# QT-Brightek Optocoupler Series

## 10Mbit/s High Speed Logic Gate Optocoupler

## Part No.: 6N137, QT2601

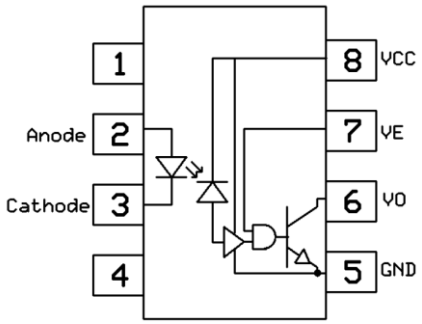
**Table of Contents:**

# Introduction

**Feature:**

- High Speed 10Mbit/s
- High Isolation voltage between input and output (Viso = 5000V rms)
- Creepage distance > 7.4mm
- Available in Tube or Tape and reel
- Available with standard DIP-8, Gullwing lead bend, SMD lead bend, and SMD low profile options.

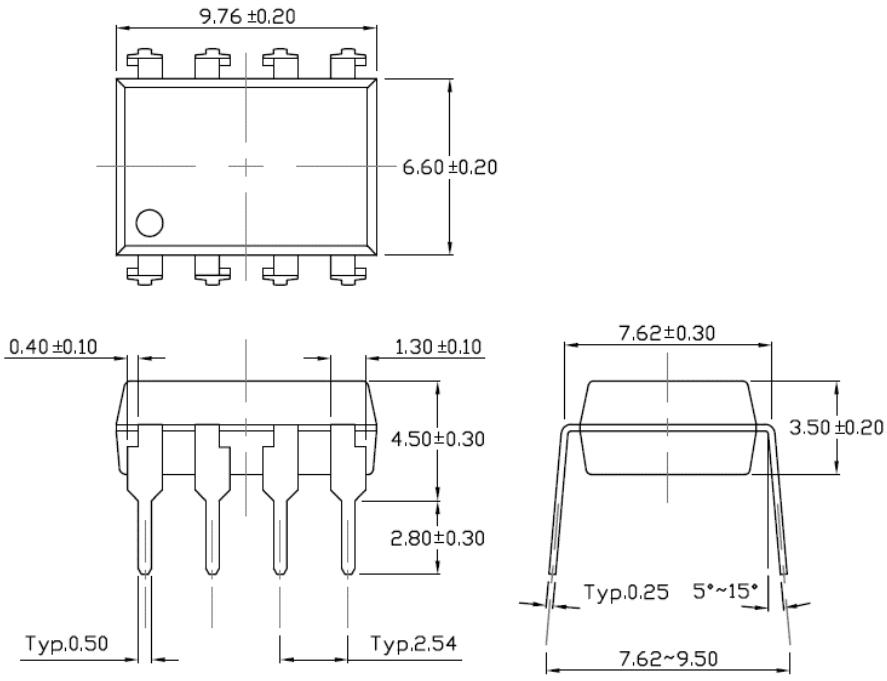
**Schematic:**



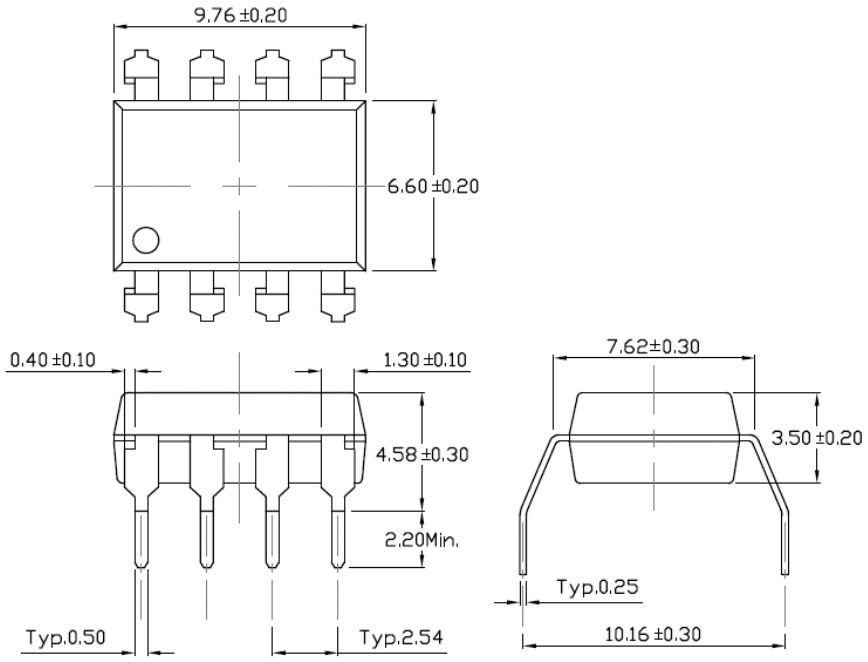

**Certification & Compliance:**

- Pb free and RoHS Compliant
- UL recognized (File #E338132)
- cUL recognized (File #E338132)
- VDE (File #40030457)

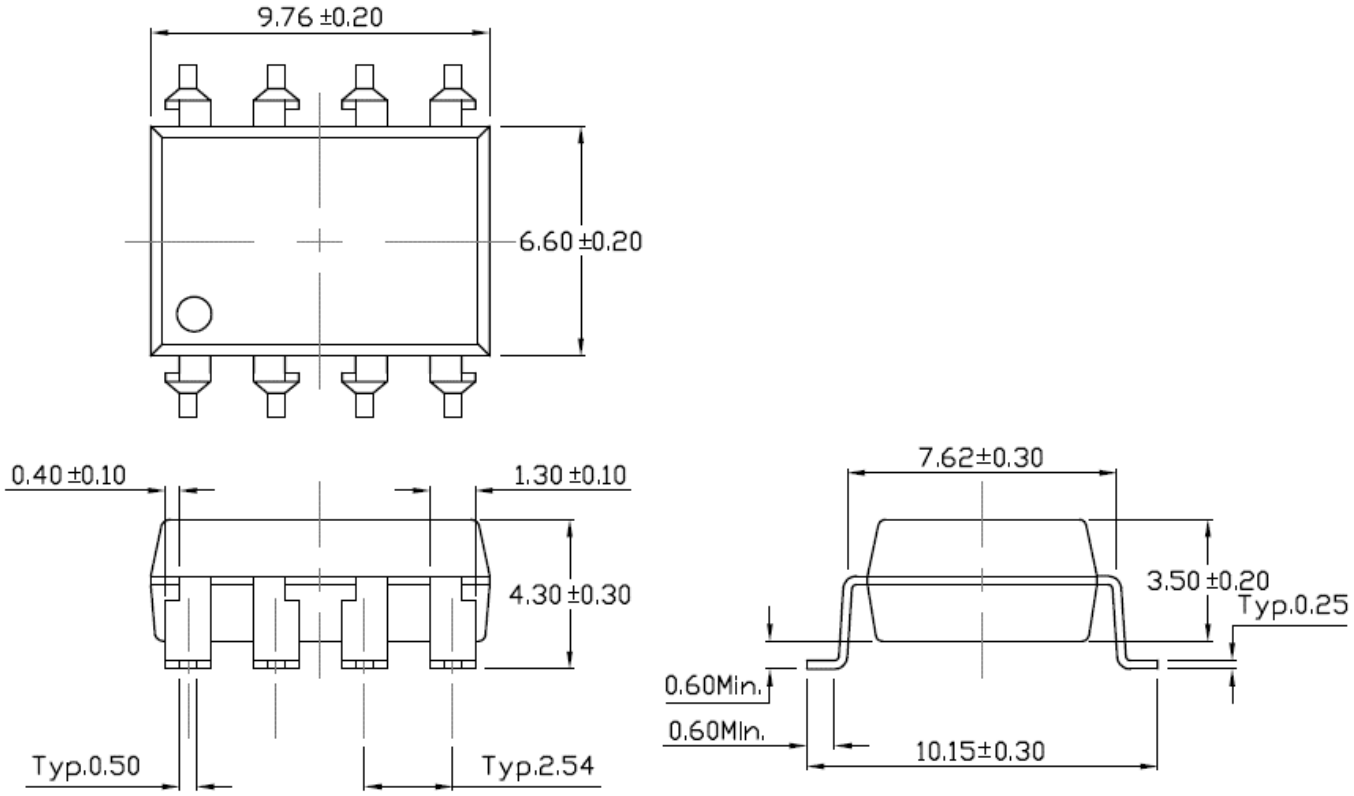
**Dimension: (Dot location indicates pin 1)**
**8-Pin Dip (standard):**



