



5-Pin Long Mini-Flat DMC-Isolator® 1A MOSFET/IGBT Gate Driver Optocoupler

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Features

- Patented coplanar structure DMC-Isolator®
- Peak Output Current: IOP = ±1A (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
- Halogen Free Compliance (Optional)
- MSL class 1
- Regulatory Approvals
 - ✓ UL - UL1577 (E364000)
 - ✓ VDE - EN60747-5-5(VDE0884-5)
 - ✓ CQC – GB4943.1, GB8898(19001231775)
 - ✓ IEC62368 (FI/41119)

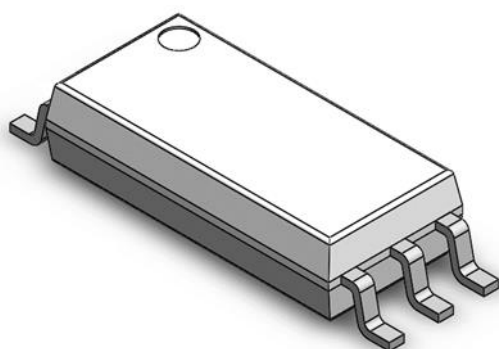
Description

The CTL5701 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

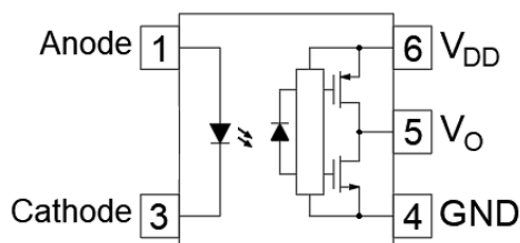
- Isolated IGBT/Power MOSFET gate drive
- Industrial Inverter
- AC brushless and DC motor drives
- Induction Heating

Package Outline



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

Schematic



Truth Table

| LED | V _{CC} -V _{EE} | V _{CC} -V _{EE} | Output |
|-----|----------------------------------|----------------------------------|------------|
| | Positive Going | Negative Going | |
| Off | 0 to 30 V | 0 to 30V | Low |
| On | 0 to 6.9V | 0 to 5.9V | Low |
| On | 6.9 to 8.7V | 5.9 to 7.5V | Transition |
| On | 8.7 to 30V | 7.5 to 30V | High |



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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_{ISO} | Isolation voltage (AC, 1 minute, 40 ~ 60% R.H.) | 5000 | V_{RMS} | |
| T_{OPR} | Operating temperature | -40 ~ +110 | $^{\circ}\text{C}$ | |
| T_{STG} | Storage temperature | -55 ~ +125 | $^{\circ}\text{C}$ | |
| T_{SOL} | Soldering temperature (For 10 seconds) | 260 | $^{\circ}\text{C}$ | 2 |
| P_{TOT} | 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 | |
| $V_{\text{O(PEAK)}}$ | Peak Output Voltage | 0 to 30 | V | 1 |
| I_{OPH} | Output High Peak Current | 1 | A | 2 |
| I_{OPL} | Output Low Peak Current | 1 | A | 2 |
| V_{CC} | Supply voltage | 0 to 30 | V | 3 |

Notes

1. The $V_{\text{O(PEAK)}}$ voltage CAN NOT BE high than V_{CC} .
2. The I_{O} maximum pulse width = 10 μs , maximum duty cycle = 0.2%.
3. The V_{CC} recommended operating condition is 10~30V.



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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 | $I_F = 10mA$, $I_O = -100mA$ | $V_{CC} - 0.6$ | $V_{CC} - 0.4$ | - | V | |
| V_{OL} | Low Level Output Voltage | $I_F = 0mA$, $I_O = 100mA$ | - | 0.25 | 0.4 | V | |
| I_{OPH} | High Level Output Current | $V_O = V_{CC} - 2V$ | - | - | -0.3 | A | 1 |
| | | $V_O = V_{CC} - 4V$ | - | - | -1 | | 1 |
| I_{OPL} | Low Level Output Current | $V_O = V_{EE} + 2V$ | 0.3 | - | - | A | 1 |
| | | $V_O = V_{EE} + 4V$ | 1 | - | - | | 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 | $I_O = 10mA$, $V_O > 5V$ | 6.9 | 7.8 | 8.7 | V | |
| V_{UVLO-} | | $I_O = 10mA$, $V_O < 5V$ | 5.9 | 6.7 | 7.5 | V | |
| $UVLO_{HYS}$ | Under Voltage Lockout Hysteresis | | - | 1.1 | - | V | |

