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CTS480

High CMR Intelligent Power Module and Gate Drive Interface Optocoupler

Features

- Wide operating temperature range: –40°C to 100°C
- Operating Temperature range: 4.5V to 30V
- Threshold Input Current: I_{FLH} = 5 mA (max)
- Common mode transient immunity : ±10kV/μs (min）
- 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)

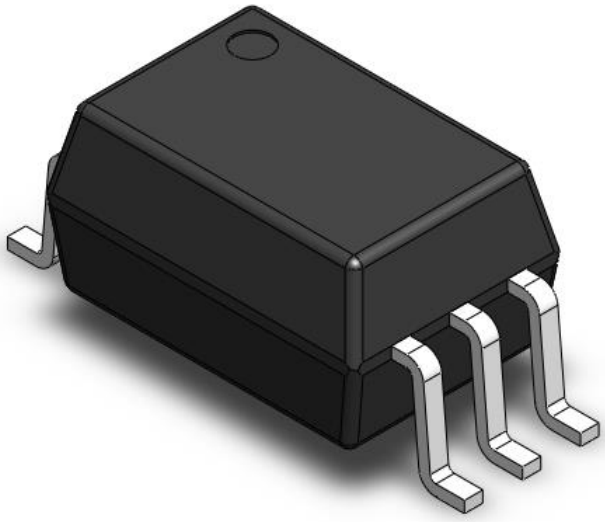
Description

The CTS480 contains AlGaAs LED and optical detector with power output stage and Schmitt trigger circuit application. The totem pole output eliminates the need for a pull-up resistor and allows for a direct-drive Intelligent Power Module or gate drive. Propagation delay difference between devices has been minimized to maximize inverter efficiency through reduced switching dead time.

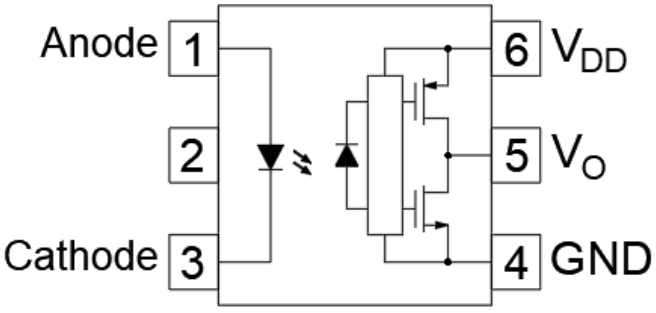
Applications

- IPM interface isolation
- Isolated IGBT/Power MOSFET gate drive
- Industrial Inverter
- AC brushless and DC motor driver

Package Outline



Schematic



Truth Table

LED	Output
Off	Low
On	High

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

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 ~ +100	^{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	185	mW	
Emitter				
I_F	Forward current	50	mA	
I_{FP}	Peak forward current (<1 μs pulse width, 300 pps)	1	A	
V_R	Reverse voltage	5	V	
Detector				
$V_{O(PEAK)}$	Peak Output Voltage	35	V	3
I_{OPH}	Output High Peak Current	50	mA	
V_{CC}	Supply voltage	35	V	

Notes

1. AC for 1 minute, RH = 40 ~ 60%.
2. For reflow profile 10 second peak.
3. The $V_{O(PEAK)}$ voltage CAN NOT BE high than V_{CC}.

Electrical Characteristics

Over recommended operating conditions TA = –40 to 100 °C. Typical values are measured at V_{CC}=30V, V_{EE}= GND, T_A = 25°C (unless otherwise stated)

Emitter Characteristics

Symbol	*Parameters*	*Test Conditions*	*Min*	*Typ*	*Max*	*Units*	*Notes*
V_F	Forward voltage	I_F = 10mA	-	1.4	1.8	V	
V_R	Reverse Voltage	I_R = 10μA	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	I_F = 0mA, V_O= Open	--	1.4	3.0	mA	
I_{CCH}	Logic High Supply Current	I_F = 10mA, V_O= Open	--	1.4	3.0	mA	

Transfer Characteristics

Symbol	*Parameters*	*Test Conditions*	*Min*	*Typ*	*Max*	*Units*	*Notes*
V_{OH}	High Level Output Voltage	I_F=10mA , I_{OH}= -6.5mA	V_{CC} - 0.5	V_{CC} - 0.1		V	
V_{OL}	Low Level Output Voltage	I_F=0mA , I_{OL}=6.5mA	-	V_{EE} + 0.1	V_{EE} + 0.5	V	
I_{OSH}	High Level Output Current	I_F = 5 mA, V_{CC} = 5.5 V V_O=GND	--	--	-80	mA	1
		I_F = 5 mA , V_{CC} = 20 V V_O=GND	--	--	-120		1
I_{OSL}	Low Level Output Current	I_F = 0 mA, V_{CC} = V_O = 5.5 V	80	--	--	mA	1
		I_F = 0 mA, V_{CC} = V_O = 20 V	150	--	--		1
I_{FLH}	Input Threshold Current	V_O > 1V	--	2.6	5.0	mA	
V_{FLH}	Input Threshold Voltage	V_O > 1V	0.8	--	--	V	

Note 1: Duration of output short circuit time should not exceed 500 μs.

