



BRIGHTTEK
BRIGHTTEK (EUROPE) LIMITED

Brighten up The World With LED!



ISO/TS 16949:2009



BS EN ISO 14001:2004



QC 080000 IECQ HSPM

PRODUCT DATASHEET



- ▶ DC Input Photo Coupler
- ▶ SMD8
- ▶ Darlington High Speed Transistor

6N138(S)(T1)-GV

Release Date: 08 June 2025 Version: A00



6N138(S) Series

DESCRIPTION:

The 6N138(S) series combine an AlGaAs infrared emitting diode as the emitter which is optically coupled to a silicon high speed photo Darlington transistor in a plastic DIP8 package with SMD8 lead forming option.

A separate design between photodiode and Darlington transistor reduces the base-collector capacitance of the input transistor which improves the speed by several orders of magnitude over conventional phototransistor opto-couplers.



APPLICATIONS:

- Low current line receivers
- Current loop receivers
- Out interface to CMOS-LSTTL-TTL
- Pulse transformer replacement
- Computer-peripheral interface

FEATURES:

- High isolation 5000Vrms
- DC input with transistor output
- Operating temperature range -55°C to +100°C
- MSL class 1
- Regulatory Approvals:
 - UL - UL1577
 - VDE - EN60747-5-5 (VDE0884-5)
 - CQC - GB4943.1, GB8898
 - cUL - CSA Component Acceptance Service Notice 5A
- Packing: 1000pcs/reel



Partner with:  LIGHTNING

NAMING & ORDERING INFORMATION:

Naming Information:

6N138 (S) (T1)- G V	
6N138	Part Number
S	Lead Form Option: SMD8
T1	Selection: Tape and Reel Option (T1(default)/T2)
G	Green Option
V	VDE Option

Ordering Information:

6N138(S)(T1)-GV

Version No.	Original Release Date
Rev: A00	29/08/2024

SCHEMATIC DIAGRAM & MARKING:

Schematic Diagram:

PIN Definition	
1	NC
2	Anode
3	Cathode
4	NC
5	GND
6	VO
7	VB
8	VCC

Marking Information:

Marking Definition	
TD	Manufacturer Code
6N13X	Part Number
V	VDE Applicable
Y	Fiscal Year
A	Manufacturing Code
WW	Work Week

Labelling Information:

 BRIGHTTEK BRIGHTTEK (EUROPE) LIMITED  LIGHTNING Part No.: XXXXXXXXXXXX Bin Code: X  Lot No.: XXXXXXXX Date Code: XXXX QTY: XXX PCS  MSL: 1 Made in Quanzhou Fujian      	This product is manufactured, tested, and packed by
	 LIGHTNING for more details, please visit www.tdled.com

ABSOLUTE CHARACTERISTICS:

Absolute Maximum Ratings:

Parameter	Symbol	Ratings	Unit
INPUT			
Forward Current	I_F	25	mA
Peak Forward Current	I_{FP}	50 ^{*1}	mA
Peak Transient Current	$I_{F(trans)}$	1 ^{*2}	A
Reverse Voltage	V_R	5	V
Input Power Dissipation	P_I	100	mW
OUTPUT			
Supply Voltage	V_{CC}	-0.5~18	V
Output Voltage	V_O	-0.5~18	V
Output Current	I_O	60	mA
Emitter-Base Reverse Voltage	V_{EBR}	0.5	V
Output Power Dissipation	P_O	100	mW
COMMON			
Total Power Dissipation	P_{tot}	200	mW
Isolation Voltage	V_{iso}	5000 ^{*3}	V _{rms}
Operating Temperature	T_{opr}	-55~+100	°C
Storage Temperature	T_{stg}	-55~+150	°C
Soldering Temperature	T_{sol}	260 ^{*4}	°C

*1. 50% duty, 1ms P.W.

*2. $\leq 1\mu s$ P.W, 300pps.

*3. AC for 1 minute, R.H.=40~60%.

*4. For 10 seconds.

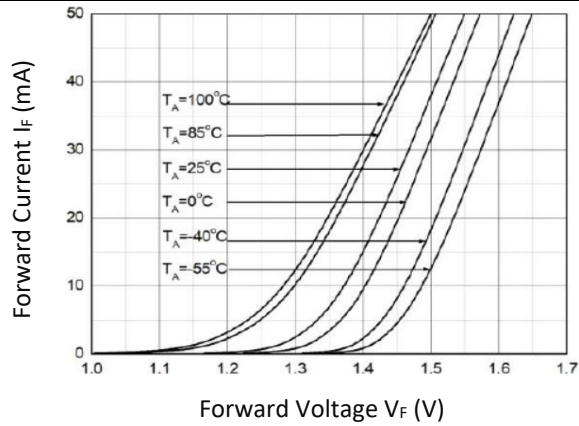
ELECTRICAL CHARACTERISTICS:

Electrical Optical Characteristics:

