

■ Features

- Performance specified for common IPM applications over industrial temperature range: -40°C to 110°C
- Fast maximum propagation delays:
 $t_{\text{PHL}} = 400\text{ ns}$, $t_{\text{PLH}} = 550\text{ ns}$
- Minimized Pulse Width Distortion:
 $\text{PWD} = 450\text{ ns}$
- Very high Common Mode Rejection (CMR): $15\text{ kV}/\mu\text{s}$ at $\text{VCM} = 1500\text{ V}$
- CTR: $>44\%$ at $\text{IF} = 10\text{ mA}$

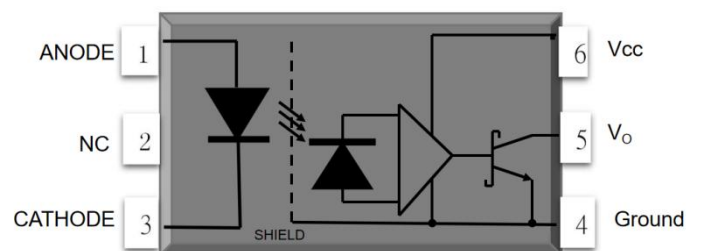
■ Description

The MP456 consists of a GaAsP LED optically coupled to an integrated high gain photo detector. Minimized propagation delay difference between devices make these optocouplers excellent solutions for improving inverter efficiency through reduced switching dead time. Specifications and performance plots are given for typical IPM applications.

■ Applications

- Isolated IGBT/MOSFET gate drive
- Industrial inverters
- AC and Brushless DC motor drives
- IPM isolation

■ Schematic



ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT	Note
INPUT				
Forward Current	IF	25	mA	
Peak Input Current	IF	50	mA	1
Peak Transient Input Current	IF(trans)	1	A	2
Reverse Voltage	VR	5	V	
Input Power Dissipation	PI	45	mW	
OUTPUT				
Supply Voltage	VCC	30	V	
Output Voltage	VO	30	V	
Peak Output Current	IO	15	mA	
Output Power Dissipation	PO	100	mW	
COMMON				
Total Power Dissipation	PT	145	mW	
Isolation Voltage	Viso	5000	Vrms	3
Operating Temperature	Topr	-40~110	°C	
Storage Temperature	Tstg	-55~125	°C	
Soldering Temperature	Tsol	260	°C	4

Note 1. 50% duty cycle, 1ms pulse width

Note 2. ≤1ms P.W, 300pps

Note 3. AC For 1 Minute, R.H. = 40 ~ 60%

Note 4. For 10 seconds

TRUTH TABLE

LED	VO
On	Low
Off	High

RECOMMENDED OPERATION CONDITIONS

PARAMETER	SYMBOL	MIN	MAX	UNIT
Operating Temperature	TA	-40	100	°C
Supply Voltage	VCC	4.5	30	V
Input Current (ON)	IF(ON)	10	20	mA
Input Voltage (OFF)	VF(OFF)	-5	0.8	V

ELECTRICAL OPTICAL CHARACTERISTICS (VCC=30V, VEE=GND, TA=25°C unless specified otherwise)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION	NOTE
INPUT CHARACTERISTICS							
Forward Voltage	VF	-	1.3	1.8	V	IF=10mA	
Reverse Current	IR	-	-	10	μA	VR=5V	
Input Capacitance	Cin	-	60	-	pF	VF=0V, f=1MHz	
OUTPUT CHARACTERISTICS							
High Level Supply Current	ICCH	-	0.7	1.3	mA	VF=0.8V, VO=Open	
Low Level Supply Current	ICCL	-	0.75	1.3	mA	IF=10mA, VO=Open	
TRANSFER CHARACTERISTICS							
Current Transfer Ratio	CTR	44	82	-	%	IF=10mA, VO=0.6V	
Low Level Output Voltage	VOL	-	0.2	0.6	V	IO= 2.4mA	
High Level Output Current	IOH	-	8	50	μA	VF=0.8V, VO=VCC=5.5V	
Low Level Output Current	IOL	4.4	8.2	-	mA	IF=10mA, VO=0.6V	
Input Threshold Current	ITH	-	1.5	5.0	mA	IO=0.75mA, VO=0.8V	
Isolation Resistance	Riso	10 ⁹	10 ¹²	-	Ω	DC500V, 40 ~ 60% R.H.	



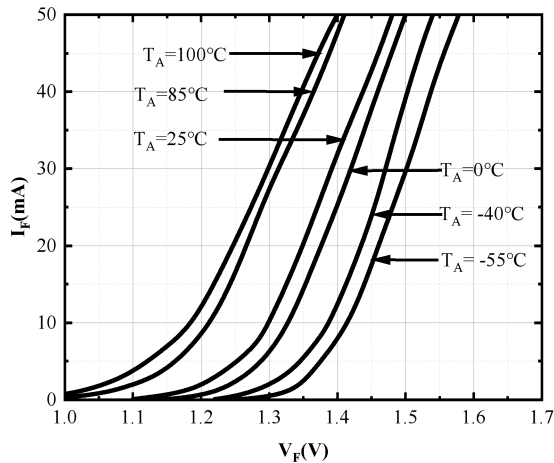
MP456 Series

LSOP6, IPM Interface

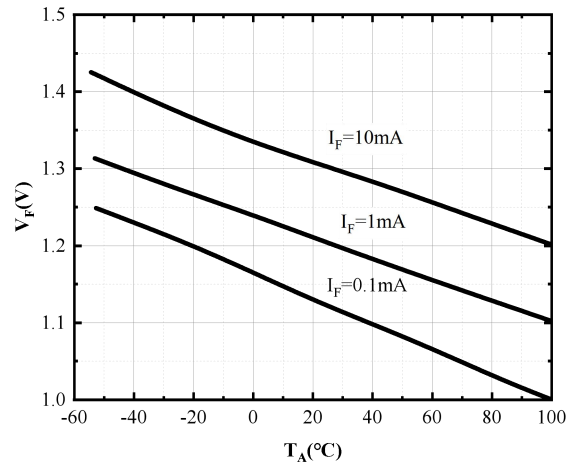
ELECTRICAL OPTICAL CHARACTERISTICS (VCC=30V, VEE=GND, TA=25°C unless specified otherwise)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION	NOTE
SWITCHING CHARACTERISTICS							
Propagation Delay Time to Output Low Level	TPHL	30	120	400	ns	IF=10mA, VCC=15V, CL=100pF RL=20KΩ, f=20kHz, Duty=50% VTHLH=2.0V, VTHHL=1.5V	
Propagation Delay Time to Output High Level	TPLH	200	280	550			
Pulse Width Distortion	PWD	-	200	450			
Propagation Delay Difference Between Any 2 Parts	PDD	-150	200	450			
Common Mode Transient Immunity at Logic High	CMH	15	30	-	kV/μs	IF=0mA, VCC=15V, RL=20KΩ CL=100pF, VCM= 1.5KVp-p	
Common Mode Transient Immunity at Logic Low	CML	15	30	-	kV/μs	IF=10mA, VCC=15V, RL=20KΩ CL=100pF, VCM= 1.5KVp-p	