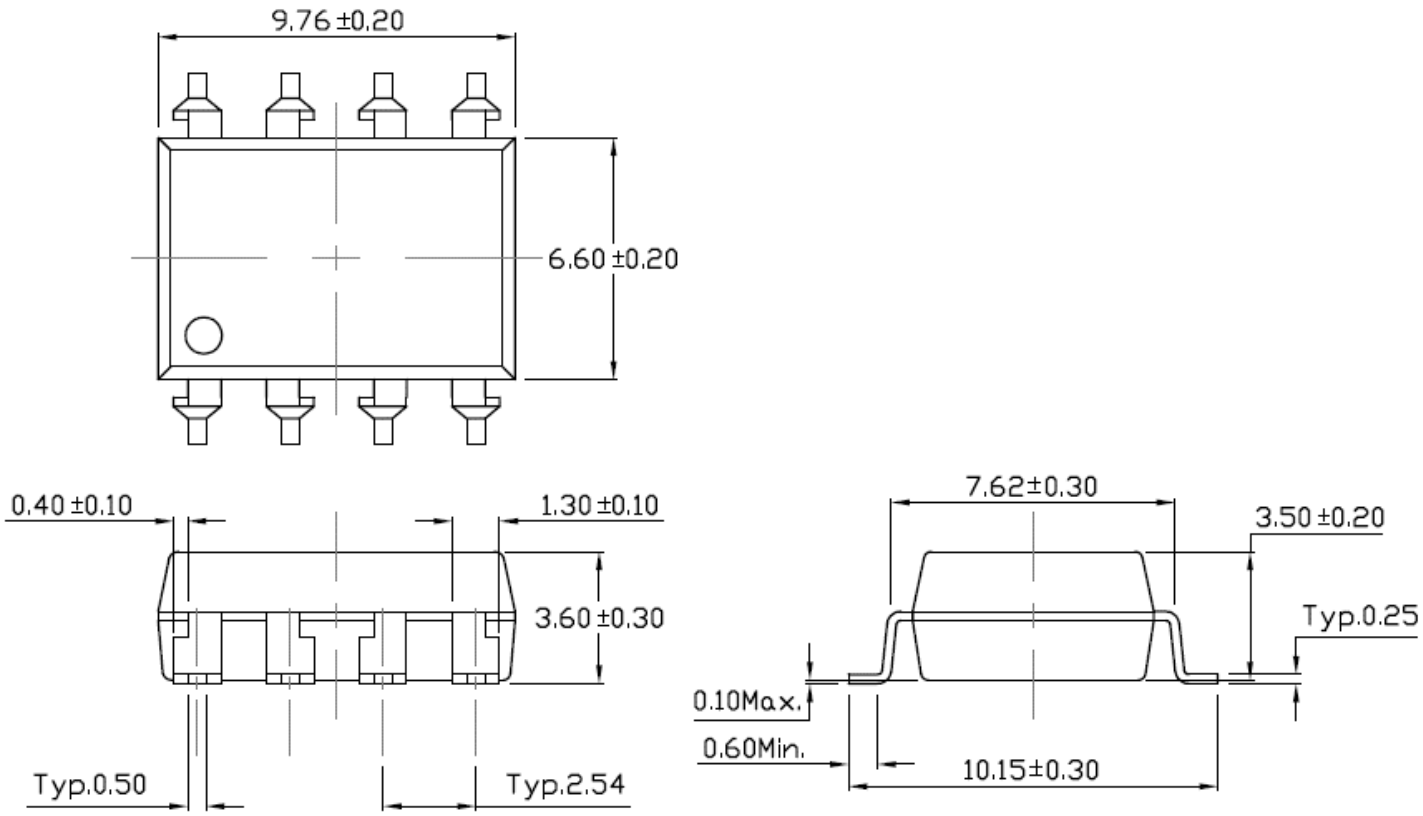
**Gullwing (400mil) lead bend (Option M):**