Notes

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



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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% , $T_A = 25$ °C | | 50 | 160 | 300 | ns | |
| T_{PLH} | Low to High Propagation Delay | | | 50 | 140 | 300 | ns | |
| P_{WD} | Pulse Width Distortion | | | | 40 | 200 | 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 | $V_{CC} = 30V$, $T_A = 25$ °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

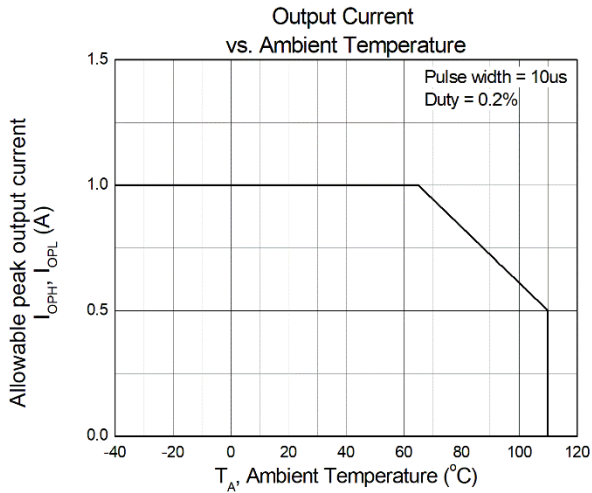


Figure 1