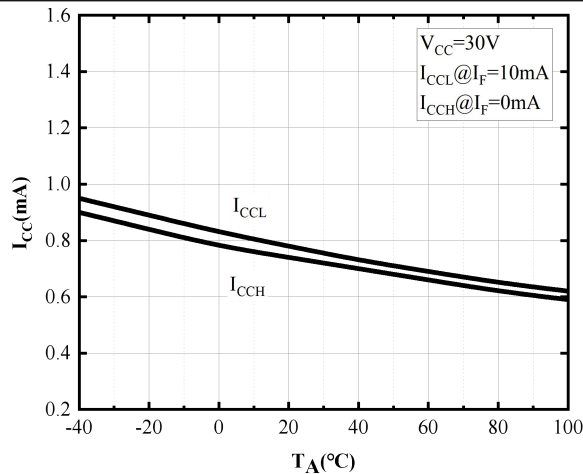
CHARACTERISTIC CURVES



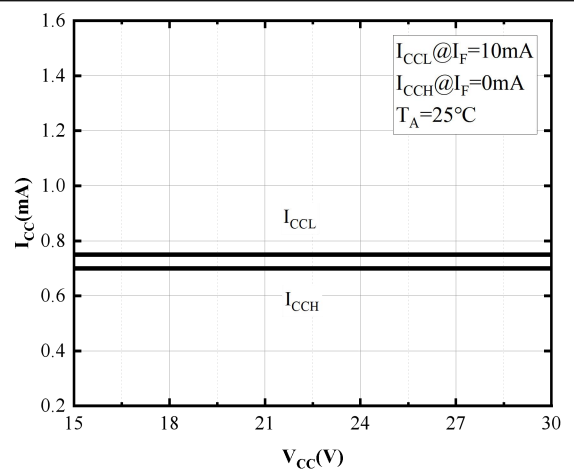
**Fig.1 Forward Current
vs. Forward Voltage**



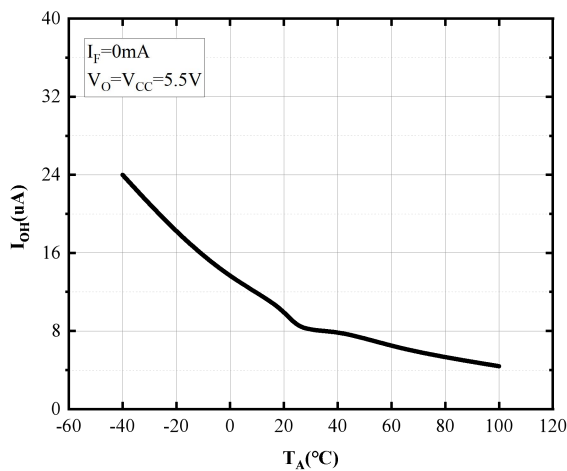
**Fig.2 Forward Voltage
vs. Ambient Temperature**



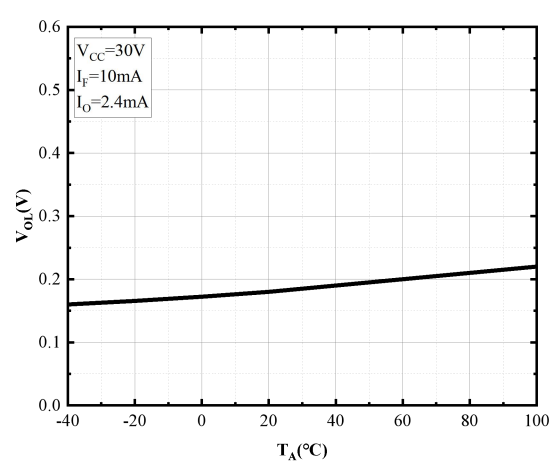
**Fig.3 Supply Current
vs. Ambient Temperature**