Electrical Characteristics

Over recommended operating conditions TA = –40 to 100 °C. Typical values are measured at V_{CC}=30V, V_{EE}= GND, T_A = 25°C (unless otherwise stated

Switching Characteristics

Symbol	*Parameters*	*Test Conditions*		*Min*	*Typ*	*Max*	*Units*	*Notes*
t_{PHL}	High to Low Propagation Delay	I_F= 5mA, V_{CC}=30V f= 100kHz, Duty = 10%, T_A= 25℃		--	130	250	ns	
t_{PLH}	Low to High Propagation Delay			--	180	250	ns	
P_{WD}	Pulse Width Distortion			--	--	250	ns	
PDD	Propagation Delay Difference Between Any Two Parts			-100	--	250	ns	
t_r	Rise Time			--	20	--	ns	
t_f	Fall Time			--	20	--	ns	
$\|CM_H\|$	Common Mode Transient High	V_{CC}= 5V, T_A= 25℃, V_{CM}= 1.0kV	I_F= 5mA	20	--	--	kV/μs	
$\|CM_L\|$	Common Mode Transient Low		I_F= 0mA	20	--	--	kV/μs	

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

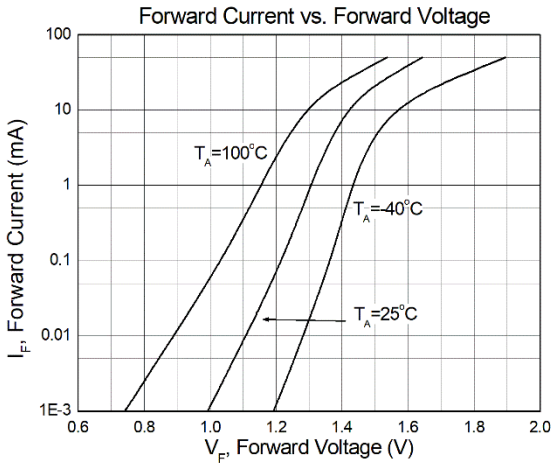


Figure 1

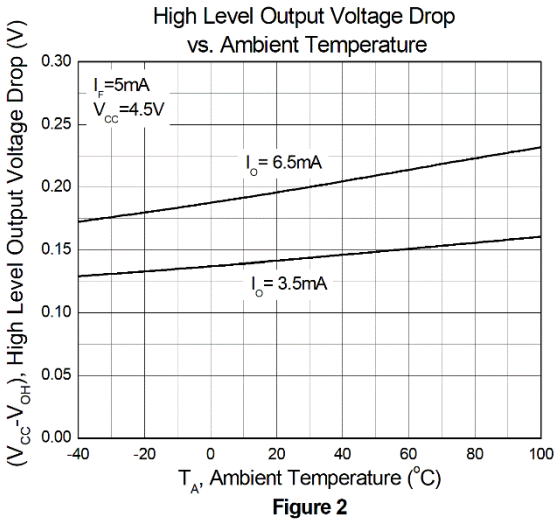


Figure 2

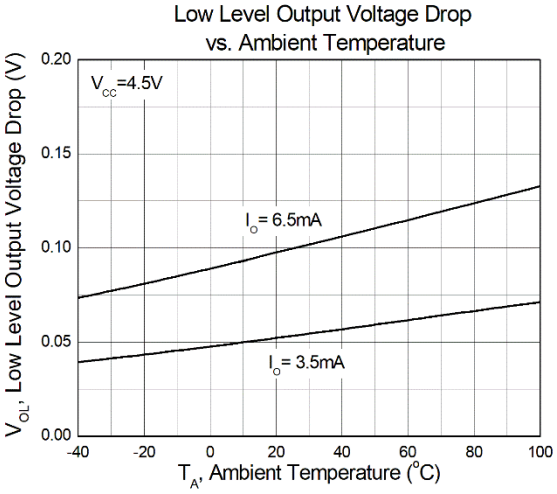


Figure 3

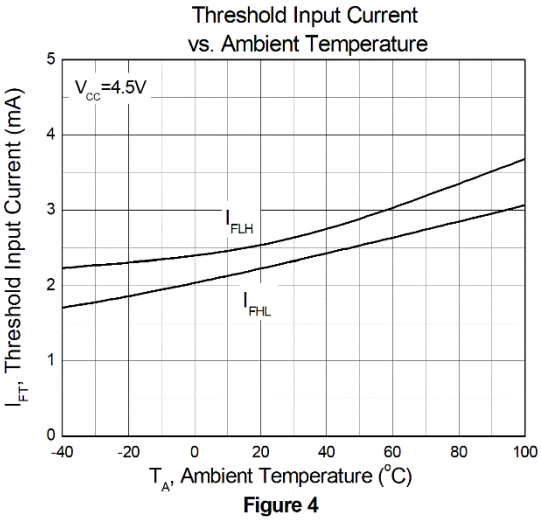
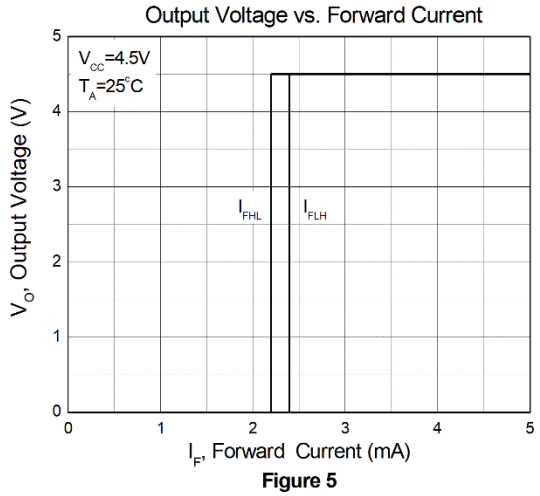