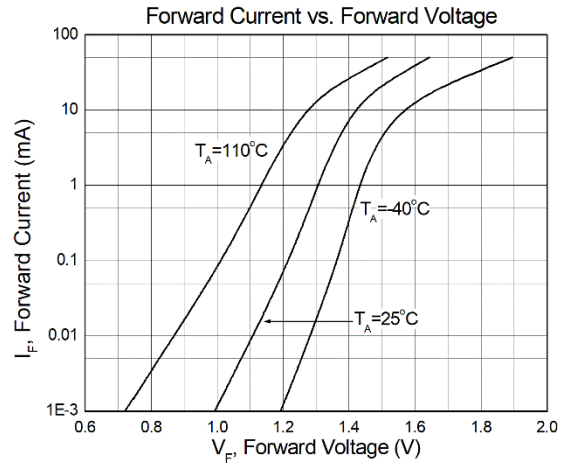


Figure 2

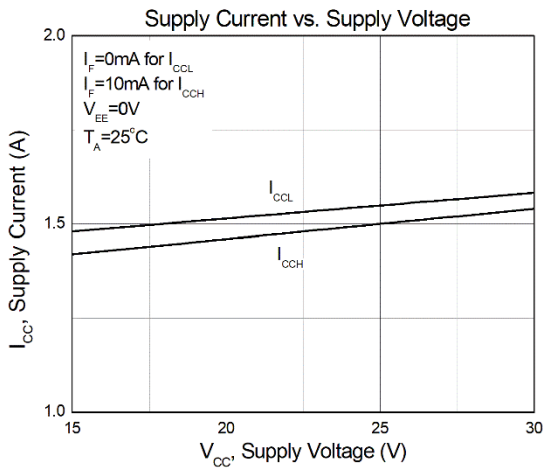


Figure 3

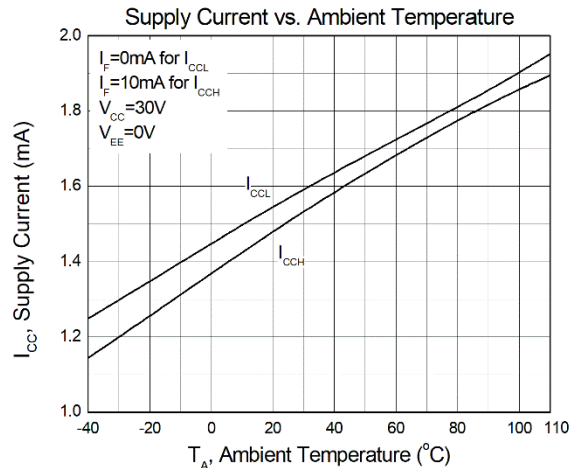


Figure 4

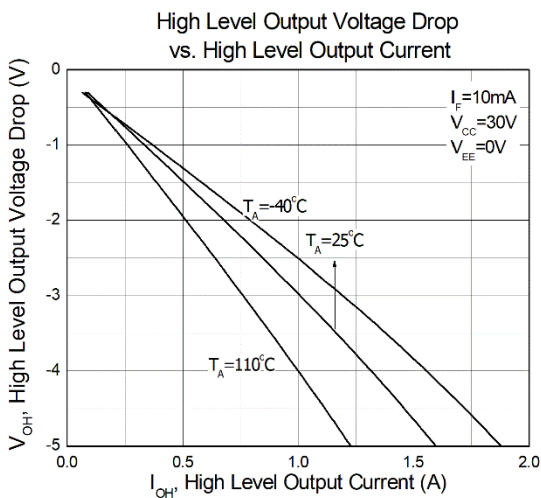


Figure 5

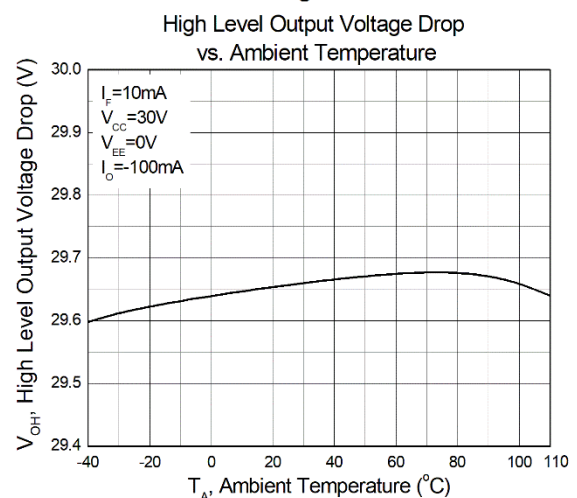


Figure 6



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

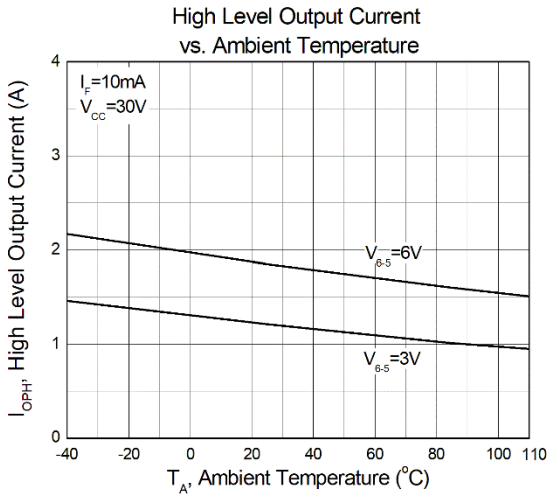


Figure 7

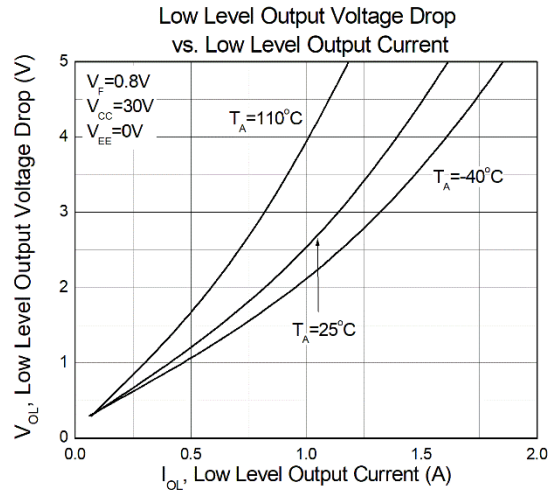


Figure 8

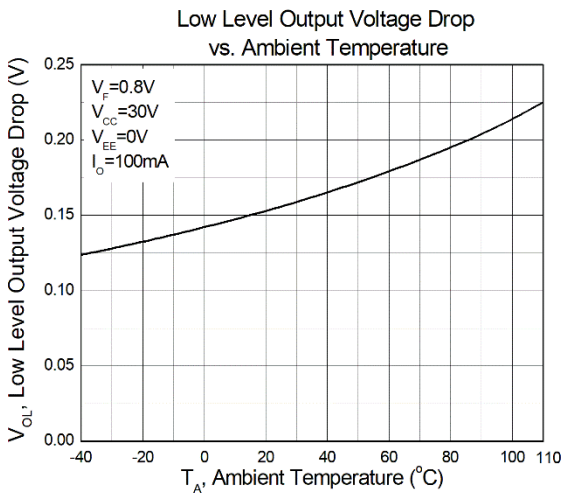


Figure 9

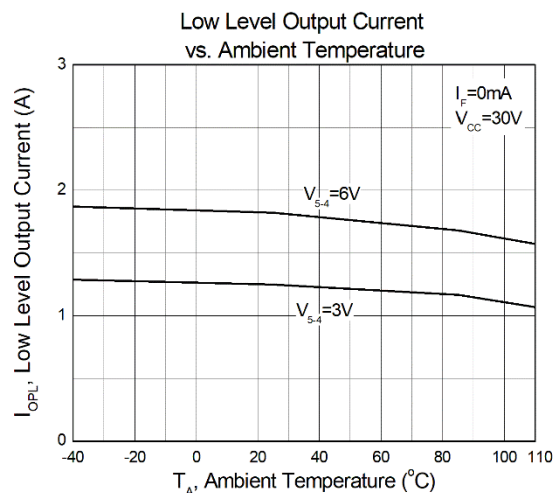


Figure 10