**Fig.4 Supply Current
vs. Supply Voltage**

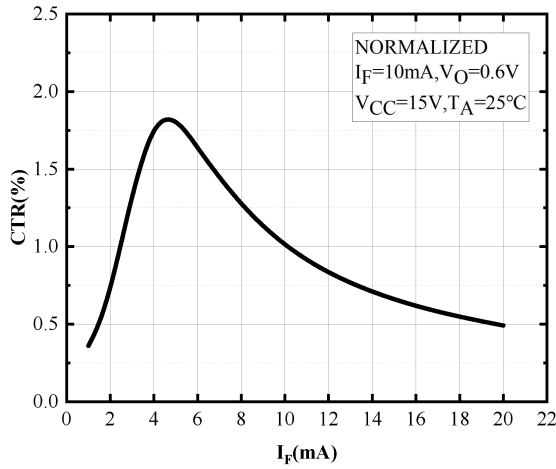


**Fig.5 High Level Output Current
vs. Ambient Temperature**

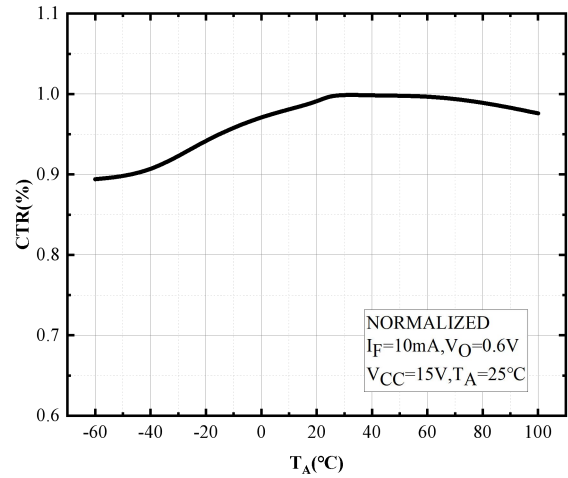


**Fig.6 Low Level Output Voltage
vs. Ambient Temperature**

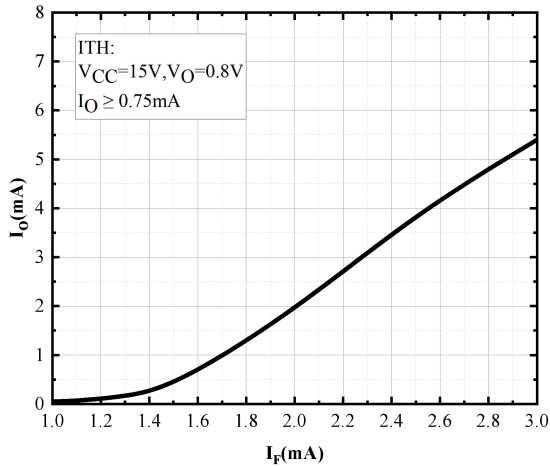
CHARACTERISTIC CURVES



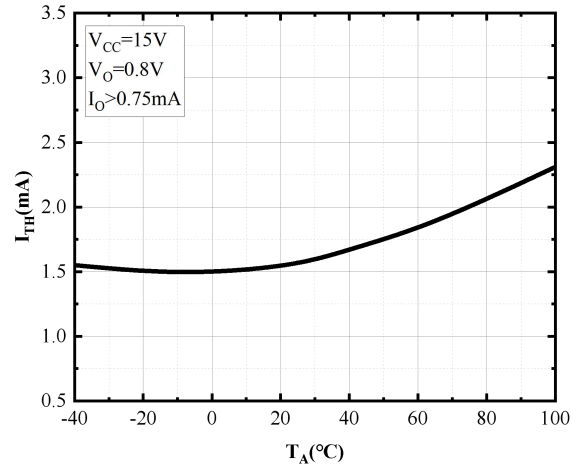
**Fig.7 Current Transfer Ratio
vs. Input Current**



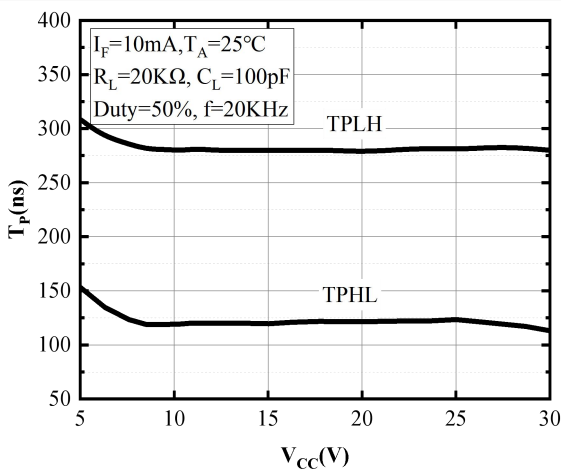
**Fig.8 Current Transfer Ratio
vs. Ambient Temperature**



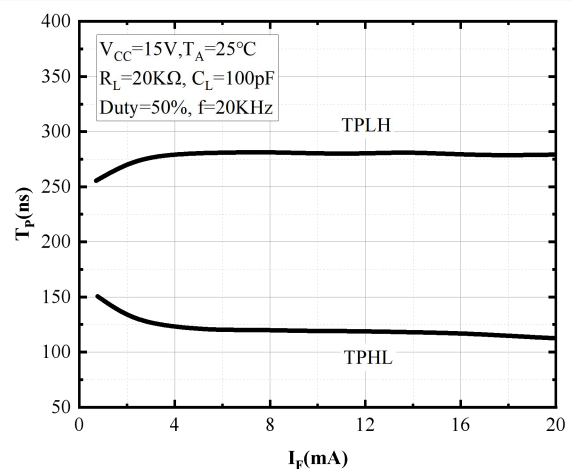
**Fig.9 Output Current
vs. Input Current**



