

### ■ Features

- High noise immunity characterized by 50kV/μs (Typ.) common mode rejection @ VCM = 2,000V
- Operating temperature range -40°C to 110°C
- Operating VDD range from 15V to 30V
- Fast switching speed and fast output rise/fall time
- 250kHz maximum switching speed
- Rail to rail output
- Under voltage lockout protection (UVLO) with hysteresis – optimized for driving IGBTs

### ■ Applications

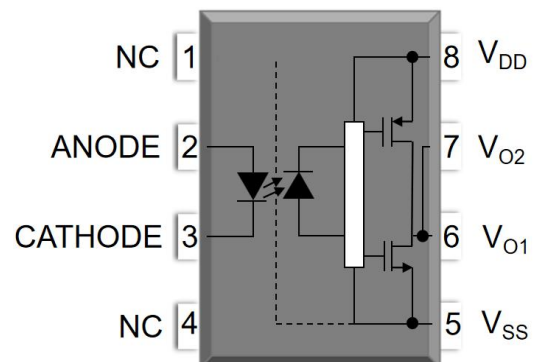
- IGBT/MOSFET gate drive
- Plasma Display Panel
- DC/DC convertor
- High performance UPS
- Switching power suppliers

### ■ Description

The MP3184 is a 3A Output Current, High Speed MOSFET/IGBT Gate Drive Optocoupler. It consists of a aluminium gallium arsenide (AlGaAs) light emitting diode optically coupled to a CMOS detector with PMOS and NMOS output power transistors integrated circuit power stage.

It is ideally suited for high frequency driving of power MOSFETS/IGBT used in Plasma Display Panels (PDPs), motor control inverter applications and high performance DC/DC converters. The device is packaged in an 8-pin dual in-line housing compatible with 260°C reflow processes for lead free solder compliance.

### ■ Schematic





# MP3184 Series

## DIP8, DC Input, 3.0A, Gate Driver Photo Coupler

### ABSOLUTE MAXIMUM RATINGS

| PARAMETER                       | SYMBOL        | VALUE   | UNIT | Note |
|---------------------------------|---------------|---------|------|------|
| INPUT                           |               |         |      |      |
| Forward Current                 | IF            | 25      | mA   |      |
| Peak Forward Current            | IFP           | 50      | mA   | 1    |
| Input Signal Rise and Fall Time | TR(IN)/TF(IN) | 500     | ns   |      |
| Reverse Voltage                 | VR            | 5       | V    |      |
| Input Power Dissipation         | PI            | 45      | mW   |      |
| OUTPUT                          |               |         |      |      |
| Supply Voltage                  | VDD-VSS       | 35      | V    |      |
| Output Voltage                  | VO(PEAK)      | VDD     | V    |      |
| “High” Peak Output Current      | IOH(PEAK)     | 3.0     | A    | 2    |
| “Low” Peak Output Current       | IOL(PEAK)     | 3.0     | A    | 2    |
| Output Power Dissipation        | PO            | 250     | mW   |      |
| COMMON                          |               |         |      |      |
| Total Power Dissipation         | Ptot          | 295     | 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.  $\leq 1\mu\text{s}$  P.W, 300pps

Note 2. Maximum pulse width =  $10\mu\text{s}$ .

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

Note 4. For 10 seconds.

### TRUTH TABLE

| LED | VDD-VSS "Positive Going"<br>(Turn-on) | VDD-VSS "Negative Going"<br>(Turn-off) | VO         |
|-----|---------------------------------------|----------------------------------------|------------|
| Off | 0V to 30V                             | 0V to 30V                              | Low        |
| On  | 0V to 11.5V                           | 0V to 10V                              | Low        |
| On  | 11.5V to 13.5V                        | 10V to 12V                             | Transition |
| On  | 13.5V to 30V                          | 12V to 30V                             | High       |



# MP3184 Series

## DIP8, DC Input, 3.0A, Gate Driver Photo Coupler

### RECOMMENDED OPERATION CONDITIONS

| PARAMETER             | SYMBOL  | MIN  | MAX | UNIT |
|-----------------------|---------|------|-----|------|
| Operating Temperature | TA      | -40  | 100 | °C   |
| Supply Voltage        | VDD-VSS | 15   | 30  | V    |
| Input Current (ON)    | IF(ON)  | 10   | 16  | mA   |
| Input Voltage (OFF)   | VF(OFF) | -3.0 | 0.8 | V    |

### ELECTRICAL OPTICAL CHARACTERISTICS (VDD=30V, VSS=0V, TA=25°C unless specified otherwise)

| PARAMETER                       | SYMBOL               | MIN             | TYP     | MAX  | UNIT | TEST CONDITION       | NOTE |
|---------------------------------|----------------------|-----------------|---------|------|------|----------------------|------|
| INPUT CHARACTERISTICS           |                      |                 |         |      |      |                      |      |
| Forward Voltage                 | VF                   | 1.1             | 1.3     | 1.8  | V    | IF=10mA              |      |
| Reverse Current                 | IR                   | -               | -       | 10   | μA   | VR=5V                |      |
| Reverse Breakdown Voltage       | BVR                  | 5               | -       | -    | V    | IR=10μA              |      |
| Input Threshold Current         | IFLH                 | -               | 2.6     | 7.5  | mA   | IO= 0mA, VO> 5V      |      |
| Input Threshold Voltage         | VFHL                 | 0.8             | 1.3     | -    | V    | IO= 0mA, VO< 5V      |      |
| Input Capacitance               | Cin                  | -               | 25      | -    | pF   | VF=0, f=1MHz         |      |
| OUTPUT CHARACTERISTICS          |                      |                 |         |      |      |                      |      |
| High Level Supply Current       | IDDH                 | -               | 1.7     | 3.5  | mA   | IF=10mA, VO= Open    |      |
| Low Level Supply Current        | IDDL                 | -               | 2.0     | 3.5  | mA   | VF=0.8V, VO= Open    |      |
| High Level Output Voltage       | VOH                  | VDD-0.5         | VDD-0.1 |      | V    | IF=10mA, IO=-100mA   |      |
| Low Level Output Voltage        | VOL                  | -               | 0.06    | 0.5  | V    | IF= 0mA, IO= 100mA   |      |
| High Level Output Current       | IOH                  | -               | -1.1    | -0.5 | A    | VO= VDD-VSS-1V       | 1    |
|                                 |                      | -               | -       | -2.5 | A    | VO= VDD-VSS-6V       | 2    |
| Low Level Output Current        | IOL                  | 0.5             | 1.4     | -    | A    | VO= VDD-VSS+1V       | 1    |
|                                 |                      | 2.5             | -       | -    | A    | VO= VDD-VSS+6V       | 2    |
| Under Voltage Lockout Threshold | VUVLO+               | 11.5            | 12.5    | 13.5 | V    | IF= 10mA, VO> 5V     |      |
|                                 | VUVLO-               | 10              | 11      | 12   | V    | IF= 10mA, VO< 5V     |      |
| UVLO Hysteresis                 | UVLO <sub>HYST</sub> | -               | 1.5     | -    | V    |                      |      |
| Isolation Resistance            | Riso                 | 10 <sup>9</sup> | -       | -    | Ω    | DC500V, 40 ~ 60%R.H. |      |

Note1. Maximum pulse width = 50μs.

Note2. Maximum pulse width = 10μs.



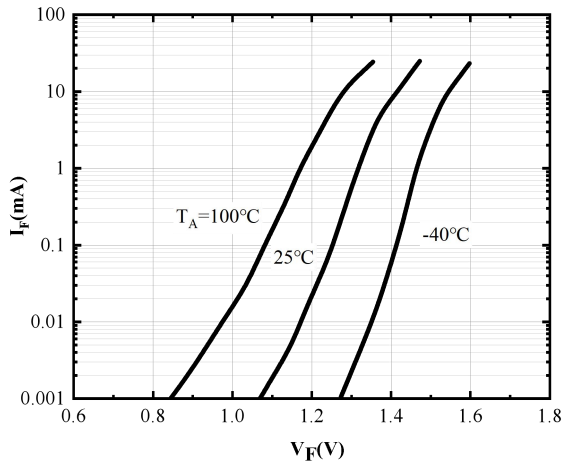
# MP3184 Series

## DIP8, DC Input, 3.0A, Gate Driver Photo Coupler

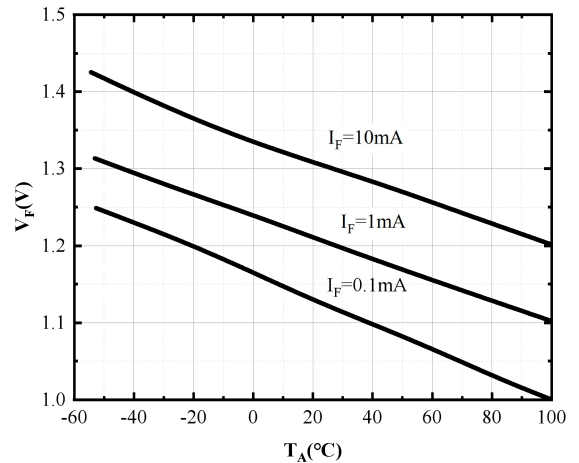
### ELECTRICAL OPTICAL CHARACTERISTICS (VDD=30V, VSS=0V, TA=25°C unless specified otherwise)

| PARAMETER                                          | SYMBOL | MIN | TYP | MAX | UNIT  | TEST CONDITION                                           | NOTE |
|----------------------------------------------------|--------|-----|-----|-----|-------|----------------------------------------------------------|------|
| SWITCHING CHARACTERISTICS                          |        |     |     |     |       |                                                          |      |
| Propagation Delay Time to Output Low Level         | TPHL   | 50  | 94  | 210 | ns    | IF=10mA, Cg= 10nF,<br>Rg= 10Ω, f= 250kHz,<br>Duty = 50%, |      |
| Propagation Delay Time to Output High Level        | TPLH   | 50  | 62  | 210 |       |                                                          |      |
| Pulse Width Distortion                             | PWD    | -   | 32  | -   |       |                                                          |      |
| Propagation Delay Difference Between Any Two Parts | PDD    | -90 | -   | 90  |       |                                                          |      |
| Rise Time                                          | tr     | -   | 30  | -   |       |                                                          |      |
| Fall Time                                          | tf     | -   | 20  | -   |       |                                                          |      |
| UVLO Turn On Delay                                 | tUVLO+ | -   | 2.0 | -   | μs    | IF= 10mA, VO> 5V                                         |      |
| UVLO Turn Off Delay                                | tUVLO- | -   | 0.3 | -   | μs    | IF= 10mA, VO< 5V                                         |      |
| Common Mode Transient Immunity at Logic High       | CMH    | 35  | 50  | -   | kV/μs | IF=10mA,<br>VDD=30V, VCM=2kV                             |      |
| Common Mode Transient Immunity at Logic Low        | CML    | 35  | 50  | -   | kV/μs | VF=0V<br>VDD=30V, VCM=2kV                                |      |

