



## ***MPC814 Series***

### ***DIP4, AC Input, Photo Transistor Coupler***

#### ■ Features

- High isolation 5000 VRMS
- CTR flexibility available see order information
- AC input with transistor output
- Operating temperature range - 55 °C to 110 °C
- REACH compliance
- Halogen free
- MSL class 1
- Regulatory Approvals
  - UL - UL1577
  - VDE - EN60747-5-5(VDE0884-5)
  - CQC – GB4943.1-2022

#### ■ Applications

- AC line monitor
- Programmable controller
- Telephone line interface
- System appliance
- Measurement instrument
- Unknown polarity DC sensor

#### ■ Description

The MPC814 series combine two AlGaAs infrared emitting diode as the AC input which is optically coupled to a silicon planar phototransistor detector in a plastic DIP4 package with different lead forming options.

With the robust coplanar double mold structure, MPC814 series provide the most stable isolation feature.

#### ■ Schematic





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#### **ABSOLUTE MAXIMUM RATINGS**

| PARAMETER                   | SYMBOL    | VALUE    | UNIT             | NOTE |
|-----------------------------|-----------|----------|------------------|------|
| INPUT                       |           |          |                  |      |
| Forward Current             | $I_F$     | $\pm 60$ | mA               |      |
| Peak Forward Current        | $I_{FP}$  | $\pm 1$  | A                | 1    |
| Input Power Dissipation     | $P_I$     | 100      | mW               |      |
| OUTPUT                      |           |          |                  |      |
| Collector - Emitter Voltage | $V_{CEO}$ | 80       | V                |      |
| Emitter - Collector Voltage | $V_{ECO}$ | 7        | V                |      |
| Collector Current           | $I_C$     | 50       | mA               |      |
| Output Power Dissipation    | $P_O$     | 150      | mW               |      |
| COMMON                      |           |          |                  |      |
| Total Power Dissipation     | $P_{tot}$ | 200      | mW               |      |
| Isolation Voltage           | $V_{iso}$ | 5000     | V <sub>rms</sub> | 2    |
| Operating Temperature       | $T_{opr}$ | -55~110  | °C               |      |
| Storage Temperature         | $T_{stg}$ | -55~150  | °C               |      |
| Soldering Temperature       | $T_{sol}$ | 260      | °C               |      |

Note 1. 100 $\mu$ s pulse, 100Hz frequency

Note 2. AC For 1 Minute, R.H. = 40 ~ 60%



# MPC814 Series

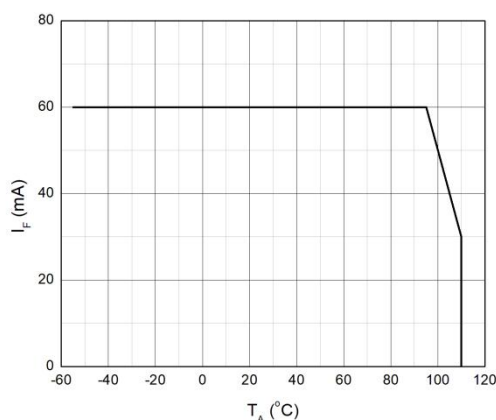
## DIP4, AC Input, Photo Transistor Coupler

| ELECTRICAL OPTICAL CHARACTERISTICS at Ta=25°C |                      |                  |                  |      |      |                                |      |
|-----------------------------------------------|----------------------|------------------|------------------|------|------|--------------------------------|------|
| PARAMETER                                     | SYMBOL               | MIN              | TYP.             | MAX. | UNIT | TEST CONDITION                 | NOTE |
| INPUT                                         |                      |                  |                  |      |      |                                |      |
| Forward Voltage                               | V <sub>F</sub>       | -                | 1.24             | 1.4  | V    | IF=±10mA                       |      |
| Input Capacitance                             | C <sub>in</sub>      | -                | 10               | -    | pF   | V=0, f=1kHz                    |      |
| OUTPUT                                        |                      |                  |                  |      |      |                                |      |
| Collector Dark Current                        | I <sub>CEO</sub>     | -                | -                | 100  | nA   | VCE=20V, IF=0                  |      |
| Collector-Emitter Breakdown Voltage           | BV <sub>CEO</sub>    | 80               | -                | -    | V    | IC=0.1mA, IF=0                 |      |
| Emitter-Collector Breakdown Voltage           | BV <sub>ECO</sub>    | 7                | -                | -    | V    | IE=0.1mA, IF=0                 |      |
| TRANSFER CHARACTERISTICS                      |                      |                  |                  |      |      |                                |      |
| Current Transfer Ratio                        | MPC814               | CTR              | 20               | -    | 300  | IF=±1mA, VCE=5V                |      |
|                                               | MPC814A              |                  | 50               | -    | 150  |                                |      |
|                                               | MPC814B              |                  | 100              | -    | 300  |                                |      |
| CTR Symmetry                                  |                      | 0.7              | -                | 1.3  |      | IF=±1mA, VCE=5V                |      |
| Collector-Emitter Saturation Voltage          | V <sub>CE(sat)</sub> | -                | 0.06             | 0.2  | V    | IF=±20mA, IC=1mA               |      |
| Isolation Resistance                          | R <sub>ISO</sub>     | 10 <sup>12</sup> | 10 <sup>14</sup> | -    | Ω    | DC500V, 40 ~ 60% R.H.          |      |
| Floating Capacitance                          | C <sub>IO</sub>      | -                | 0.4              | 1    | pF   | V=0, f=1MHz                    |      |
| Cut-off Frequency                             | f <sub>c</sub>       | -                | 80               | -    | kHz  | VCE=2V, IC=2mA<br>RL=100Ω,-3dB | 3    |
| Response Time (Rise)                          | t <sub>r</sub>       | -                | 3                | 18   | μs   | VCE=2V, IC=2mA<br>RL=100Ω      | 4    |
| Response Time (Fall)                          | t <sub>f</sub>       | -                | 4                | 18   | μs   |                                | 4    |