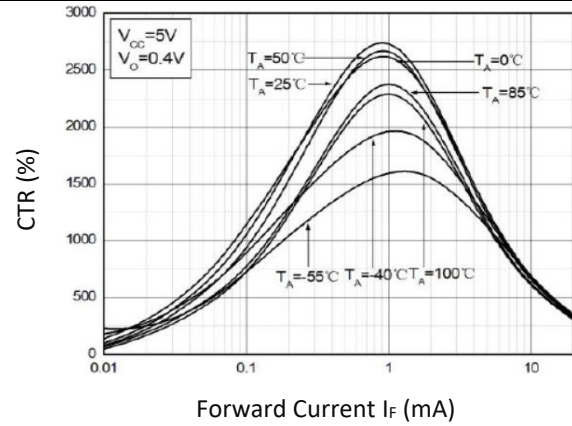
Parameter	Symbol	Values			Unit	Test Condition
		Min.	Typ.	Max.		
INPUT (at T _a =0 to 70°C, unless specified otherwise)						
Forward Voltage	V _F	---	1.28	1.7	V	I _F =1.6mA
Reverse Current	I _R	---	---	10	μA	V _R =5V
Input Capacitance	C _{IN}	---	60	---	pF	V=0, f=1MHz
OUTPUT (at T _a =0 to 70°C, unless specified otherwise)						
High Level Supply Current	I _{CC} H	---	0.05	10	μA	I _F =0mA, V _O =OPEN V _{CC} =18V
Low Level Supply Current	I _{CC} L	---	0.6	1.5	mA	I _F =1.6mA V _O =OPEN V _{CC} =18V
Logic High Output Current	I _{OH}	---	0.01	100	μA	I _F =0mA V _O =V _{CC} =18V
TRANSFER CHARACTERISTICS (at T _a =0 to 70°C, unless specified otherwise)						
Current Transfer Ratio	CTR	300	2600	---	%	I _F =1.6mA V _O =0.4V V _{CC} =4.5V
Logic Low Output Voltage	V _{OL}	---	0.05	0.4	V	I _F =1.6mA, I _O = 4.8mA, V _{CC} =4.5V
Isolation Resistance	R _{iso}	10 ¹²	10 ¹⁴	---	Ω	DC500V 40~60% R.H.
Floating Capacitance	C _{IO}	---	0.3	1	pF	V=0, f=1MHz
SWITCHING CHARACTERISTICS (at T _a =0 to 70°C, V _{CC} =5V, unless specified otherwise)						
Propagation Delay Time to Logic Low	T _{PHL}	---	1.4	10	μs	I _F =1.6mA R _L =2.2kΩ T _a =25°C
		---	---	15		I _F =1.6mA R _L =2.2kΩ
Propagation Delay Time to Logic High	T _{PLH}	---	10.7	35	μs	I _F =1.6mA R _L =2.2kΩ T _a =25°C
		---	---	50		I _F =1.6mA R _L =2.2kΩ
Common Mode Transient Immunity at Logic High	CM _H	1000	---	---	V/μs	I _F =0mA V _{CM} =10V _{pp} R _L =2.2kΩ T _a =25°C
Common Mode Transient Immunity at Logic Low	CM _L	1000	---	---	V/μs	I _F =1.6mA V _{CM} =10V _{pp} R _L =2.2kΩ T _a =25°C

CHARACTERISTIC CURVES:

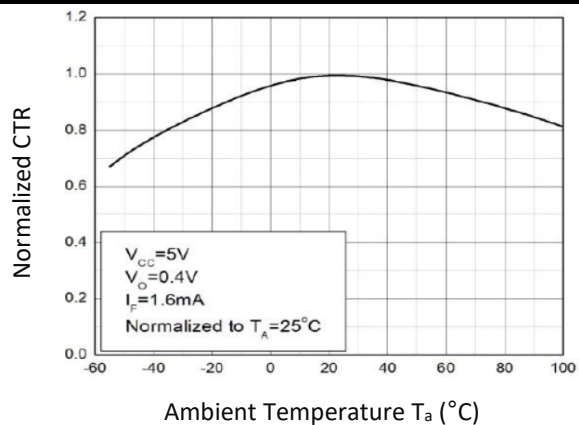
Forward Current v.s. Forward Voltage



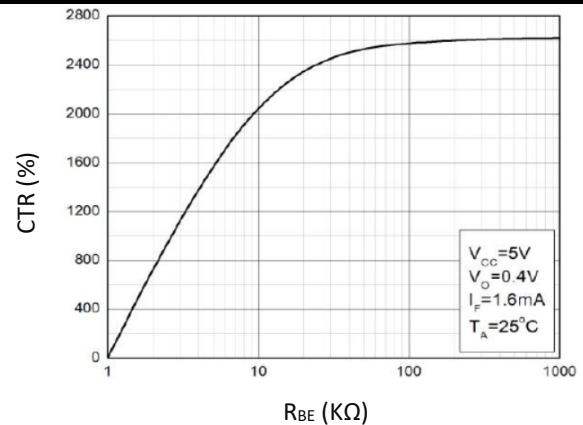
Current Transfer Ratio v.s. Forward Current