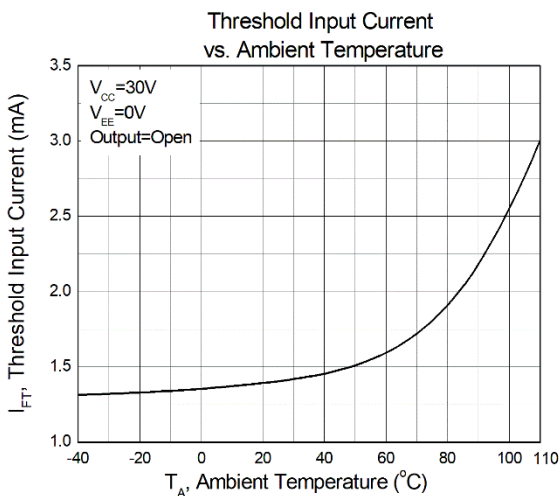


Figure 11

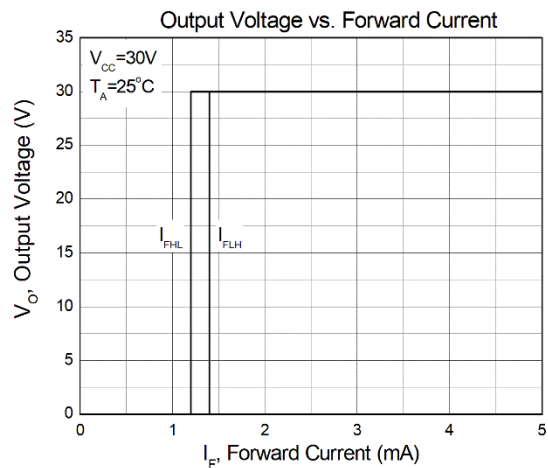


Figure 12



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

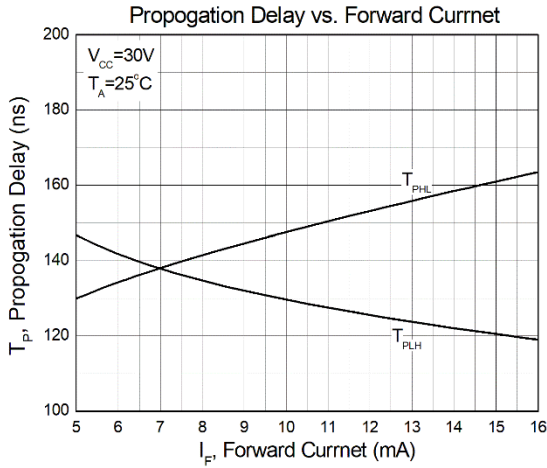


Figure 13

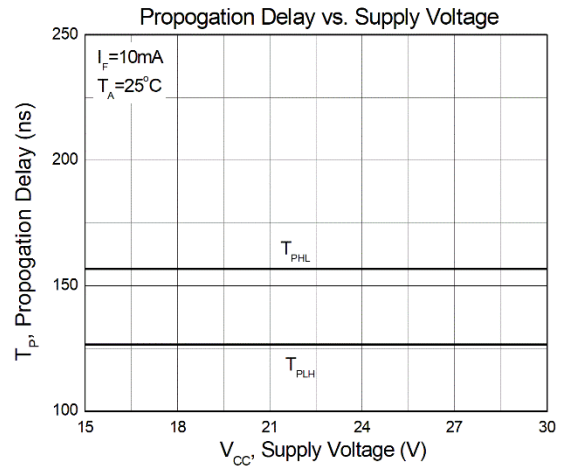


Figure 14

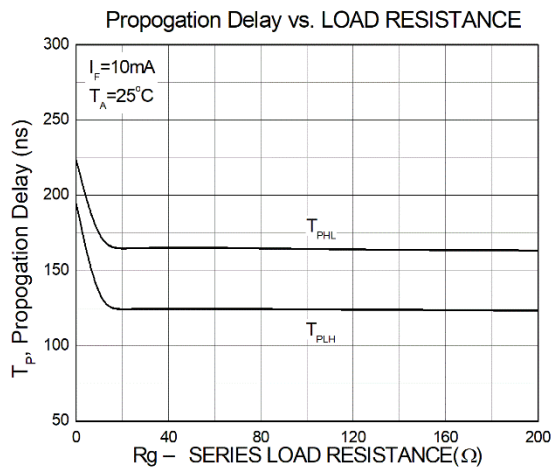


Figure 15

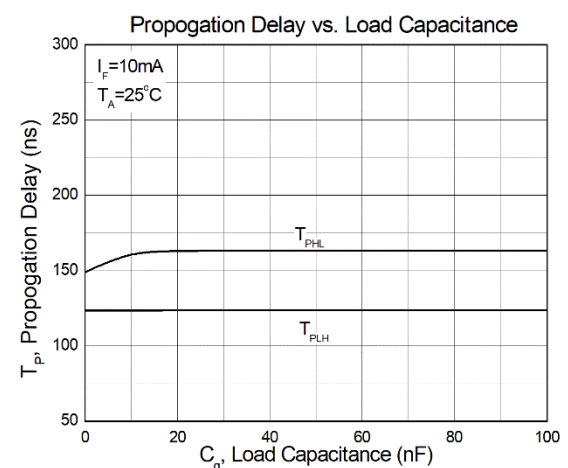


Figure 16

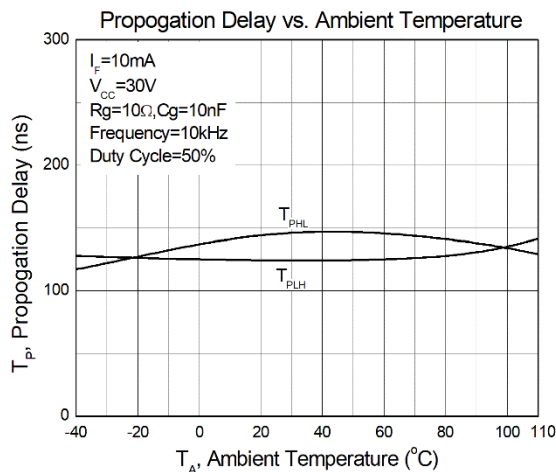


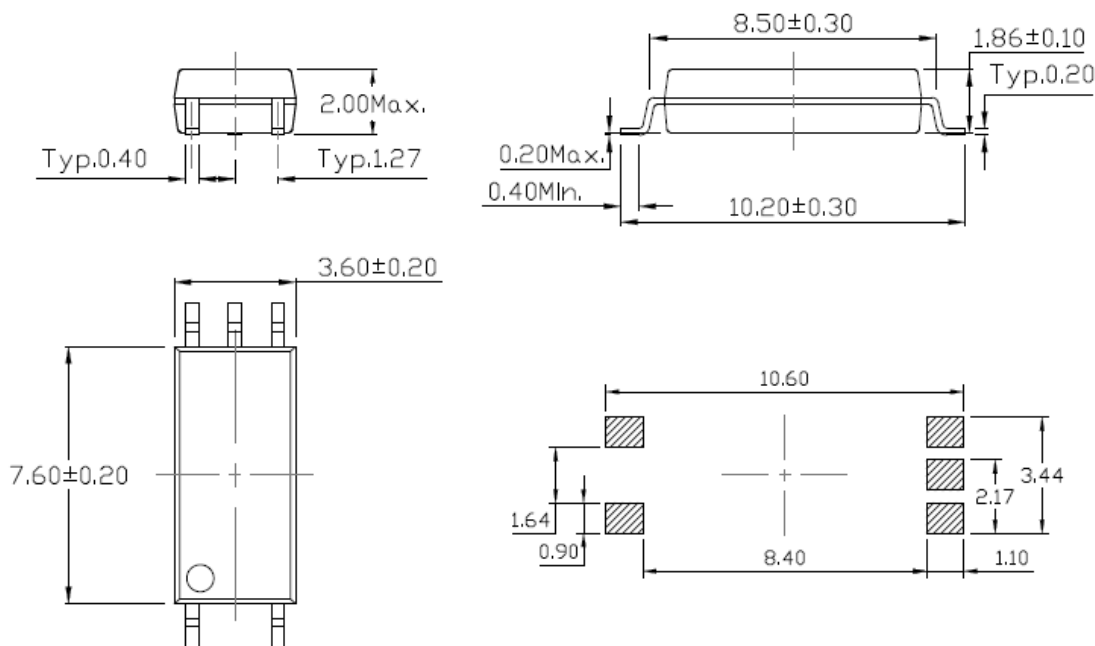
Figure 17



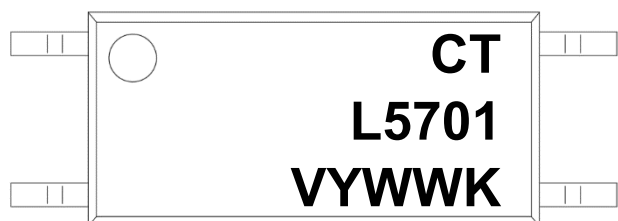