Figure 4



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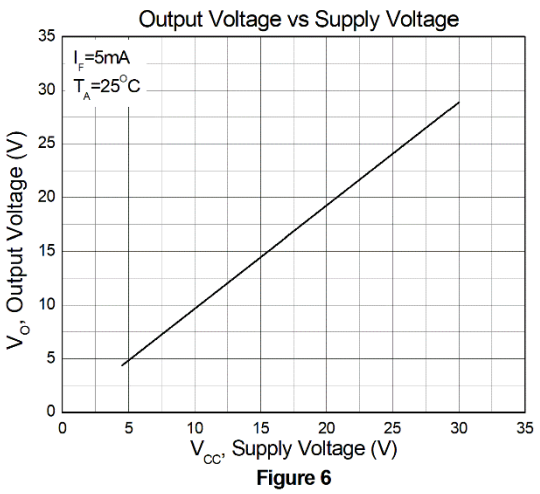
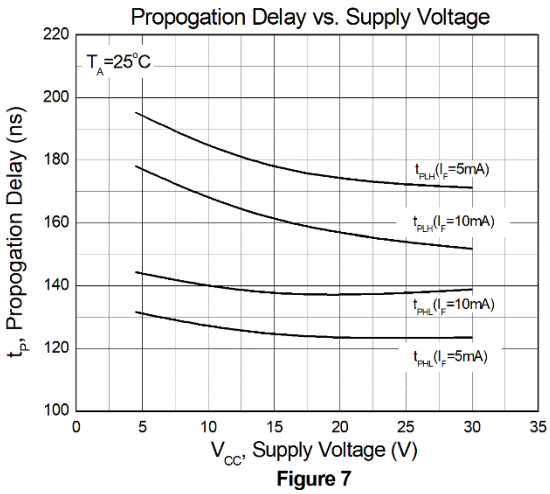


Figure 6

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



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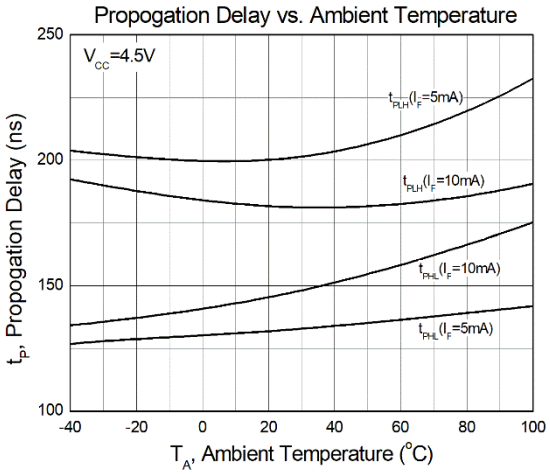

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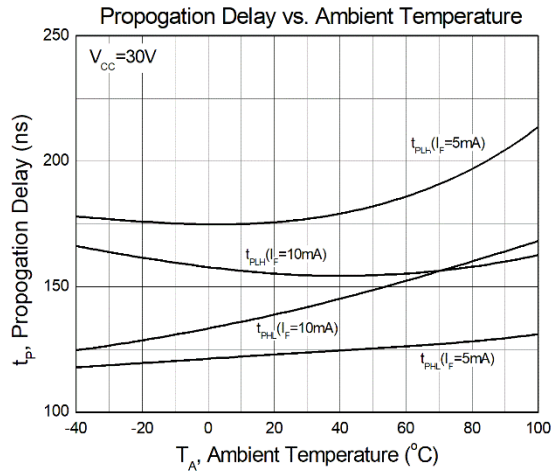

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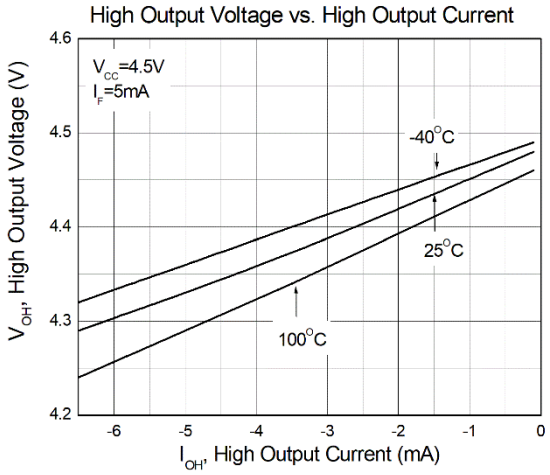