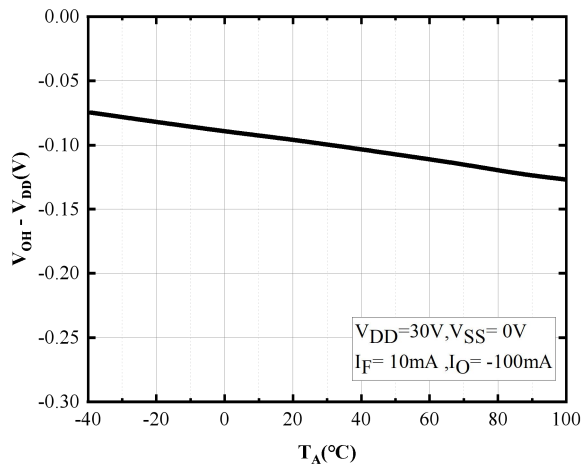
## CHARACTERISTIC CURVES



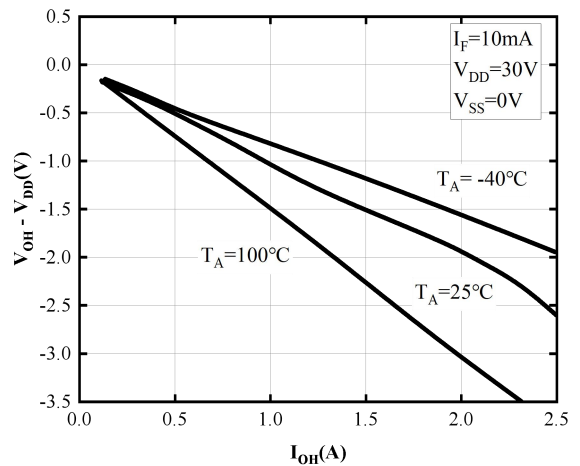
**Fig.1 Forward Current  
vs. Forward Voltage**



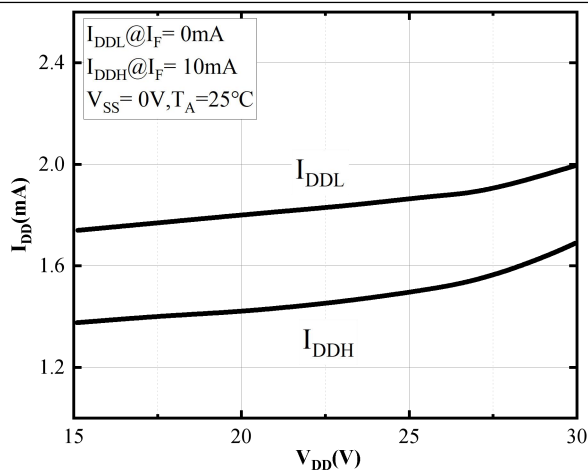
**Fig.2 Forward Voltage  
vs. Ambient Temperature**



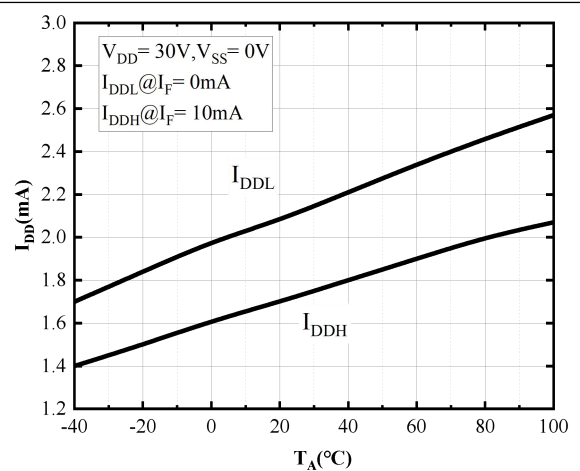
**Fig.3 High Level Output Voltage  
vs. Ambient Temperature**



**Fig.4 High Level Output Voltage  
vs. High Level Output Current**

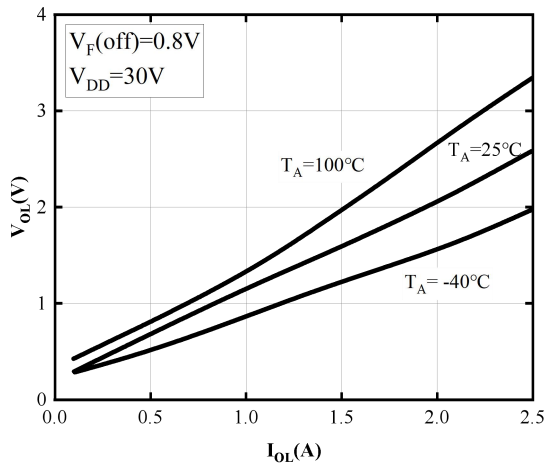


**Fig.5 Supply Current  
vs. Supply Voltage**

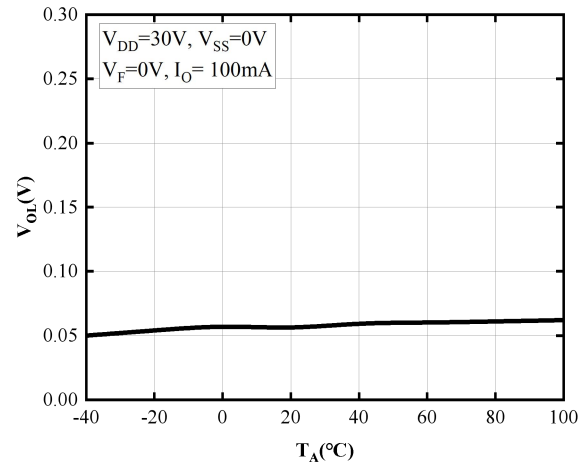


**Fig.6 Supply Current  
vs. Ambient Temperature**

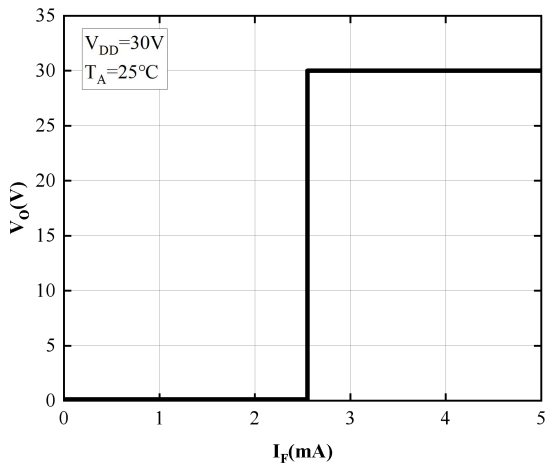
### CHARACTERISTIC CURVES



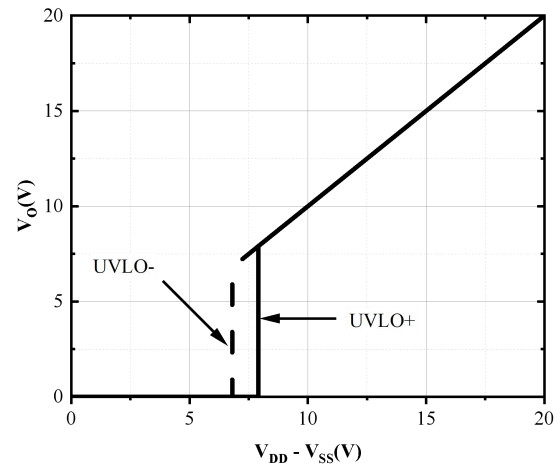
**Fig.7 Low Level Output Voltage  
vs. Low Level Output Current**



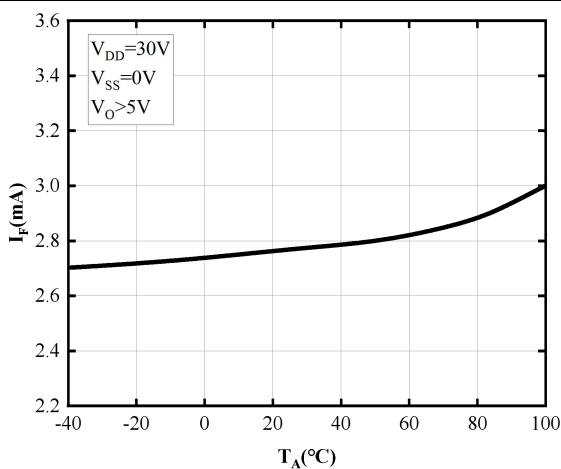
**Fig.8 Low Level Output Voltage  
vs. Ambient Temperature**



