



## 10MBit/s High Speed Logic Gate Optocoupler

### Features

- High speed 10MBit/s
- High isolation voltage between input and output (Viso=5000 Vrms )
- Guaranteed performance from -40°C to 85°C
- Wide operating temperature range of -55°C to 100°C
- Regulatory Approvals
  - UL - UL1577 (E364000)
  - VDE - EN60747-5-5(VDE0884-5)
  - CQC – GB4943.1, GB8898
  - IEC60065, IEC60950

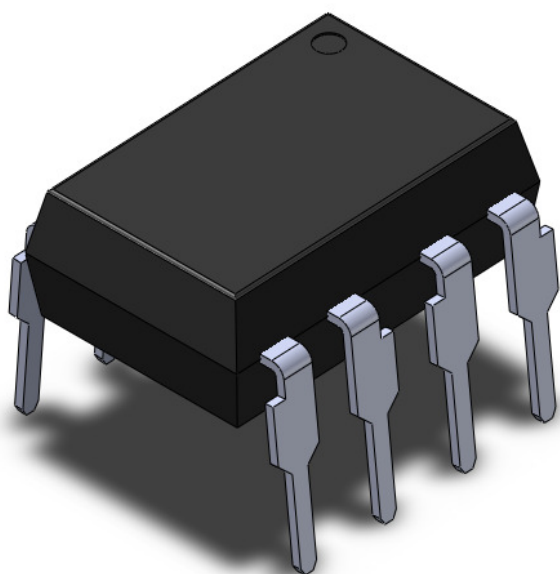
### Description

The 6N137 optocouplers consist of a 850 nm AlGaAs LED, optically coupled to a very high speed integrated photo-detector logic gate with a strobable output. This output features an open collector, there by permitting wired OR outputs. The switching parameters are guaranteed over the temperature range of -40°C to +85°C. A maximum input signal of 5mA will provide a minimum output sink current of 13mA (fan out of 8).

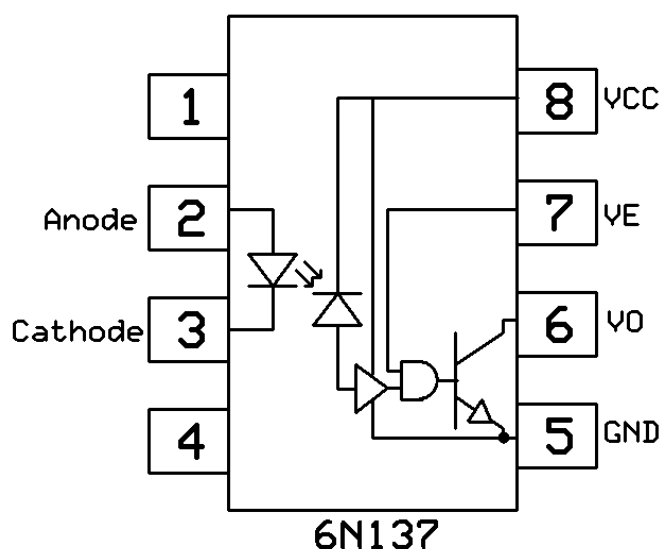
### Applications

- Line receivers
- Telecommunication equipment
- Feedback loop in switch-mode power supplies
- Home appliances
- High speed logic ground isolation

### Package Outline



### Schematic



Note: Different lead forming options available. See package dimension.



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### Absolute Maximum Rating at 25°C

| <b>Symbol</b>    | <b>Parameters</b>   | <b>Ratings</b> | <b>Units</b>     | <b>Notes</b> |
|------------------|---|----------------|------------------|--------------|
| V <sub>ISO</sub> | Isolation voltage *1                                      | 5000           | V <sub>RMS</sub> |              |
| T <sub>OPR</sub> | Operating temperature                                     | -55 ~ +100     | °C               |              |
| T <sub>STG</sub> | Storage temperature                                       | -55 ~ +125     | °C               |              |
| T <sub>SOL</sub> | Soldering temperature *2                                  | 260            | °C               |              |
| <b>Emitter</b>   |   |                |                  |              |
| I <sub>F</sub>   | Forward current   | 50             | mA               |              |
| V <sub>R</sub>   | Reverse voltage   | 5              | V                |              |
| P <sub>I</sub>   | Power dissipation   | 100            | mW               |              |
| <b>Detector</b>  |   |                |                  |              |
| P <sub>O</sub>   | Power dissipation   | 85             | mW               |              |
| I <sub>O</sub>   | Average Output current                                    | 50             | mA               |              |
| V <sub>O</sub>   | Output voltage  | 7.0            | V                | 1min(Max.)   |
| V <sub>CC</sub>  | Supply voltage  | 7.0            | V                |              |
| V <sub>E</sub>   | Enable Input Voltage Not to Exceed VCC by more than 500mV | 5.5            | V                |              |



# 10MBit/s High Speed Logic Gate Optocoupler

## Electrical Characteristics

$T_A = -40 - 85^\circ\text{C}$  (unless otherwise specified). Typical values are measured at  $T_A = 25^\circ\text{C}$  and  $V_{CC}=5\text{V}$

### Emitter Characteristics

| Symbol                  | Parameters                                 | Test Conditions       | Min | Typ  | Max | Units                | Notes |
|-------------------------|--|-----------------------|-----|------|-----|----------------------|-------|
| $V_F$                   | Forward voltage                            | $I_F = 10\text{mA}$   | -   | 1.4  | 1.6 | V                    |       |
| $V_R$                   | Reverse Voltage                            | $I_R = 10\mu\text{A}$ | 5.0 | -    | -   | V                    |       |
| $\Delta V_F/\Delta T_A$ | Temperature coefficient of forward voltage | $I_F = 10\text{mA}$   | -   | -1.8 | -   | mV/ $^\circ\text{C}$ |       |

