CT4505

1Mbit/s High Speed Phototransistor Optocoupler

www.ct-micro.com

Features

- High speed 1MBit/s
- High isolation voltage between input and output (Viso=5000 Vrms)
- Operating emperature range -55°C to 100°C
- MSL class 1
- Regulatory Approvals
  - ✓ UL - UL1577 (E364000)
  - ✓ VDE - EN60747-5-5(VDE0884-5)
  - ✓ CQC – GB4943.1, GB8898(14001104779)
  - ✓ IEC62368 (FI/41119)

Applications

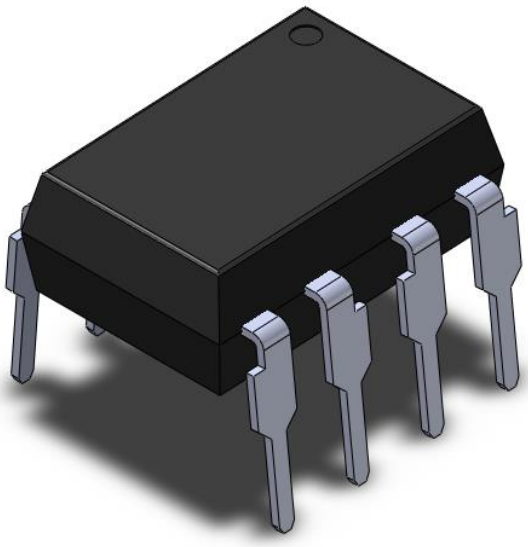
- Line receivers
- Telecommunication equipment
- High speed logic ground isolation
- Feedback loop in switch-mode power supplies
- Home appliances

Description

The CT4505 devices each consist of an infrared emitting diode, optically coupled to a high speed photo detector transistor. A separate connection for the photodiode bias and output-transistor collector increase the speed by several orders of magnitude over conventional phototransistor couplers by reducing the base-collector capacitance of the input transistor.

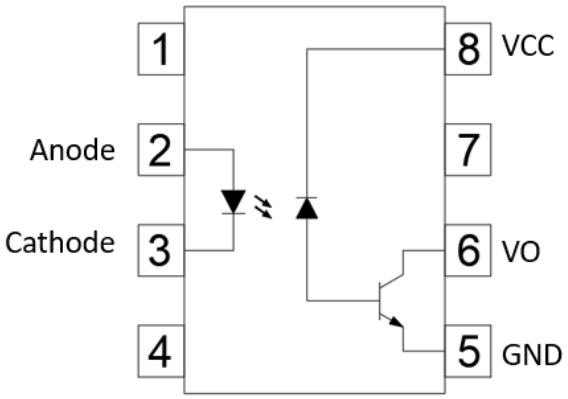
The devices are packaged in an 8-pin DIP package and also available in gullwing (400mil) and surface mount lead forming.

Package Outline



Note: Different bending options available. See package dimension.

Schematic



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	-55 ~ +100	°C	
T_{STG}	Storage temperature	-55 ~ +125	°C	
T_{SOL}	Soldering temperature (For 10 seconds)	260	°C	***2***
Emitter				
I_F	Forward current	25	mA	
I_{FP}	Peak forward current (50% duty, 1ms P.W)	50	mA	
$I_{F(TRANS)}$	Peak transient current (≤1μs P.W,300pps)	1	A	
V_R	Reverse voltage	5	V	
P_D	Power dissipation	40	mW	
Detector				
P_D	Power dissipation	100	mW	
$I_{O(AVG)}$	Average Output current	8	mA	
$I_{O\ (Peak)}$	Peak Output current	16	mA	
V_O	Output voltage	-0.5 to 20	V	
V_{CC}	Supply voltage	-0.5 to 30	V	

Electrical Characteristics *Typical values are measured at $T_A = 25^0C$*

Emitter Characteristics

Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes
V_F	Forward voltage	IF = 16mA	-	1.5	1.8	V	
V_R	Reverse voltage	IR = 10μA	5.0	-	-	V	
$\Delta V_F/\Delta T_A$	Temperature coefficient of forward voltage	IF = 16mA	-	-1.8	-	mV/°C	
C_T	Input capacitance	VF = 0, f = 1MHz		12		pF	