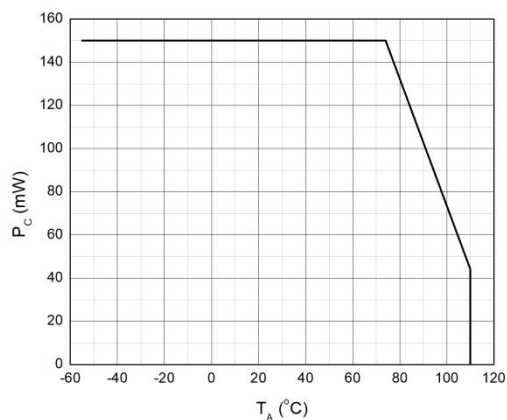
Note 3. Fig.12&13

Note 4. Fig.14

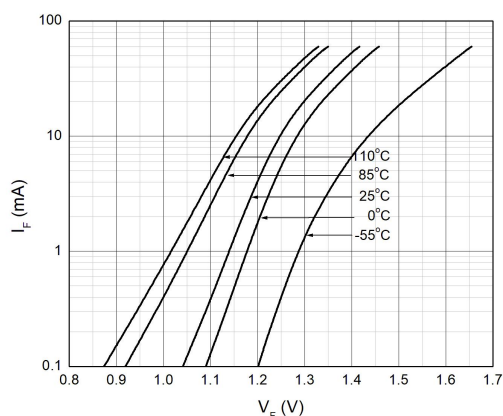
### CHARACTERISTIC CURVES



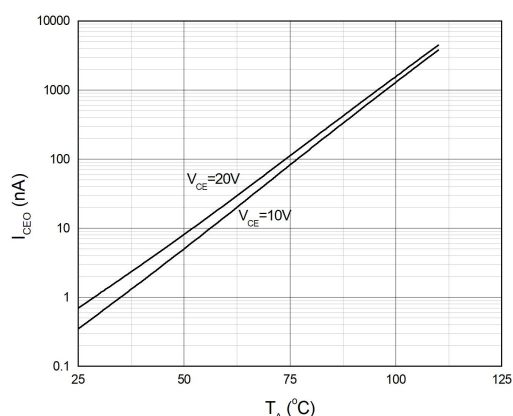
**Fig.1 Forward Current  
vs. Ambient Temperature**



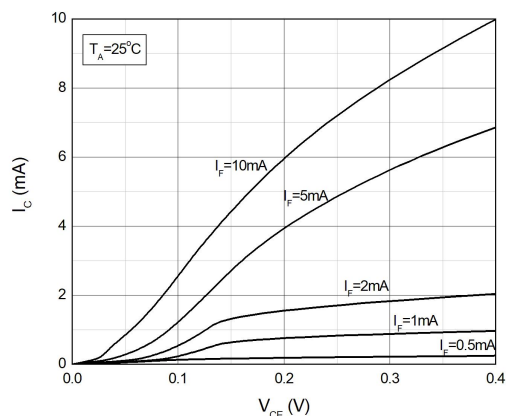
**Fig.2 Collector Power Dissipation  
vs. Ambient Temperature**



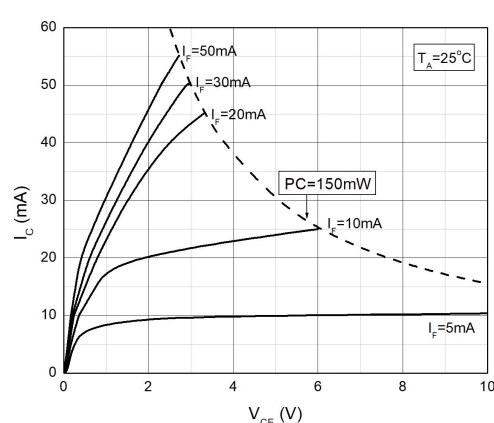
**Fig.3 Forward Current  
vs. Forward Voltage**



**Fig.4 Collector Dark Current  
vs. Ambient Temperature**

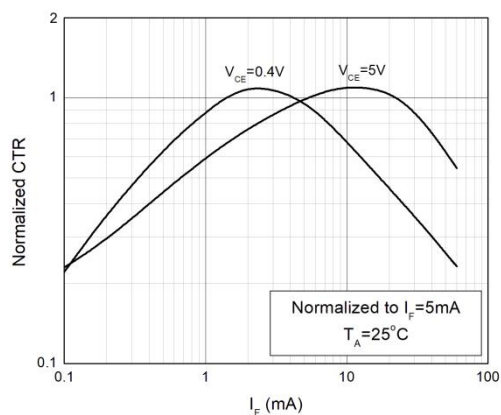


**Fig.5 Collector Current  
vs. Collector-emitter Voltage**

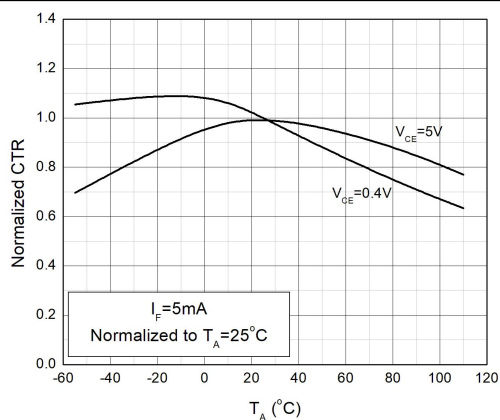


**Fig.6 Collector Current  
vs. Collector-emitter Voltage**

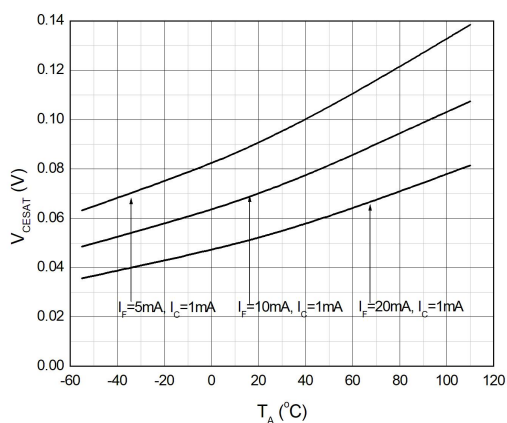
### CHARACTERISTIC CURVES



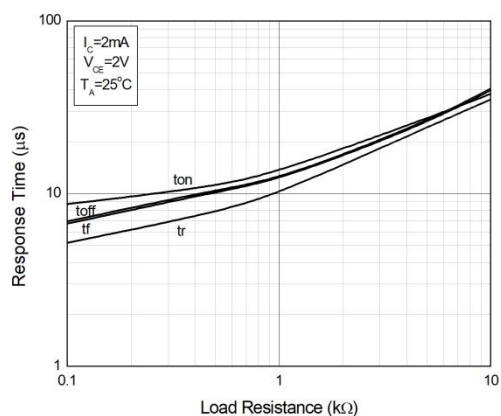
**Fig.7 Normalized Current Transfer Ratio vs. Forward Current**