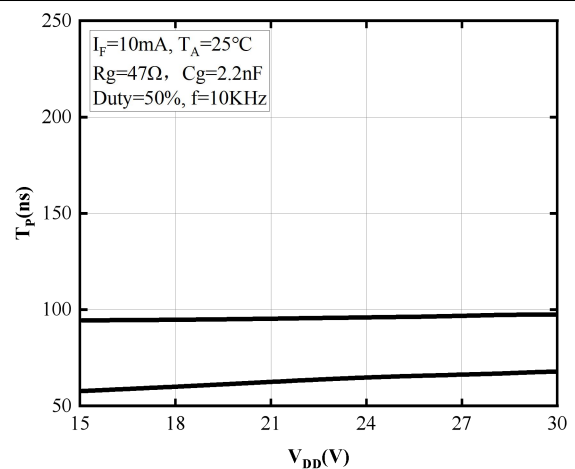
**Fig.9 Output Voltage  
vs. Forward Current**



**Fig.10 Output Voltage  
vs. Supply Voltage**

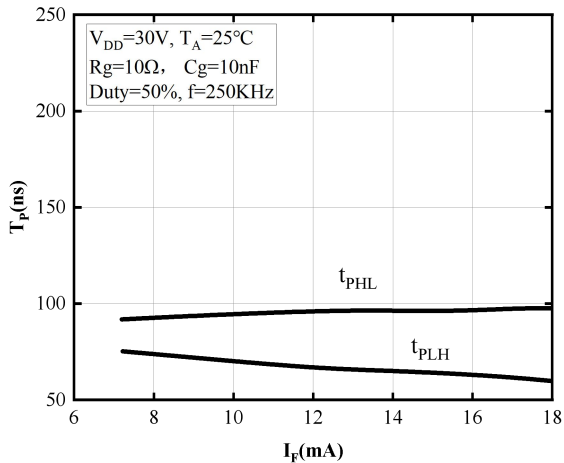


**Fig.11 Forward Current  
vs. Ambient Temperature**

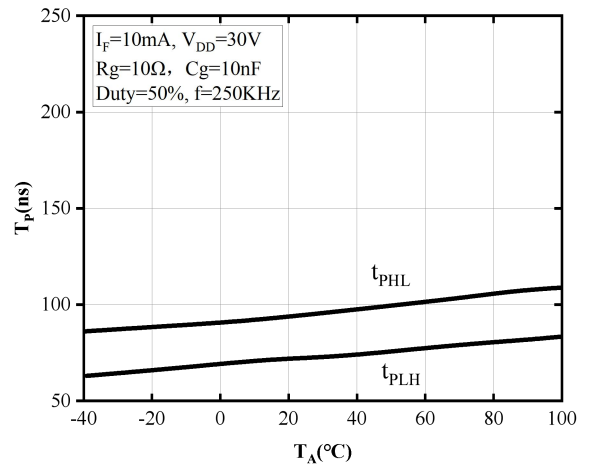


**Fig.12 Propagation Delay  
vs. Supply Voltage**

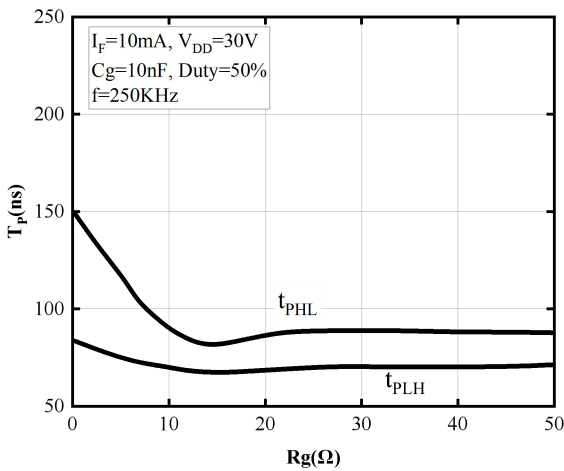
### CHARACTERISTIC CURVES



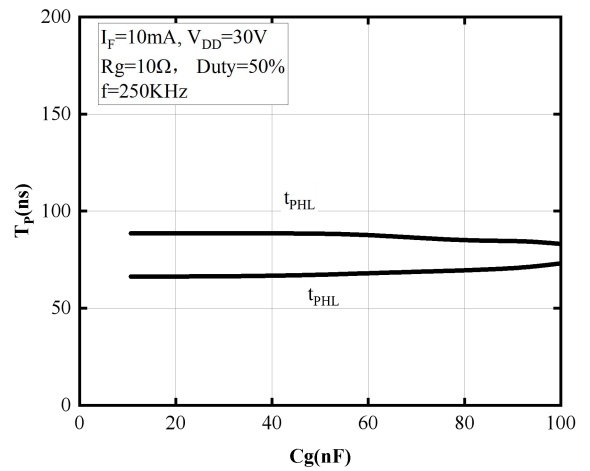
**Fig.13 Propagation Delay  
vs. Forward Current**