Detector Characteristics

Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes
I_{OH}	Logic High Output current	I_F=0mA, V_O=V_{CC}=5.5V, T_A=25°C	-	-	0.5	μA	
		I_F=0mA, V_{CC}=30V, Vo=20V, T_A=25°C	-	-	5		
		I_F=0mA, V_{CC}=30V, Vo=20V, T_A=70°C	-	-	50		
I_{CCL}	Logic Low Supply current	I_F=10mA, V_O=Open, V_{CC}=30V	-	-	200	μA	
I_{CCH}	Logic High Supply current	I_F=0mA, V_O=Open, V_{CC}=30V	-	-	1	μA	

Transfer Characteristics

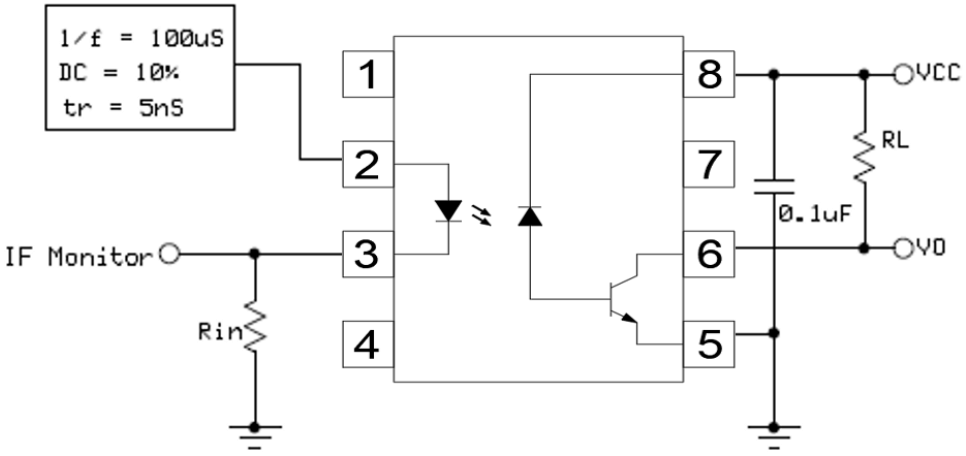
Symbol	Parameters	Test Conditions	Min	Typ	Max	Units	Notes
CTR	Current Transfer Ratio	I_F=10mA, V_O=0.4V,V_{CC}=4.5V, T_A=25°C	25	-	75	%	
		I_F=16mA, V_O=0.4V, V_{CC}=4.5V, T_A=-25~100°C	15	-	-		
V_{OL}	Logic Low Output voltage	I_F=16mA, I_O=2.4mA, V_{CC}=4.5V	-	-	0.4	V	
C_S	Capacitance input to output	VF = 0, f = 1MHz		1.1		pF	

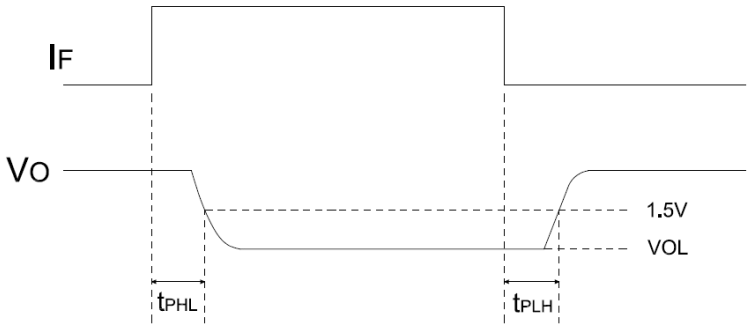
Electrical Characteristics *Typical values are measured at $T_A = 25^0C$*