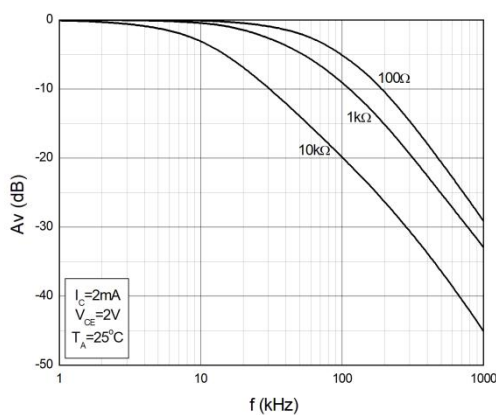
**Fig.8 Normalized Current Transfer Ratio vs. Ambient Temperature**



**Fig.9 Collector-emitter Saturation Voltage vs. Ambient Temperature**

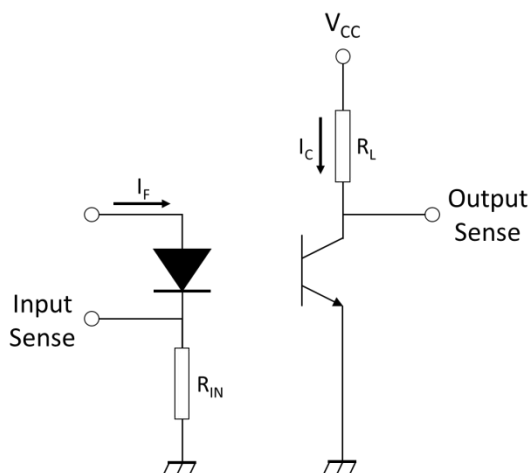


**Fig.10 Switching Time vs. Load Resistance**

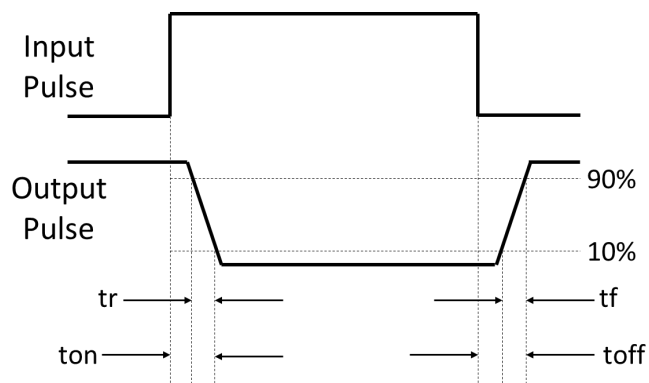


**Fig.11 Frequency Response**

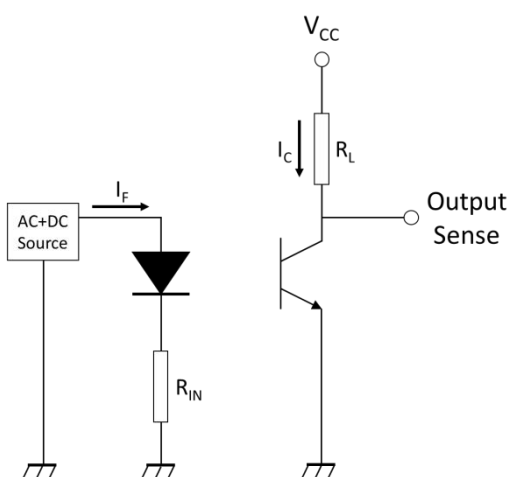
### TEST CIRCUITS



**Fig.12 Test Circuits of Response Time**



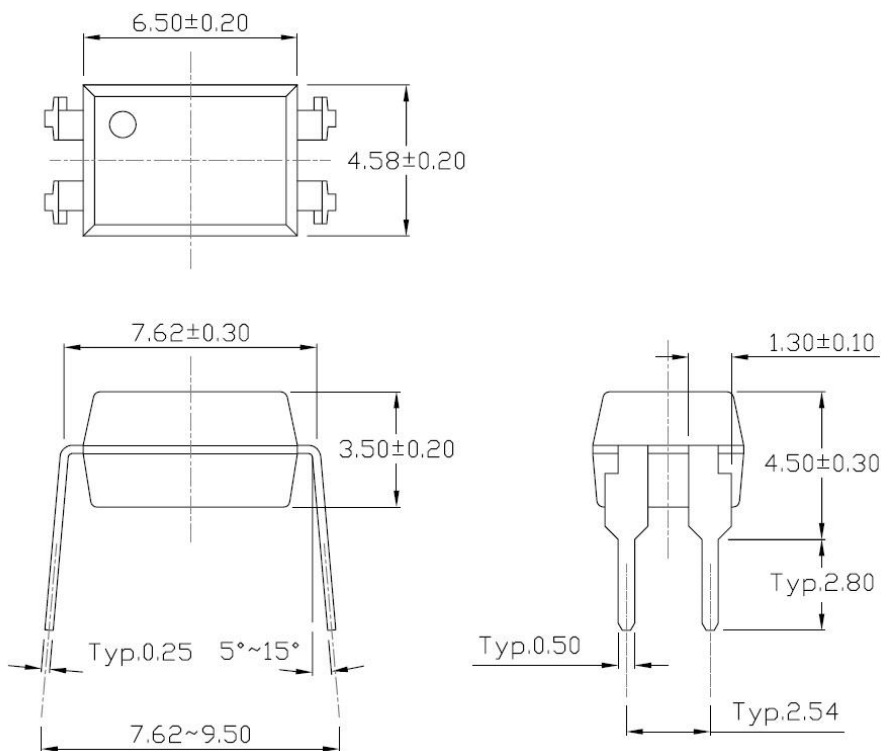
**Fig.13 Curves of Response Time**



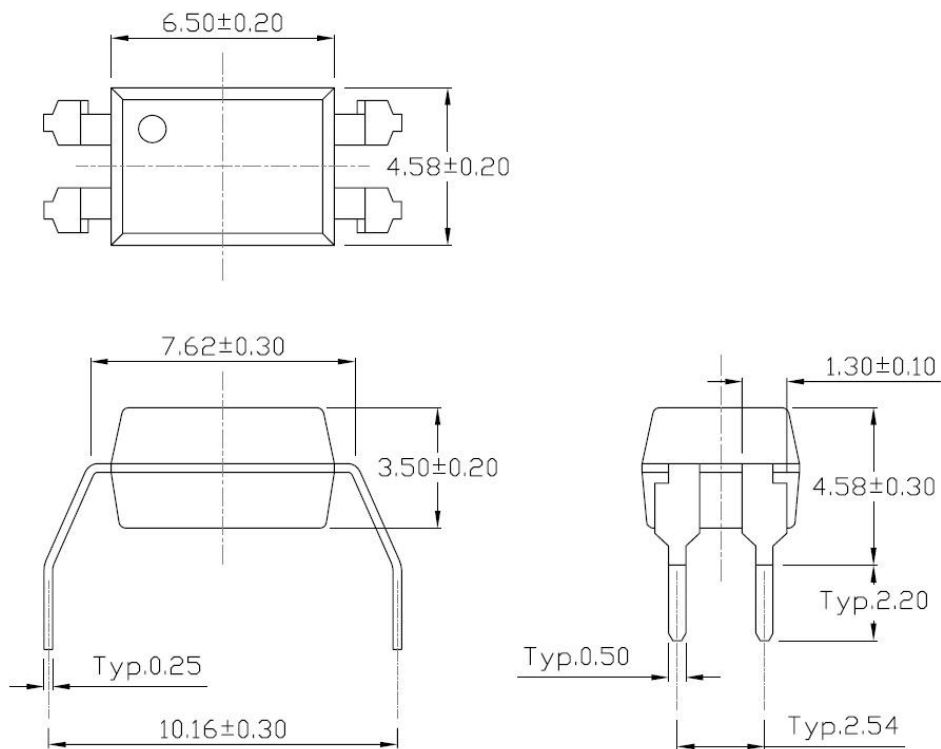
**Fig.14 Test Circuits of Frequency Response**