**SMD lead bend (Option S):**



**SMD (Low Profile) bend (Option SL):**




- All Dimensions are in mm

## Absolute Maximum Rating

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| $V_{ISO}$ | Isolation Voltage* | 5000 | $V_{RMS}$ |
| $T_{STG}$ | Storage Temperature | -55 ~ +125 | ºC |
| $T_{OPR}$ | Operating Temperature | -55 ~ +85 | ºC |
| $T_{SOL}$ | Lead Solder Temperature | 260 for 10 sec | ºC |
| **EMITTER** | | | |
| $I_F$ | Forward Current | 50 | mA |
| $V_R$ | Reverse Voltage | 5 | V |
| $P_I$ | Power Dissipation | 100 | mW |
| | Power Dissipation Derated above 100ºC | - | mW/ºC |
| **DETECTOR** | | | |
| $P_O$ | Power Dissipation | 85 | mW |
| $I_O$ | Average Output current | 50 | mA |
| $V_O$ | Output voltage** | 7.0 | V |
| $V_{CC}$ | Supply voltage | 7.0 | V |
| VE | Enable Input Voltage Not to Exceed VCC by more than 500mW | 5.5 | V |

*AC for 1 minute, RH =40~60%
**1min (Max.)

# Electrical Characteristic ($T_A$=25 °C)

($T_A$=0 to 70C unless specified otherwise)

**Emitter**

| Symbol | Characteristics | Device | Test Condition | Range | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | |
| $V_F$ | Forward Voltage | - | $I_F$ = 10mA | - | 1.4 | 1.6 | V |
| $V_R$ | Reverse Voltage | | $I_R$= 10μA | 5 | - | - | V |
| $\Delta V_F/\Delta T_A$ | Temperature coefficient of forward voltage | | $I_F$ = 10mA | - | -1.8 | - | mV/°C |

**Detector**

| Symbol | Characteristic | Device | Test Condition | Range | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | |
| $I_{CCH}$ | Logic High Supply Current | - | $I_F$=0mA, $V_E$=0.5V, $V_{CC}$=5.5V | - | 6.5 | 10 | mA |
| $I_{CCL}$ | Logic Low Supply Current | - | $I_F$=10mA, $V_E$=0.5V, $V_{CC}$ =5.5V | - | 8.8 | 13 | mA |
| $V_{EH}$ | High Level Enable Voltage | - | $I_F$=10mA, $V_{CC}$ =5.5V | 2.0 | - | - | V |
| $V_{EL}$ | Low Level Enable Voltage | - | $I_F$=10mA, $V_{CC}$ =5.5V | - | - | 0.8 | V |
| $I_{EH}$ | High Level Enable Current | - | $V_E$=2.0V, $V_{CC}$=5.5V | - | -0.53 | -1.6 | mA |
| $I_{EL}$ | Low Level Enable Current | - | $V_E$=0.5V, $V_{CC}$=5.5V | - | -0.75 | -1.6 | mA |

## Transfer Characteristics

| Symbol | Characteristic | Device | Test Condition | Range | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | |
| $I_{FT}$ | Input Threshold Current | - | $V_{CC}$=5.5V, $V_O$=0.6V, $V_E$=2.0V, $I_O$=13mA | - | 2.5 | 5 | mA |
| $I_{OH}$ | Logic High Output Current | - | $I_F$=250μA, $V_O$=$V_{CC}$=5.5V, $V_E$=2.0V | - | 2.0 | 100 | μA |
| $V_{OL}$ | Logic Low Output Voltage | - | $I_F$=5mA, $I_O$=13mA, $V_{CC}$=5.5V, $V_E$=2.0V | - | 0.35 | 0.6 | V |