Switching Characteristics

Symbol	*Parameters*	*Test Conditions*	*Min*	*Typ*	*Max*	*Units*	*Notes*
T_{PHL}	Propagation Delay Time Logic High to Logic Low	I_F=10mA, V_{CC}=15V, R_L=20KΩ, T_A=25°C	0.1	0.45	0.8	μs	
		I_F=10mA, V_{CC}=15V, R_L=20KΩ , T_A=0~85°C	0.1	-	1.9		
		I_F=10mA, V_{CC}=15V, R_L=20KΩ , T_A= -25~100°C	0.1	-	2.0		
T_{PLH}	Propagation Delay Time Logic Low to Logic High	I_F=10mA, V_{CC}=15V, R_L=20KΩ, T_A=25°C	0.1	0.45	0.8	μs	
		I_F=10mA, V_{CC}=15V, R_L=20KΩ, T_A=0~85°C	0.1	-	1.9		
		I_F=10mA, V_{CC}=15V, R_L=20KΩ , T_A= -25~100°C	0.1	-	2.0		
$\|T_{PHL}-T_{PLH}\|$	Pulse width distortion	I_F=10mA, V_{CC}=15V, R_L=20KΩ		0.25	0.8	μs	
		I_F=10mA, V_{CC}=15V, R_L=20KΩ, T_A=0~85°C			1.7		
		I_F=10mA, V_{CC}=15V, R_L=20KΩ , T_A= -25~100°C			1.8		
CM_H	Common Mode Transient Immunity at Logic High	I_F = 0mA , V_{CM}=1500Vp-p, R_L=20KΩ, T_A =25°C	15,000			V/μs	
CM_L	Common Mode Transient Immunity at Logic Low	I_F = 16mA , V_{CM}=1500Vp-p, R_L=20KΩ, T_A=25°C	15,000			V/μs	