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

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

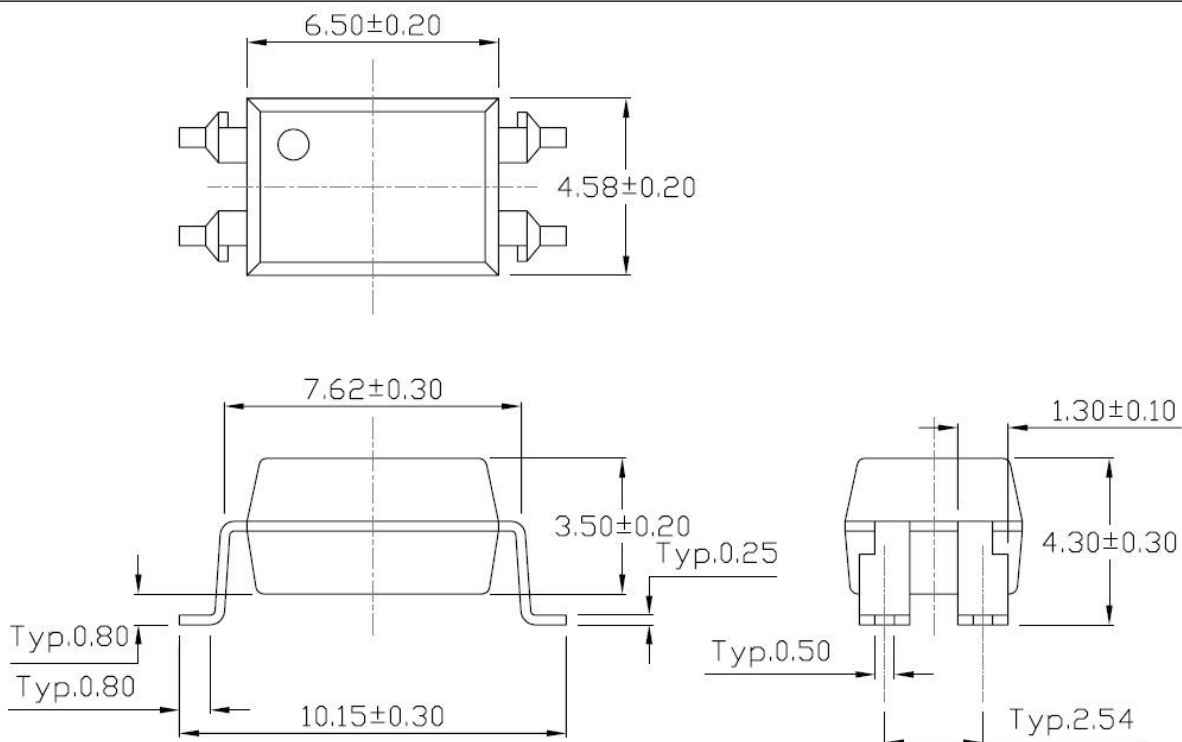


#### Gullwing (400mil) Lead Forming – Through Hole (M Type)

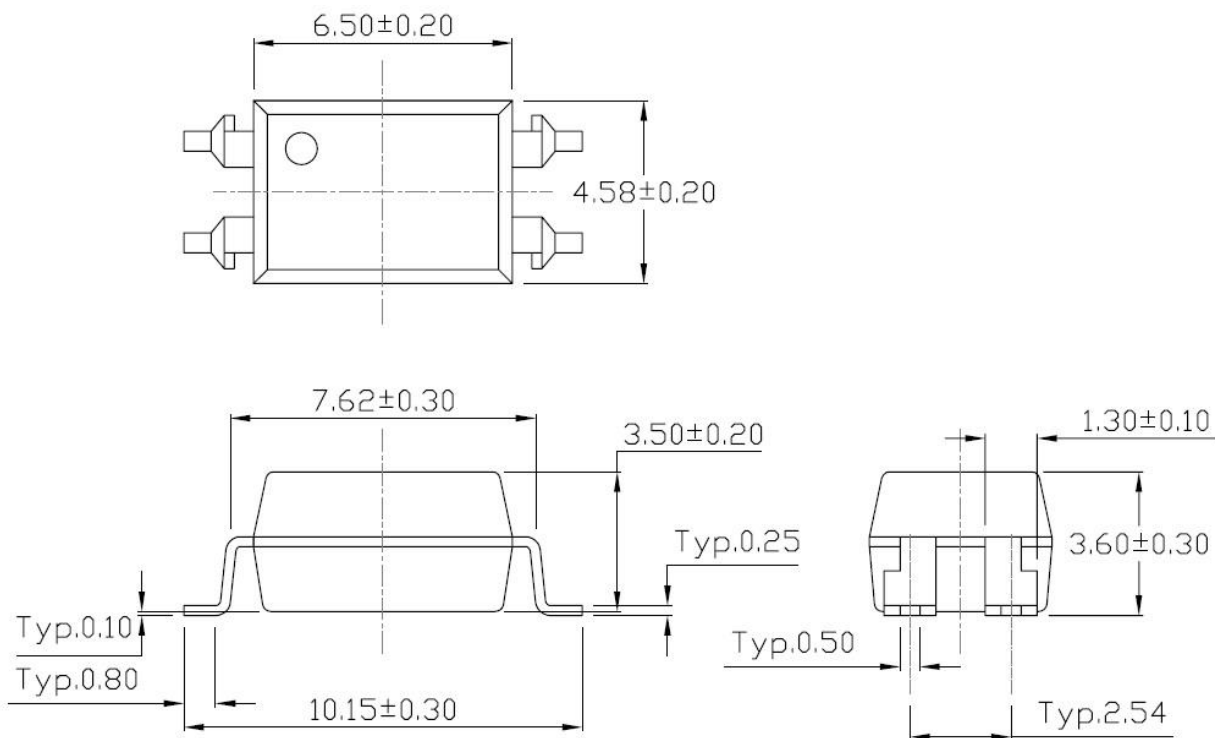


### PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)

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



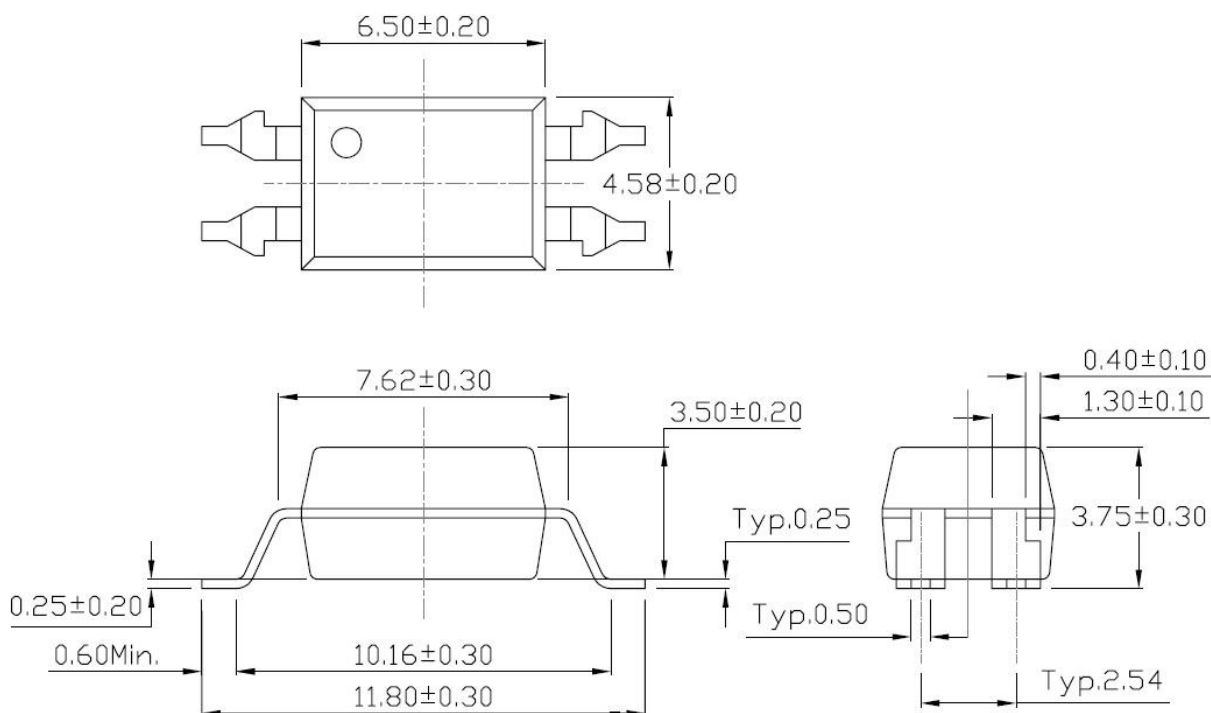
#### Surface Mount (Low Profile) Lead Forming (SL Type)





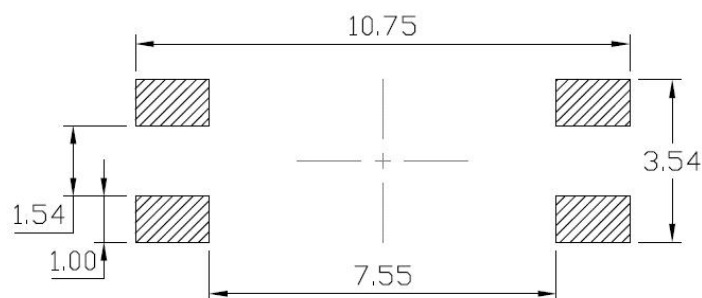
### PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)