### Detector Characteristics

| Symbol    | Parameters                | Test Conditions  | Min | Typ   | Max  | Units | Notes |
|-----------|---------------------------|--|-----|-------|------|-------|-------|
| $I_{CCH}$ | Logic High Supply Current | $I_F=0\text{mA}, V_E=0.5\text{V}, V_{CC}=5.5\text{V}$  | -   | 6.5   | 10   | mA    |       |
| $I_{CCL}$ | Logic Low Supply Current  | $I_F=10\text{mA}, V_E=0.5\text{V}, V_{CC}=5.5\text{V}$ | -   | 8.8   | 13   | mA    |       |
| $V_{EH}$  | High Level Enable Voltage | $I_F=10\text{mA}, V_{CC}=5.5\text{V}$                  | 2.0 | -     | -    | V     |       |
| $V_{EL}$  | Low Level Enable Voltage  | $I_F=10\text{mA}, V_{CC}=5.5\text{V}$                  | -   | -     | 0.8  | V     |       |
| $I_{EH}$  | High Level Enable Current | $V_E=2.0\text{V}, V_{CC}=5.5\text{V}$                  | -   | -0.53 | -1.6 | mA    |       |
| $I_{EL}$  | Low Level Enable Current  | $V_E=0.5\text{V}, V_{CC}=5.5\text{V}$                  | -   | -0.75 | -1.6 | mA    |       |

### Transfer Characteristics

| Symbol   | Parameters                | Test Conditions   | Min | Typ  | Max | Units         | Notes |
|----------|---------------------------|---|-----|------|-----|---------------|-------|
| $I_{FT}$ | Input Threshold Current   | $V_{CC}=5.5\text{V}, V_O=0.6\text{V}, V_E=2.0\text{V}, I_O=13\text{mA}$ | -   | 2.5  | 5   | mA            |       |
| $I_{OH}$ | Logic High Output Current | $I_F=250\mu\text{A}, V_O=V_{CC}=5.5\text{V}, V_E=2.0\text{V}$           | -   | 2.0  | 100 | $\mu\text{A}$ |       |
| $V_{OL}$ | Low Level Output Voltage  | $I_F=5\text{mA}, V_{CC}=5.5\text{V}, V_E=2.0\text{V}, I_O=13\text{mA}$  | -   | 0.35 | 0.6 | V             |       |



## 10MBit/s High Speed Logic Gate Optocoupler

**Electrical Characteristics**

$T_A = -40 - 85^\circ\text{C}$  (unless otherwise specified). Typical values are measured at  $T_A = 25^\circ\text{C}$ ,  $V_{CC} = 5\text{V}$  and  $I_F = 7.5\text{mA}$

**Switching Characteristics**

| Symbol    | Parameters                                   | Test Conditions  | Min  | Typ | Max | Units                  | Notes |
|-----------|--|--|------|-----|-----|------------------------|-------|
| $T_{PHL}$ | Output Propagation Delay High to Low         | $C_L = 15\text{pF}$ , $R_L = 350\Omega$  | -    | 34  | 75  | ns                     |       |
| $T_{PLH}$ | Output Propagation Delay Low to High         |  | -    | 39  | 75  | ns                     |       |
| $P_{WD}$  | Pulse Width Distortion                       |  | -    | 5   | 34  | ns                     |       |
| $T_r$     | Output Rise Time                             |  | -    | 37  | -   | ns                     |       |
| $T_f$     | Output Fall Time                             |  | -    | 10  | -   | ns                     |       |
| $T_{ELH}$ | Enable Propagation Delay Low To High         | $V_{EH} = 3.5\text{V}$ , $C_L = 15\text{pF}$ , $R_L = 350\Omega$                             | -    | 15  | -   | ns                     |       |
| $T_{EHL}$ | Enable Propagation Delay High To Low         |  | -    | 15  | -   | ns                     |       |
| $CM_H$    | Common Mode Transient Immunity at Logic High | $I_F = 0\text{mA}$ , $V_{CM} = 50\text{Vp-p}$ , $V_{OH} = 2.0\text{V}$ , $R_L = 350\Omega$   | 5000 | -   | -   | $\text{V}/\mu\text{s}$ |       |
| $CM_L$    | Common Mode Transient Immunity at Logic Low  | $I_F = 7.5\text{mA}$ , $V_{CM} = 50\text{Vp-p}$ , $V_{OL} = 0.8\text{V}$ , $R_L = 350\Omega$ | 5000 | -   | -   | $\text{V}/\mu\text{s}$ |       |