**Fig.14 Propagation Delay  
vs. Ambient Temperature**

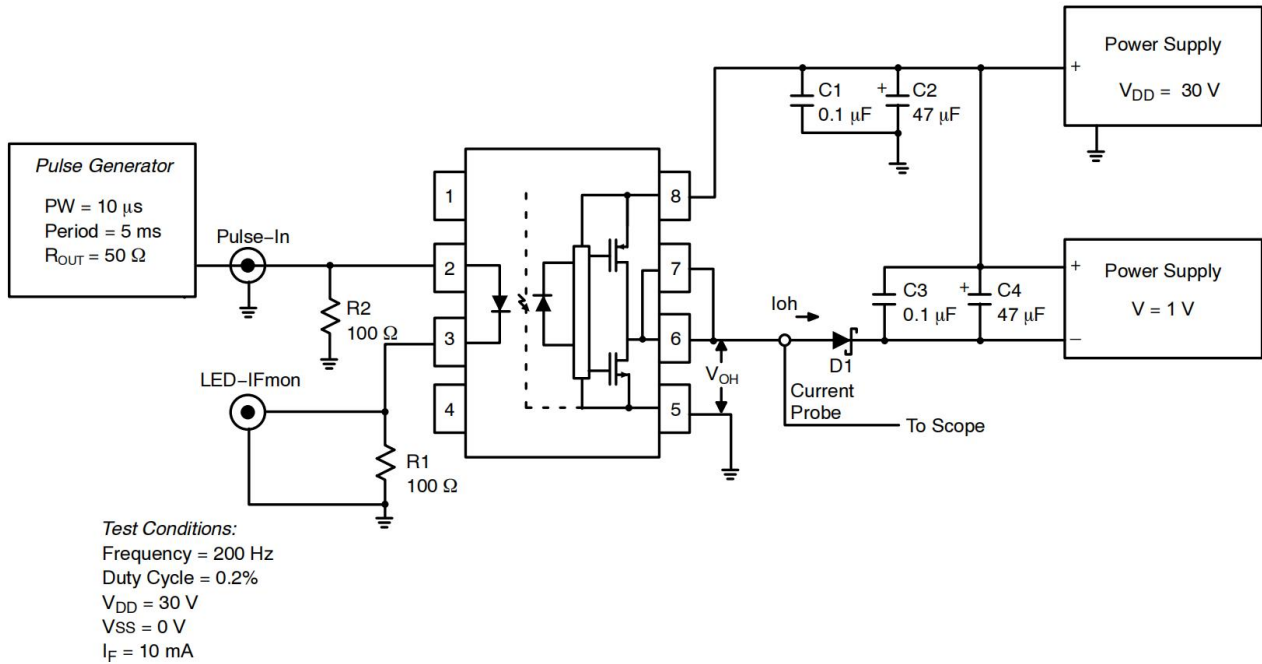


**Fig.15 Propagation Delay  
vs. Load Resistance**

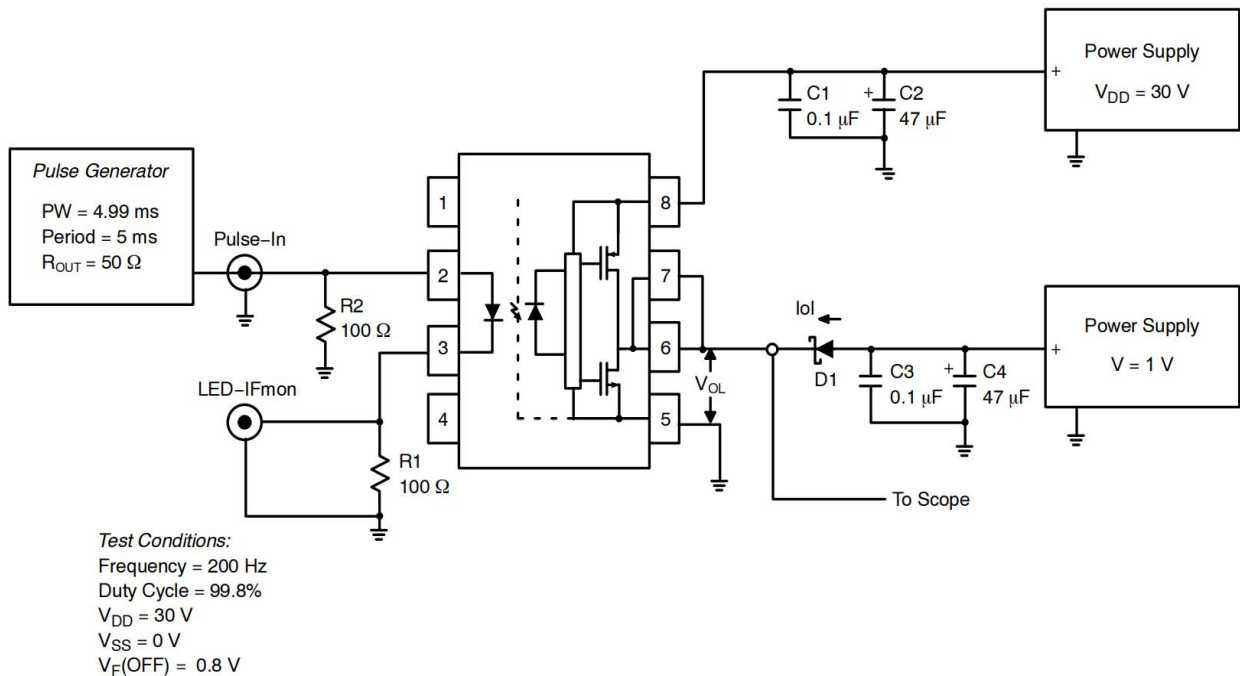


**Fig.16 Propagation Delay  
vs. Load Capacitance**

### TEST CIRCUITS



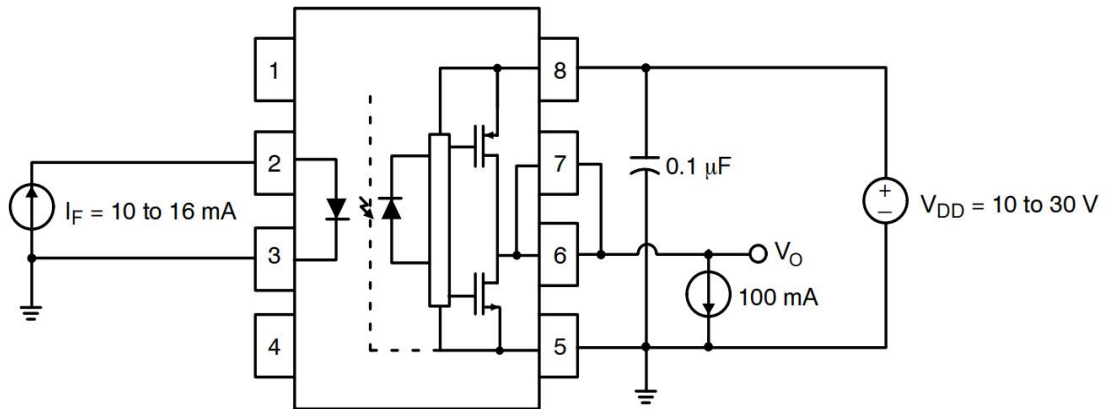
**Fig.17 Test Circuits for IOH**



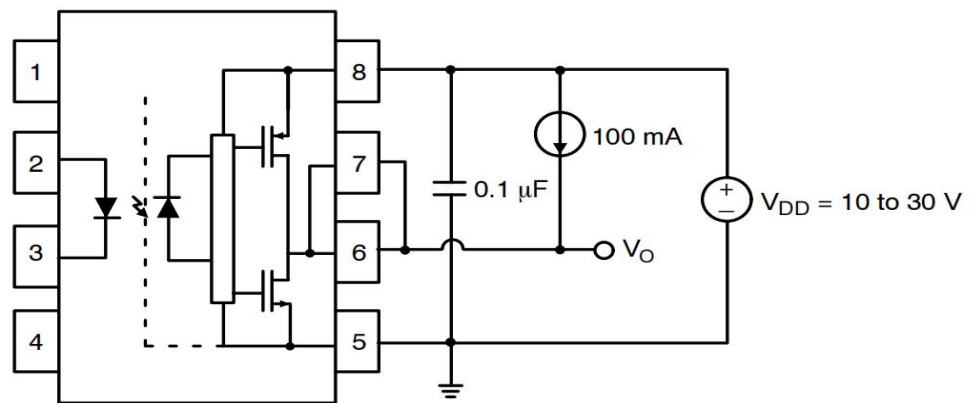
**Fig.18 Test Circuits for IOL**



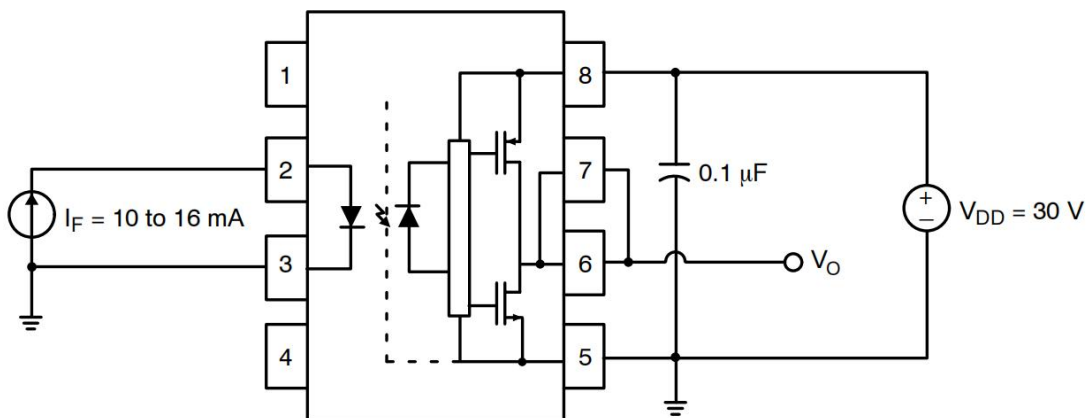
**TEST CIRCUITS**



**Fig.19 Test Circuits for V<sub>OH</sub>**

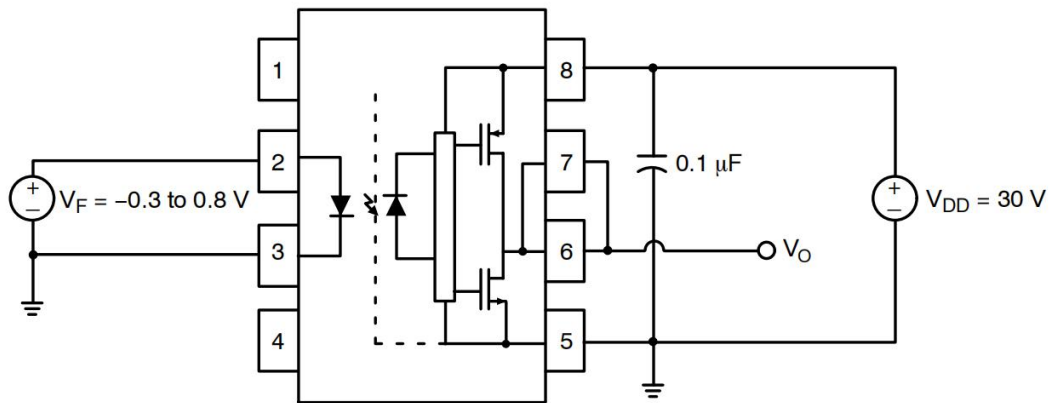


**Fig.20 Test Circuits for V<sub>OL</sub>**

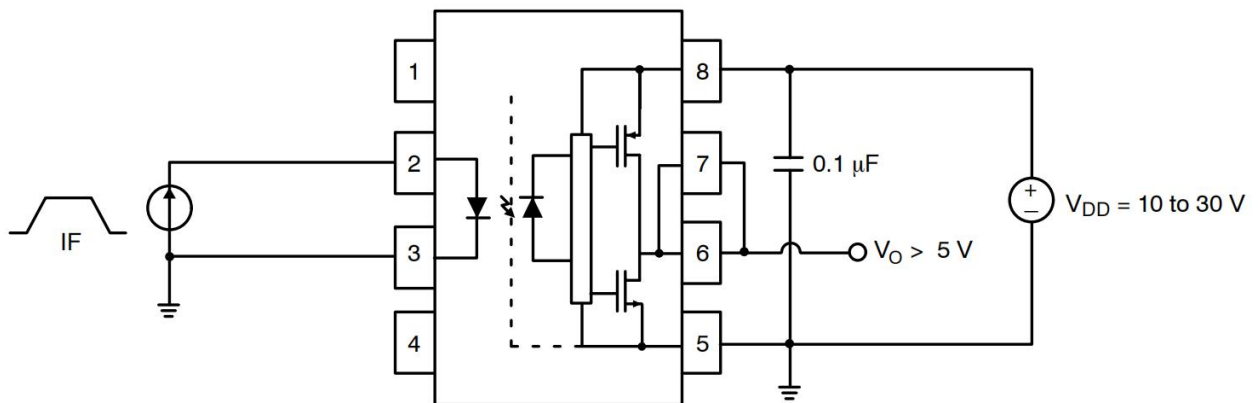