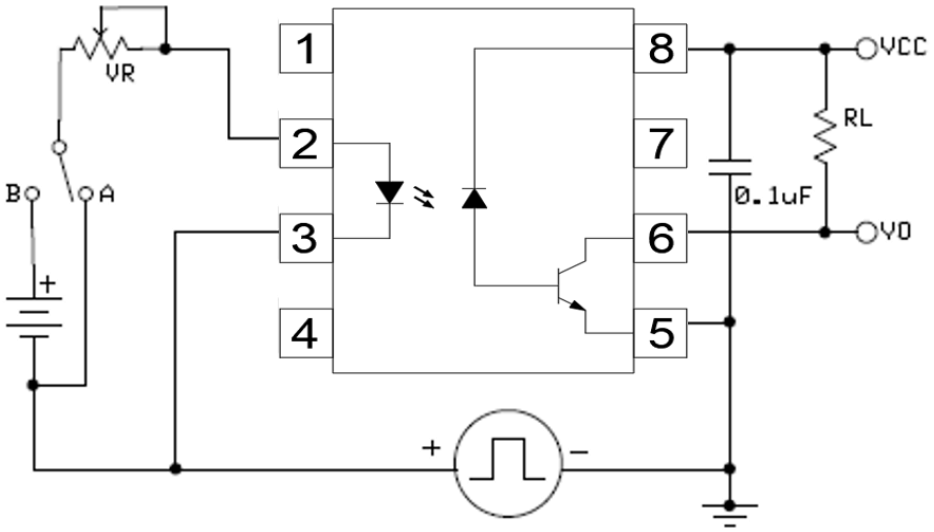
Test Circuits

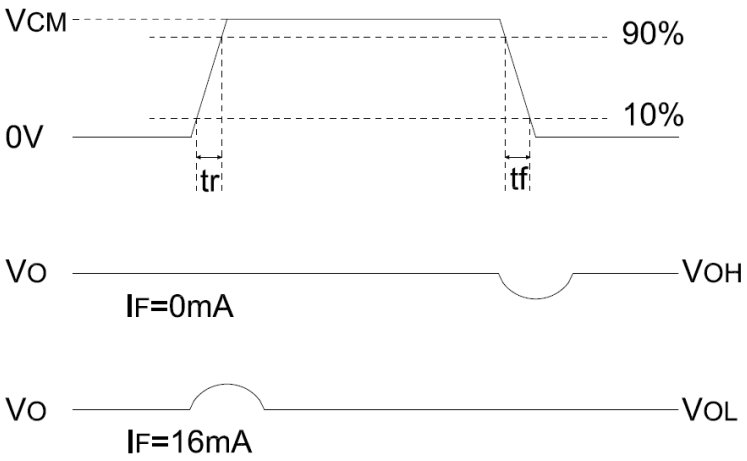




Switching Time Test Circuits

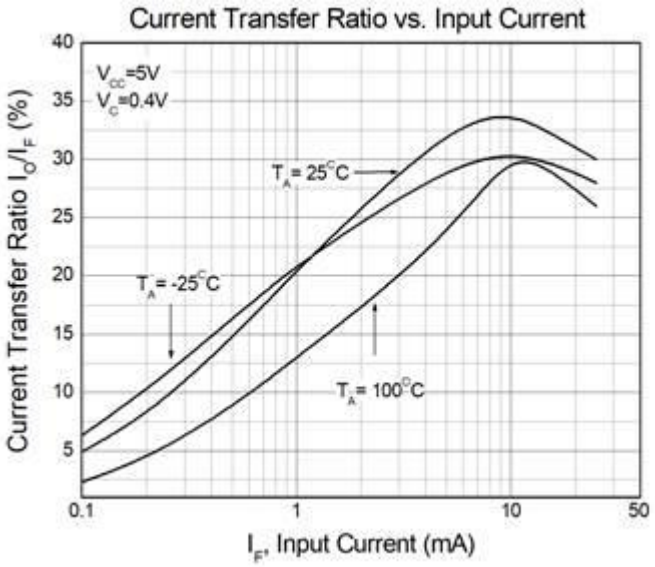
Test Circuits





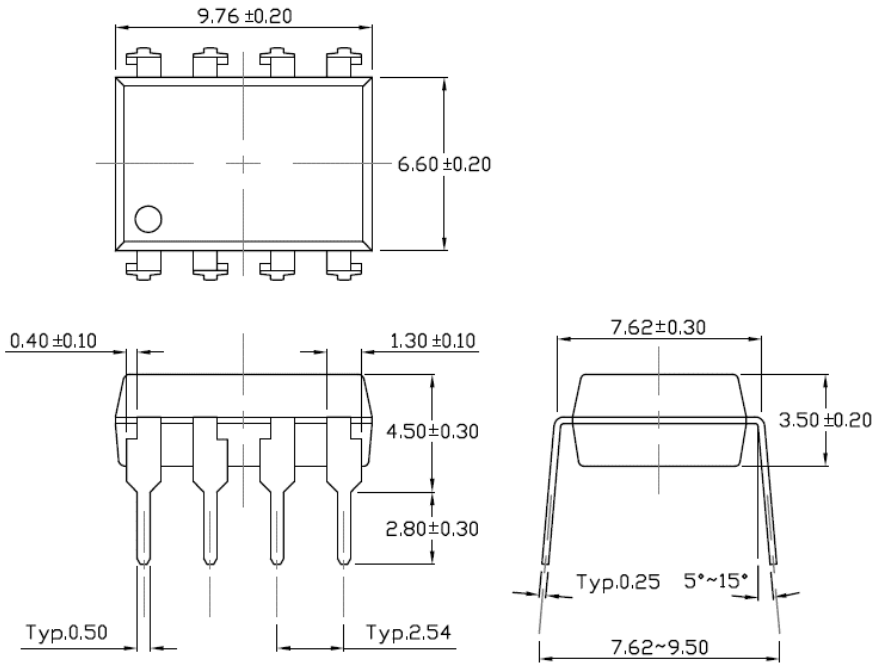
CMR Test Circuits

Test Circuits



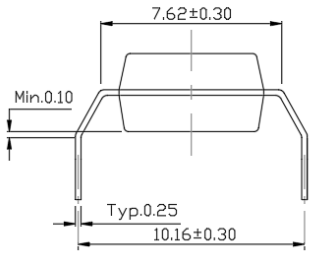
CTR Test Circuits

Package Dimension *Dimensions in mm unless otherwise stated*

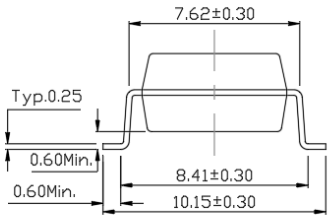


Package Dimension *Dimensions in mm unless otherwise stated*

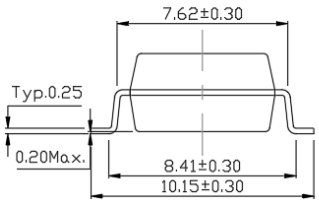
M Type

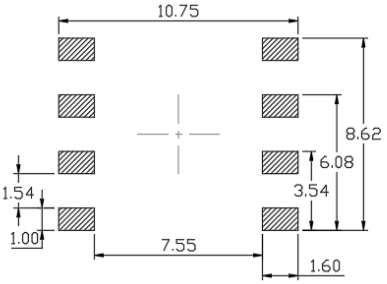


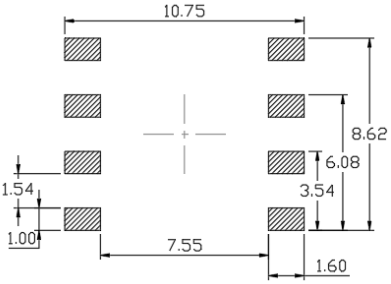
S Type



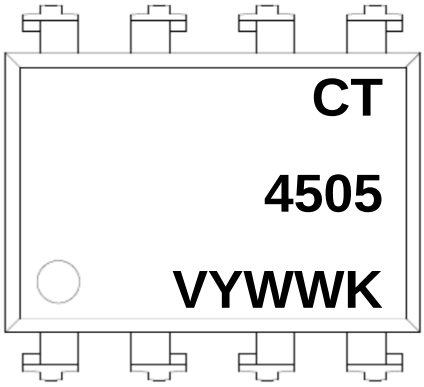
SL Type