Typical Characteristic Curves

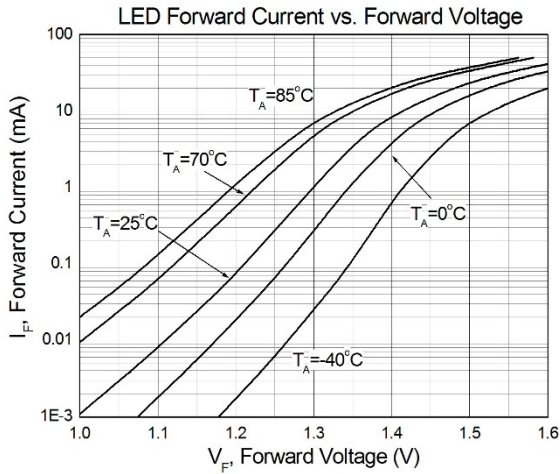


Figure 1

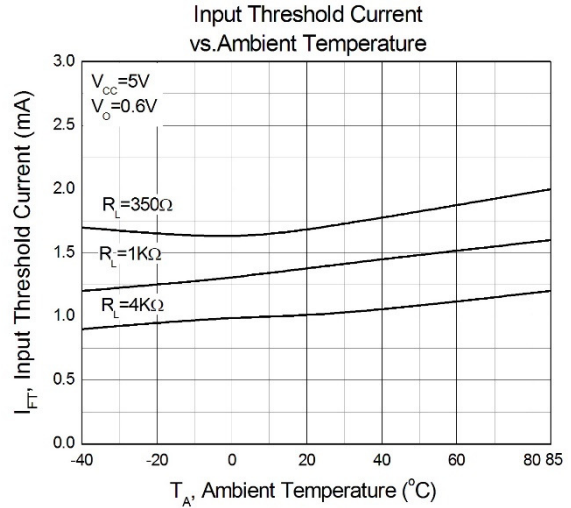


Figure 2

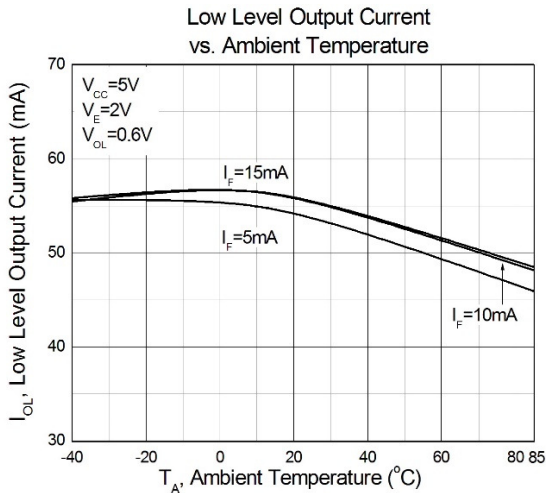


Figure 3

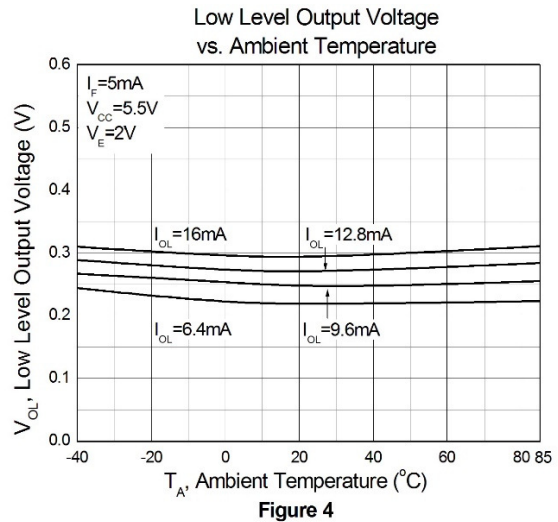


Figure 4

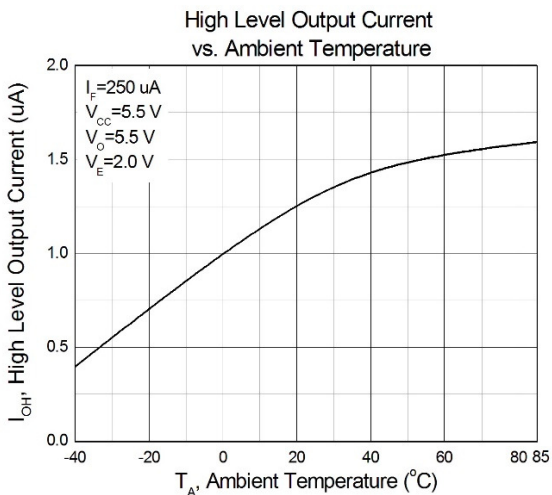