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Package Dimension *Dimensions in mm unless otherwise stated*



Marking Information



Note:

- CT : Denotes "CT Micro"
- L5701 : Part Number
- 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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Ordering Information

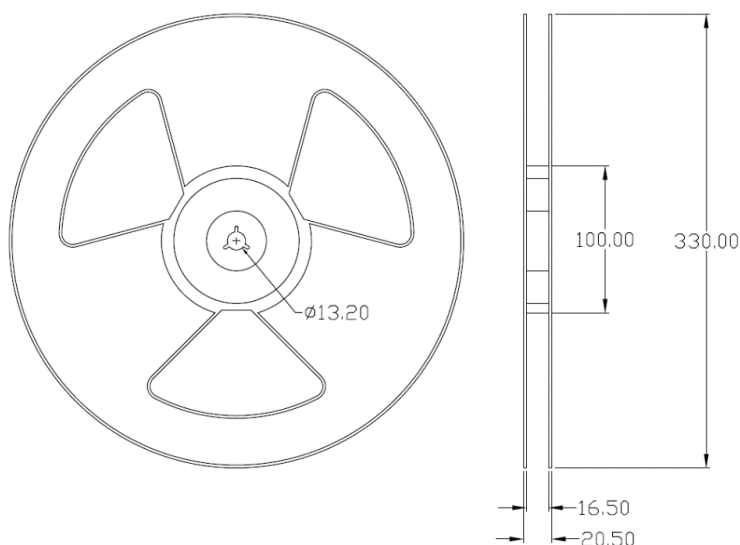
CTL5701(V)(Z)

- CT = Denotes “CT Micro”
- 5701 = Part Number
- V = VDE Safety Mark Option (Blank or V)
- Z = Tape and Reel Option (T1 or T2)

| Option | Description | Quantity |