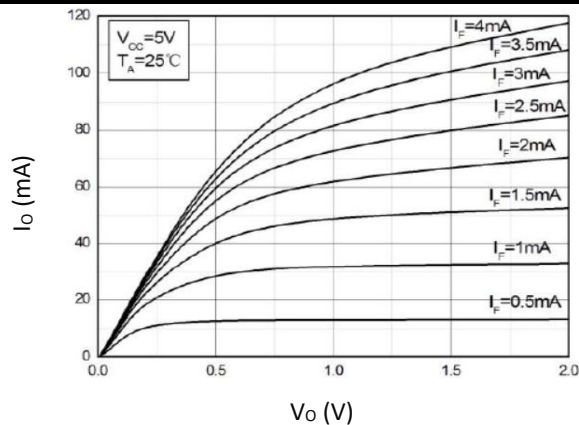
Normalized Current Transfer Ratio v.s. Ambient Temperature



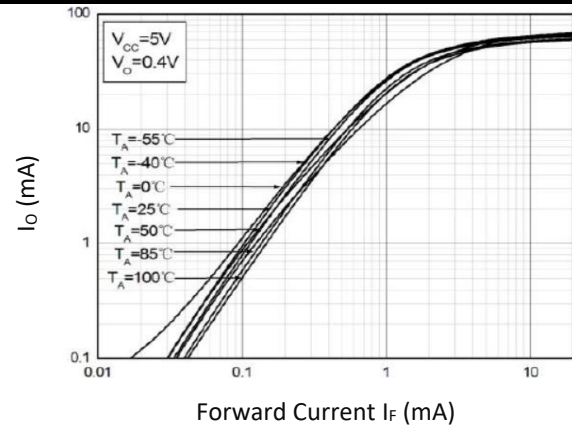
Current Transfer Ratio v.s. Base-Emitter Resistance



Low Level Output Current v.s. Output Voltage



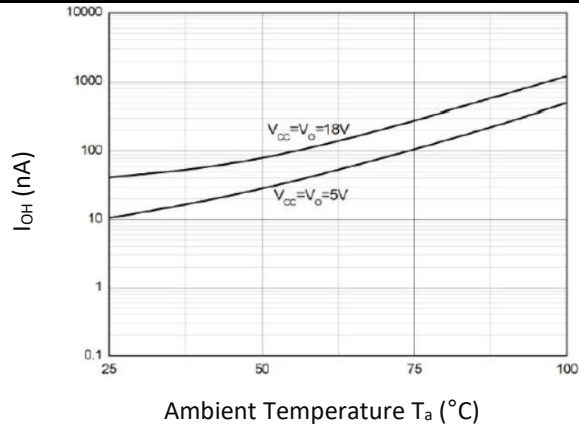
Low Level Output Current v.s. Forward Current



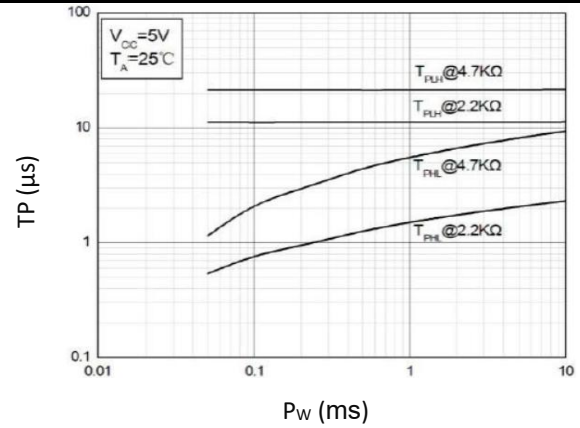


CHARACTERISTIC CURVES:

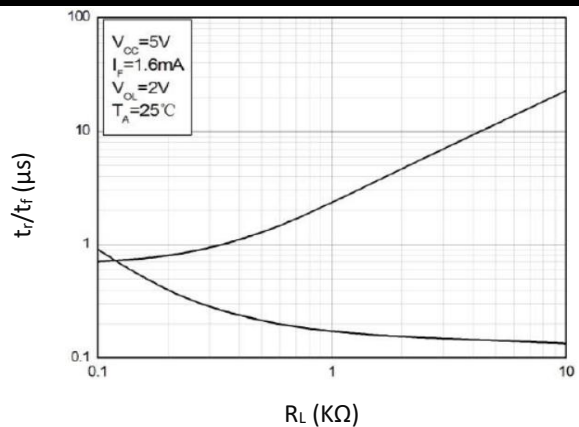
High Level Output Current v.s. Ambient Temperature