Figure 5

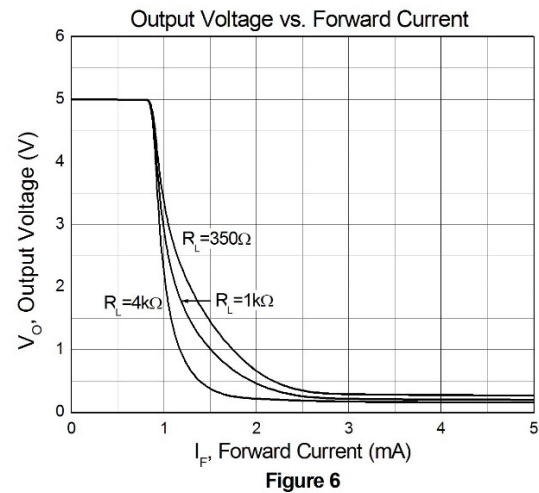
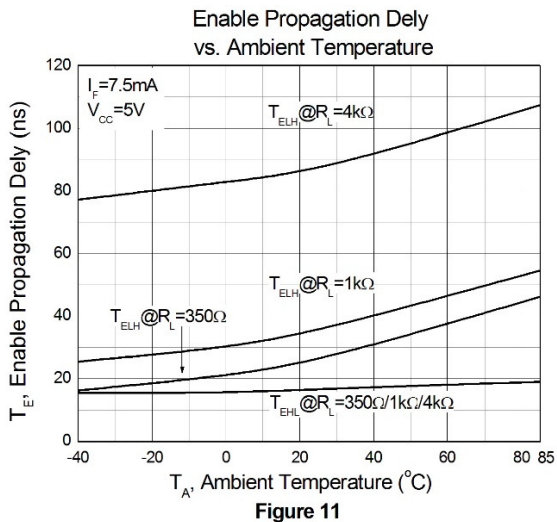
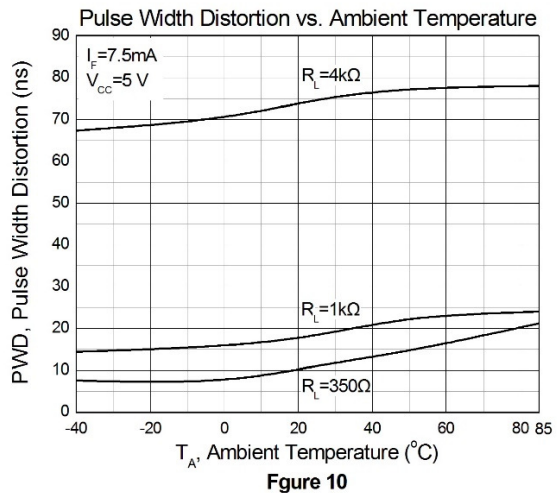
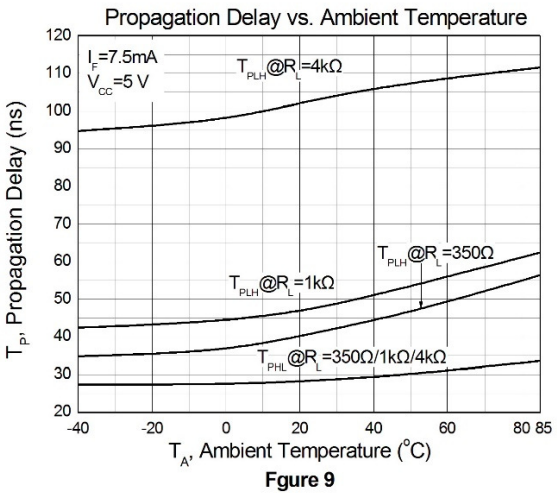
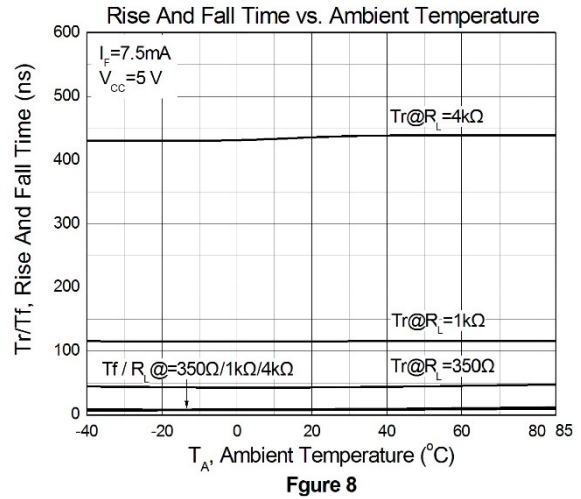
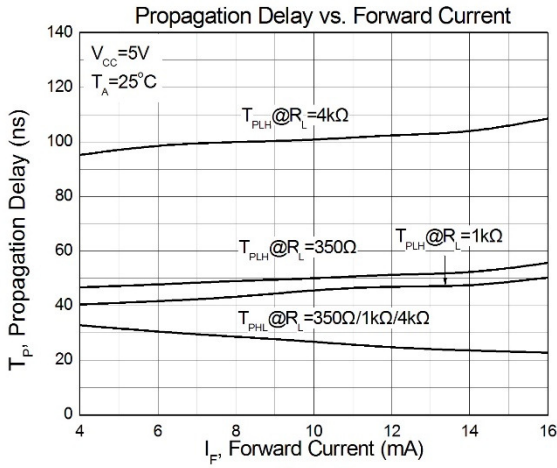