**Fig.21 Test Circuits for I<sub>DDH</sub>**

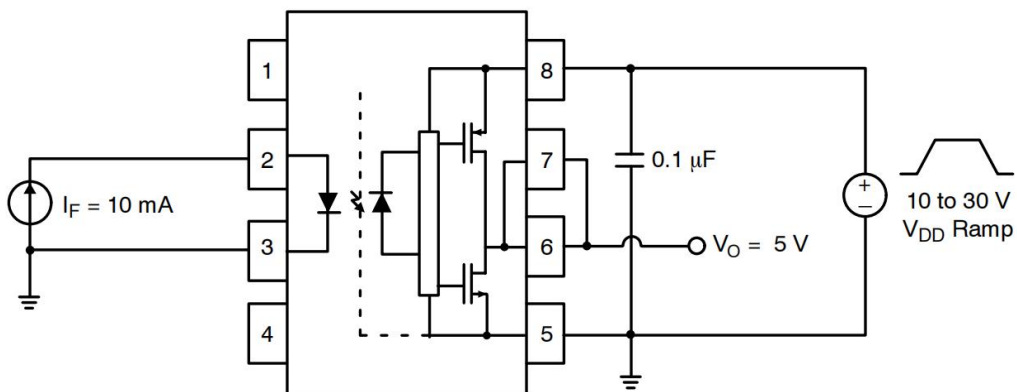
**TEST CIRCUITS**



**Fig.22 Test Circuits for  $I_{DD\_L}$**

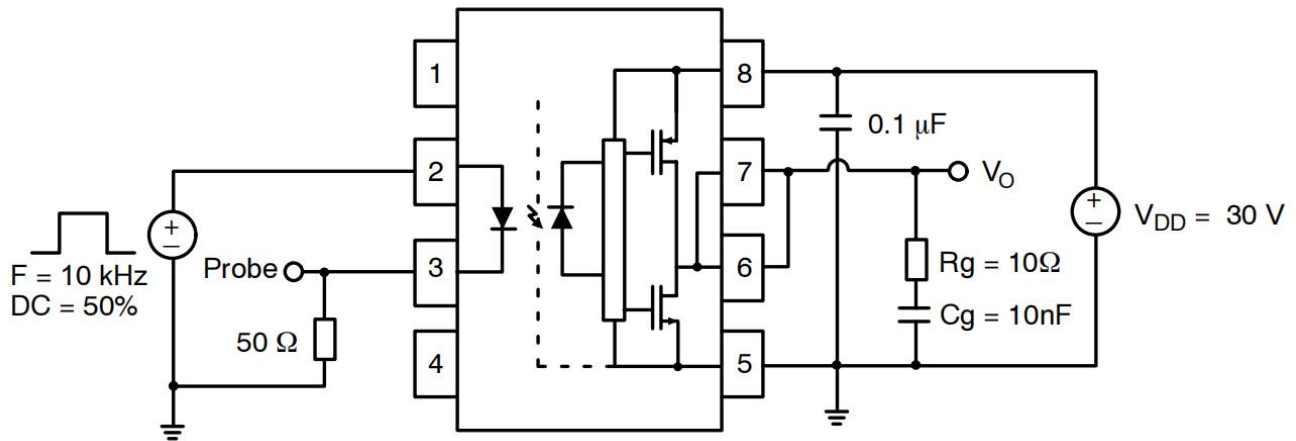


**Fig.23 Test Circuits for  $I_{FL\_H}$**

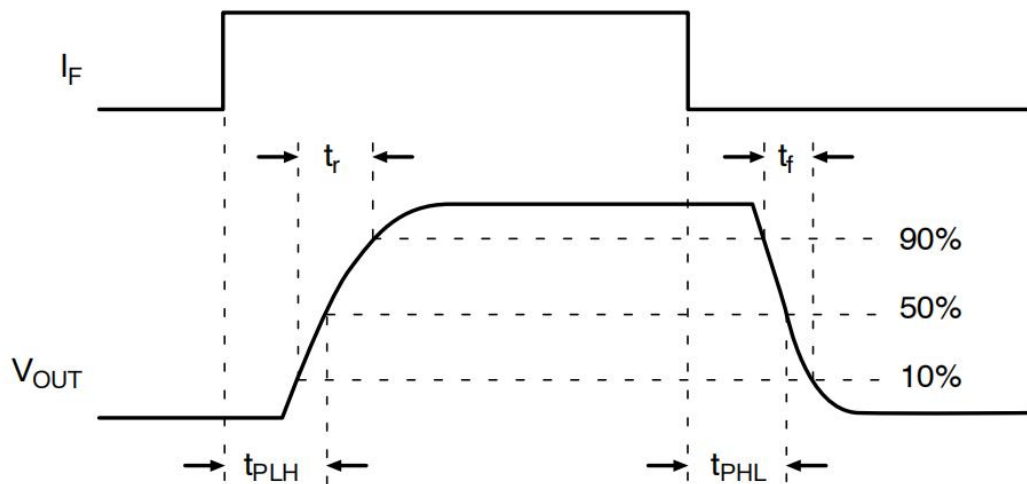


**Fig.24 Test Circuits for UVLO**

**TEST CIRCUITS**

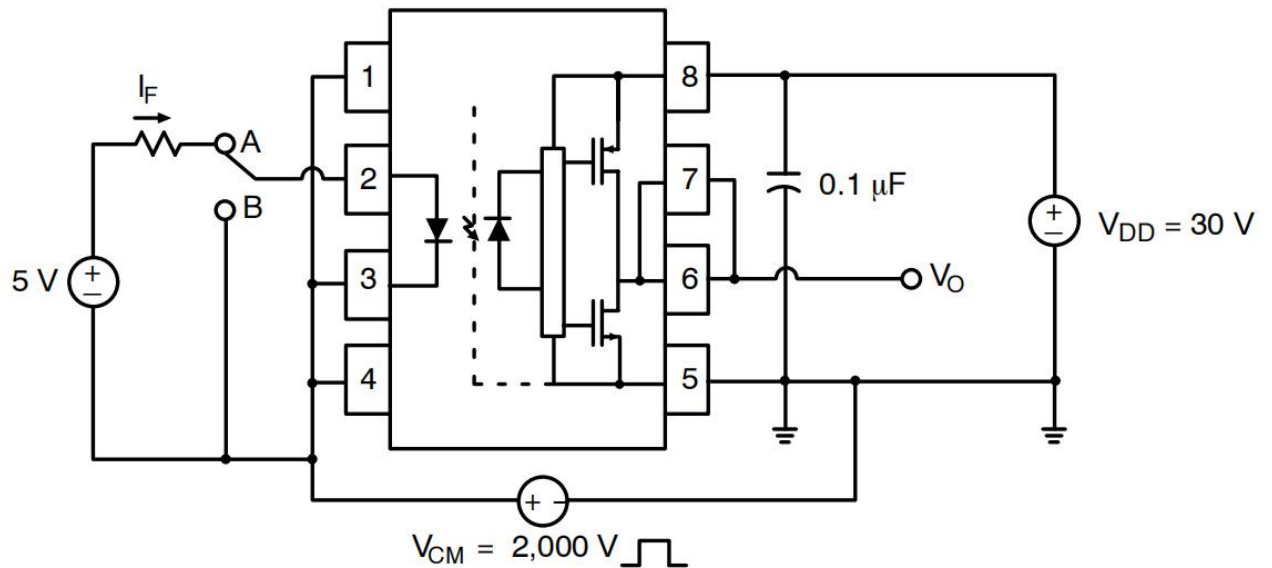


**Fig.25 Test Circuits for TPHL, TPLH, tr, tf**

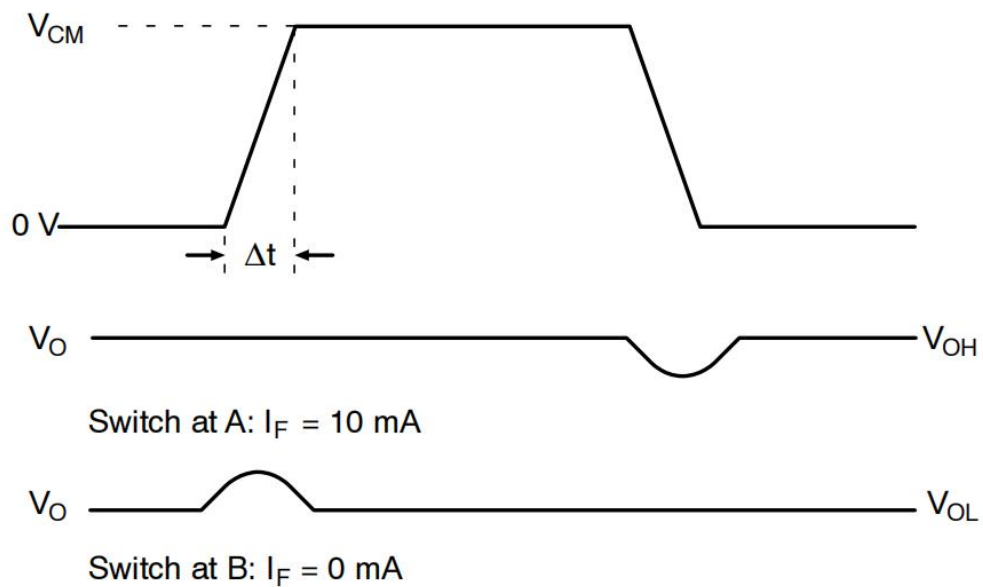


**Fig.26 Wave forms of TPHL, TPLH, tr, tf**

**TEST CIRCUITS**



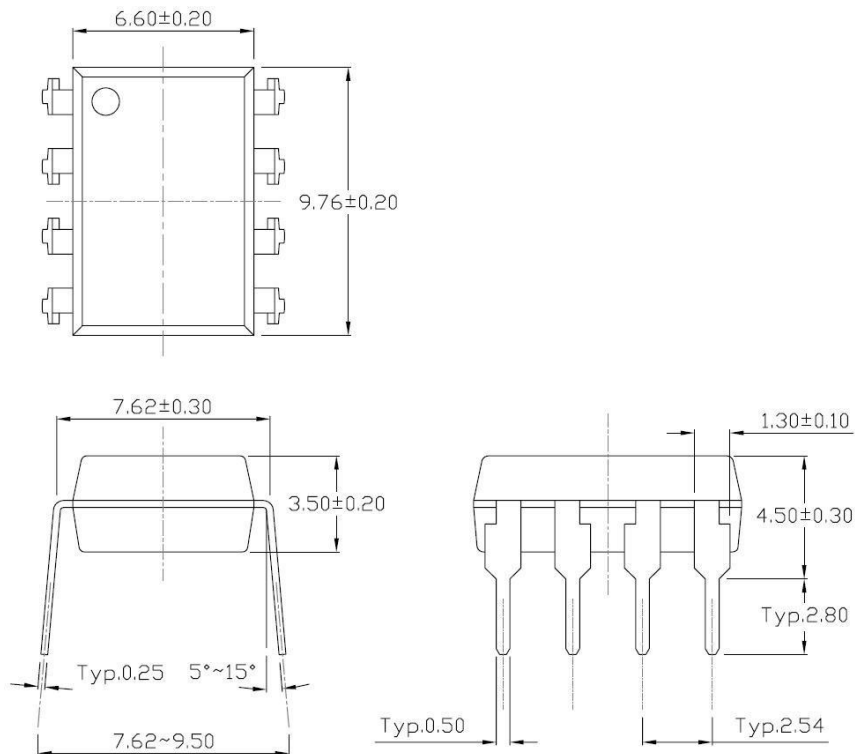
**Fig.27 Test Circuits for Common Mode Transient Immunity**