**Fig.10 Input Threshold Current
vs. Ambient Temperature**

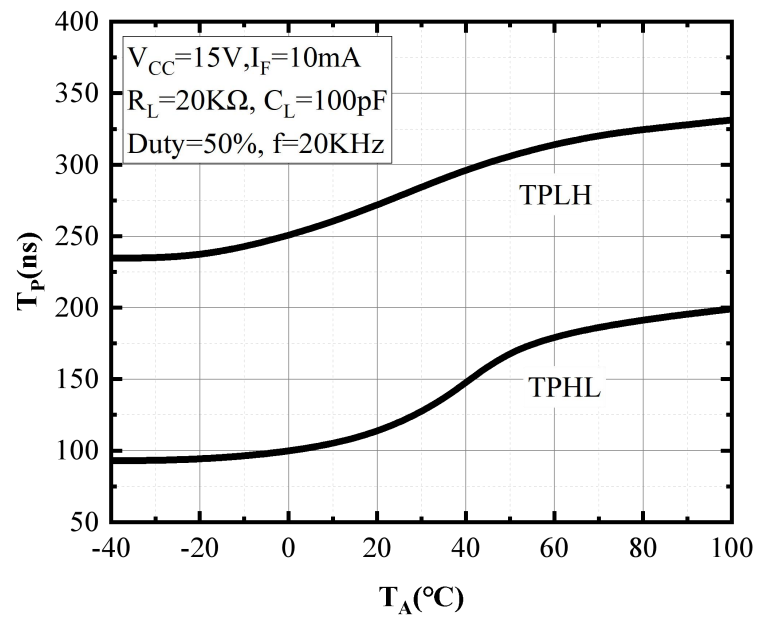


**Fig.11 Propagation Delay
vs. Supply Voltage**



**Fig.12 Propagation Delay
vs. Forward Current**

CHARACTERISTIC CURVES



**Fig.13 Propagation Delay
vs. Ambient Temperature**

TEST CIRCUITS

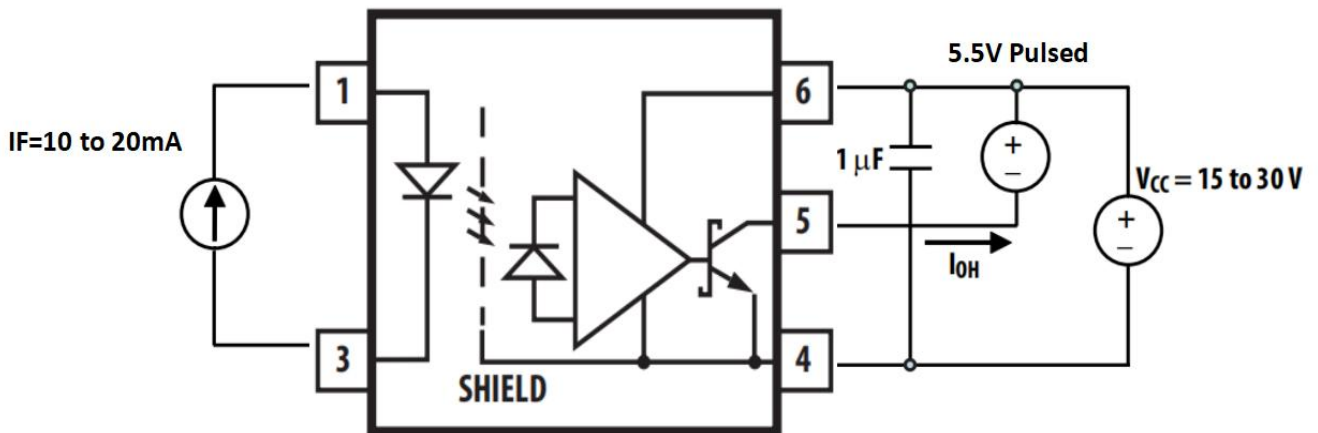


Fig.14 Test Circuits for I_{OH}

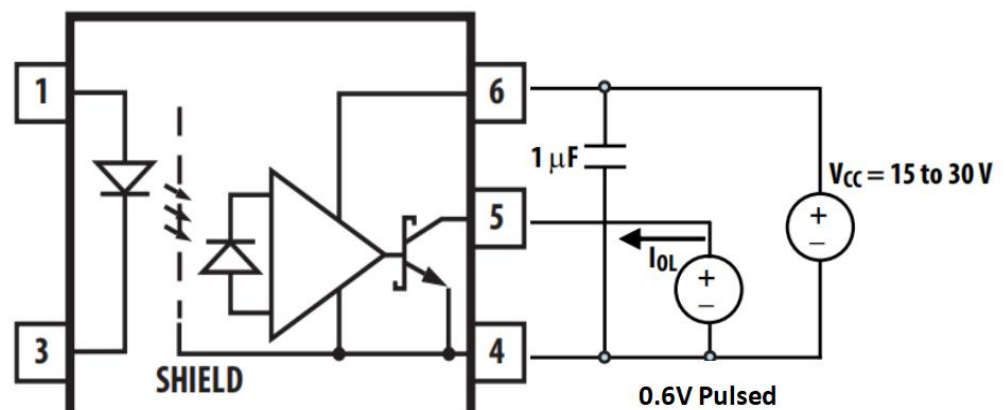


Fig.15 Test Circuits for I_{OL}

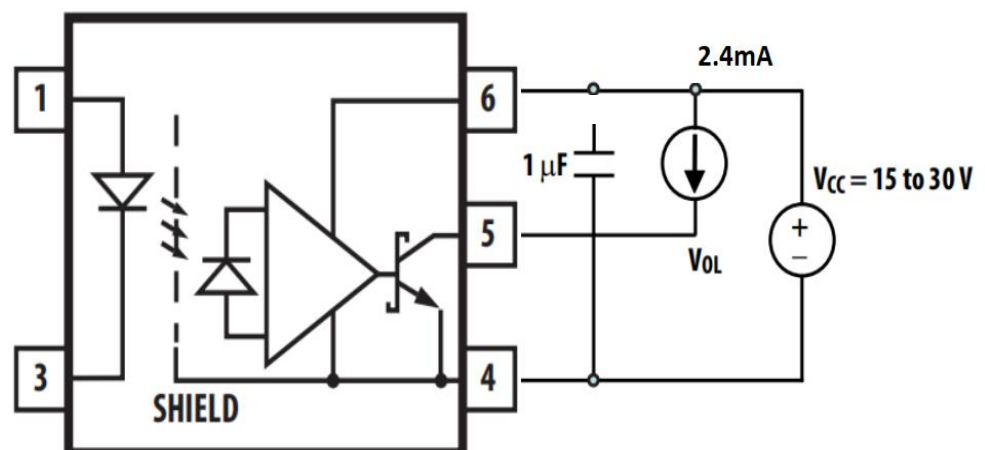


