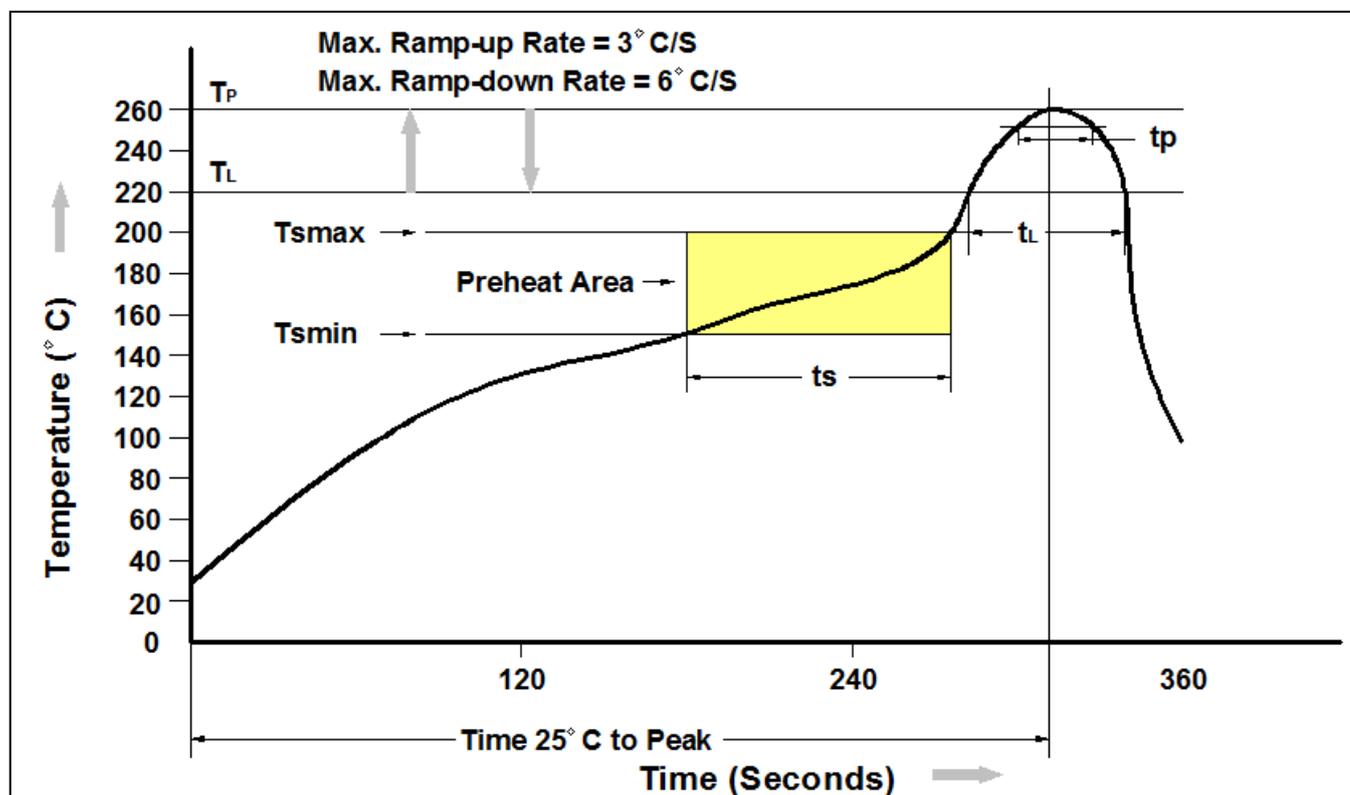
One time soldering is recommended. Temperature:  $350 \pm 10^\circ\text{C}$

Time: 5 sec max.



## 2.5A MOSFET/IGBT Gate Driver Optocoupler

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



Profile Feature	Pb-Free Assembly Profile
Temperature Min. (T <sub>smin</sub> )	150°C
Temperature Max. (T <sub>smax</sub> )	200°C
Time (t <sub>s</sub> ) from (T <sub>smin</sub> to T <sub>smax</sub> )	60-120 seconds
Ramp-up Rate (t <sub>L</sub> to t <sub>P</sub> )	3°C/second max.
Liquidous Temperature (T <sub>L</sub> )	217°C
Time (t <sub>L</sub> ) Maintained Above (T <sub>L</sub> )	60 – 150 seconds
Peak Body Package Temperature	260°C +0°C / -5°C
Time (t <sub>P</sub> ) within 5°C of 260°C	30 seconds
Ramp-down Rate (T <sub>P</sub> to T <sub>L</sub> )	6°C/second max
Time 25°C to Peak Temperature	8 minutes max.



## 2.5A MOSFET/IGBT Gate Driver Optocoupler

[www.ct-micro.com](http://www.ct-micro.com)

---

### DISCLAIMER

CT MICRO RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. CT MICRO DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

---

DISCOLORATION MIGHT OCCUR ON THE PACKAGE SURFACE AFTER SOLDERING, REFLOW OR LONG TERM USE. THIS DOES NOT IMPACT THE PRODUCT PERFORMANCE NOR THE PRODUCT RELIABILITY.

---

CT MICRO ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT EXPRESS WRITTEN APPROVAL OF CT MICRO INTERNATIONAL CORPORATION.

- 1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instruction for use provided in the labelling, can be reasonably expected to result in significant injury to the user.*
- 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.*