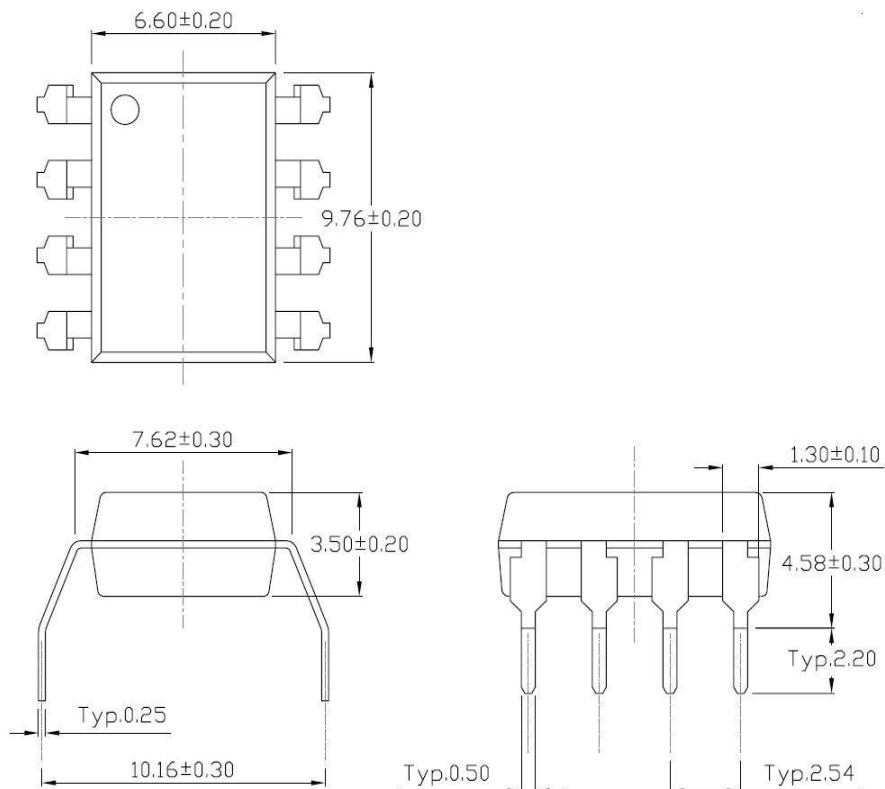
**Fig.28 Waveforms of Common Mode Transient Immunity**