|--------|---------------------------------------------------|----------------|
| T1 | Surface Mount Lead Forming – With Option 1 Taping | 3000Units/Reel |
| T2 | Surface Mount Lead Forming – With Option 2 Taping | 3000Units/Reel |

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

Option T1/T2





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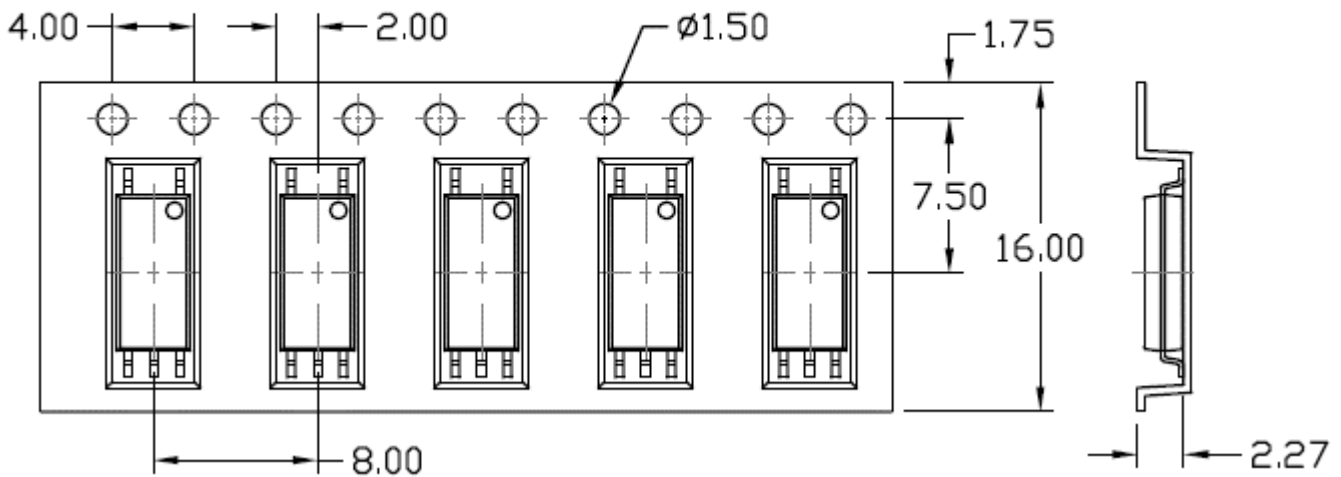
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Carrier Tape Specifications *Dimensions in mm unless otherwise stated*