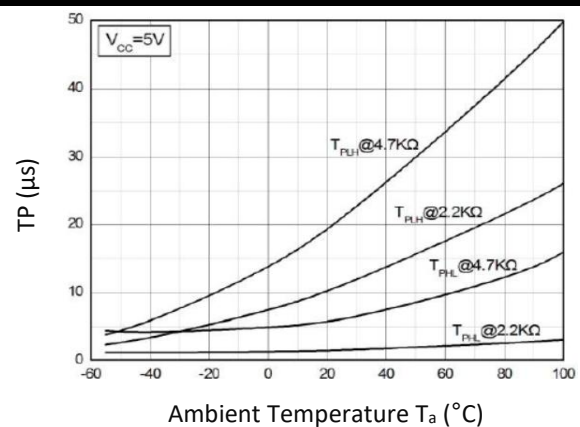
Propagation Delay v.s. Pulse Width



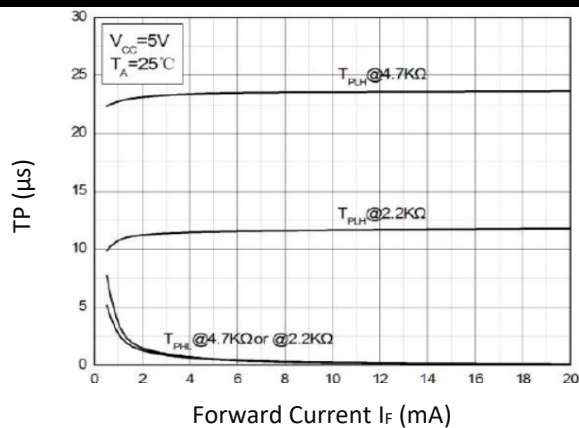
Rise and Fall Time v.s. Load Resistance



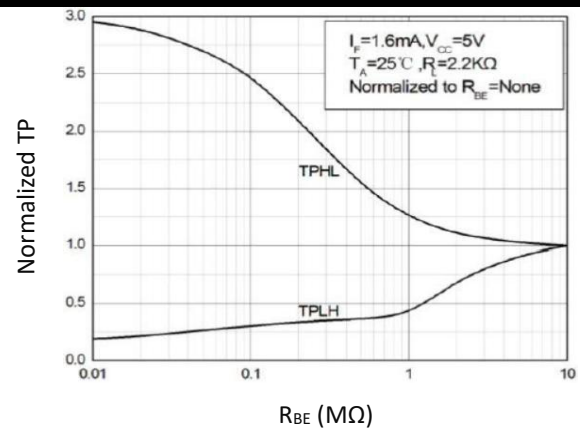
Propagation Delay v.s. Ambient Temperature