Fig.16 Test Circuits for V_{OL}

TEST CIRCUITS

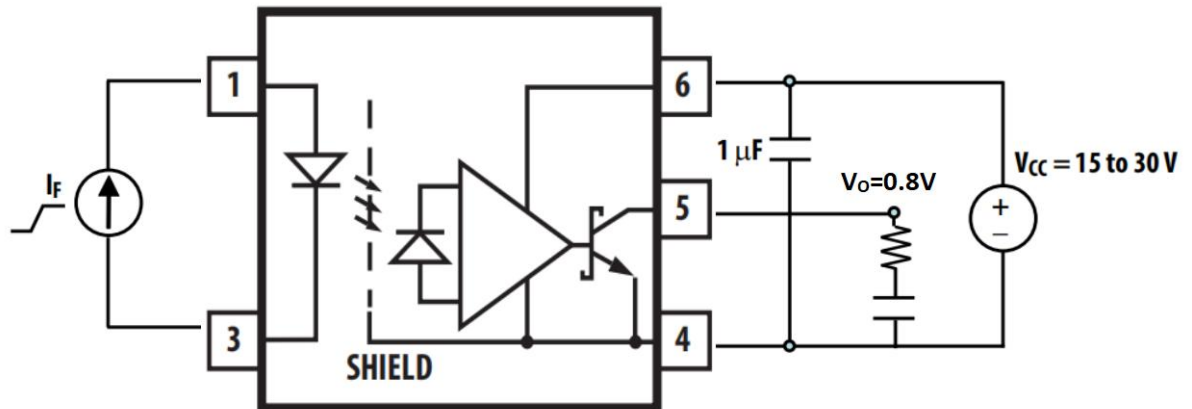


Fig.17 Test Circuits for ITH

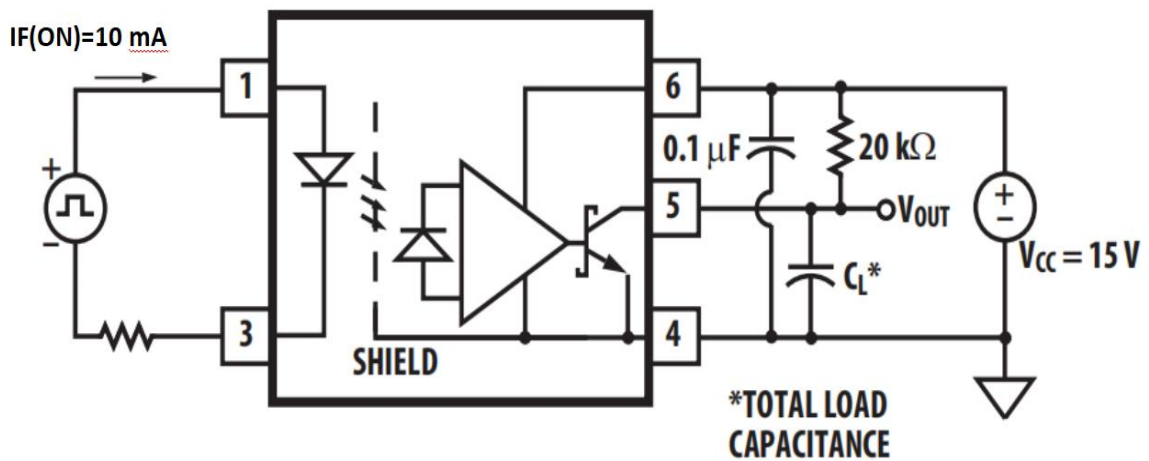


Fig.18 Test Circuits for TPHL, TPLH

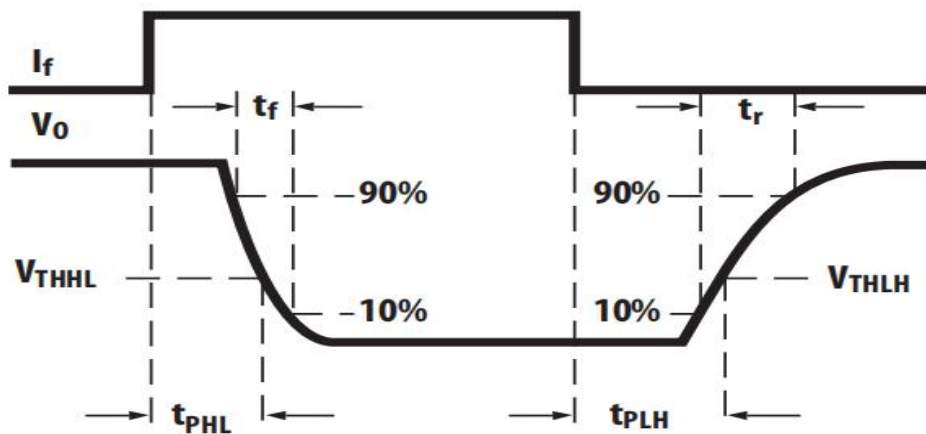


Fig.19 Wave forms of TPHL, TPLH

TEST CIRCUITS

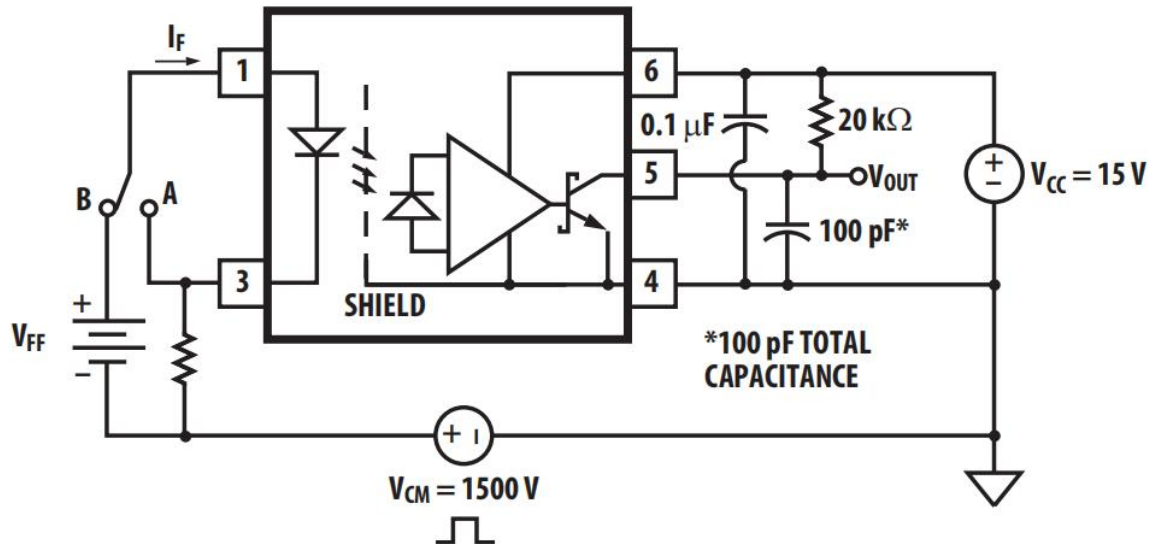


Fig.20 Test Circuits for Common Mode Transient Immunity

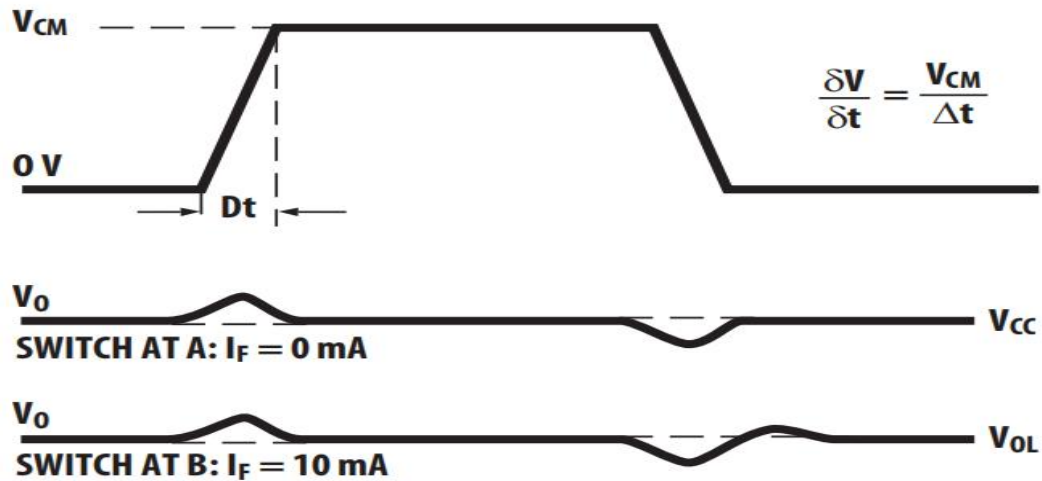
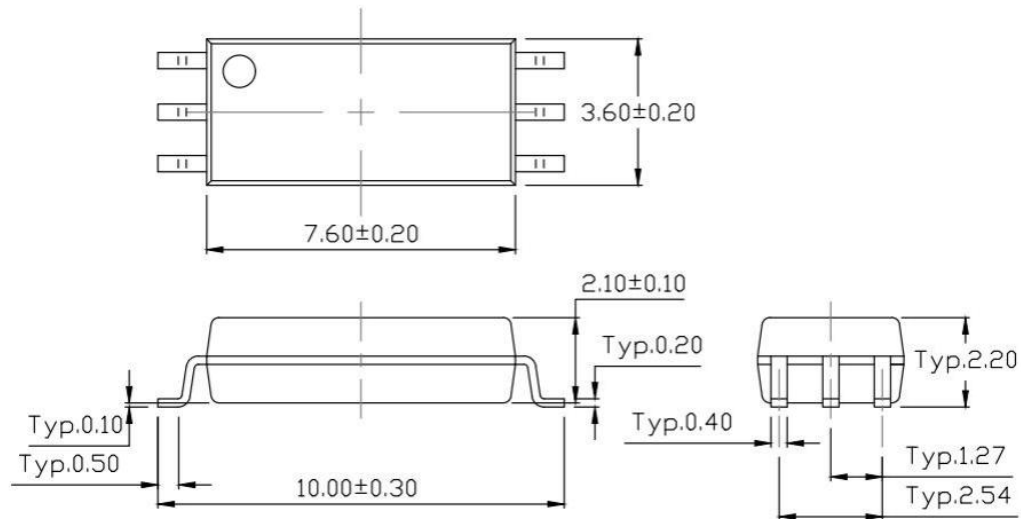