**PACKAGE DIMENSIONS** (Dimensions in mm unless otherwise stated)

**Standard DIP – Through Hole (DIP Type)**

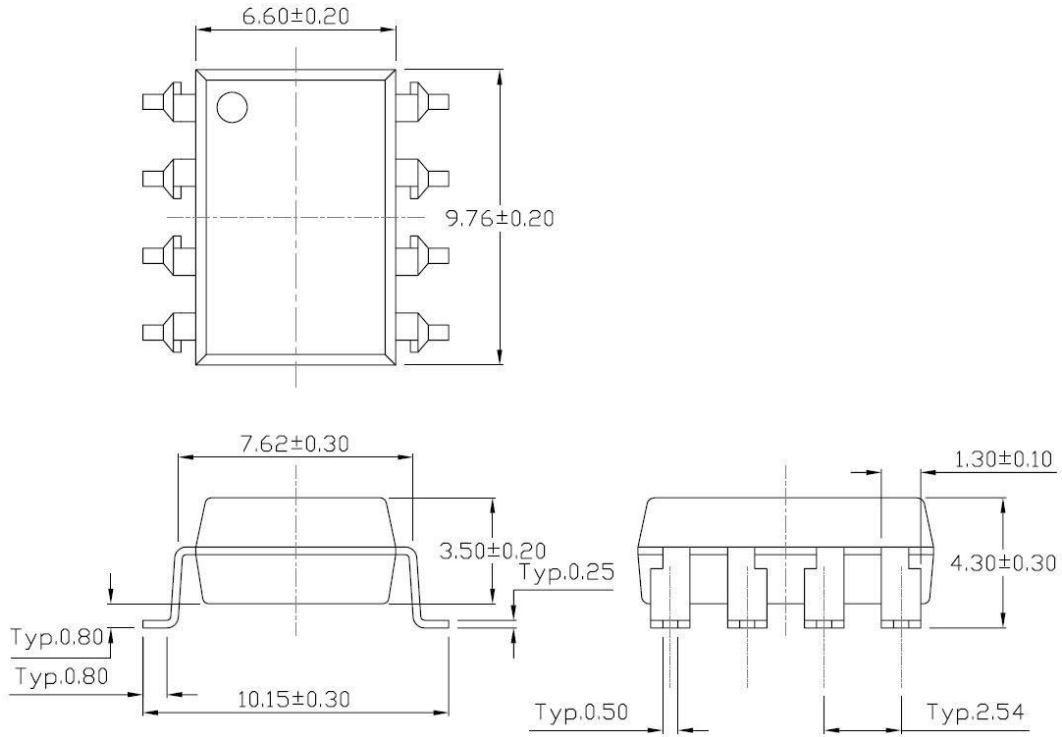


**Gullwing (400mil) Lead Forming – Through Hole (M Type)**

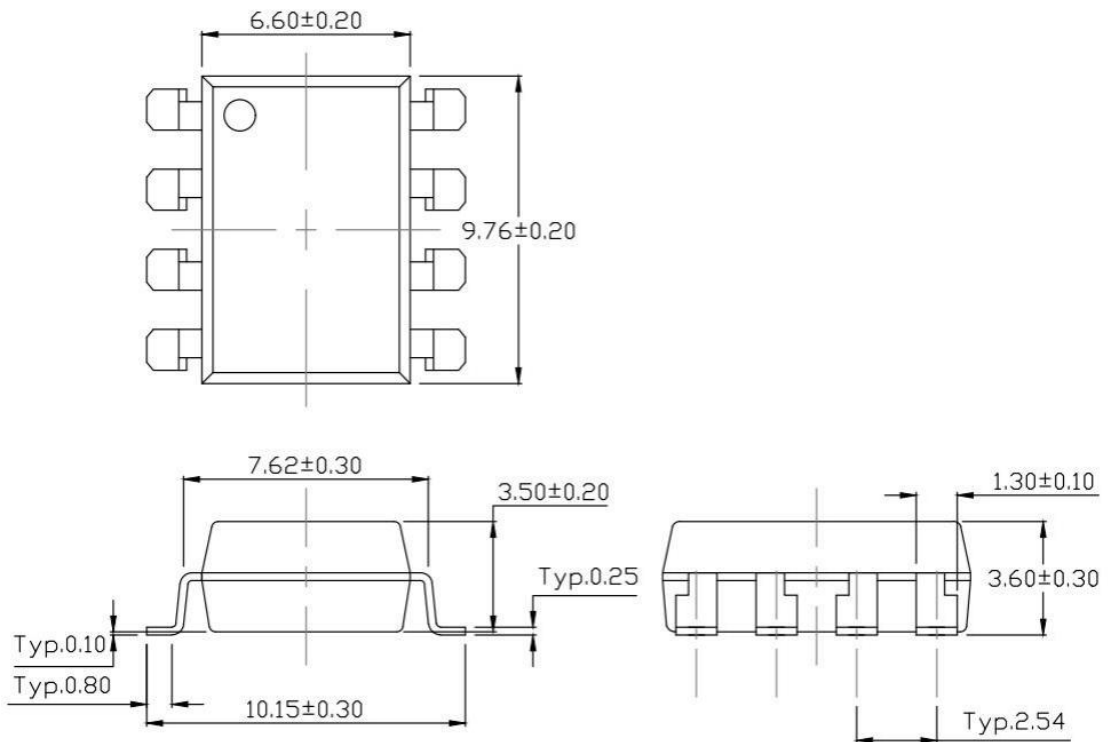


**PACKAGE DIMENSIONS** (Dimensions in mm unless otherwise stated)

**Surface Mount Lead Forming (S Type)**

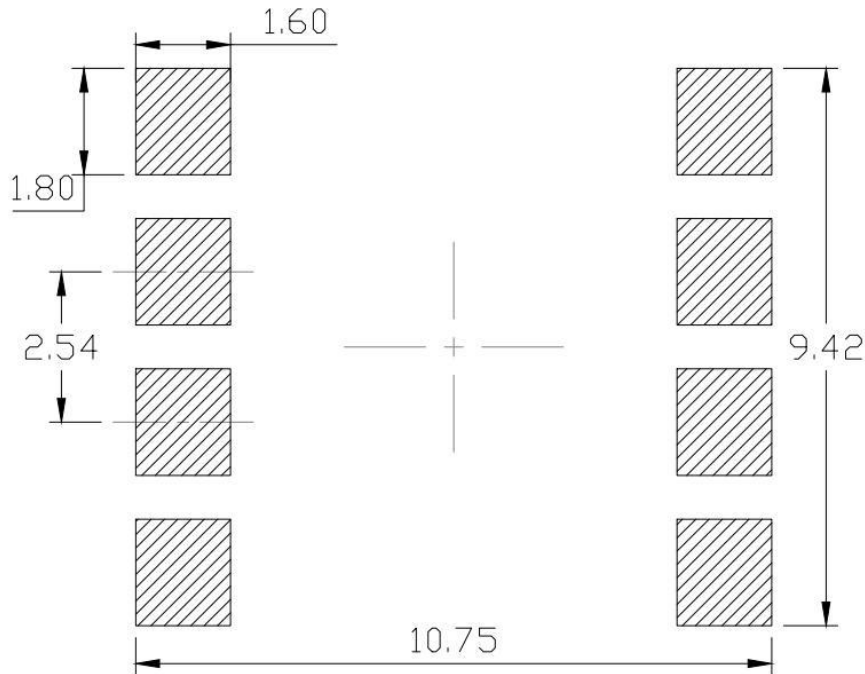


**Surface Mount (Low Profile) Lead Forming (SL Type)**

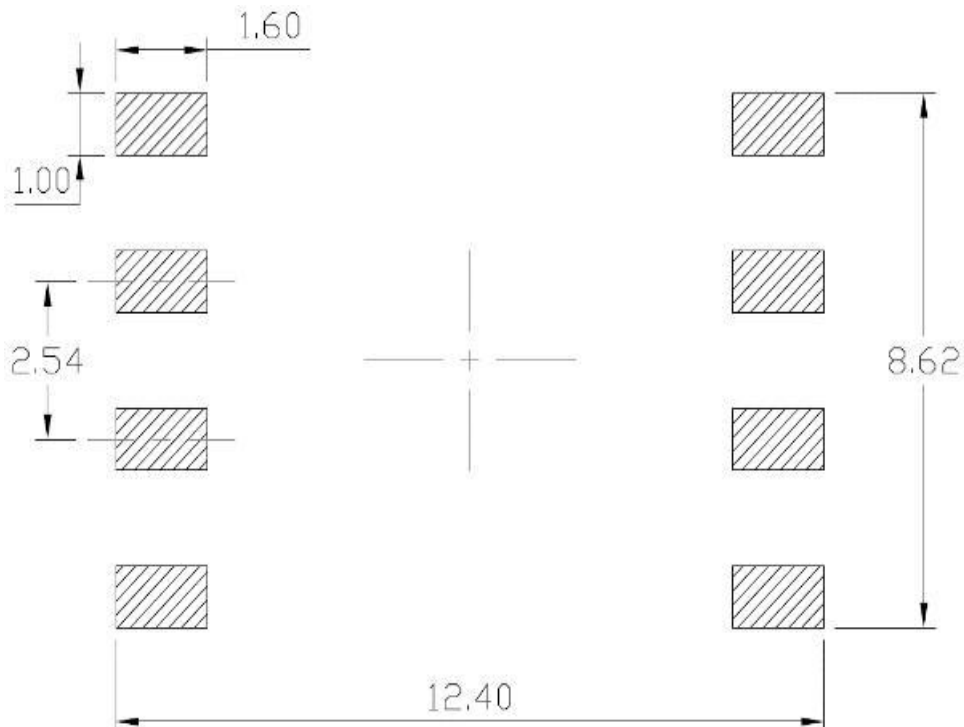


**Recommended Solder Mask (Dimensions in mm unless otherwise stated)**

**Surface Mount Lead Forming & Surface Mount (Low Profile) Lead Forming**

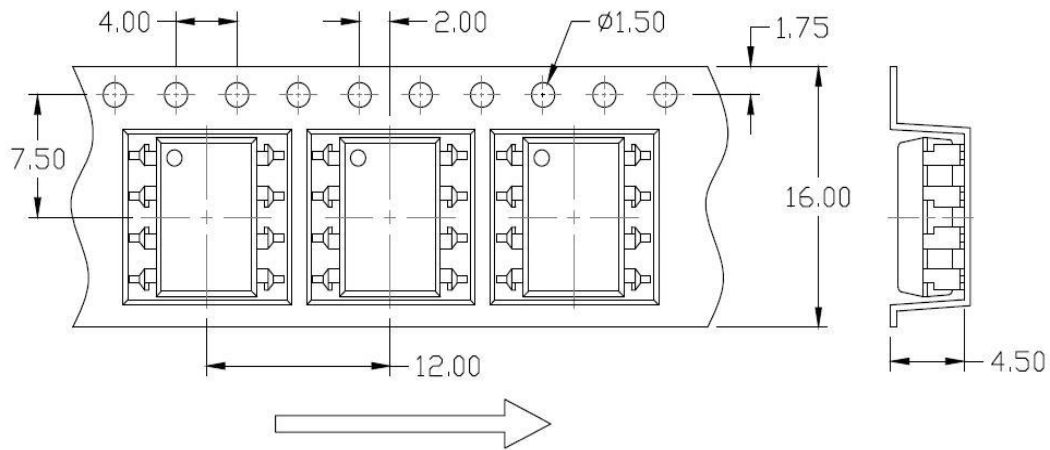


**Surface Mount (Gullwing) Lead Forming**

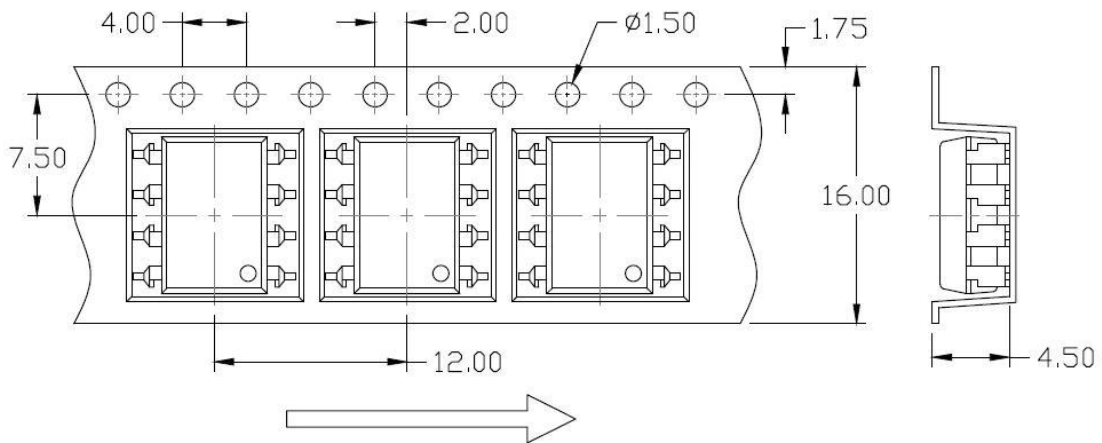


**CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)**

**Option S(T1)**



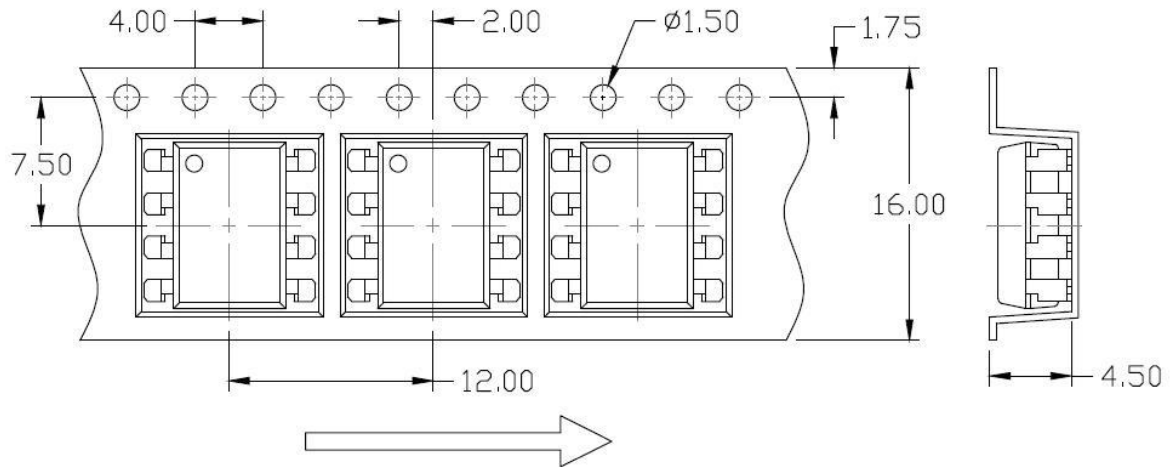
**Option S(T2)**



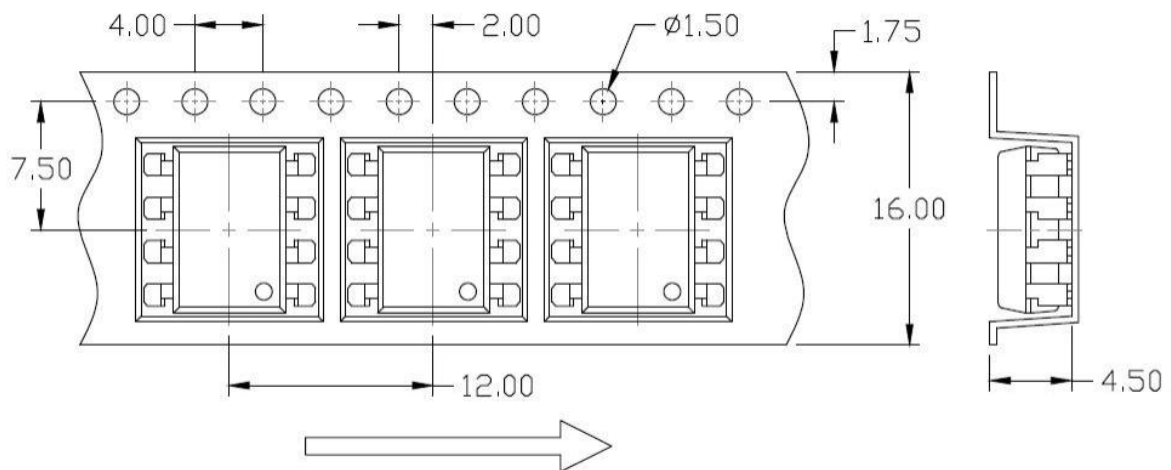


**CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)**

**Option SL(T1)**

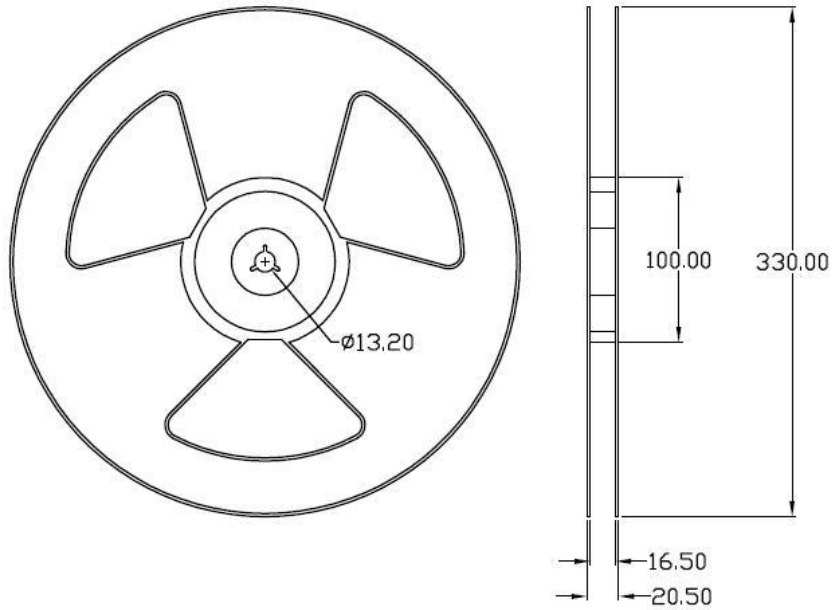


**Option SL(T2)**



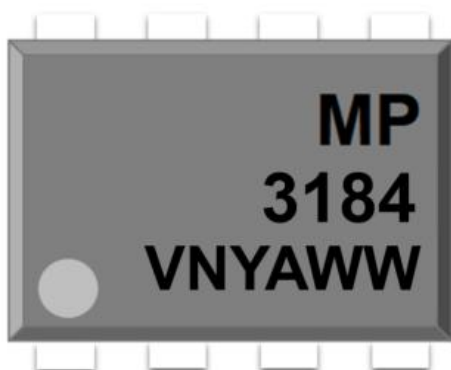
**REEL SPECIFICATIONS** (Dimensions in mm unless otherwise stated)

**Option S & SL**



## ORDERING AND MARKING INFORMATION

### MARKING INFORMATION



**MP** : Company Abbr.

**3184** : 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

## MP3184(Y)(Z)-GV(XN)

MP -Company Abbr.

3184 -Part Number.

(Y) -Lead Form Option (M/S/SL/None).

(Z) -Tape and Reel Option (T1/T2).

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

V -VDE Option (V or None).

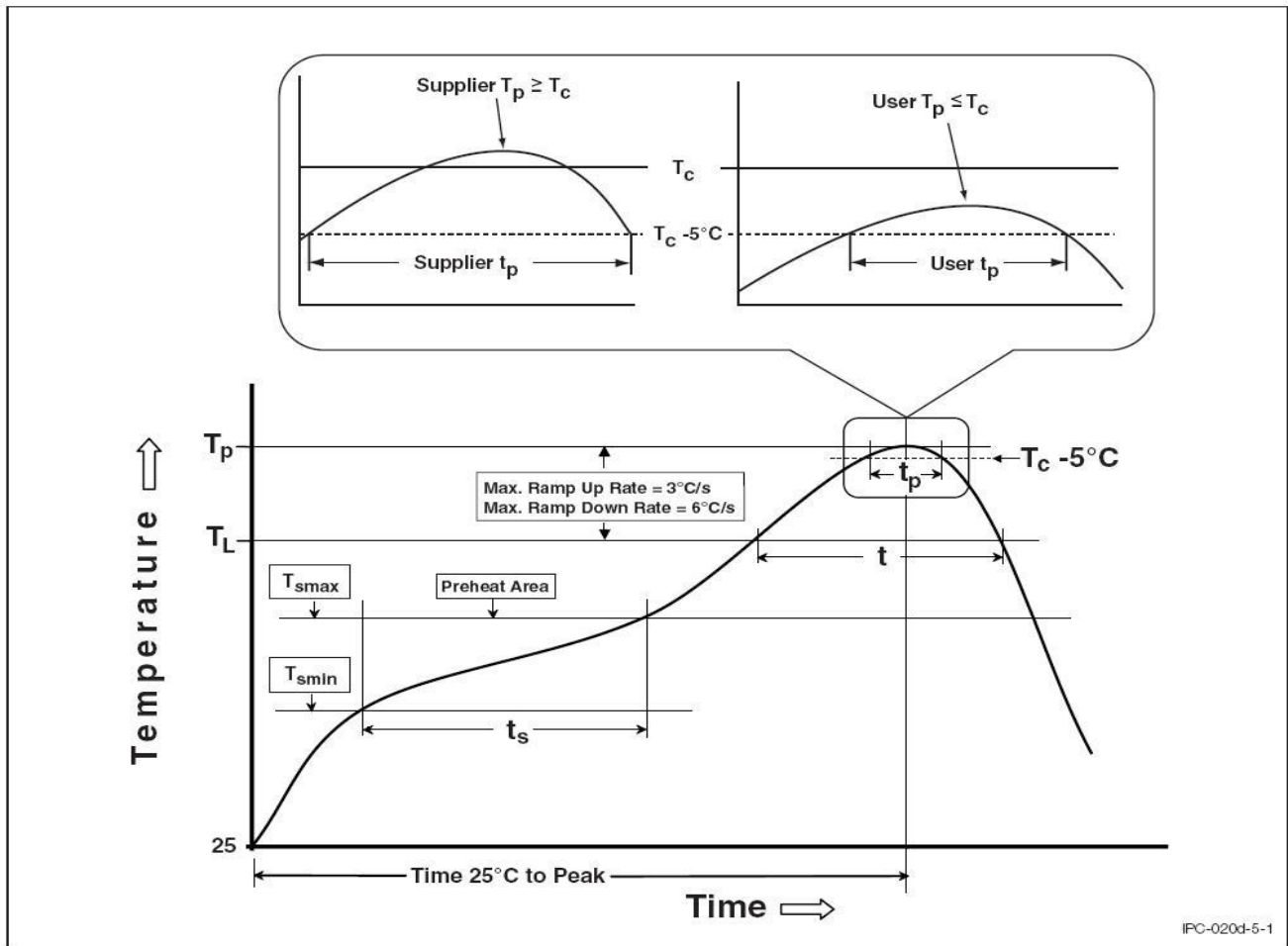
(XN)-Customer Specified Option ( X: A~Z or None; N:1~9 or None)

### PACKING QUANTITY

| Option | Quantity        | Quantity – Inner box | Quantity – Outer box                 |
|--------|-----------------|----------------------|--------------------------------------|
| None   | 45 Units/Tube   | 32 Tubes/Inner box   | 10 Inner box/Outer box = 14.4k Units |
| M      | 45 Units/Tube   | 32 Tubes/Inner box   | 10 Inner box/Outer box = 14.4k Units |
