BRIGHTEK

BRIGHTEK (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
- Standard DIP8
- Darlington High Speed Transistor

Release Date: 08 June 2025 Version: A00

6N138-GV

6N138 Series

6N138 Series

RoHS Compliant

DESCRIPTION:

The 6N138 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 different lead forming options.

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: 45pcs/tube

Partner with: LIGHTNING

NAMING & ORDERING INFORMATION:

Naming Information:

6N138 - G V	
6N138	Part Number
G	Green Option
V	VDE Option

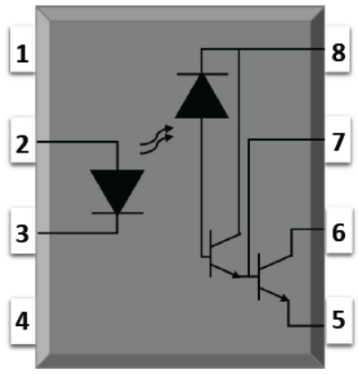
Ordering Information:

6N138-GV

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

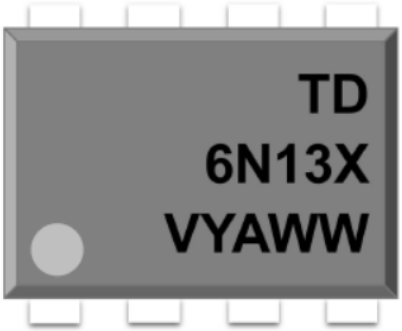
SCHEMATIC DIAGRAM & MARKING:

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:

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	Vrms
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. ≤1μs P.W, 300pps.
*3. AC for 1 minute, R.H.=40~60%.
*4. For 10 seconds.

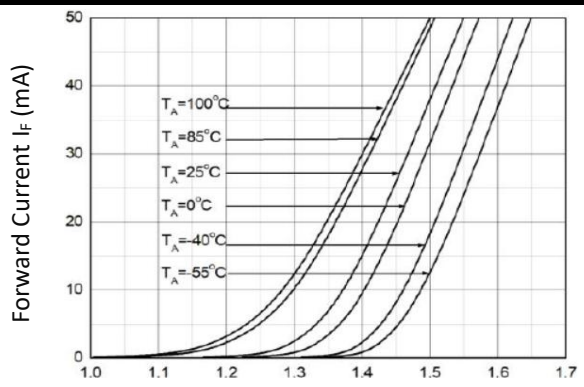
ELECTRICAL CHARACTERISTICS:

Electrical Optical Characteristics:

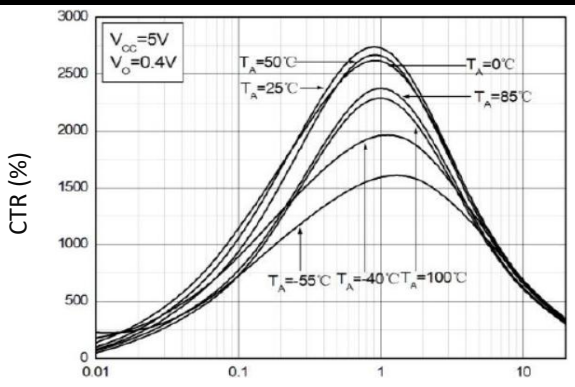
Parameter	Symbol	Values			Unit	Test Condition
		Min.	Typ.	Max.		
INPUT (at T_a=0 to 70°C, unless specified otherwise)						
Forward Voltage	V_F	---	1.28	1.7	V	I_F=1.6mA
Reverse Current	I_R	---	---	10	μA	V_R=5V
Input Capacitance	C_{IN}	---	60	---	pF	V=0, f=1MHz
OUTPUT (at T_a=0 to 70°C, unless specified otherwise)						
High Level Supply Current	I_{CCH}	---	0.05	10	μA	I_F=0mA, V_O=OPEN V_{CC}=18V
Low Level Supply Current	I_{CCL}	---	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:

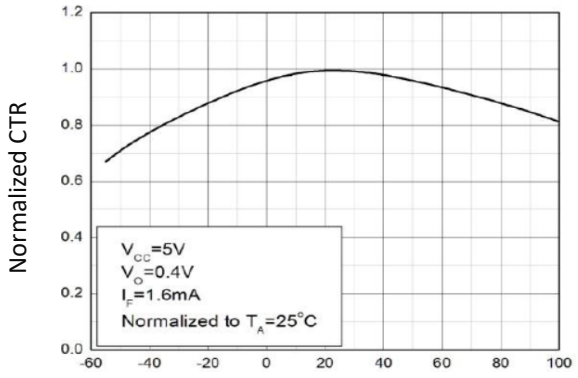
Forward Current v.s. Forward Voltage



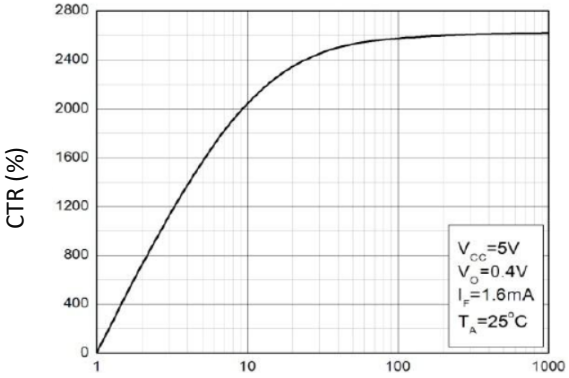
Current Transfer Ratio v.s. Forward Current



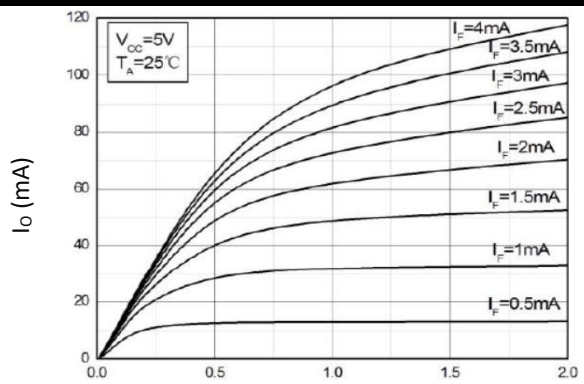
Normalized Current Transfer Ratio v.s. Ambient Temperature



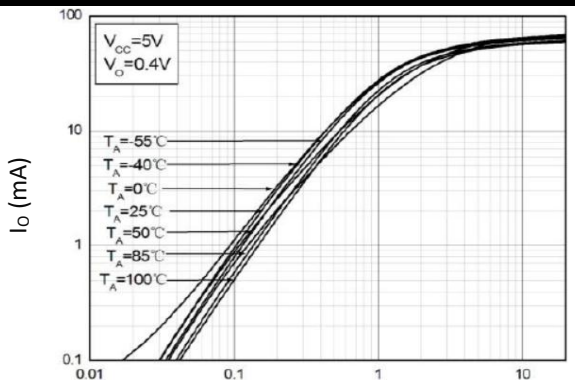
Current Transfer Ratio v.s. Base-Emitter Resistance



Low Level Output Current v.s. Output Voltage

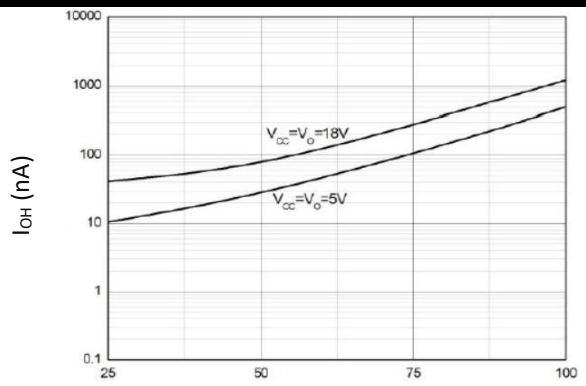


Low Level Output Current v.s. Forward Current

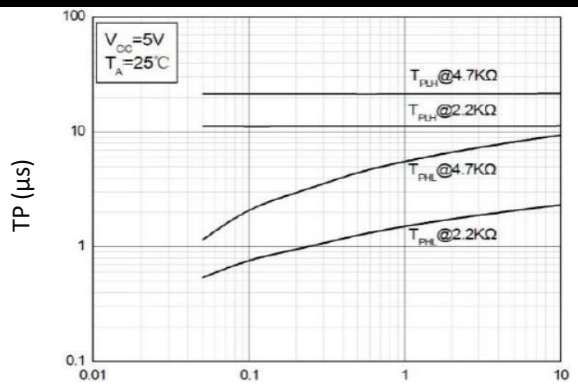


CHARACTERISTIC CURVES:

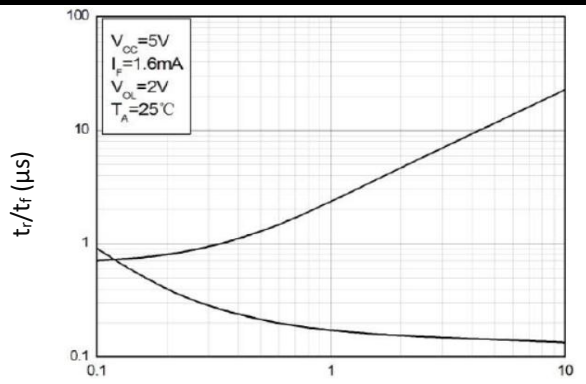
High Level Output Current v.s. Ambient Temperature



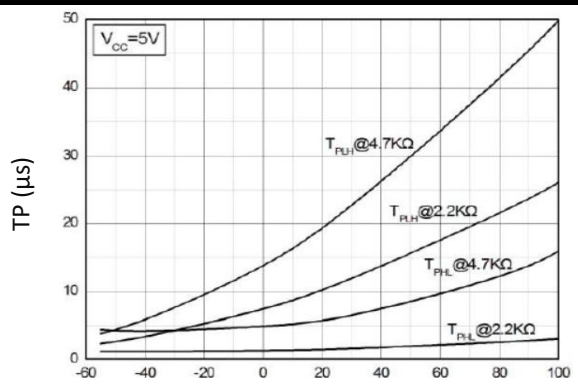
Propagation Delay v.s. Pulse Width



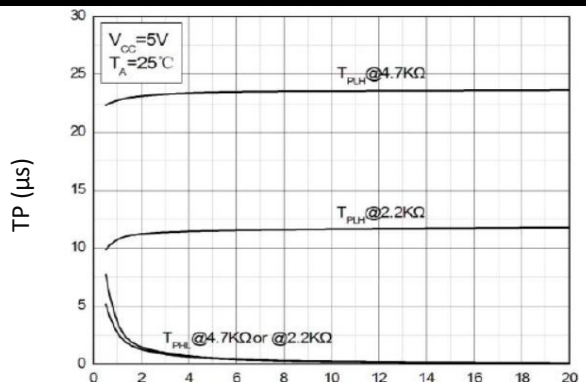
Rise and Fall Time v.s. Load Resistance



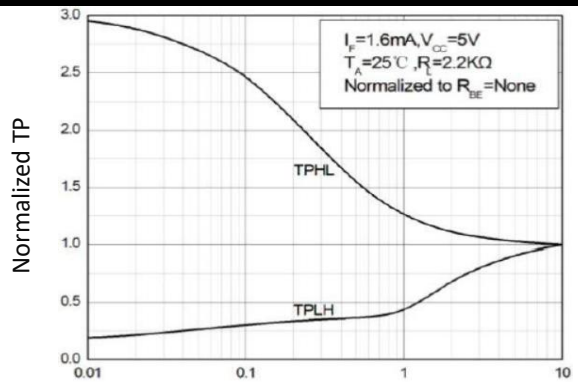
Propagation Delay v.s. Ambient Temperature