Figure 6



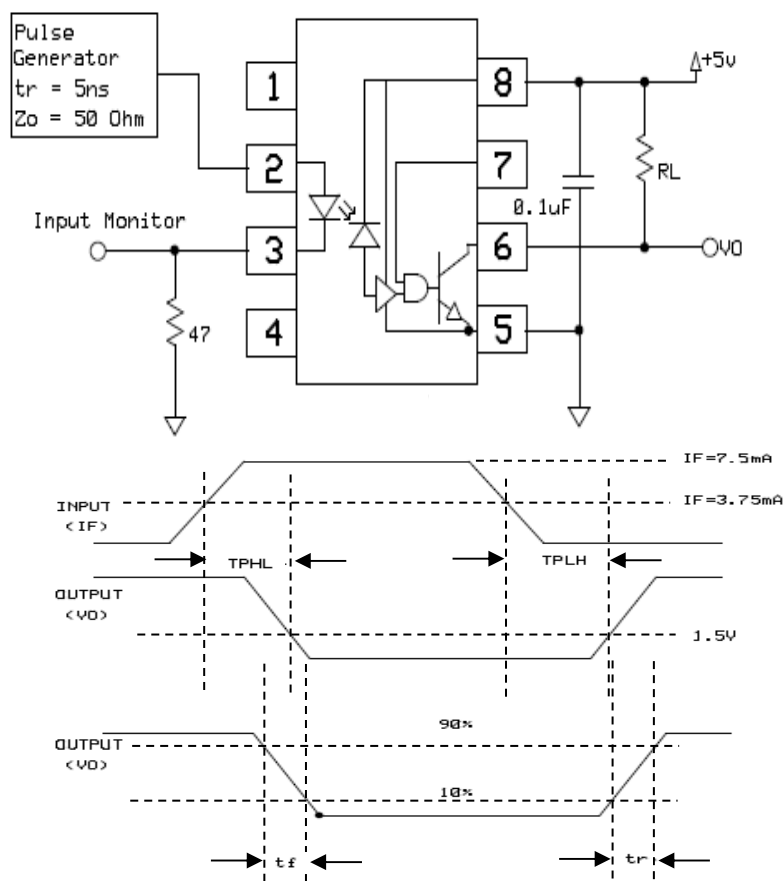
Typical Characteristic Curves





# 10MBit/s High Speed Logic Gate Optocoupler

## Test Circuits

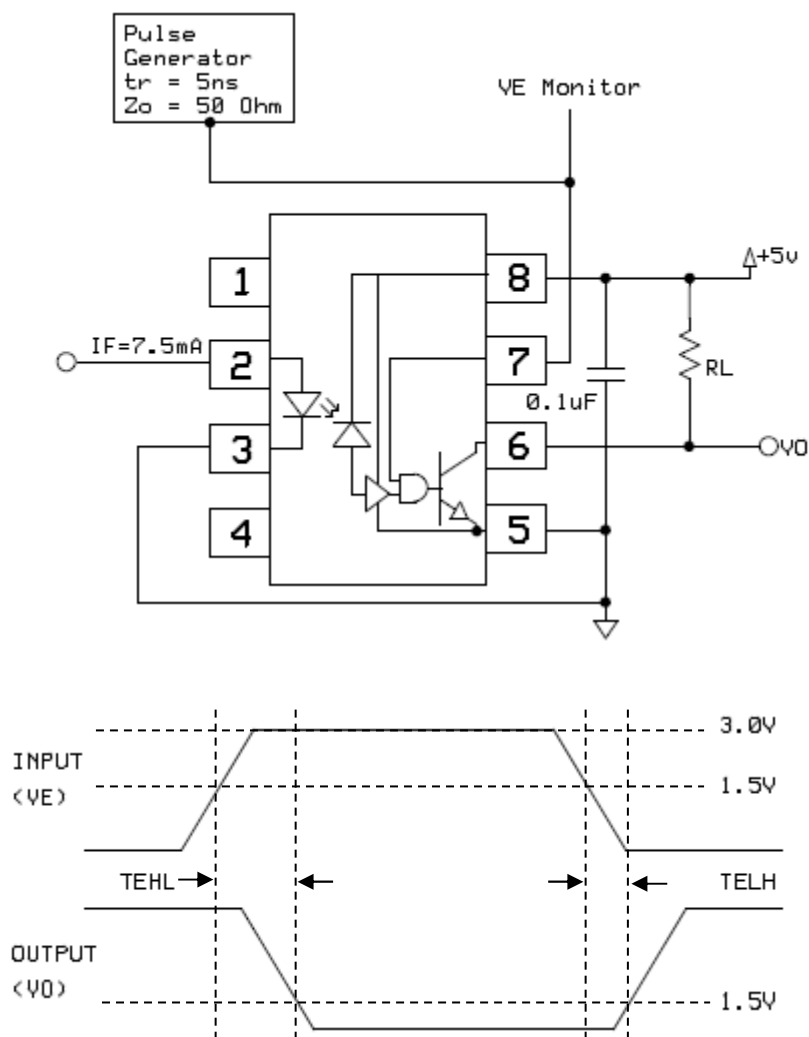


Switching Time Test Circuit



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## Test Circuits

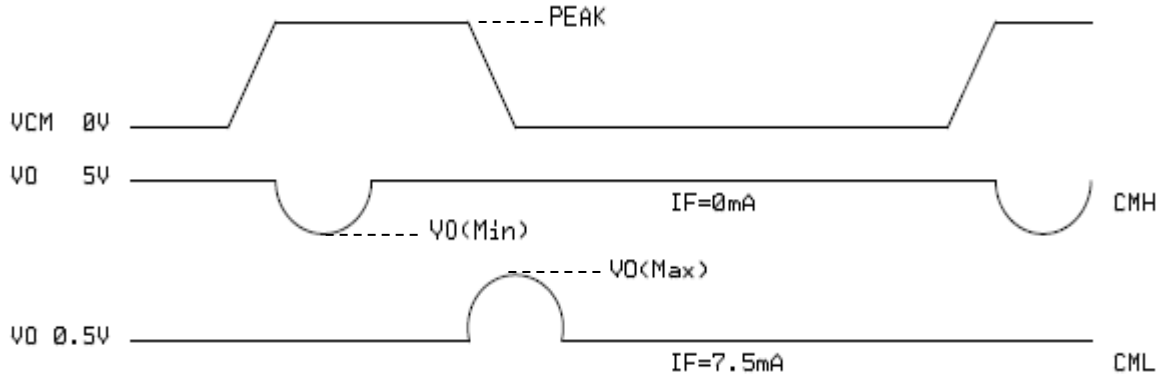
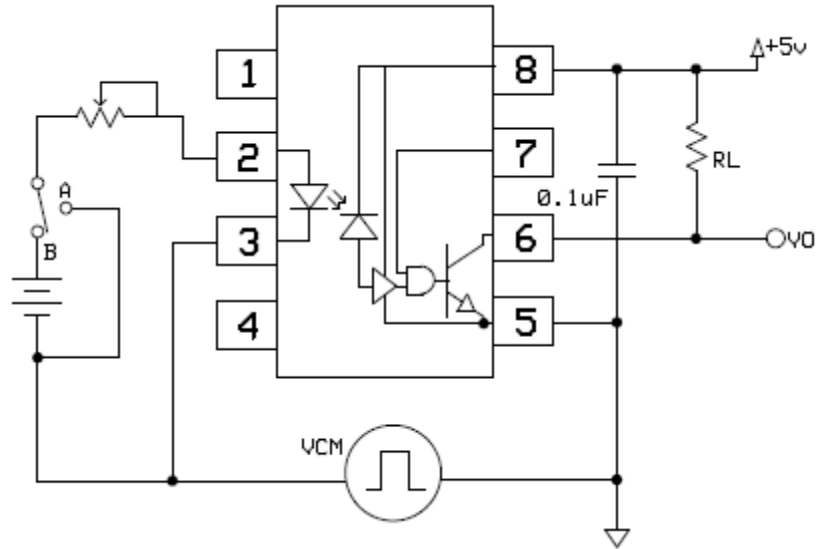