Figure 10

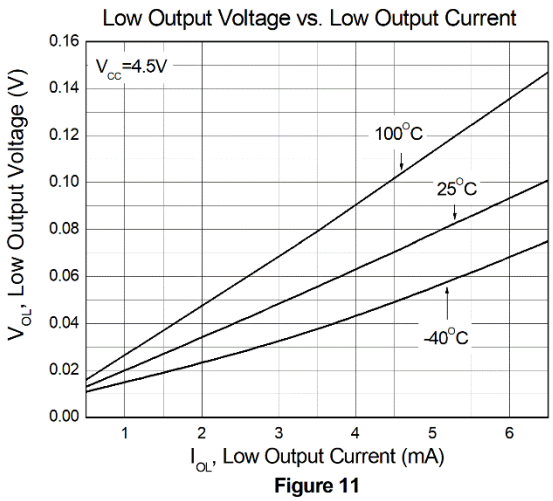


Figure 11

Test Circuits

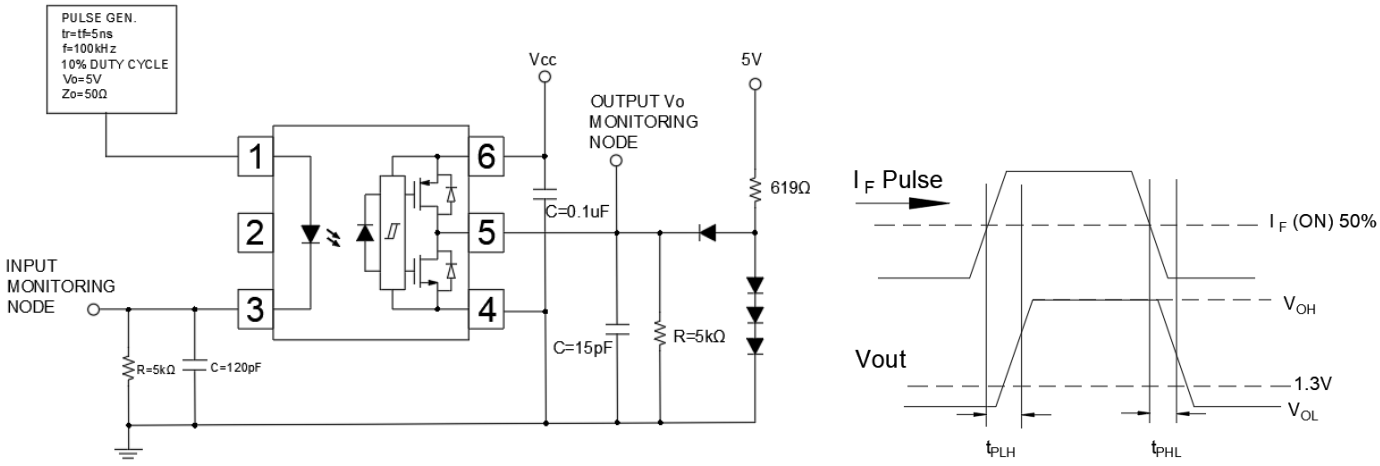


Fig. 10 Test circuit and waveforms for t_{PHL}, t_{PLH}, t_r, and t_f

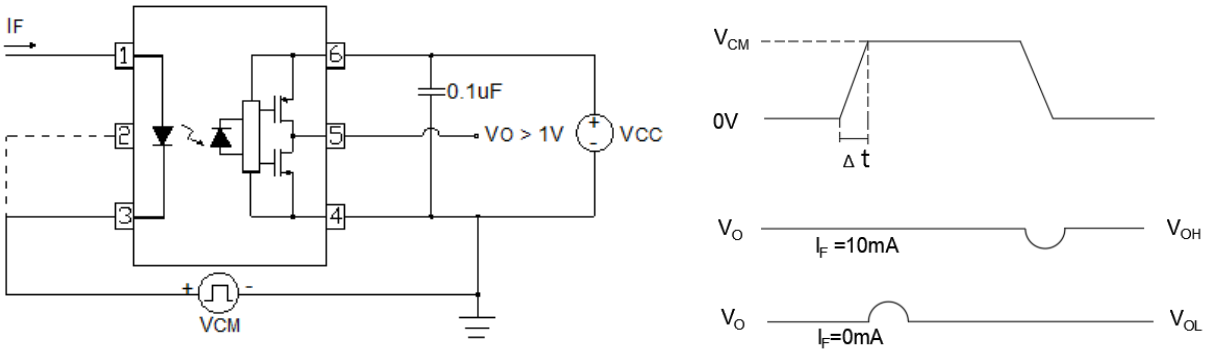
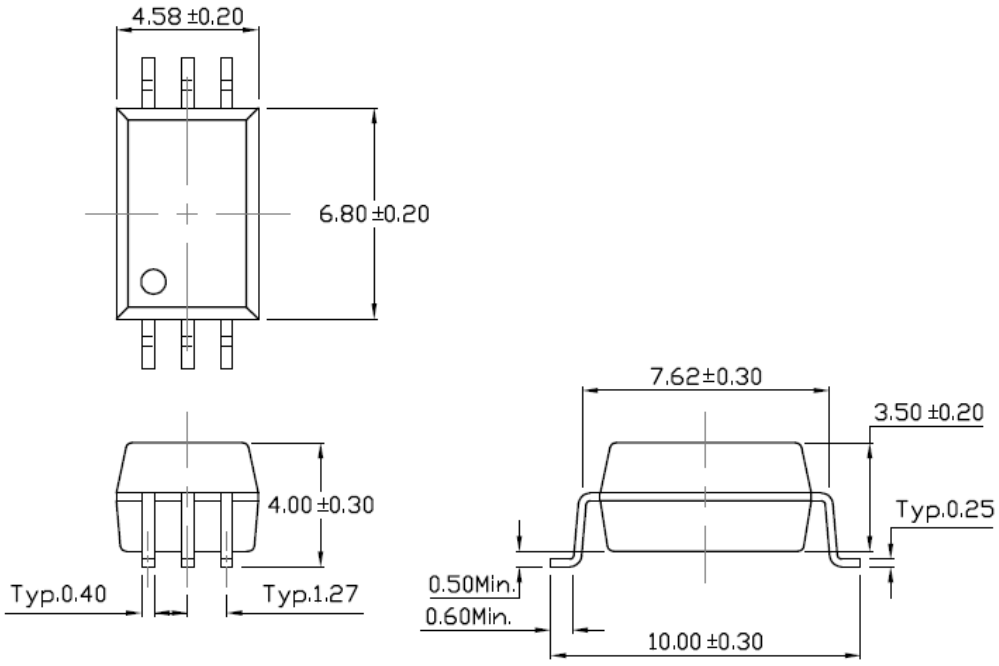