## Switching Characteristics (TA=25°C, Vcc=5V)

| Symbol | Characteristic | Device | Test Condition | Range | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | |
| $T_{PHL}$ | Propagation Delay Time Logic High to Logic Low | - | $C_L$=15pF, $R_L$=350Ω | - | 34 | 75 | ns |
| $T_{PLH}$ | Propagation Delay Time Logic Low to Logic High | - | | - | 39 | 75 | |
| $P_{WD}$ | Pulse Width Distortion | - | | - | 5 | 34 | |
| $T_r$ | Output Rise Time | - | | - | 37 | - | |
| $T_f$ | Output Fall Time | - | | - | 10 | - | |
| $T_{ELH}$ | Enable Propagation Delay Low To High | - | VEH=3.5V, $C_L$=15pF, $R_L$=350Ω | - | 15 | - | ns |
| $T_{EHL}$ | Enable Propagation Delay High To Low | - | | - | 15 | - | ns |
| $CM_H$ | Common Mode Transient Immunity at Logic High | 6N137 | $I_F$ = 0mA, $V_{CM}$=50Vp-p, $V_{OH}$=2.0V, $R_L$=350Ω | - | 10000 | - | V/μs |
| | | QT2601 | | 5000 | 10000 | - | |
| $CM_L$ | Common Mode Transient Immunity at Logic Low | 6N137 | $I_F$ = 7.5mA, $V_{CM}$=50Vp-p, $V_{OH}$=0.8V, $R_L$=350Ω | - | 10000 | - | |
| | | QT2601 | | 5000 | 10000 | - | |