Enable Switching Time Test Circuit





Test Circuits



CMR Test Circuit

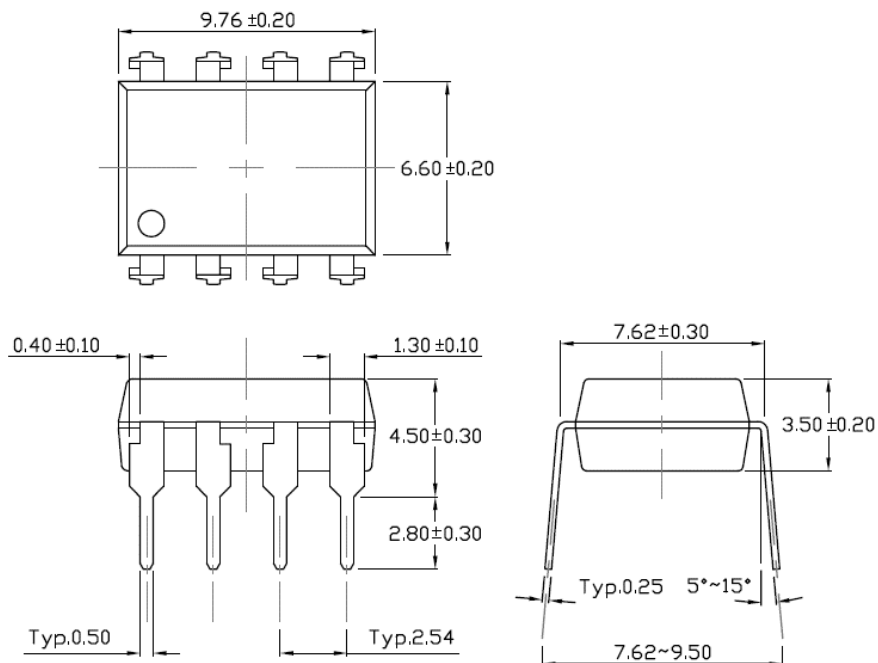


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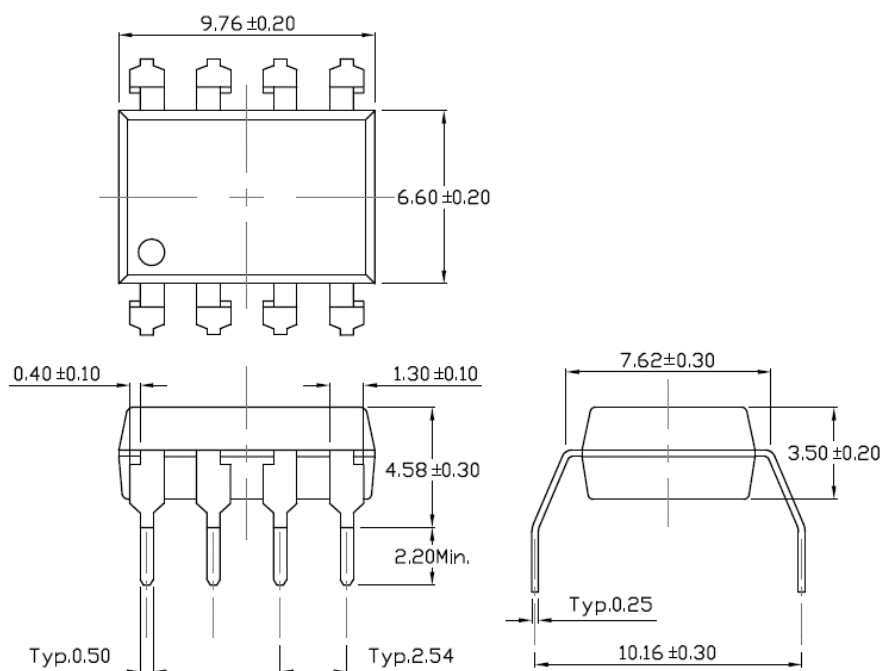
# 10MBit/s High Speed Logic Gate Optocoupler

## Package Dimension *Dimensions in mm unless otherwise stated*

### Standard DIP – Through Hole



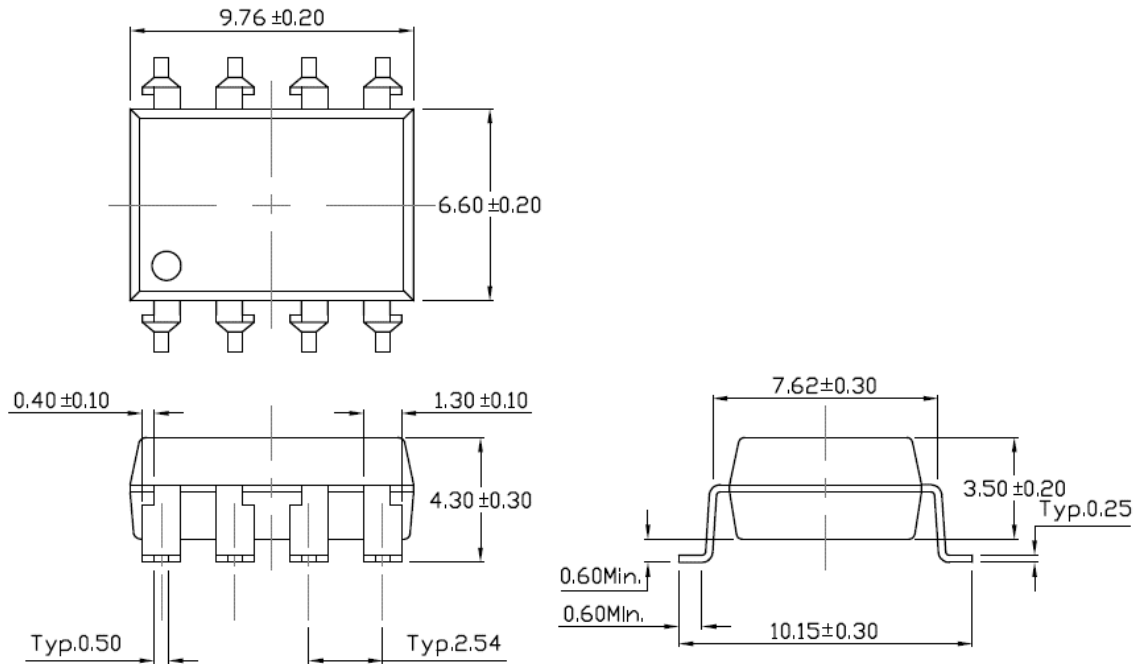
### Gullwing (400mil) Lead Forming – Through Hole (M Type)



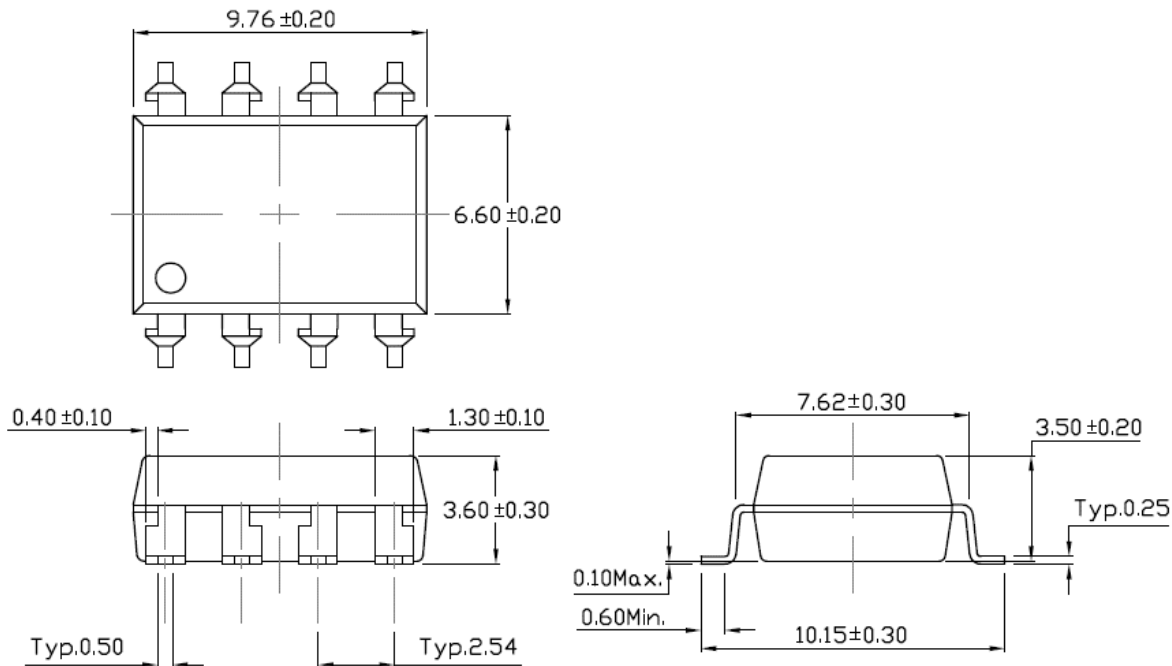


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## Surface Mount Lead Forming (S Type)