Propagation Delay v.s. Forward Current

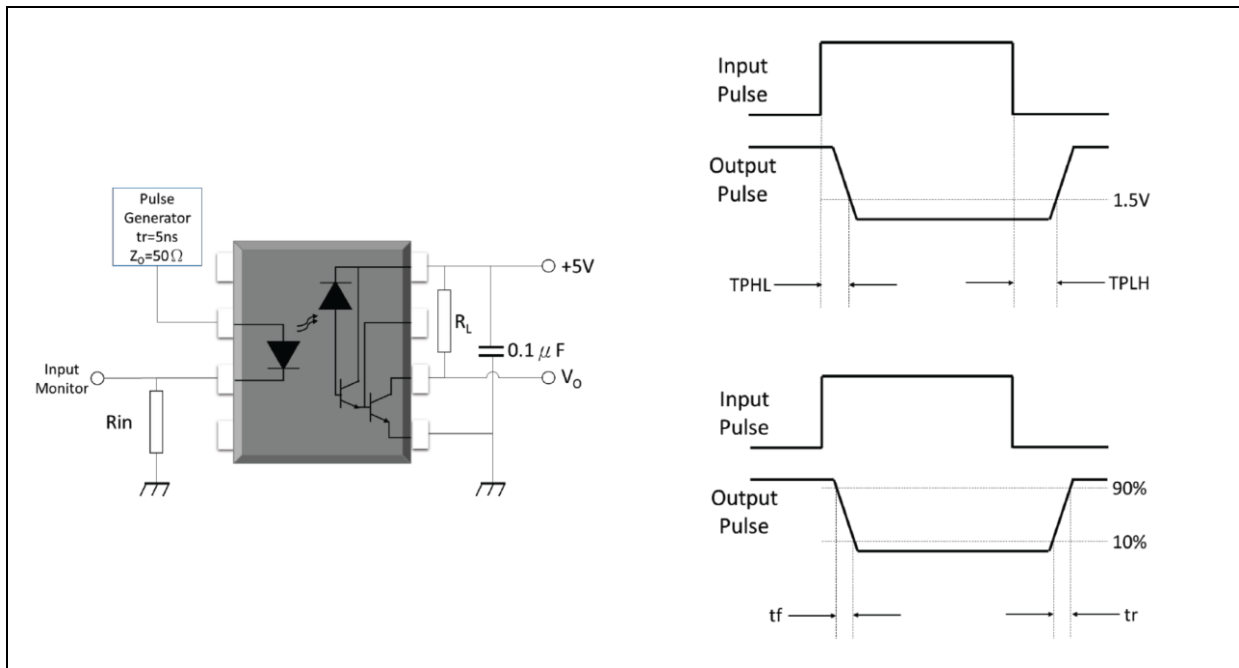


Propagation Delay v.s. Base-Emitter Resistance

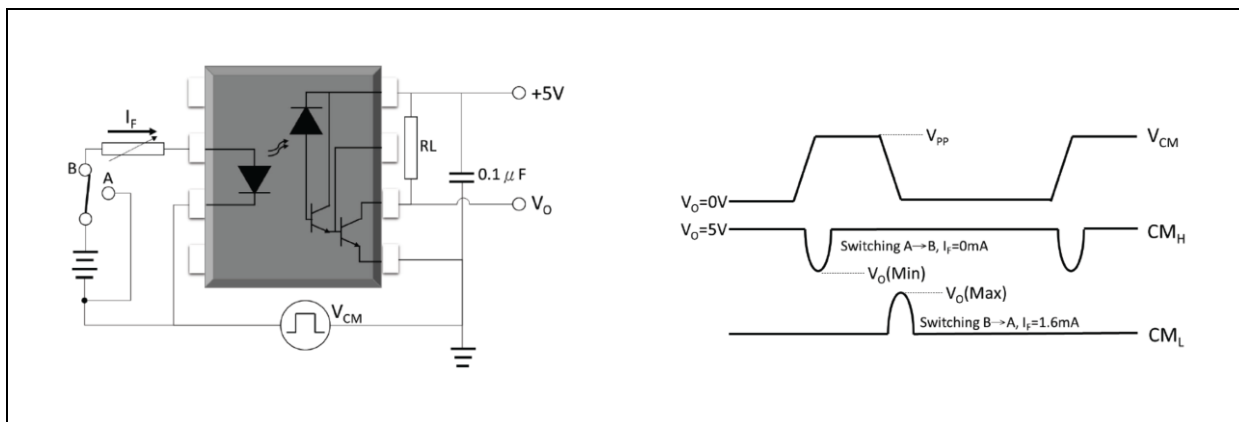


TEST CIRCUIT:

Test Circuit and Waveforms for TPHL, TPLH, tr, tf:

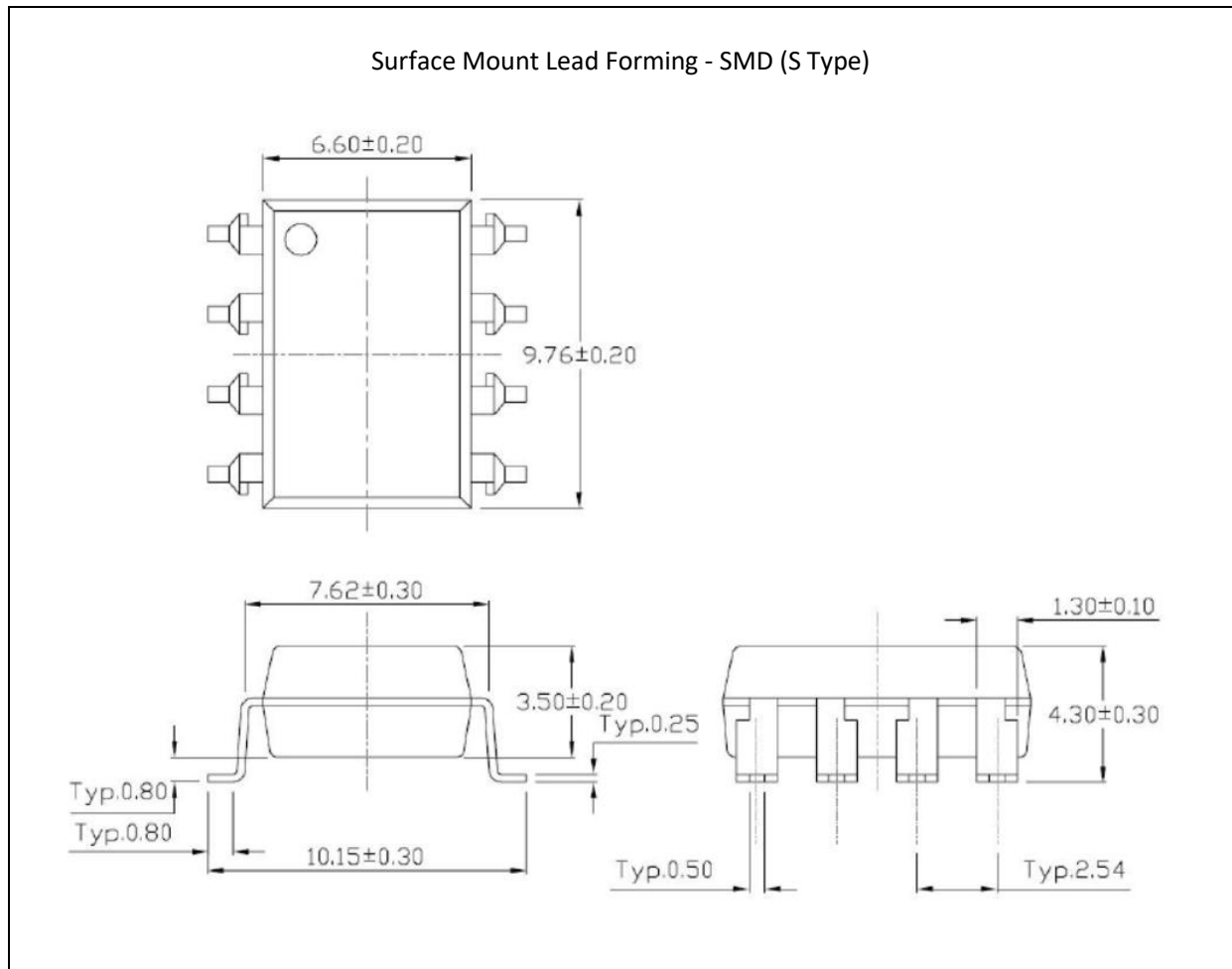


Test Circuit and Waveforms for Common Mode Transient Immunity:



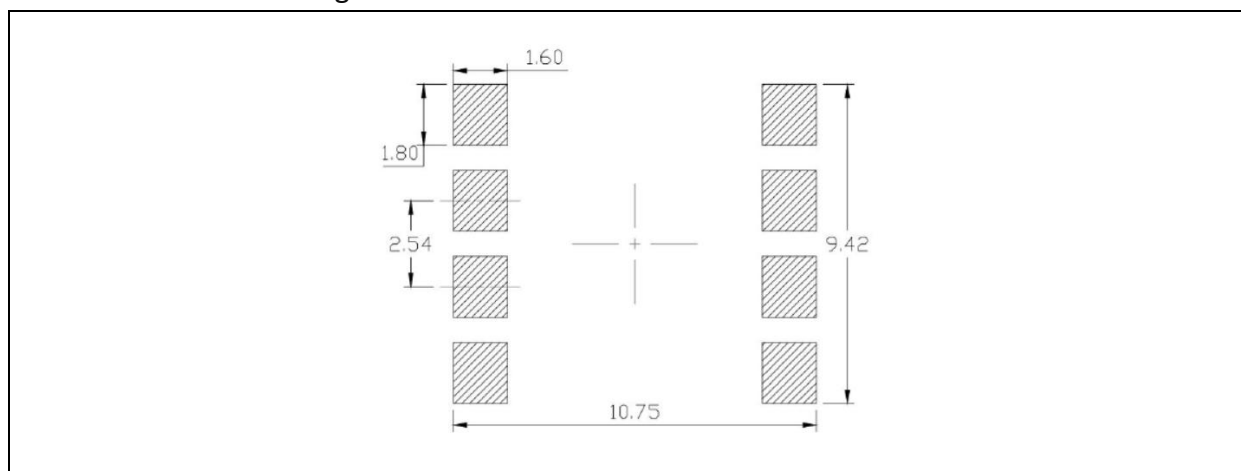
OUTLINE DIMENSION:

Package Dimension:



1. All dimensions are in millimetre (mm).

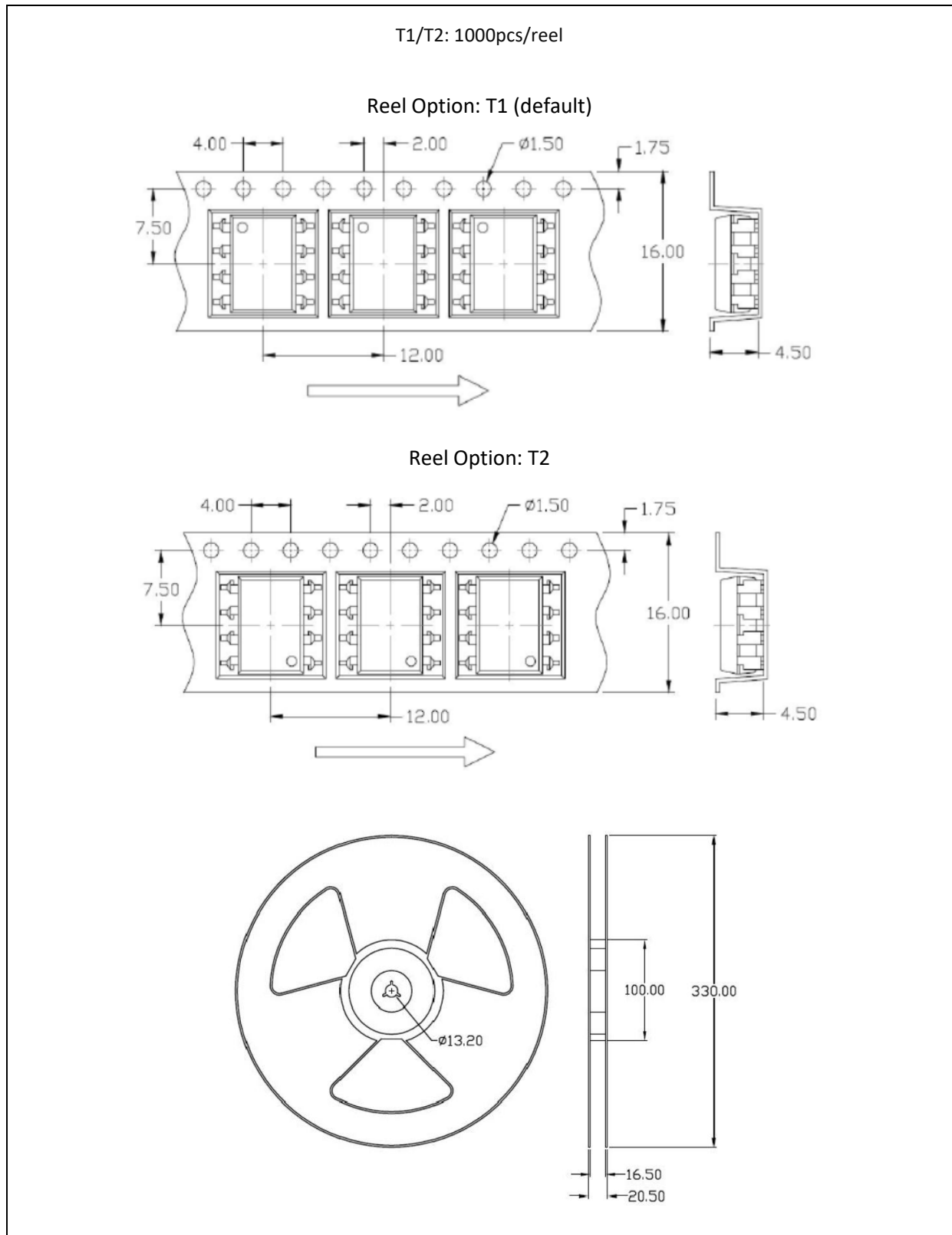
Recommended Soldering Mask:



1. Dimensions are in millimetre (mm).

PACKING SPECIFICATION:

Reel Dimension:

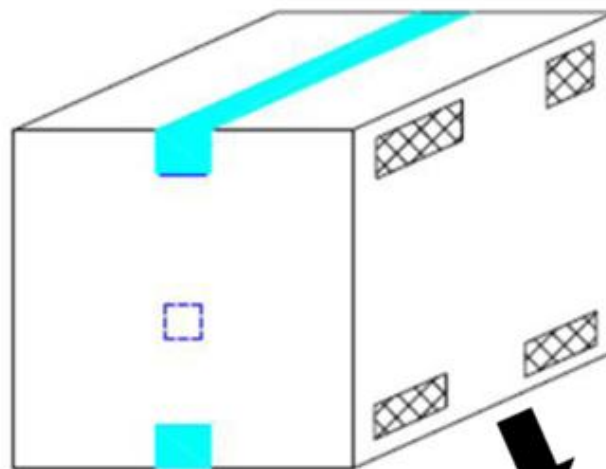


Box Dimension:

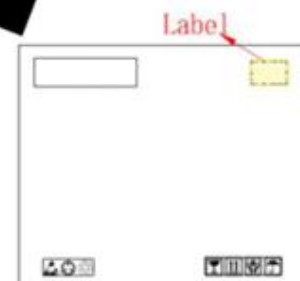
T1/T2: 3 reels (3Kpcs)/inner box, 5 inner boxes (15Kpcs)/carton