## Characteristic Curves

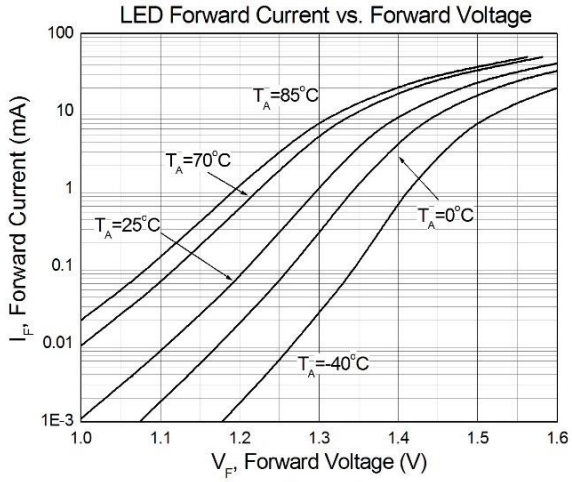



**Figure 1**

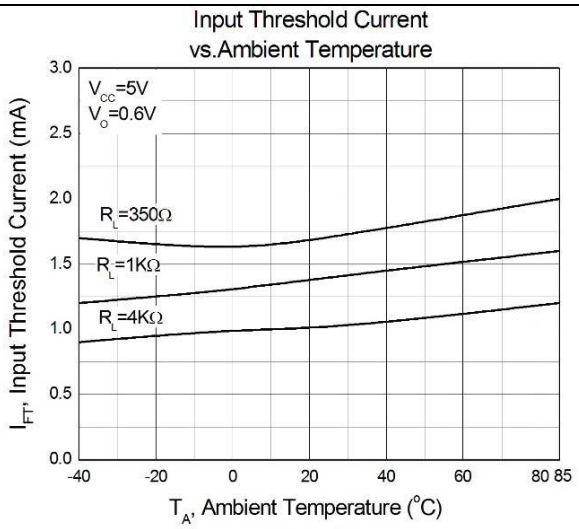



**Figure 2**

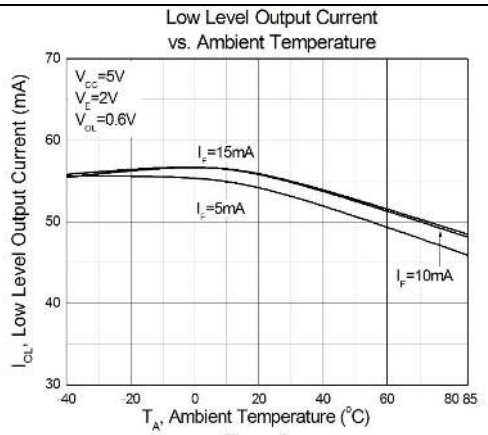



**Figure 3**

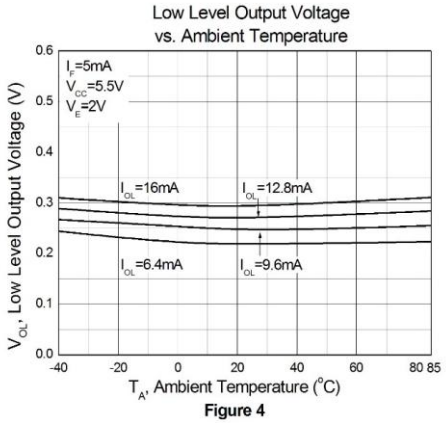



**Figure 4**

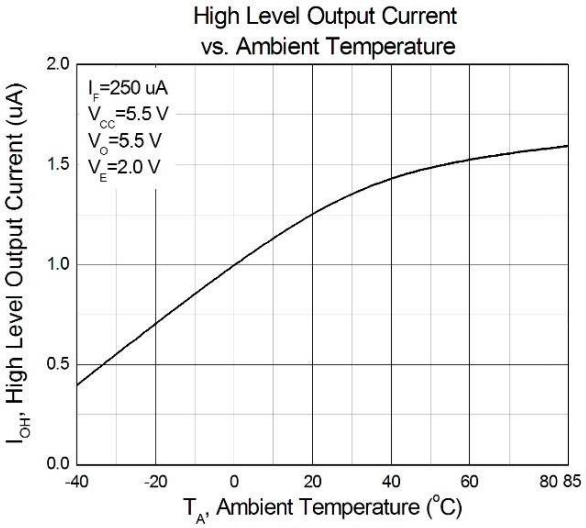



**Figure 5**

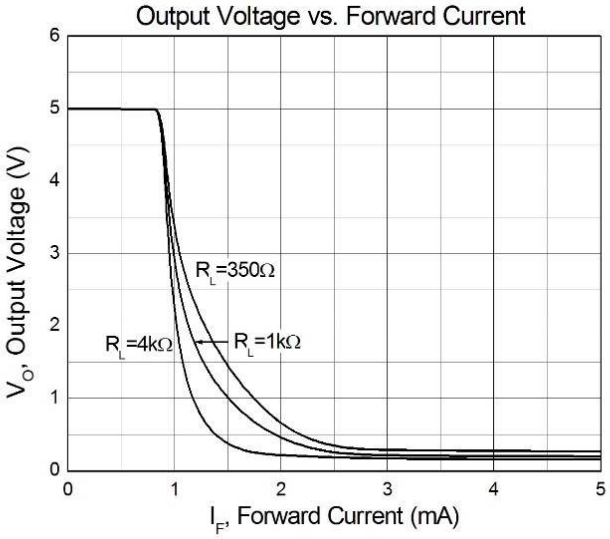



**Figure 6**

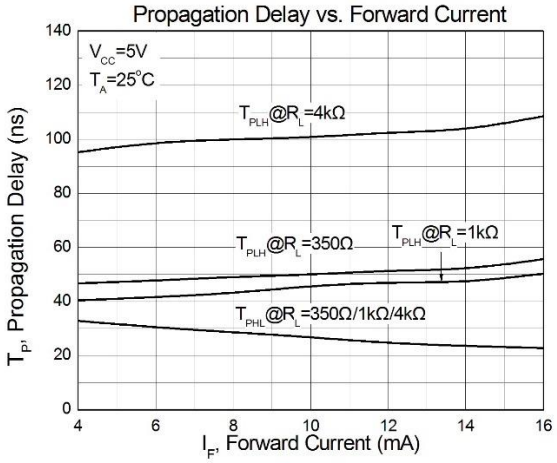
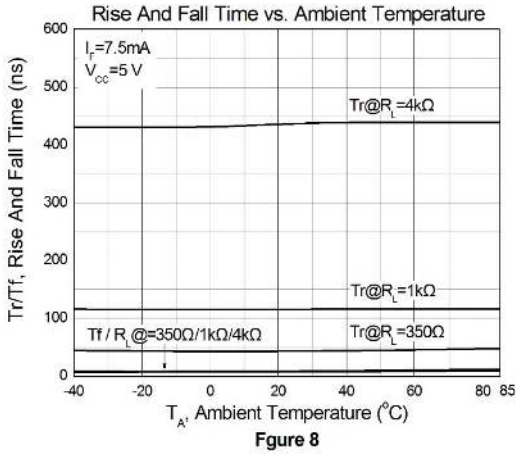
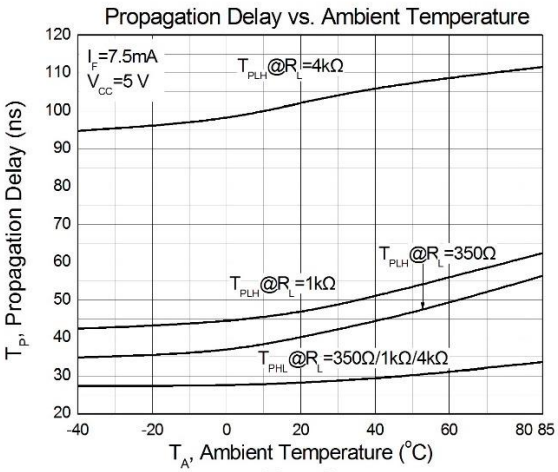