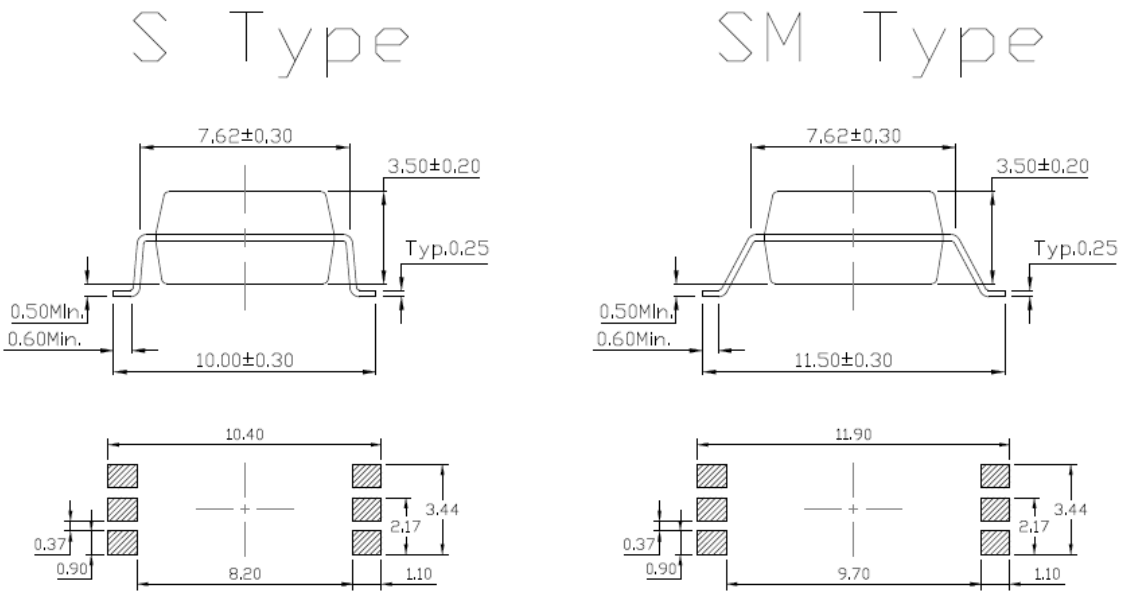
Fig. 11 Test circuit for Common mode Transient Immunity

Package Dimension *Dimensions in mm unless otherwise stated*

Surface Mount Lead Forming



Forming Option *Dimensions in mm unless otherwise stated*



Marking Information

Note:

CT : Denotes “CT Micro”
480 : 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

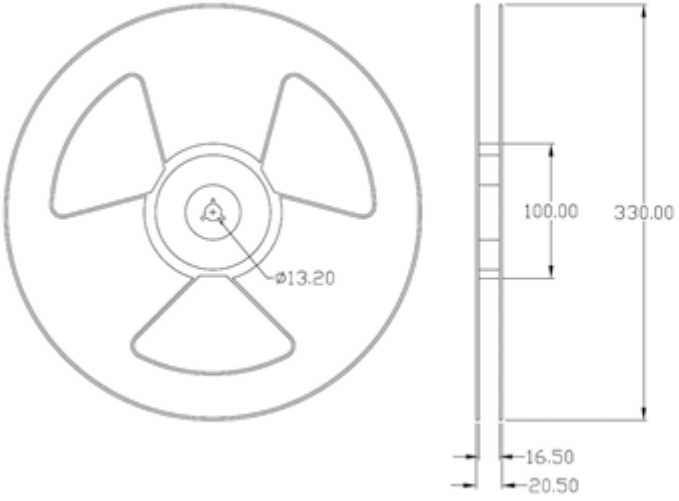
CTS480(V)(Y)(Z)

CT = Denotes “CT Micro”
S480 = Part Number
V = VDE Safety Mark Option (Blank or V)
Y = Lead Form Option (S or SM)
Z = Tape and Reel Option (T1 or T2)

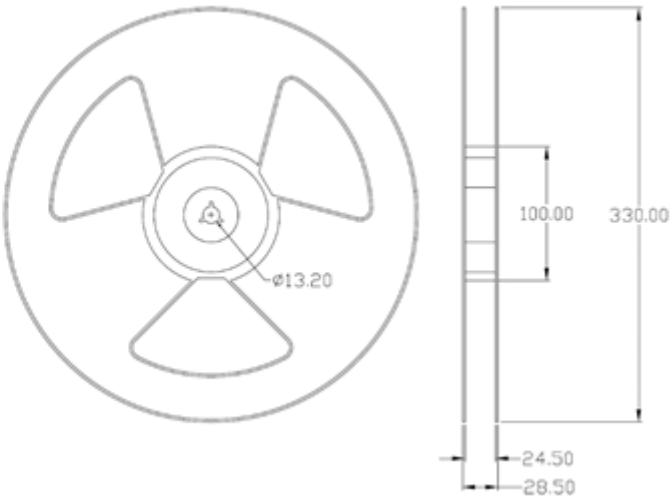
Option	*Description*	*Quantity*
T1	Surface Mount Lead Forming with Option 1 Taping	1500 Units/Reel
T2	Surface Mount Lead Forming with Option 2 Taping	1500 Units/Reel
M(T1)	Surface Mount (Gullwing) Lead Forming with Option 1 Taping	1500 Units/Reel
M(T2)	Surface Mount (Gullwing) Lead Forming with Option 2 Taping	1500 Units/Reel

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

Option S(T1/T2)