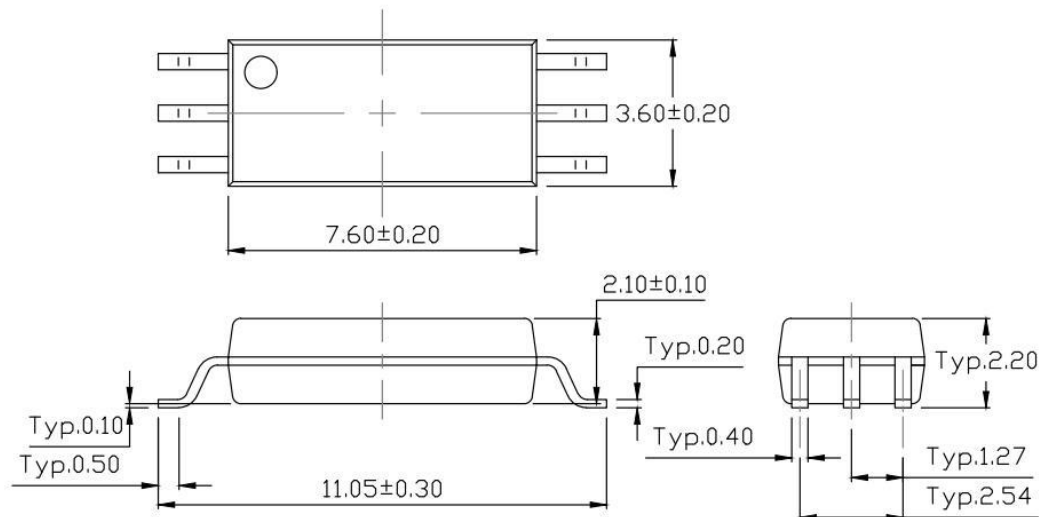
Fig.21 Waveforms of Common Mode Transient Immunity

PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)

Standard P Type

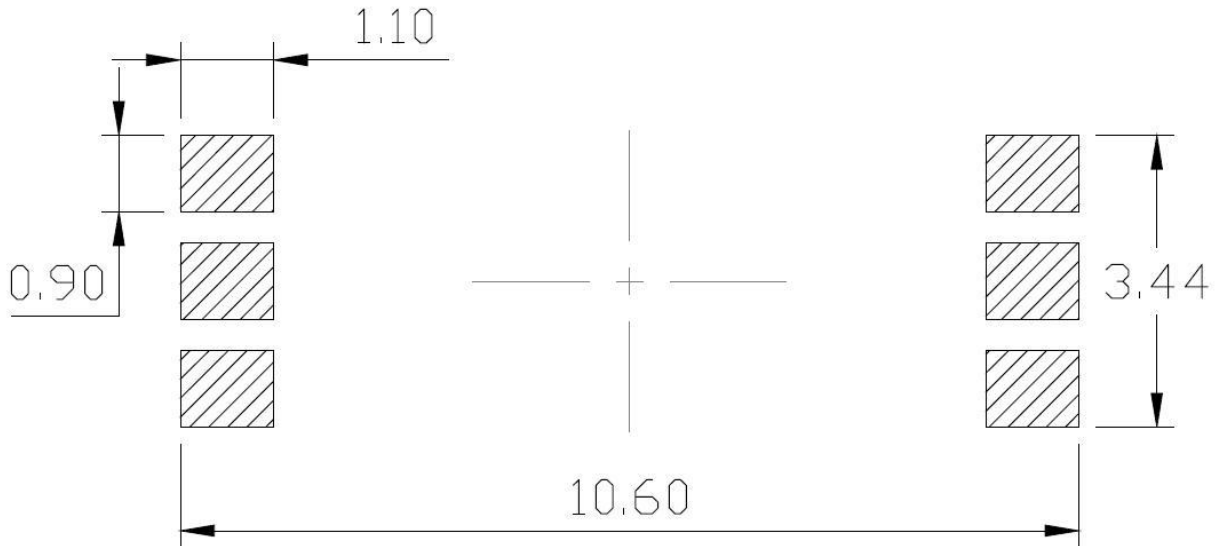


Standard W Type

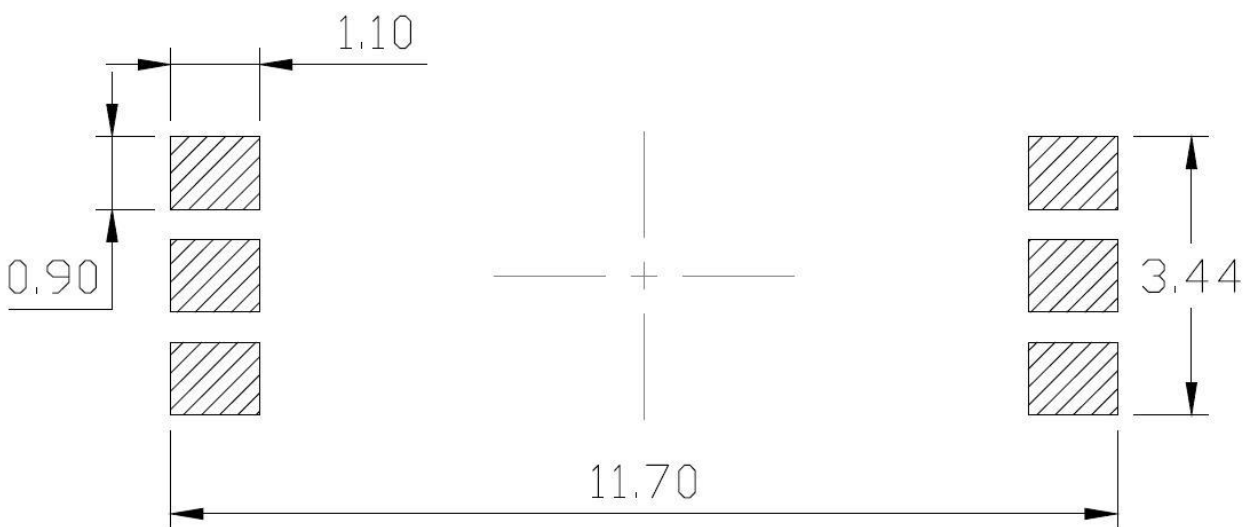


Recommended Solder Mask (Dimensions in mm unless otherwise stated)