Marking Information



Note:

CT : Denotes “CT Micro”
4503 : 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

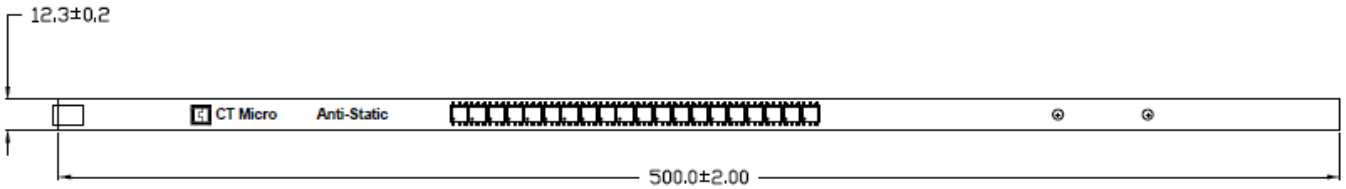
CT4505(V)(Y)(Z)

V = VDE Option (V or None)
Y = Lead form option (S, SL, M or none)
Z = Tape and reel option (T1, T2 or none)

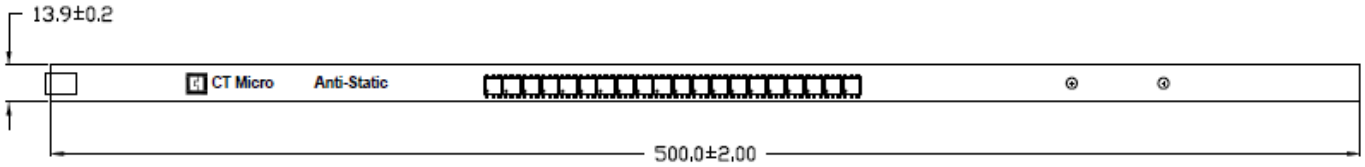
Option	***Description***	***Quantity***
None	Standard 8 Pin Dip	40 Units/Tube
M	Gullwing (400mil) Lead Forming	40 Units/Tube
S(T1)	Surface Mount Lead Forming – With Option 1 Taping	1000 Units/Reel
S(T2)	Surface Mount Lead Forming – With Option 2 Taping	1000 Units/Reel
SL(T1)	Surface Mount (Low Profile)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