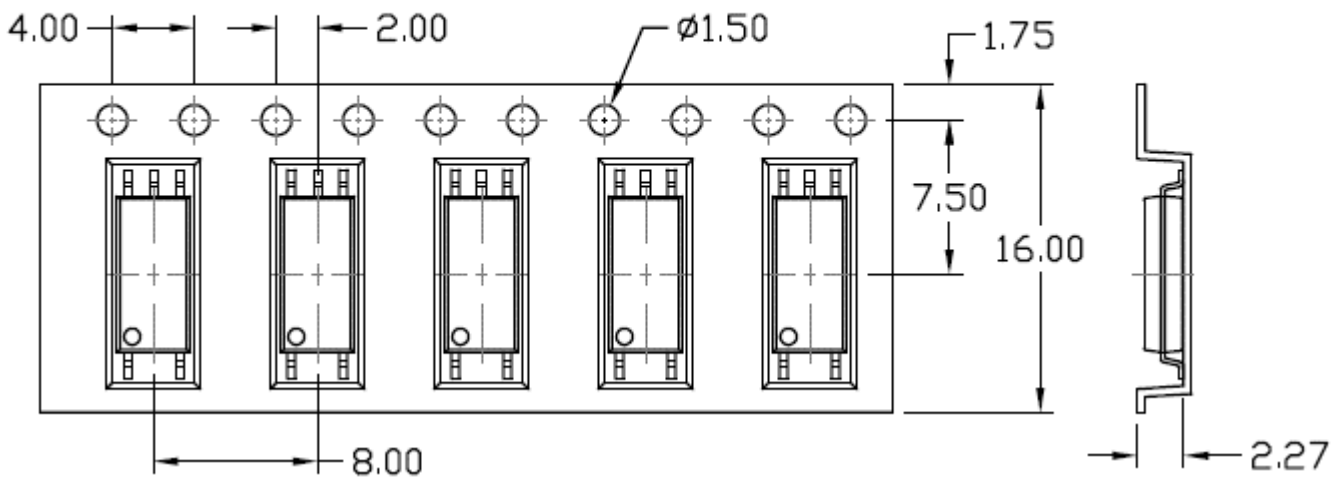
Option T1

Input Direction



Option T2

Input Direction





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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)

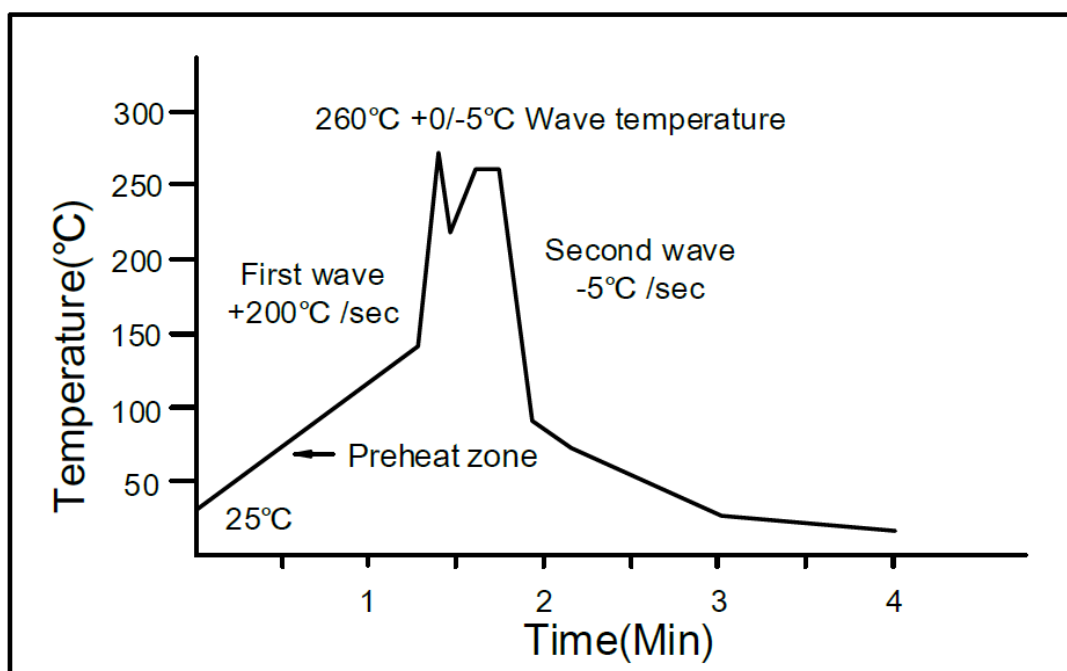
One time soldering is recommended within the condition of temperature.