#### Surface Mount (Gullwing) Lead Forming (SLM Type)

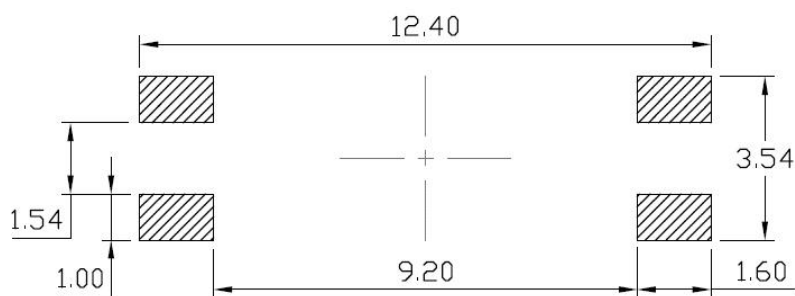


### RECOMMENDED SOLDER MASK (Dimensions in mm unless otherwise stated)

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

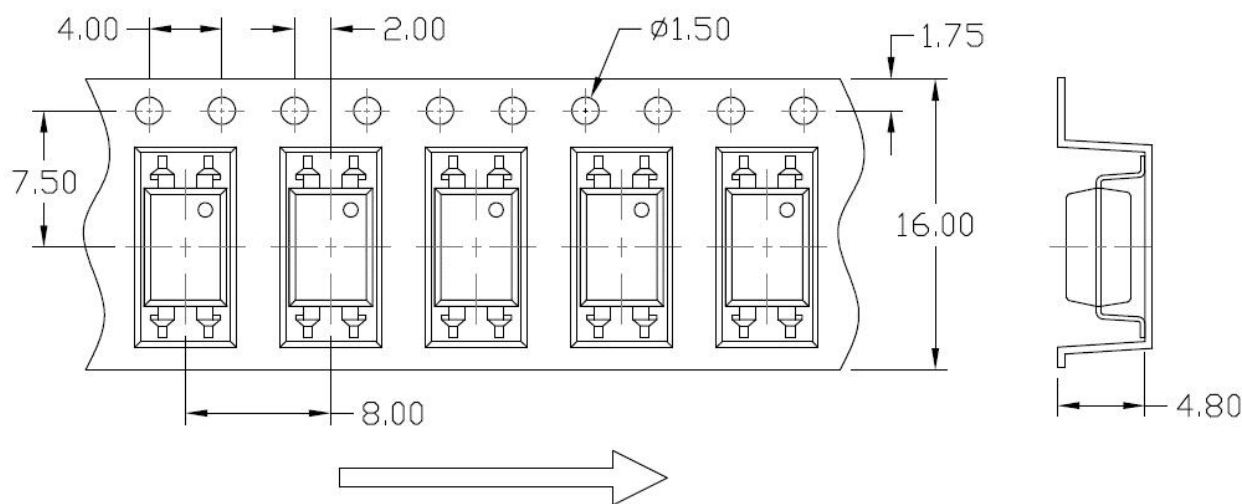


#### Surface Mount (Gullwing) Lead Forming

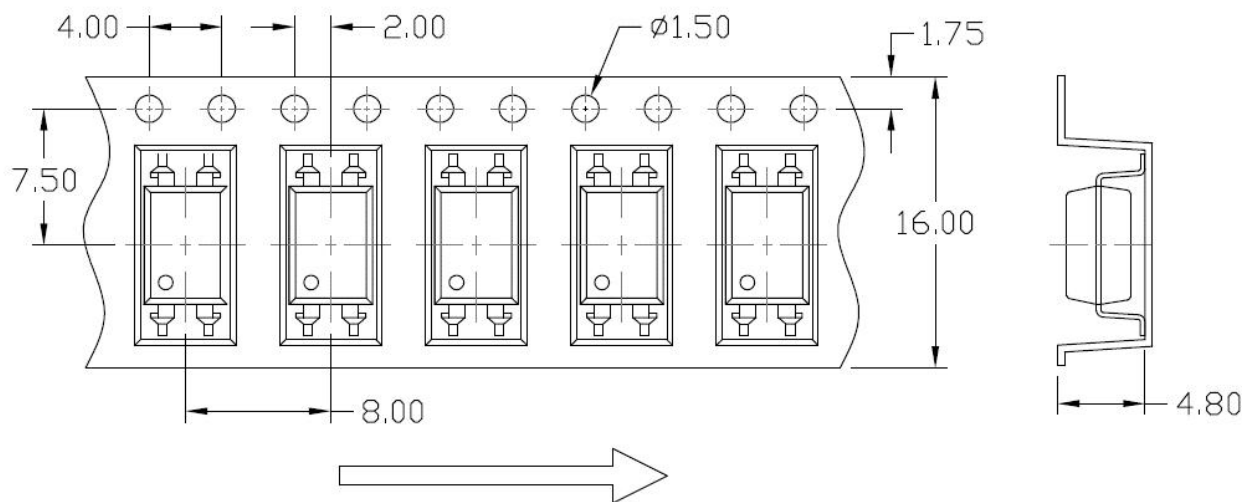


### CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

#### Option S(T1) & SL(T1)

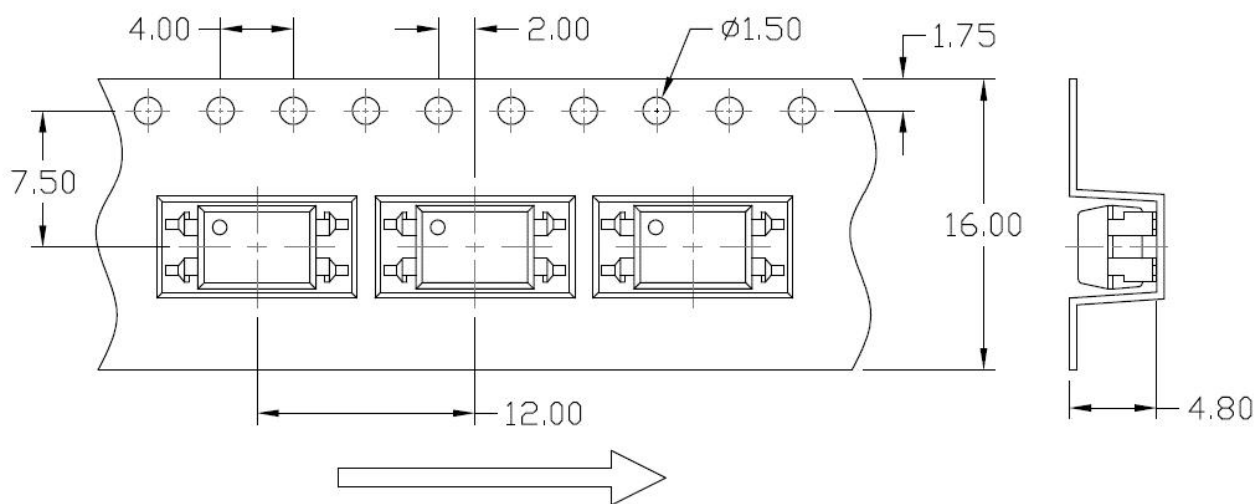


#### Option S(T2) & SL(T2)

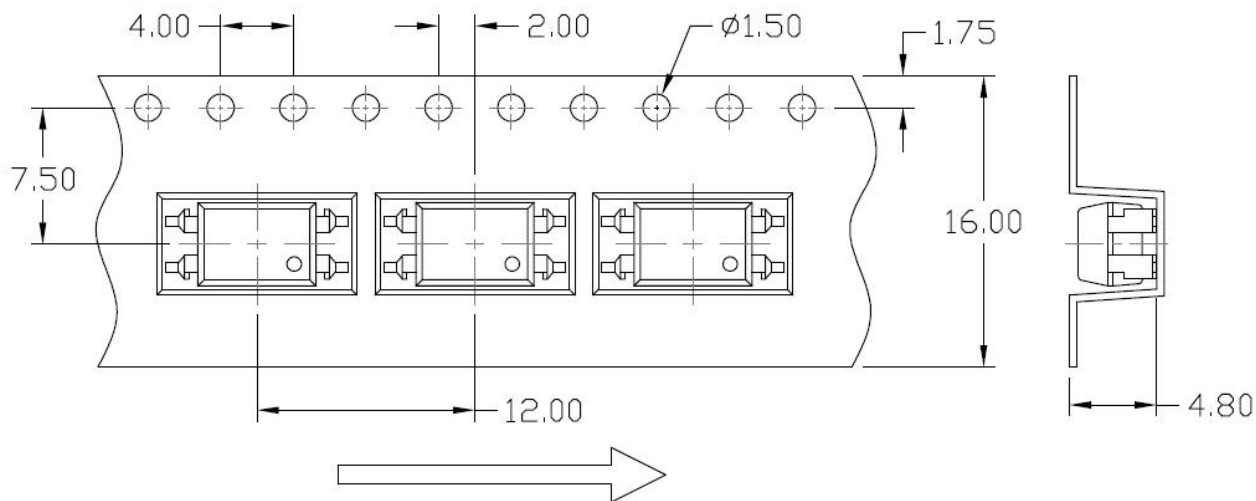


### CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

#### Option S(T3) & SL(T3)

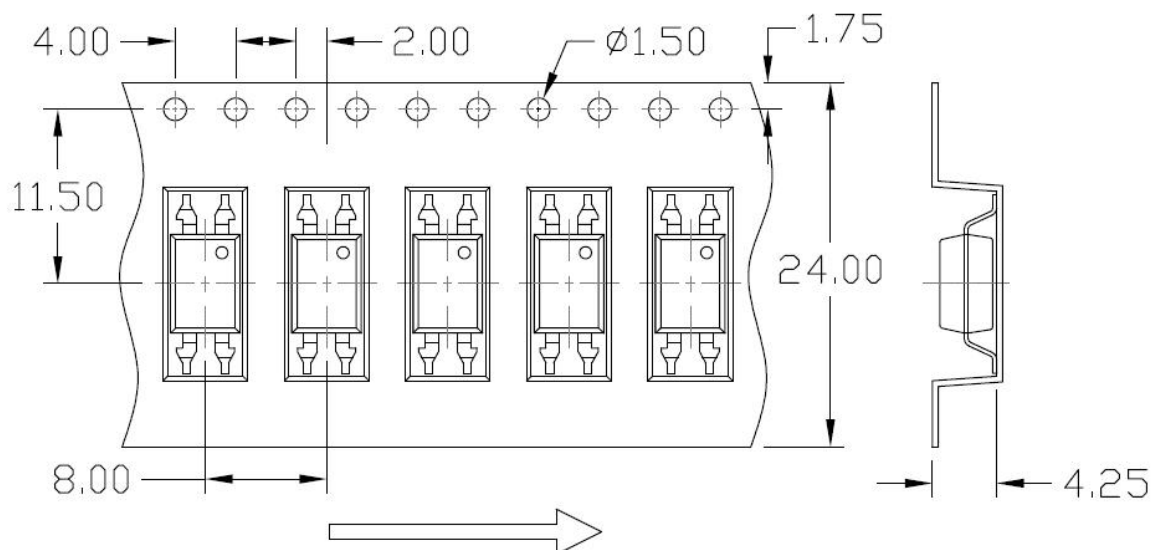


#### Option S(T4) & SL(T4)

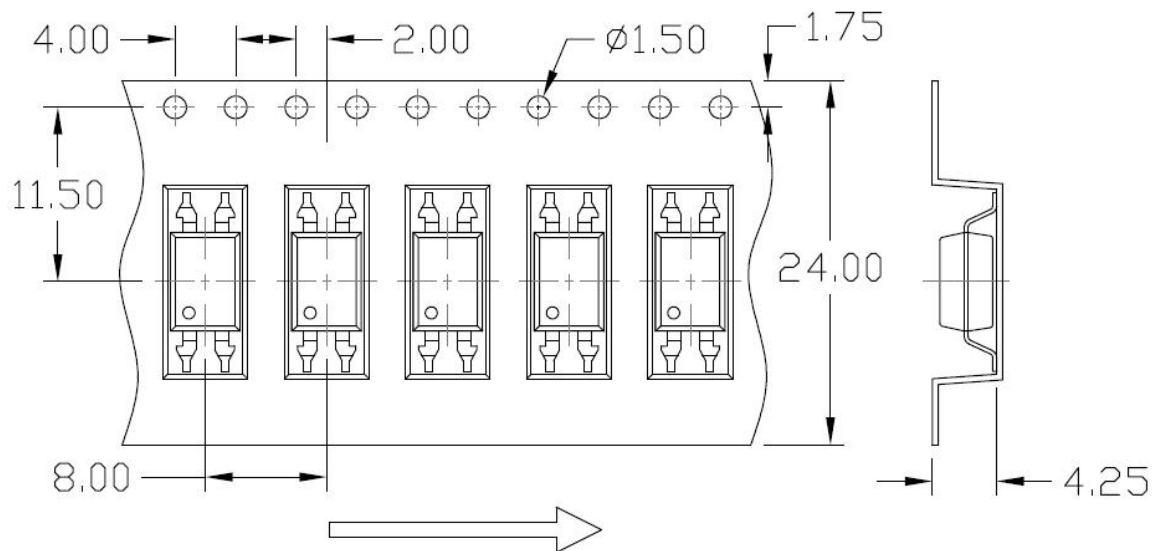


### CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

#### Option SLM(T1)



#### Option SLM(T2)



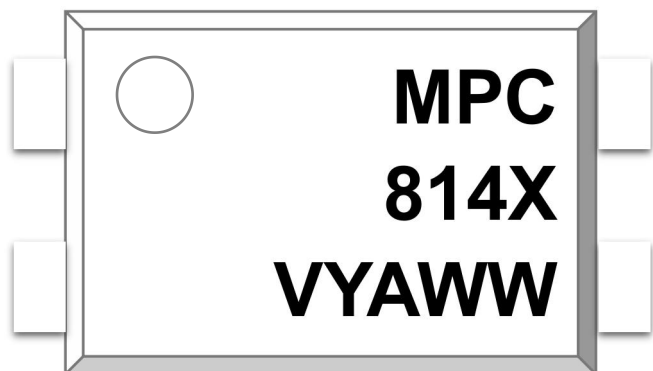


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### ORDERING AND MARKING INFORMATION

#### MARKING INFORMATION



**MPC** : Company Abbr.  
**814** : Part Number  
**X** : CTR Rank  
**V** : VDE Option  
**Y** : Fiscal Year  
**A** : Manufacturing Code  
**WW** : Work Week