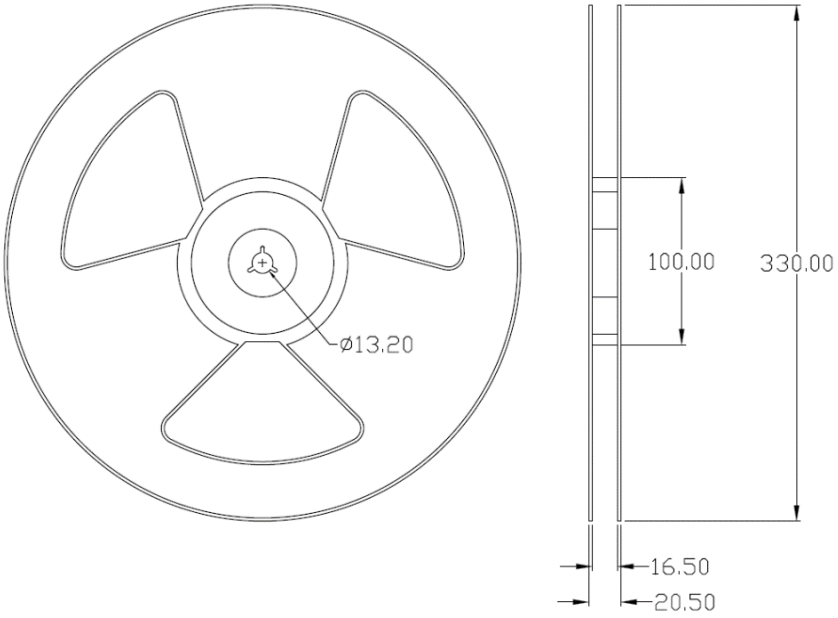


Tube Option M Type



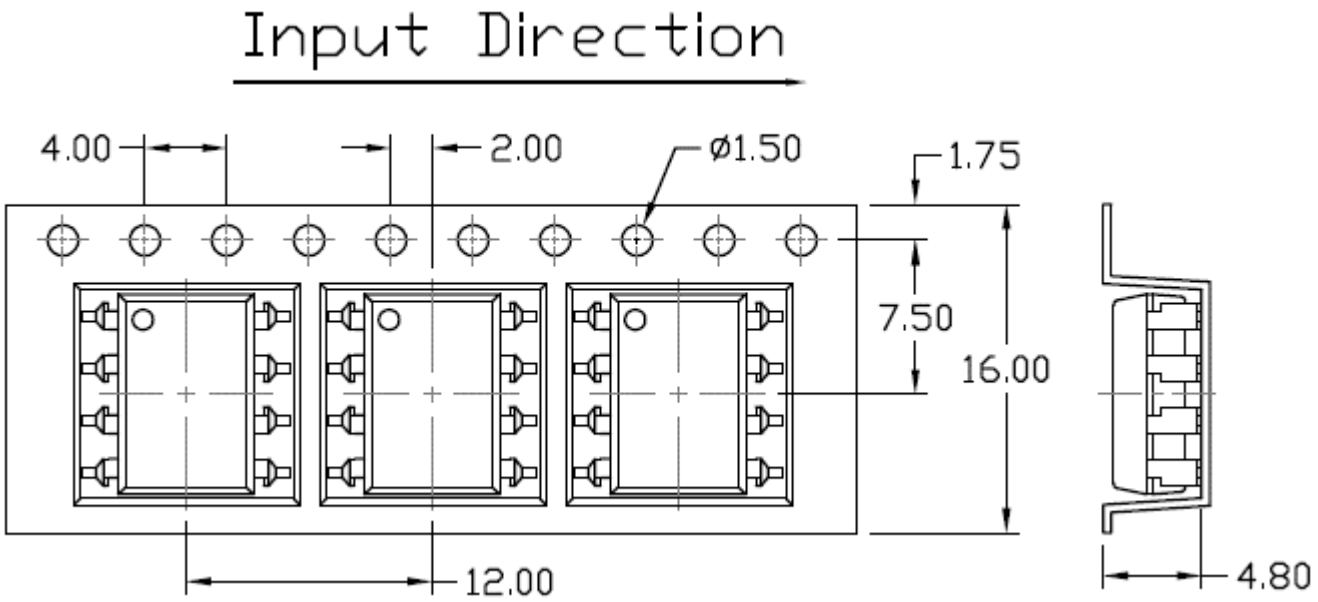
Reel Dimension *All dimensions are in mm, unless otherwise stated*