Propagation Delay v.s. Forward Current

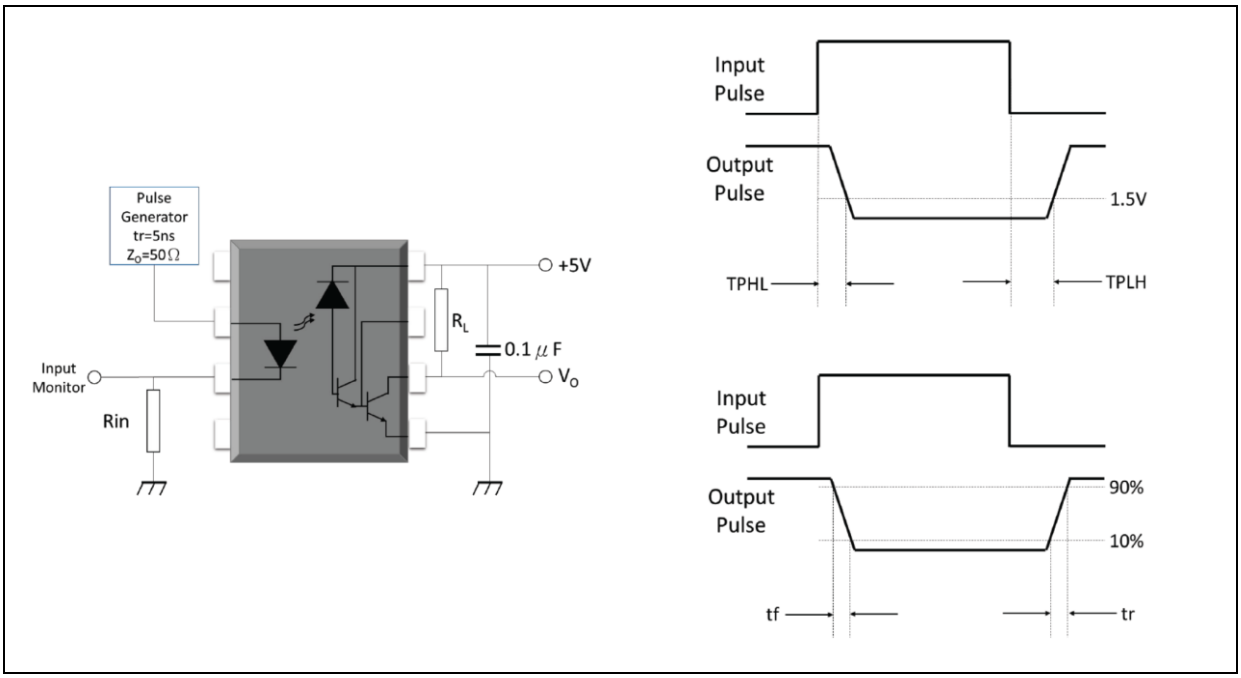


Propagation Delay v.s. Base-Emitter Resistance

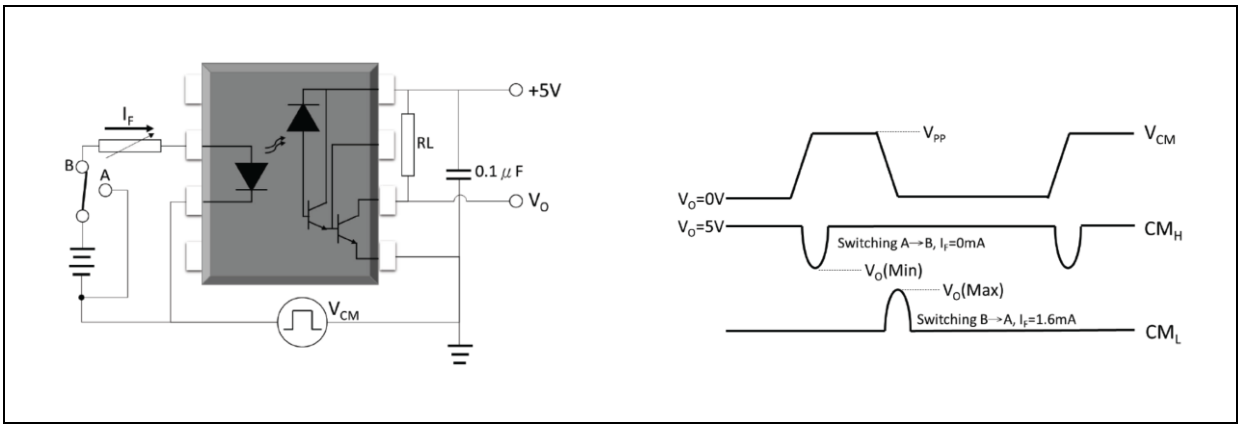


TEST CIRCUIT:

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



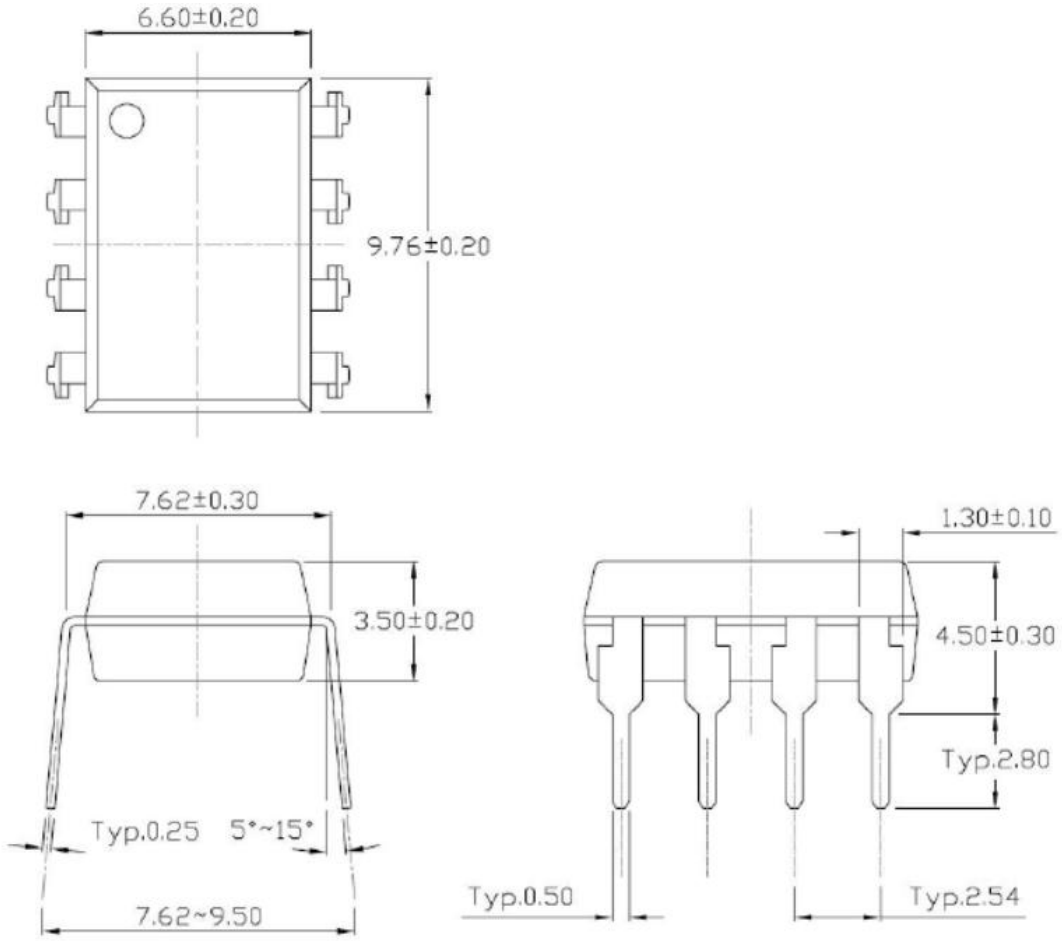
Test Circuit and Waveforms for Common Mode Transient Immunity:



OUTLINE DIMENSION:

Package Dimension:

Standard DIP - Through Hole (DIP Type)

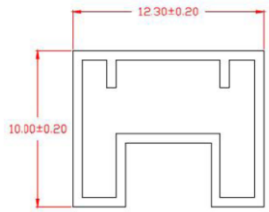


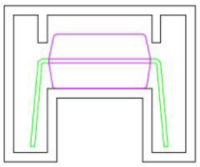
1. All dimensions are in millimetre (mm).