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

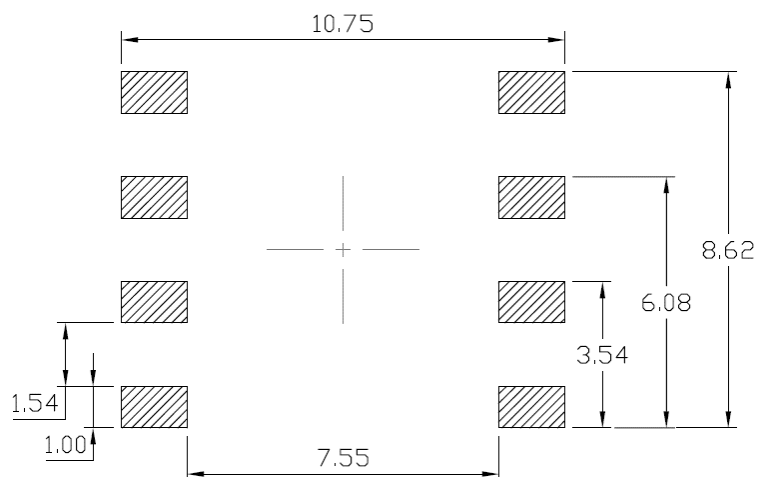




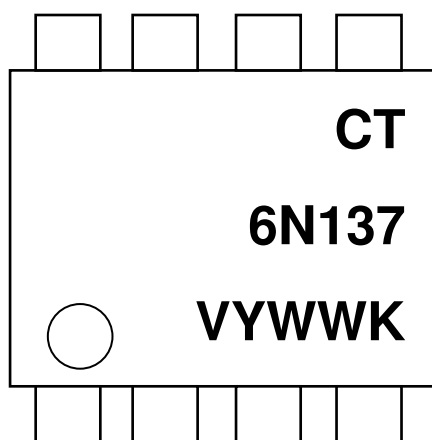
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## 10MBit/s High Speed Logic Gate Optocoupler

### Recommended Solder Mask *Dimensions in mm unless otherwise stated*



### Device Marking



#### Note:

- CT : Denotes "CT Micro"
- 6N137 : Product Number
- V : VDE Option
- Y : Fiscal Year
- WW : Work Week
- K : Production Code



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## 10MBit/s High Speed Logic Gate Optocoupler

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### Ordering Information

6N137(V)(Y)(Z)

V = VDE Option ( V or None)

Y = Lead form option (S, SL, M or none)

Z = Tape and reel option (T1, T2 or none)

| <b>Option</b> | <b>Description</b>   | <b>Quantity</b> |
|---------------|--|-----------------|
| None          | Standard 8 Pin Dip   | 40 Units/Tube   |
| M             | Gullwing (400mil) Lead Forming                                 | 40 Units/Tube   |
| S(T1)         | Surface Mount Lead Forming – With Option 1 Taping              | 1000 Units/Reel |
| S(T2)         | Surface Mount Lead Forming – With Option 2 Taping              | 1000 Units/Reel |
| SL(T1)        | Surface Mount (Low Profile) Lead Forming– With Option 1 Taping | 1000 Units/Reel |
| SL(T2)        | Surface Mount (Low Profile) Lead Forming– With Option 2 Taping | 1000 Units/Reel |