Standard P Type

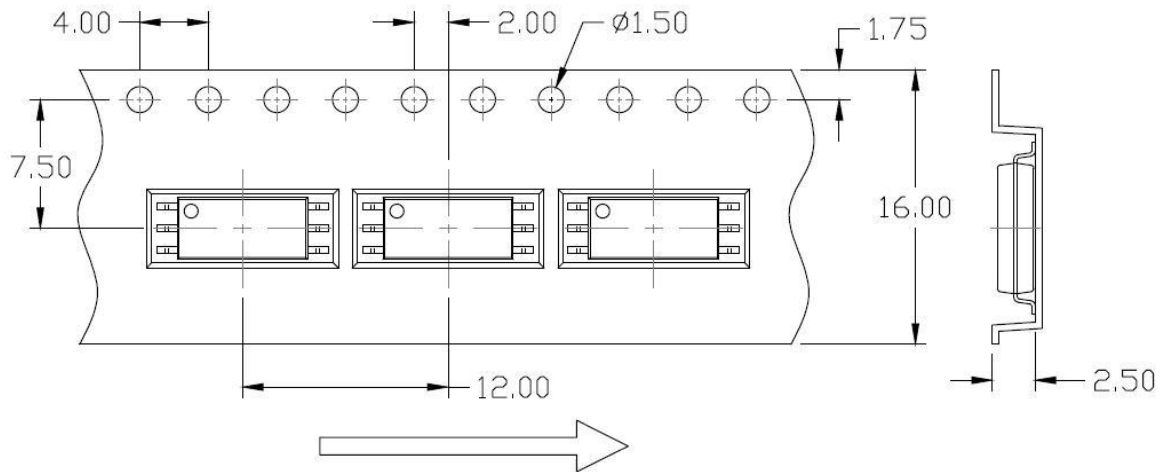


Standard W Type

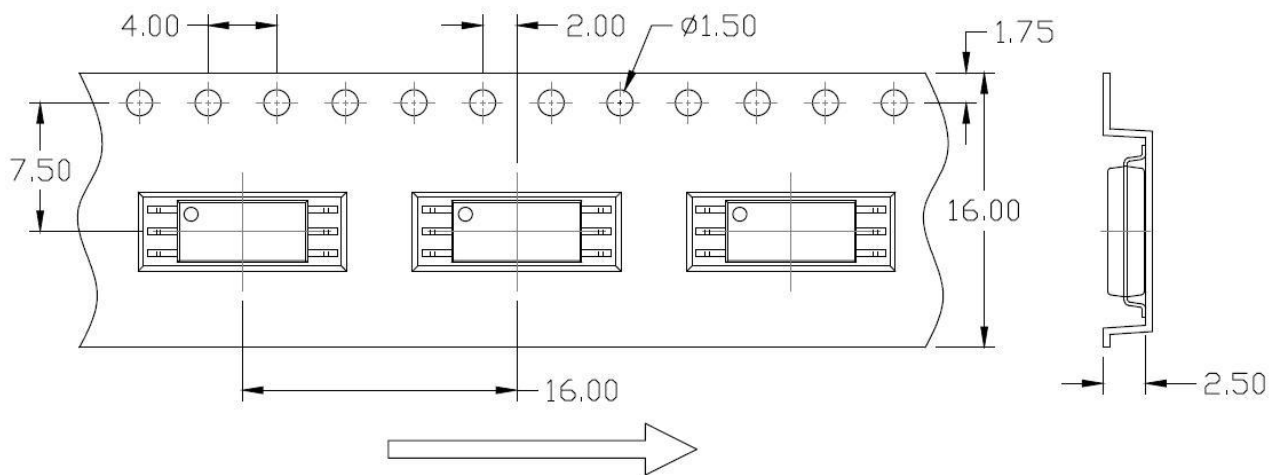


CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

Option P(T3)

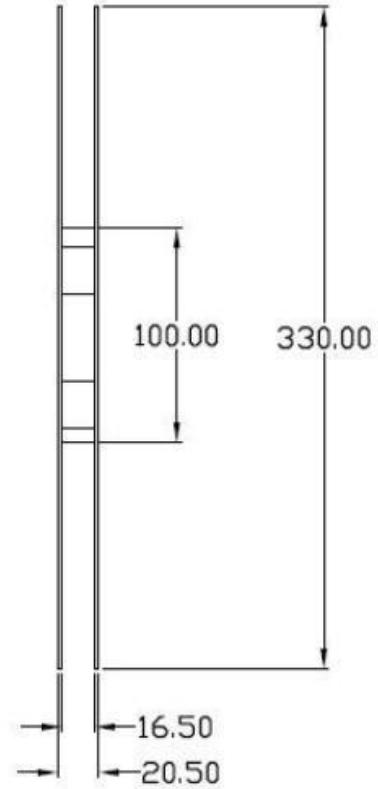
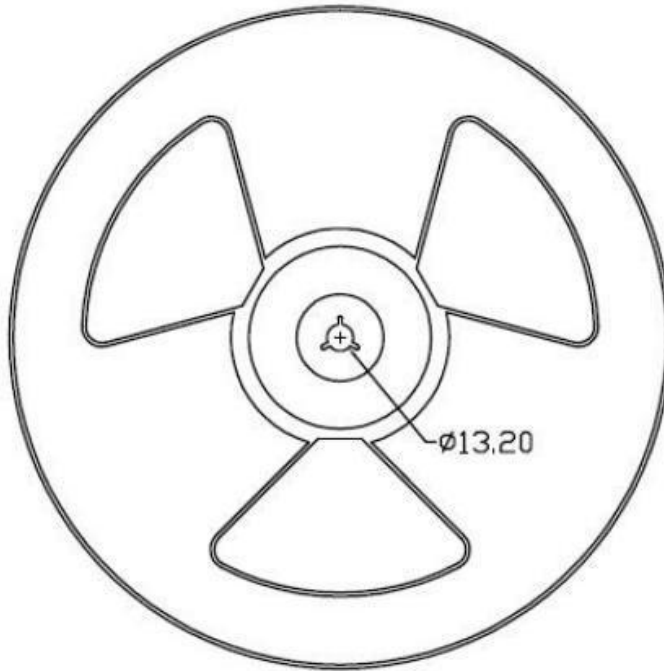