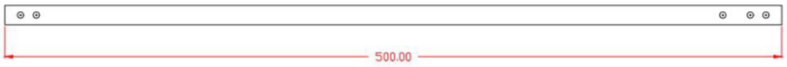
PACKING SPECIFICATION:

Tube Dimension:

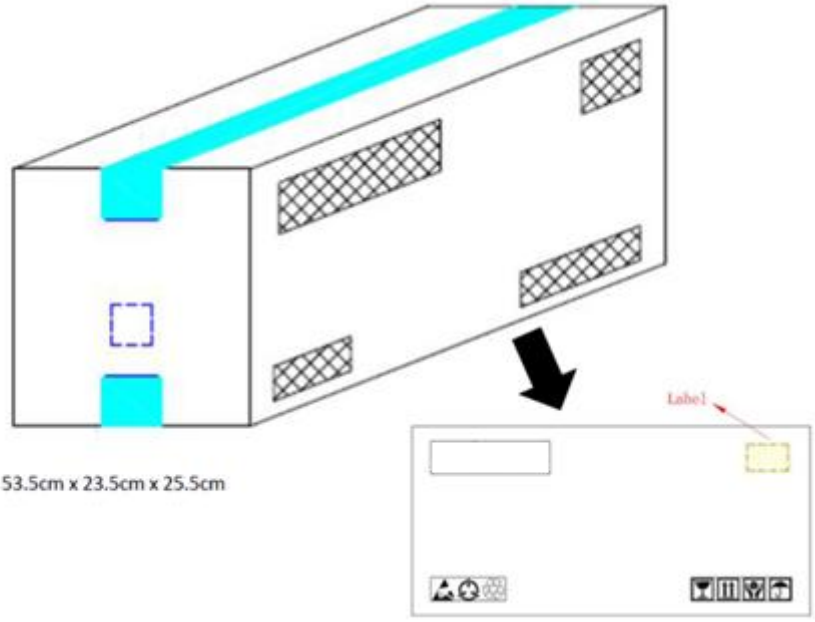
45pcs/tube, 32 tube/inner box, 10 inner box (14.4Kpcs)/carton