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

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

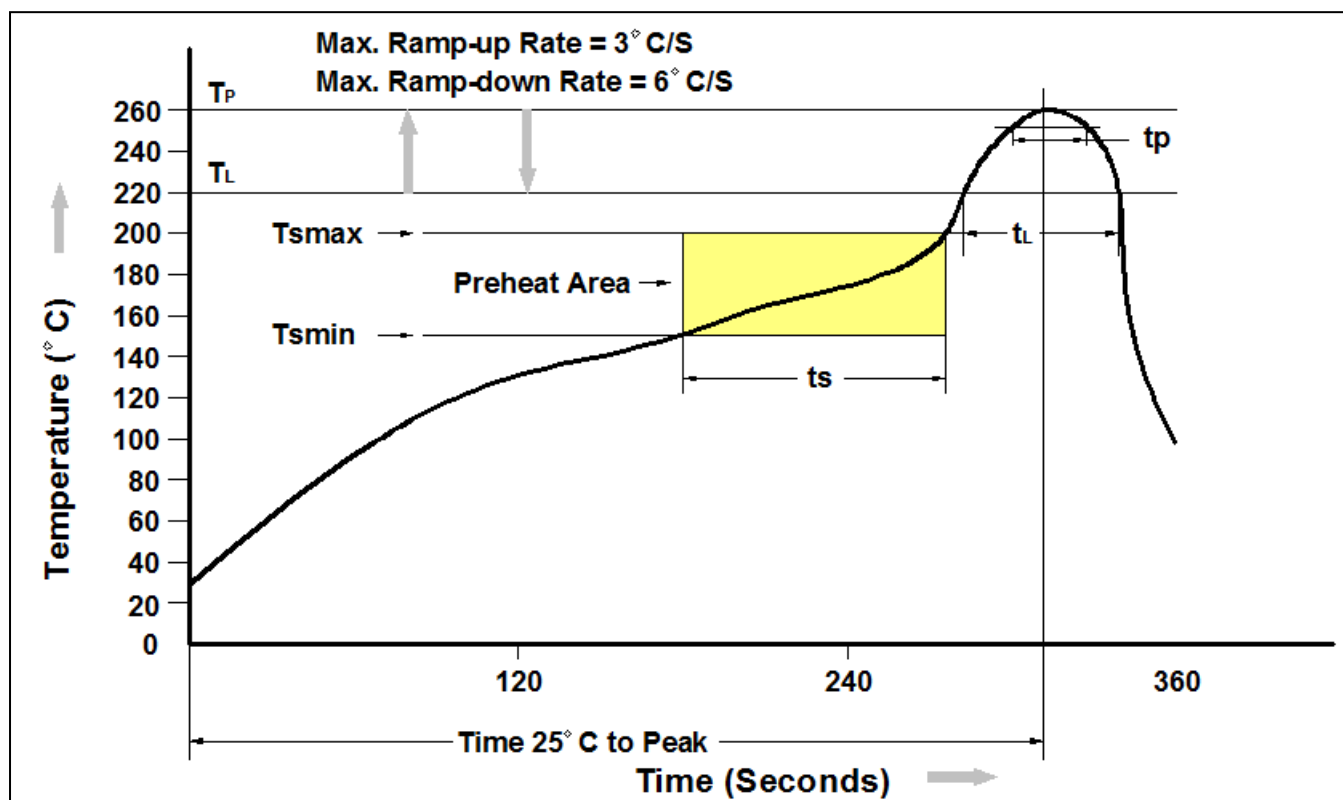
Time: 5 sec max.



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



| Profile Feature | Pb-Free Assembly Profile |
|---------------------------------------------------------------------|--------------------------|
| Temperature Min. (T _{min}) | 150°C |
| Temperature Max. (T _{max}) | 200°C |
| Time (t _s) from (T _{min} to T _{max}) | 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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