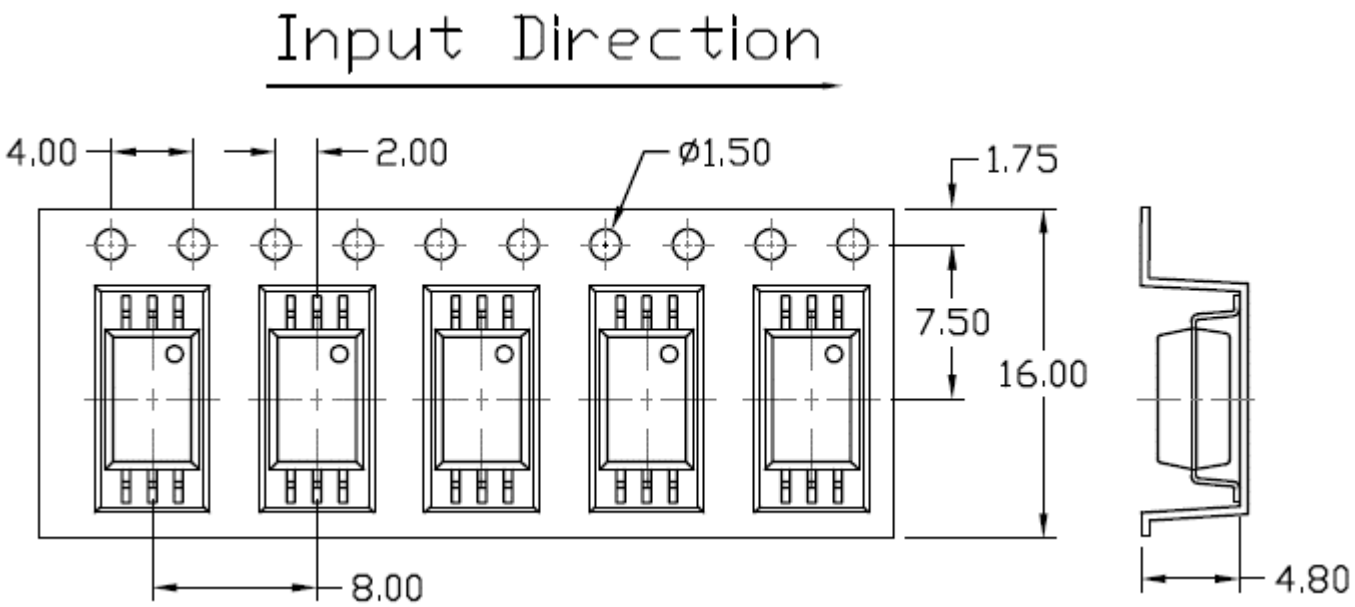


Option M(T1/T2)