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

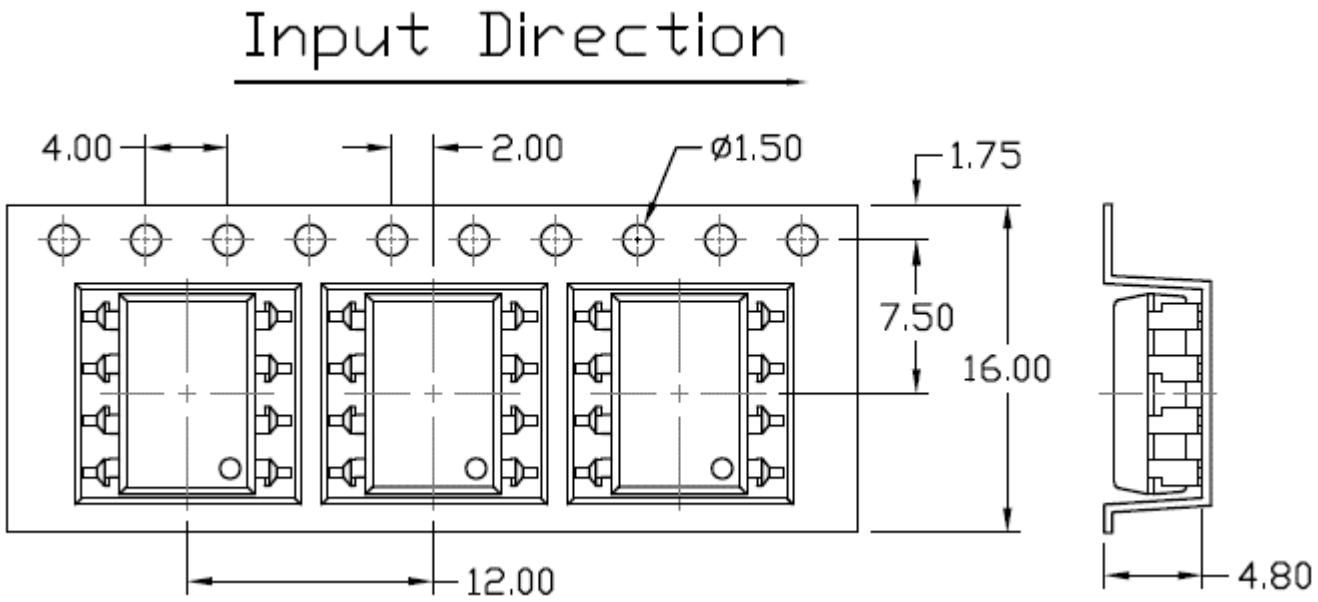


Carrier Tape Specifications *Dimensions in mm unless otherwise stated*

Option S(T1) & SL(T1)



Option S(T2) & SL(T2)

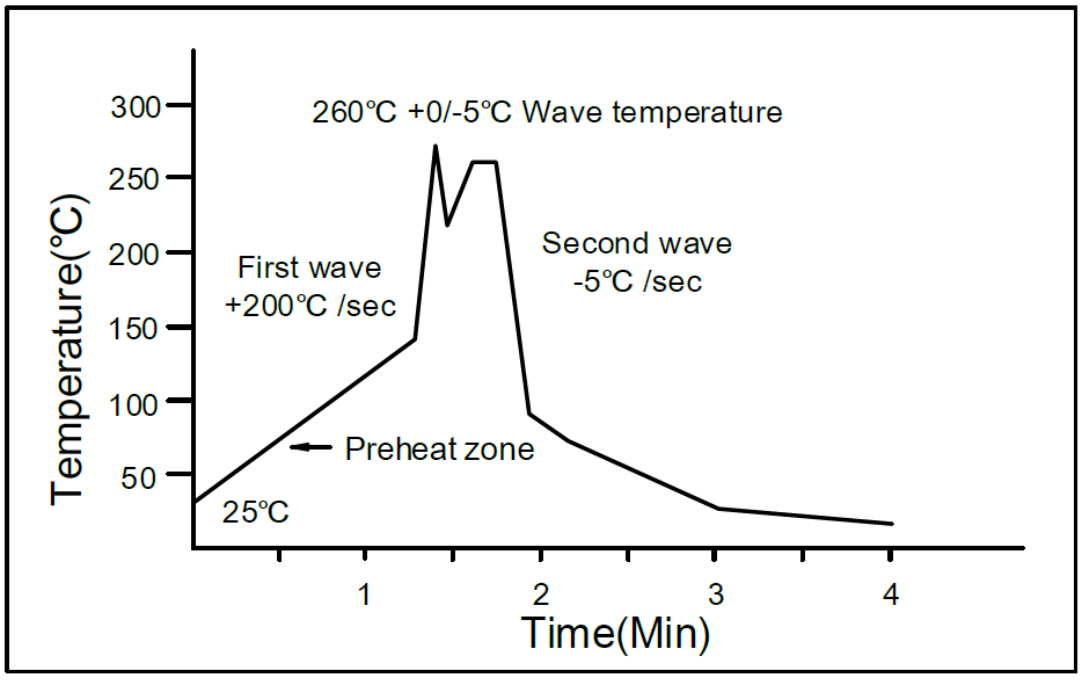


Solderability spec (Follow the JEDEC standard JESD22-B102)