#### ORDERING INFORMATION

### MPC814XN(Y)(Z)-GV

MPC – Company Abbr.  
 814 – Part Number  
 X – Rank1 (A to Z, or None)  
 N – Rank2 (1 to 9, or None)

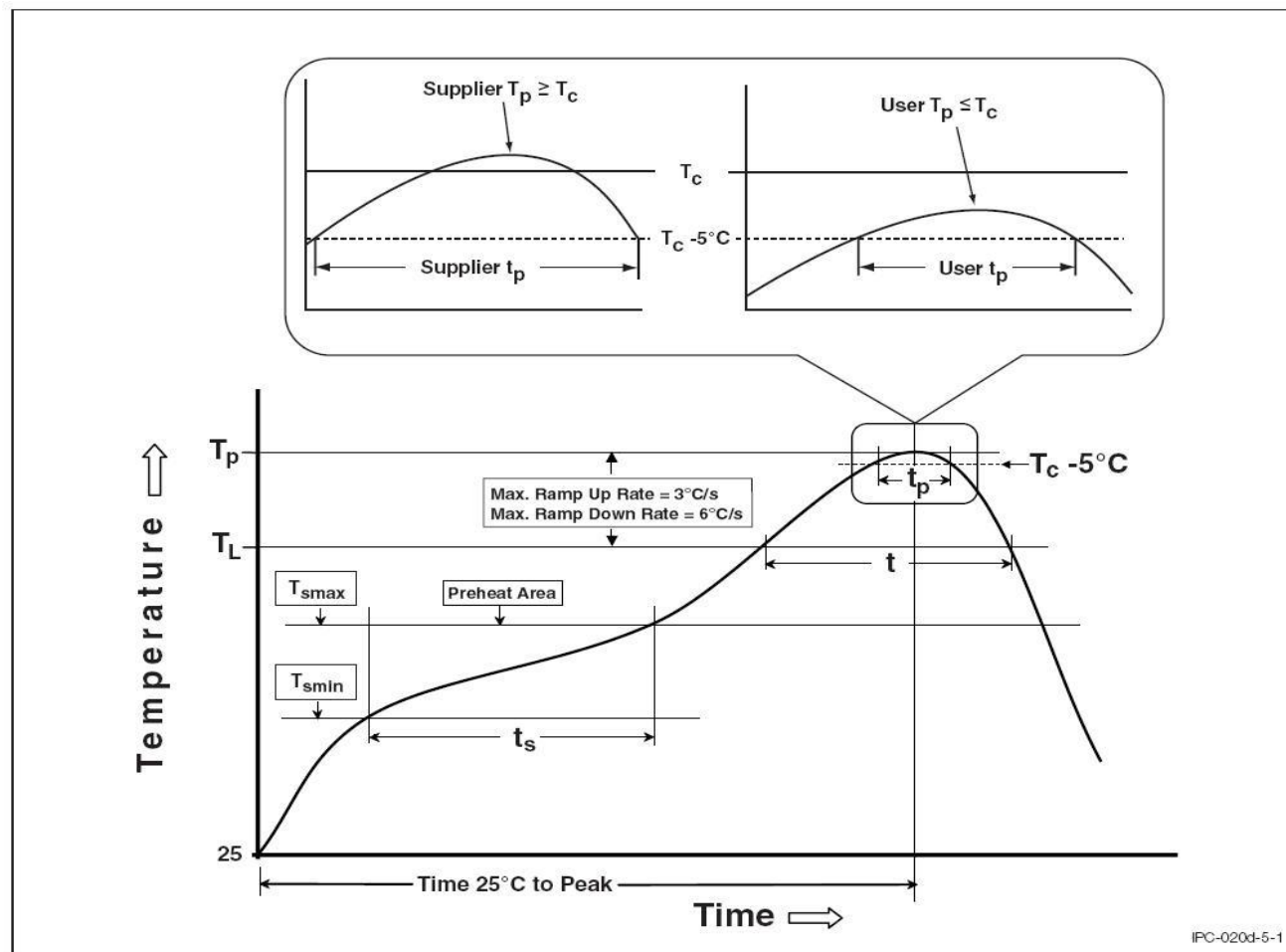
Y – Lead Form Option (M/S/SL/SLM/None)  
 Z – Tape and Reel Option (T1/T2/T3/T4)  
 G – Green  
 V – VDE Option (V or None)

#### Packing Quantity

| Option  | Description                                                     | Quantity        |
|---------|-----------------------------------------------------------------|-----------------|
| None    | Standard 4 Pin Dip                                              | 100 Units/Tube  |
| M       | Gullwing (400mil) Lead Forming                                  | 100 Units/Tube  |
| S(T1)   | Surface Mount Lead Forming – With Option 1 Taping               | 1500 Units/Reel |
| S(T2)   | Surface Mount Lead Forming – With Option 2 Taping               | 1500 Units/Reel |
| S(T3)   | Surface Mount Lead Forming – With Option 3 Taping               | 1000 Units/Reel |
| S(T4)   | Surface Mount Lead Forming – With Option 4 Taping               | 1000 Units/Reel |
| SL(T1)  | Surface Mount (Low Profile) Lead Forming– With Option 1 Taping  | 1500 Units/Reel |
| SL(T2)  | Surface Mount (Low Profile) Lead Forming – With Option 2 Taping | 1500 Units/Reel |
| SL(T3)  | Surface Mount (Low Profile) Lead Forming– With Option 3 Taping  | 1000 Units/Reel |
| SL(T4)  | Surface Mount (Low Profile) Lead Forming – With Option 4 Taping | 1000 Units/Reel |
| SLM(T1) | Surface Mount (Gullwing) Lead Forming– With Option 1 Taping     | 1500 Units/Reel |
| SLM(T2) | Surface Mount (Gullwing) Lead Forming – With Option 2 Taping    | 1500 Units/Reel |

## REFLOW INFORMATION

### REFLOW PROFILE



IPC-020d-5-1

| 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.           |



## ***MPC814 Series***

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#### **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**

| <b>Version</b> | <b>Date</b> | <b>Subjects (major changes since last revision)</b> |
|----------------|-------------|-----------------------------------------------------|
| 1.0            | 2018-12-21  | Datasheet Complete                                  |
| 1.1            | 2020-03-08  | Upgrade Datasheet                                   |
| 1.2            | 2023-07-05  | Upgrade Datasheet                                   |