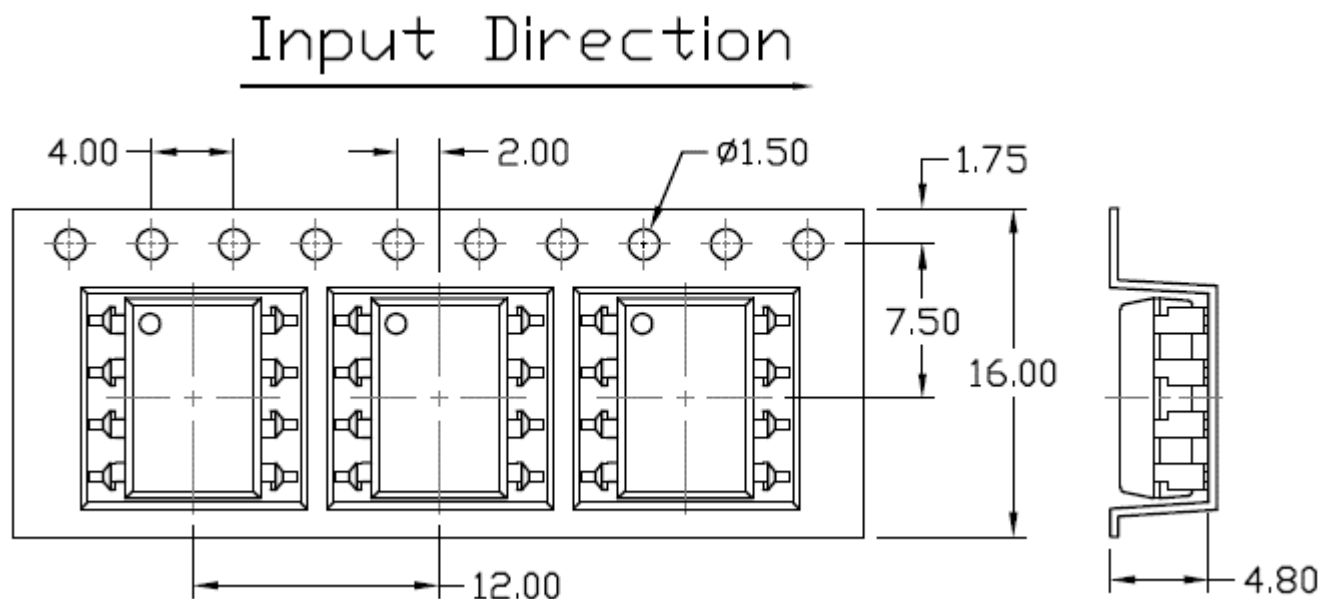


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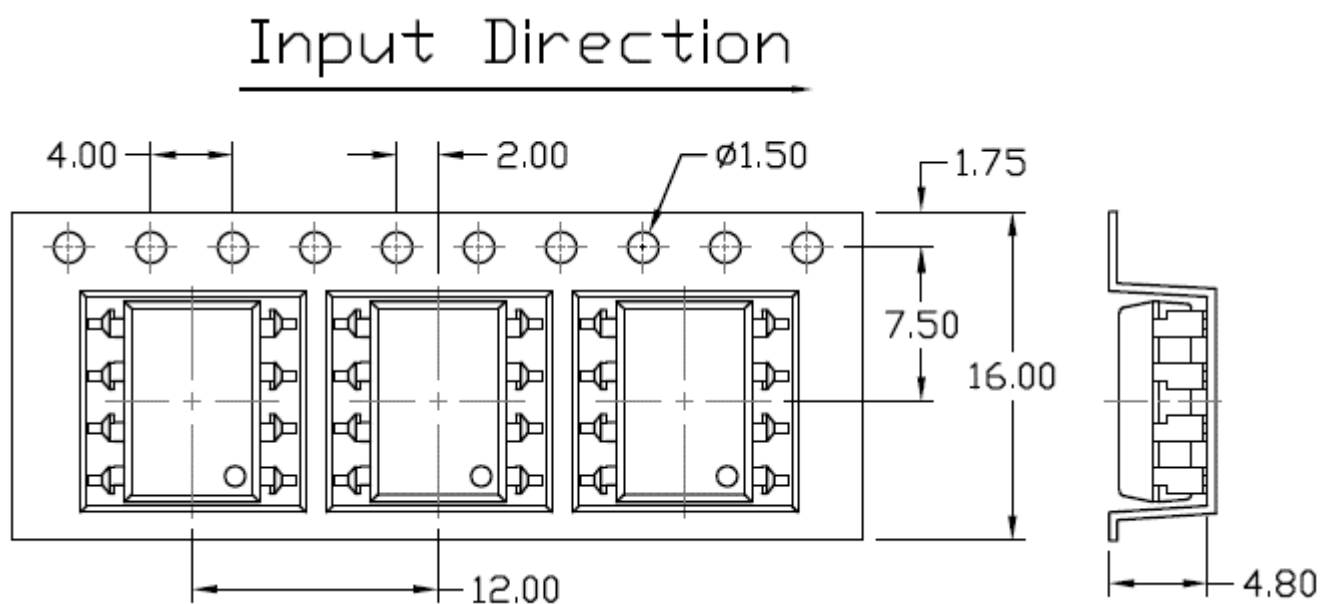
## 10MBit/s High Speed Logic Gate Optocoupler

### Carrier Tape Specifications *Dimensions in mm unless otherwise stated*

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



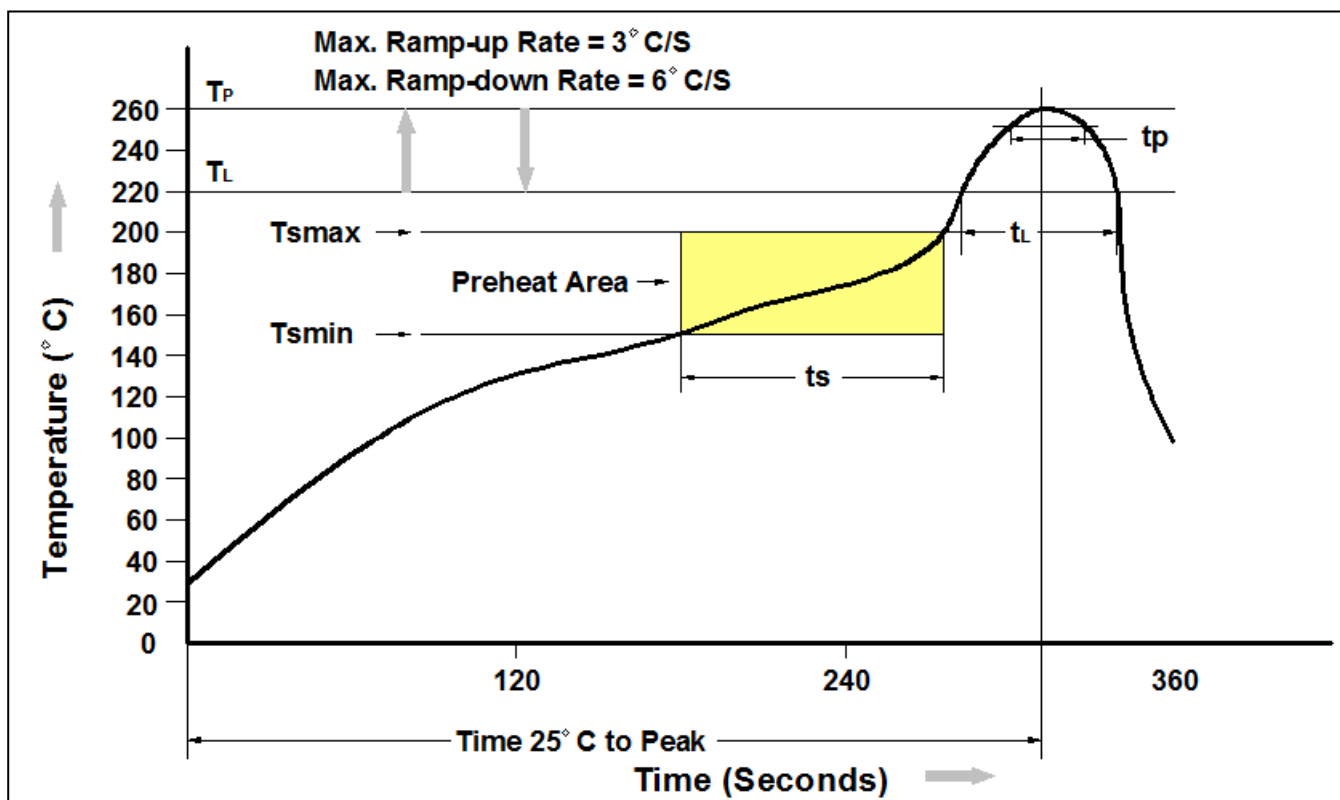
#### Option S(T2) & SL(T2)





# 10MBit/s High Speed Logic Gate Optocoupler

## Reflow Profile



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



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