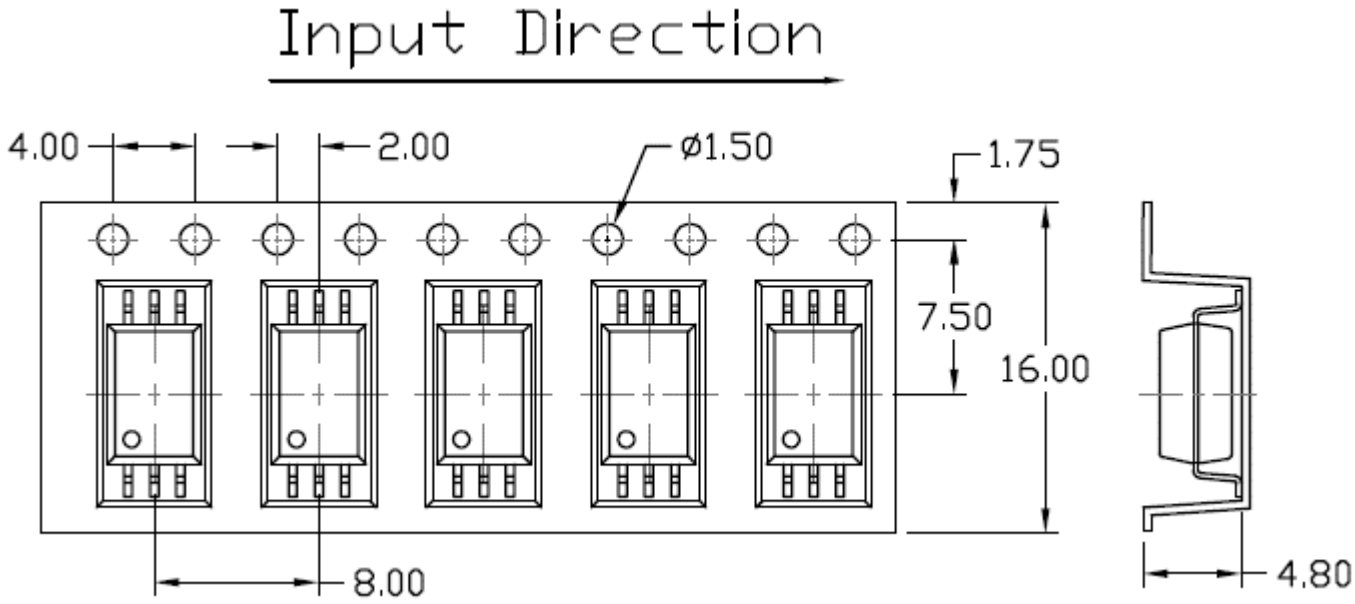


Carrier Tape Specifications *Dimensions in mm unless otherwise stated*

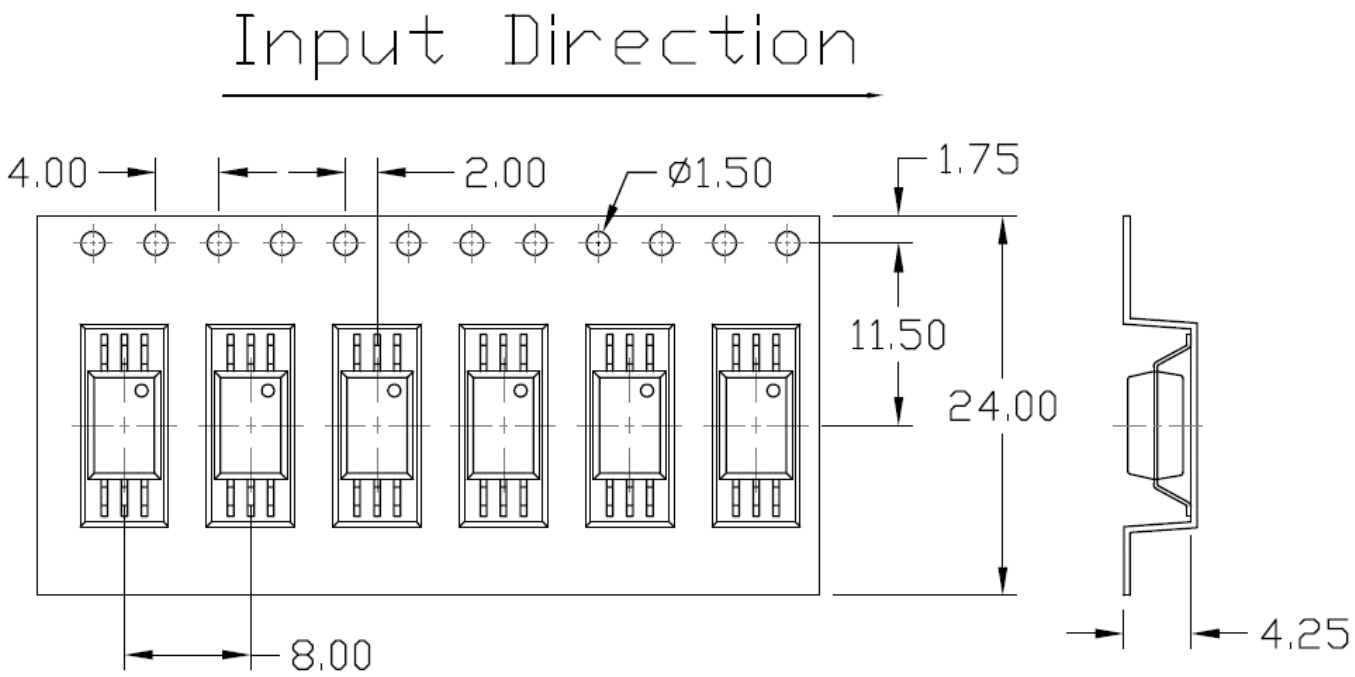
Option S(T1)



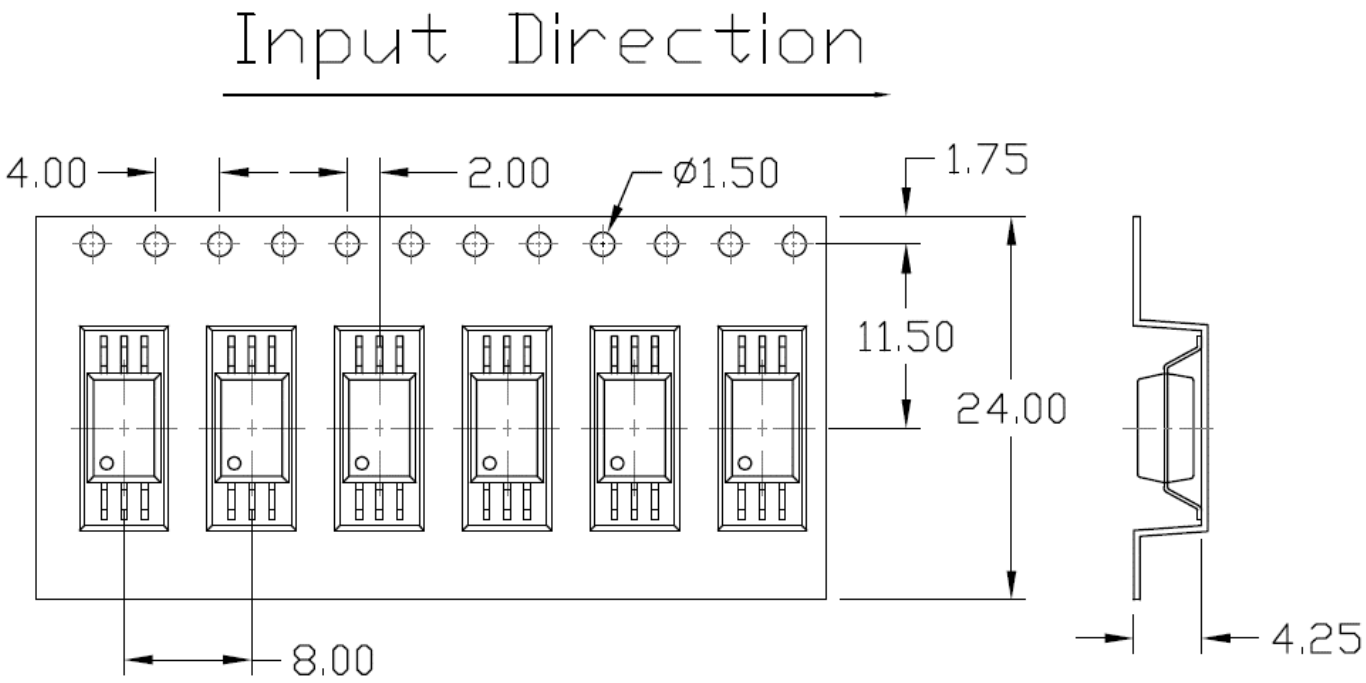
Option S(T2)



Option SM(T1)



Option SM(T2)