- L x W x H = 36cm x 36cm x 6.9cm



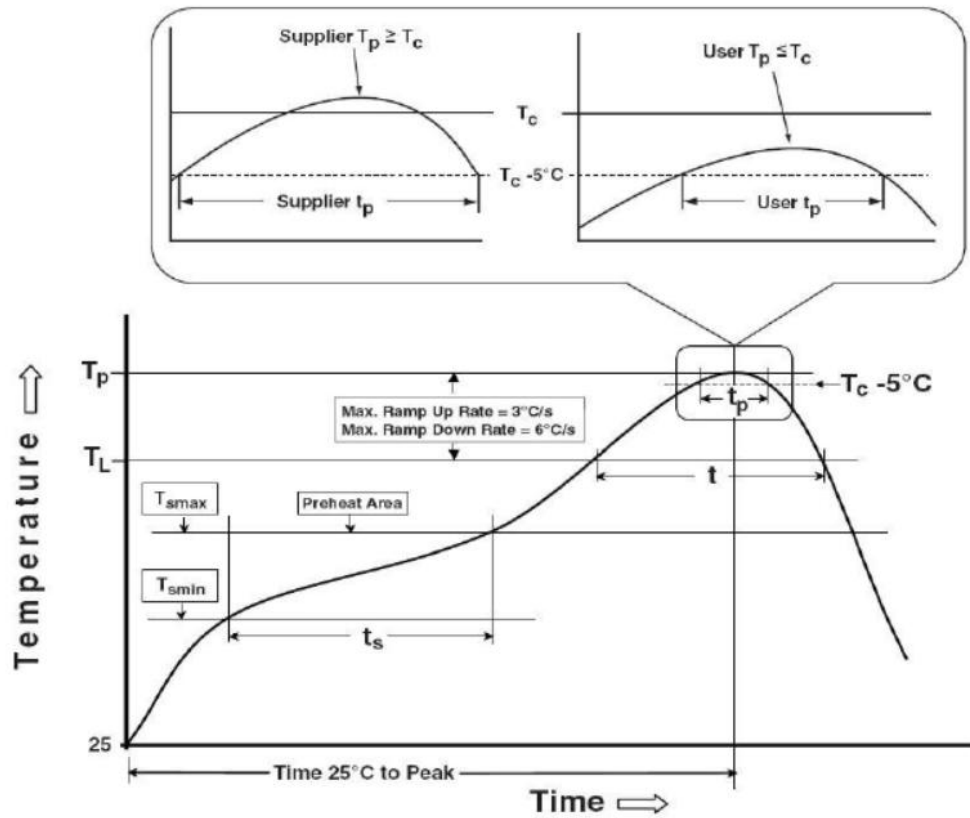
- L x W x H = 45cm x 38cm x 38cm





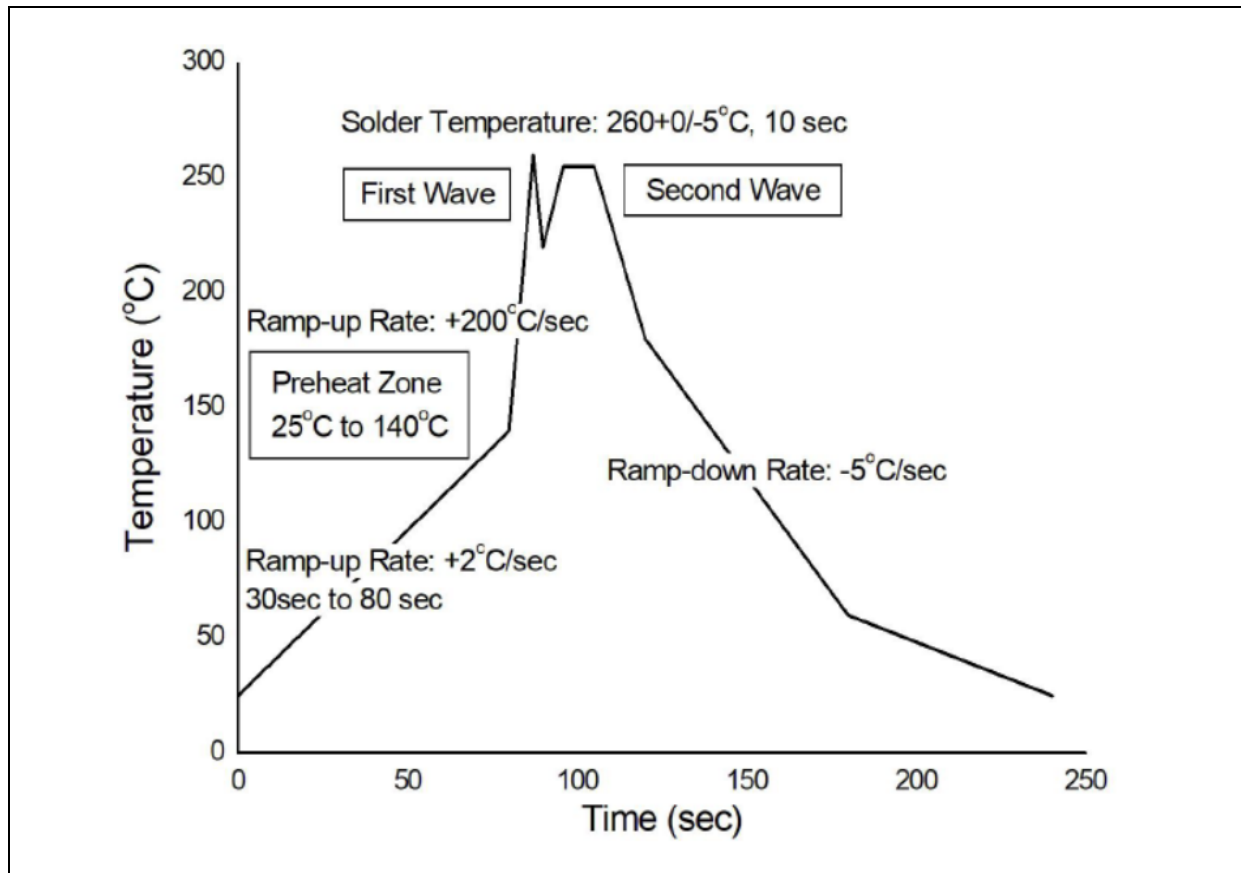
RECOMMENDED SOLDERING PROFILE:

Reflow Information:



Profile Feature	Sn-Pb Assembly Profile	Pb-Free Assembly Profile
Temperature Min. (T_{smin})	100°C	150°C
Temperature Max. (T_{smax})	150°C	200°C
Time (t_s) from (T_{smin} to T_{smax})	60-120 seconds	60-120 seconds
Ramp-up Rate (t_L to t_P)	3°C/second max.	3°C/second max.
Liquidous Temperature (T_L)	183°C	217°C
Time (t_L) Maintained Above (T_L)	60-150 seconds	60-150 seconds
Peak Body Package Temperature	235°C +0°C / -5°C	260°C +0°C / -5°C
Time (t_P) within 5°C of 260°C	20 seconds	30 seconds
Ramp-down Rate (T_P to T_L)	6°C/second max.	6°C/second max.
Time 25°C to Peak Temperature	6 minutes max.	8 minutes max.

Wave Soldering (JESD22-A111 Compliant):



Hand Soldering:

Soldering Temperature	$380 \pm 5^{\circ}\text{C}$
Soldering Time	3 sec max.

Note:

- One time soldering is recommended for all soldering methods.
- Do not solder more than three times for IR reflow soldering.