Option W (T3)



REEL SPECIFICATIONS (Dimensions in mm unless otherwise stated)

Option



ORDERING AND MARKING INFORMATION

MARKING INFORMATION

	MP	: Company Abbr.
	456	: Part Number
	V	: VDE Option (V or None)
	N	:Customer Specified Option(1~9 or None)
	Y	: Fiscal Year
	A	: Manufacturing Code
	WW	: Work Week

ORDERING INFORMATION

MP454(Y)(Z)-GV(XN)

MP -Company Abbr.

456 -Part Number.

(Y) -Lead Form Option (P/W).

(Z) -Tape and Reel Option (T3).

G -Material Option (G: Green, None: Non-Green).

V -VDE Option (V or None).

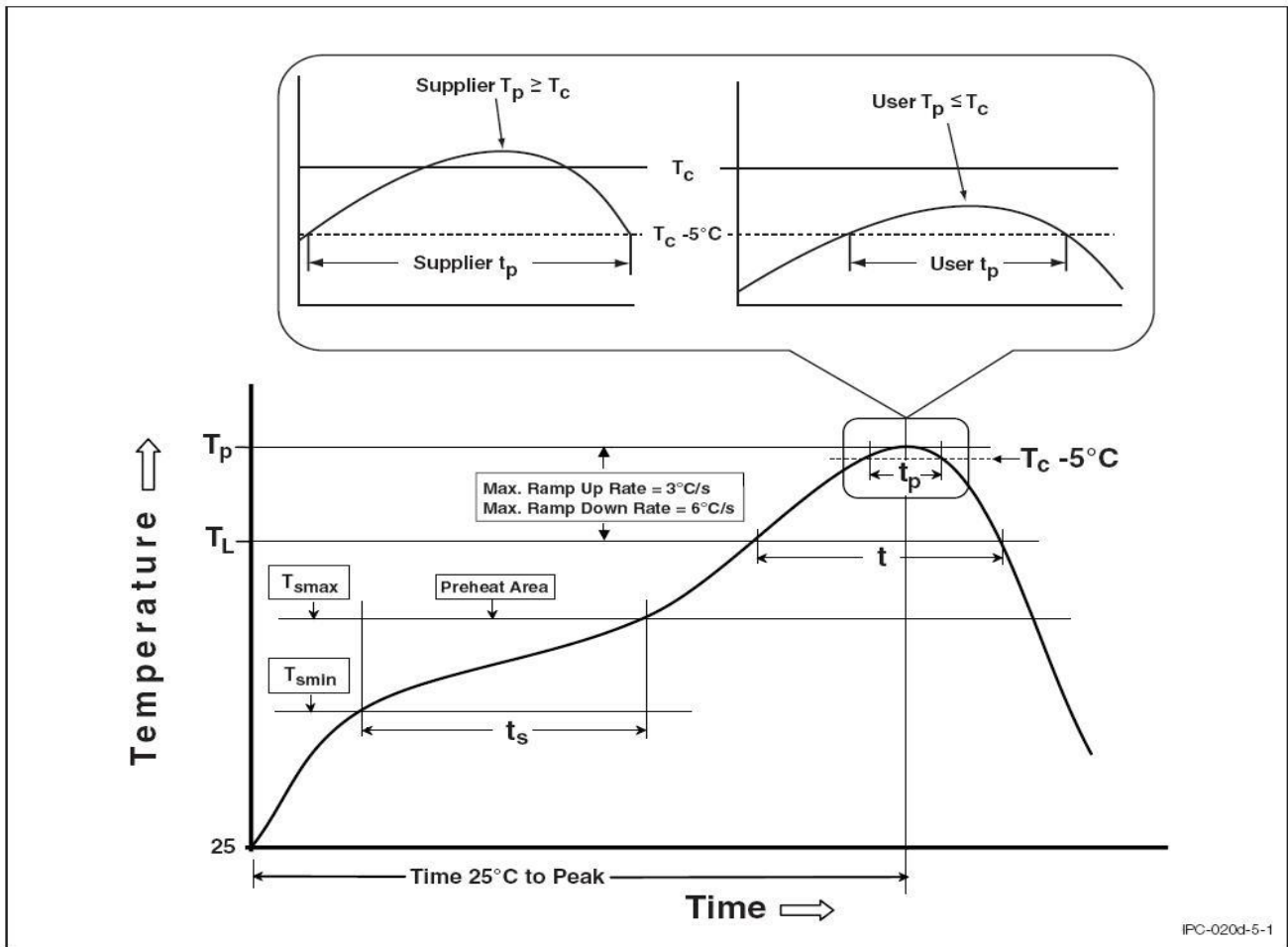
(XN)-Customer Specified Option (X: A~Z or None; N:1~9 or None)

PACKING QUANTITY

Option	Quantity	Quantity – Inner box	Quantity – Outer box
P(T3)	1500 Units/Reel	3 Reels/Inner box	5 Inner box/Outer box = 22.5k Units
W(T3)	1500 Units/Reel	3 Reels/Inner box	5 Inner box/Outer box = 22.5k Units

REFLOW INFORMATION

REFLOW PROFILE



Profile Feature	Sn-Pb Assembly Profile	Pb-Free Assembly Profile
Temperature Min. (T _{min})	100	150°C
Temperature Max. (T _{max})	150	200°C
Time (t _s) from (T _{min} to T _{max})	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.

DISCLAIMER

- Our company is continually improving the quality, reliability, function and design. Our company reserves the right to make changes without further notices.
- The characteristic curves shown in this datasheet are representing typical performance which are not guaranteed.
- This product is not intended to be used for military, aircraft, automotive, medical, life sustaining or lifesaving applications or any other application which can result in human injury or death.
- Immerge unit's body in solder paste is not recommended.
- Discoloration might be occurred on the package surface after soldering, reflow or long-time use. It neither impacts the performance nor reliability.

■ Revision History

Version	Date	Subjects (major changes since last revision)
0.1	2024-05-09	Datasheet Complete