| S(T1)  | 1000 Units/Reel | 3 Reels/Inner box    | 5 Inner box/Outer box = 15k Units    |
| S(T2)  | 1000 Units/Reel | 3 Reels/Inner box    | 5 Inner box/Outer box = 15k Units    |
| SL(T1) | 1000 Units/Reel | 3 Reels/Inner box    | 5 Inner box/Outer box = 15k Units    |
| SL(T2) | 1000 Units/Reel | 3 Reels/Inner box    | 5 Inner box/Outer box = 15k Units    |

## REFLOW INFORMATION

### REFLOW PROFILE



| Profile Feature                                                       | Sn-Pb Assembly Profile | Pb-Free Assembly Profile |
|-----------------------------------------------------------------------|------------------------|--------------------------|
| Temperature Min. (T <sub>smin</sub> )                                 | 100                    | 150°C                    |
| Temperature Max. (T <sub>smax</sub> )                                 | 150                    | 200°C                    |
| Time (t <sub>s</sub> ) from (T <sub>smin</sub> to T <sub>smax</sub> ) | 60-120 seconds         | 60-120 seconds           |
| Ramp-up Rate (t <sub>L</sub> to t <sub>P</sub> )                      | 3°C/second max.        | 3°C/second max.          |
| Liquidous Temperature (T <sub>L</sub> )                               | 183°C                  | 217°C                    |
| Time (t <sub>L</sub> ) Maintained Above (T <sub>L</sub> )             | 60 – 150 seconds       | 60 – 150 seconds         |
| Peak Body Package Temperature                                         | 235°C +0°C / -5°C      | 260°C +0°C / -5°C        |
| Time (t <sub>P</sub> ) within 5°C of 260°C                            | 20 seconds             | 30 seconds               |
| Ramp-down Rate (T <sub>P</sub> to T <sub>L</sub> )                    | 6°C/second max         | 6°C/second max           |
| Time 25°C to Peak Temperature                                         | 6 minutes max.         | 8 minutes max.           |



# **MP3184 Series**

## **DIP8, DC Input, 3.0A, Gate Driver Photo Coupler**

### **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     | 2024-04-18 | Datasheet Complete                           |
|         |            |                                              |