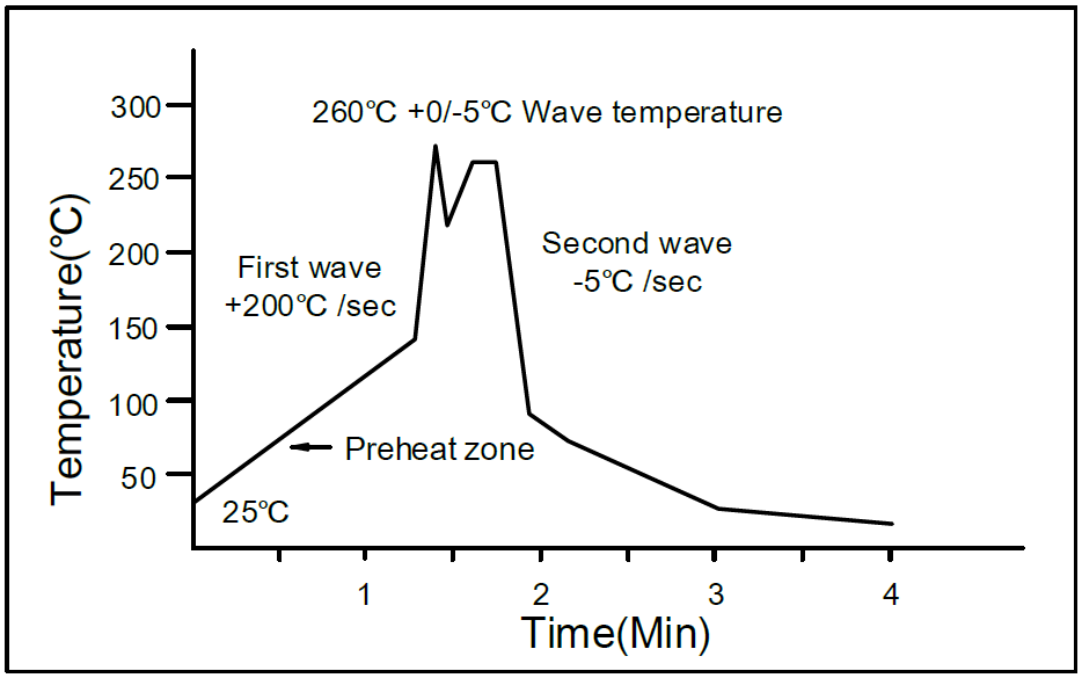


Solderability spec (Follow the JEDEC standard JESD22-B102)

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)

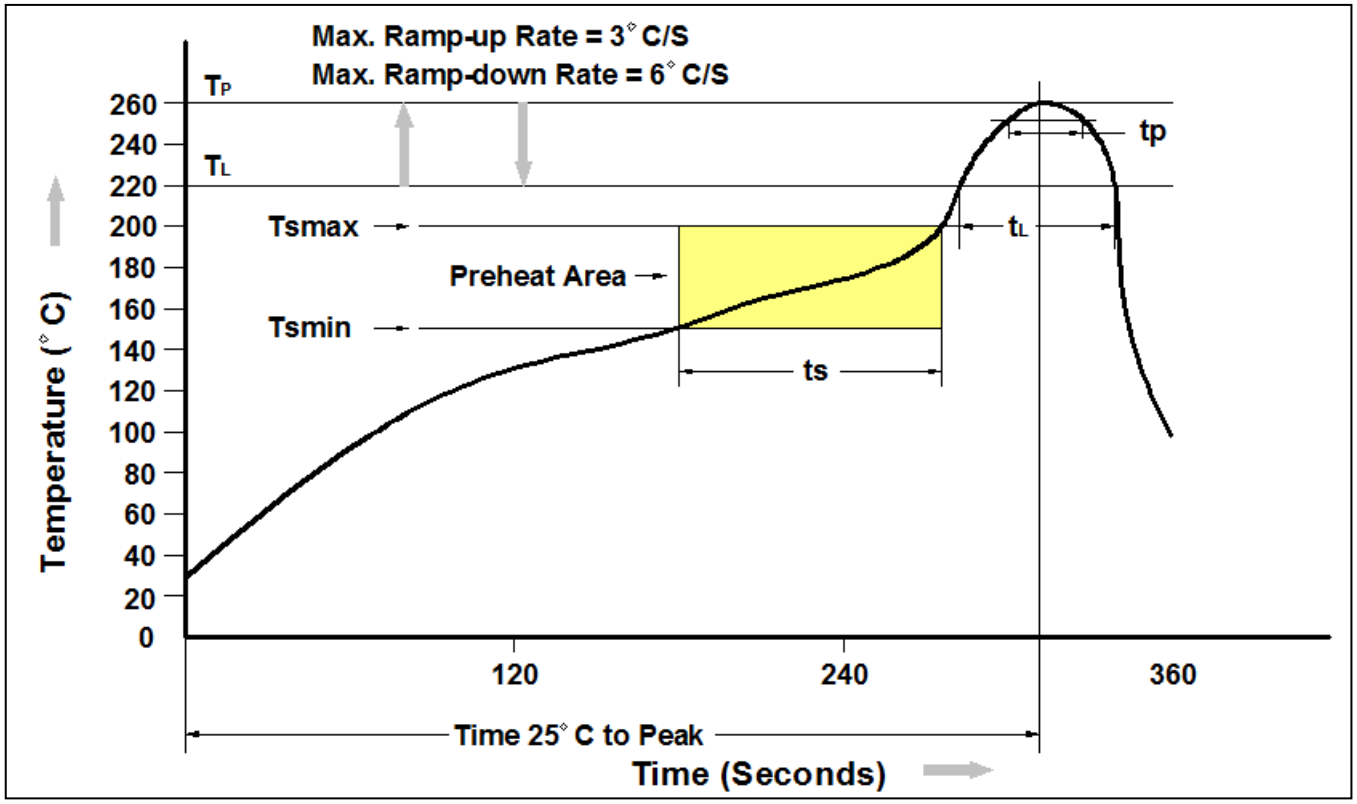
One time soldering is recommended within the condition of temperature.
Temperature: 260+0/-5˚C.
Time: 10 sec.
Preheat temperature: 25 to 140˚C.
Preheat time: 30 to 80 sec.



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.*