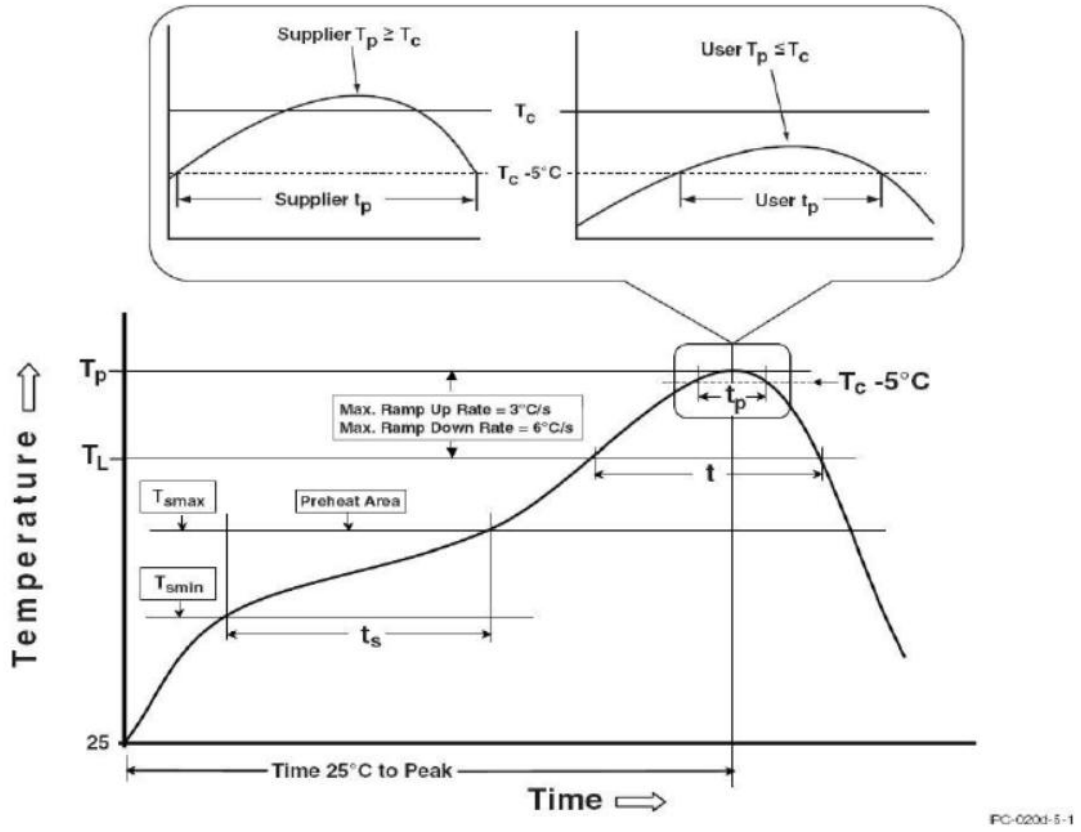
- L x W x H = 52.5cm x 10.7cm x 4.7cm



- L x W x H = 53.5cm x 23.5cm x 25.5cm

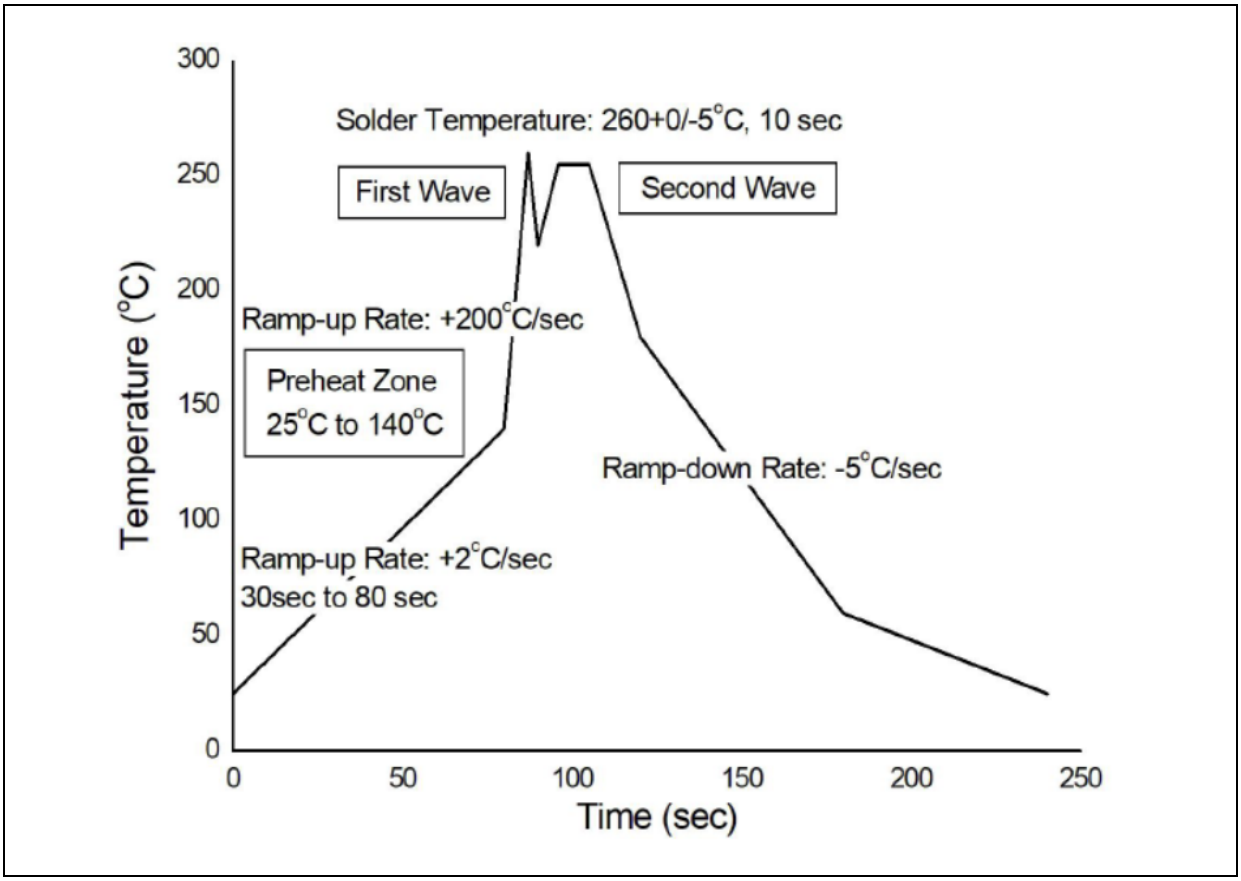
RECOMMENDED SOLDERING PROFILE:

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±5°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.