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)

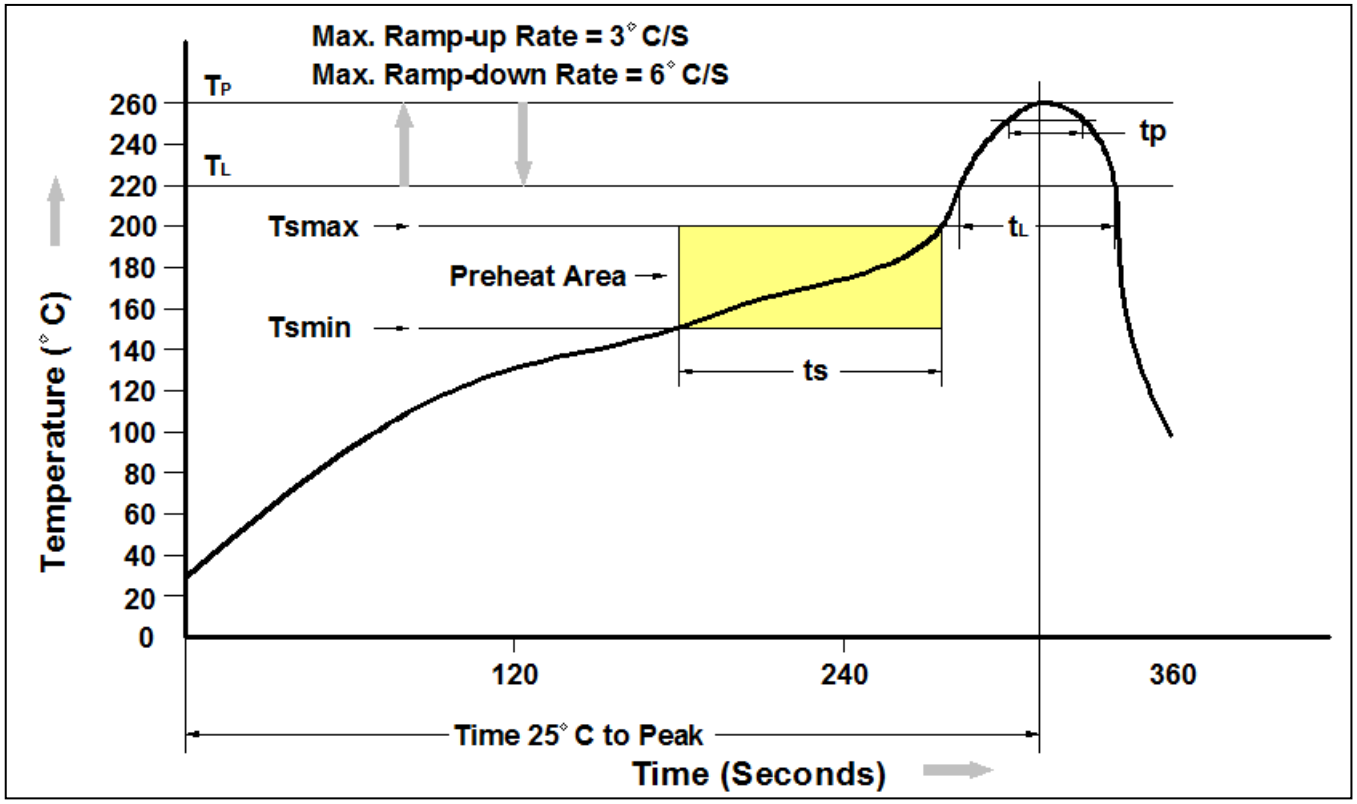
One time soldering is recommended within the condition of temperature.
Temperature: 260+0/-5˚C.
Time: 10 sec.
Preheat temperature: 25 to 140˚C.
Preheat time: 30 to 80 sec.



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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