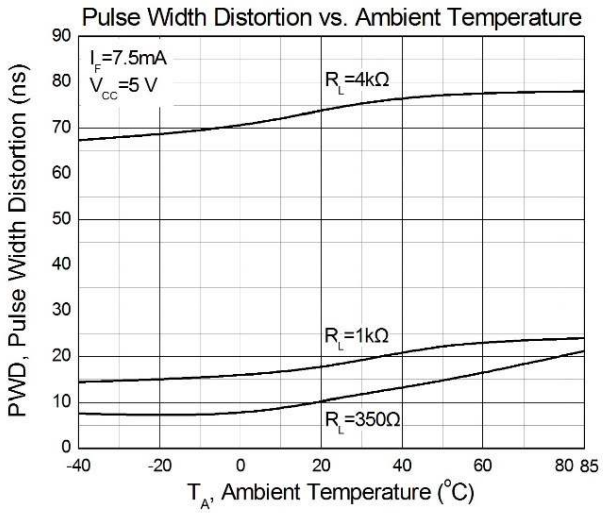

**Figure 7**




**Fgure 8**




**Fgure 9**




**Fgure 10**

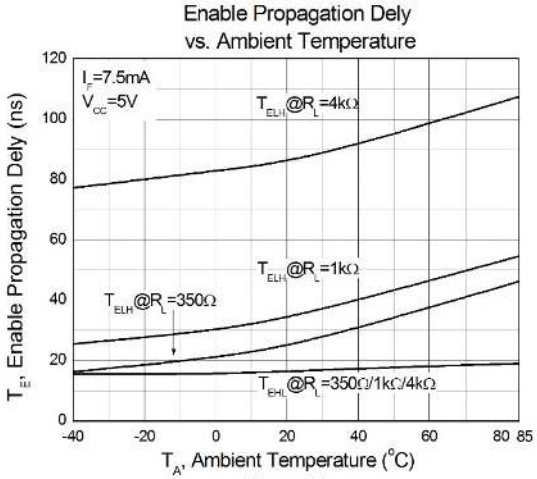
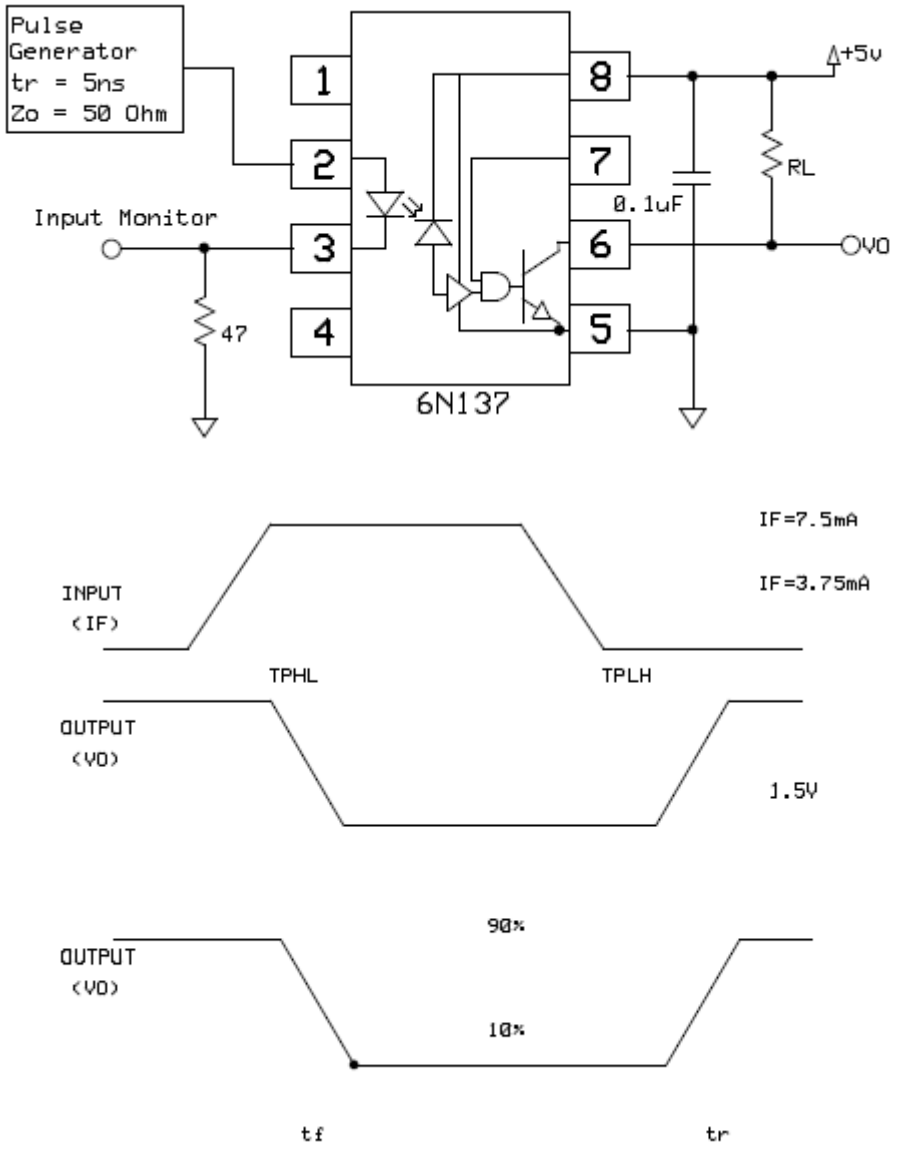
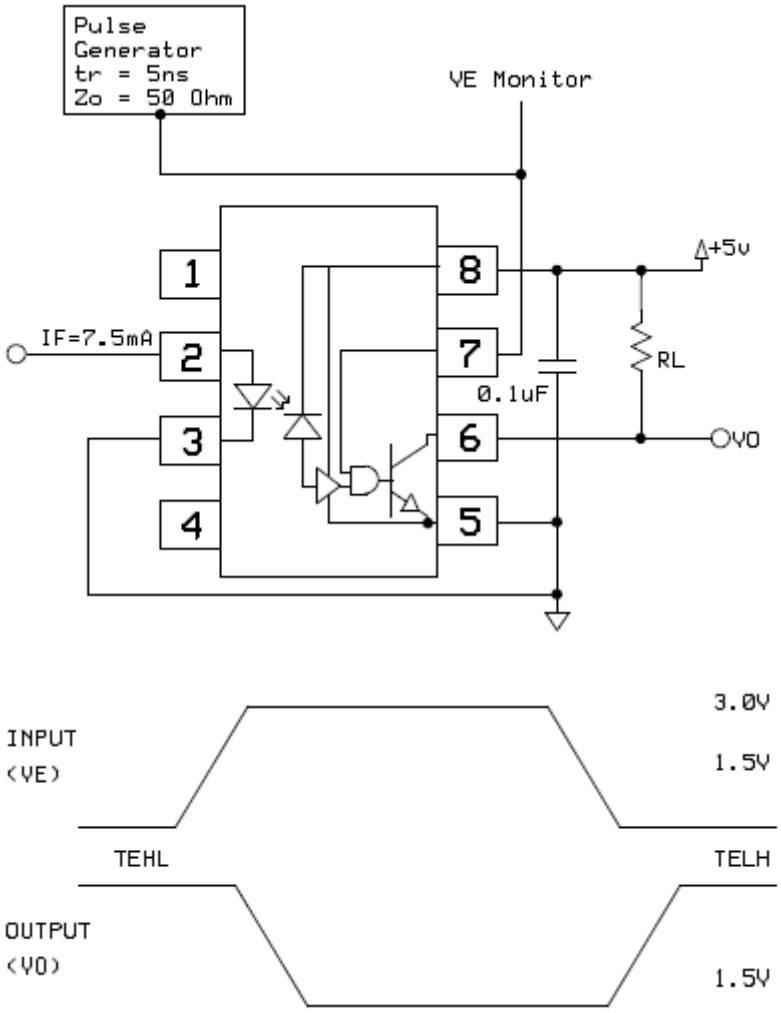



**Figure 11**

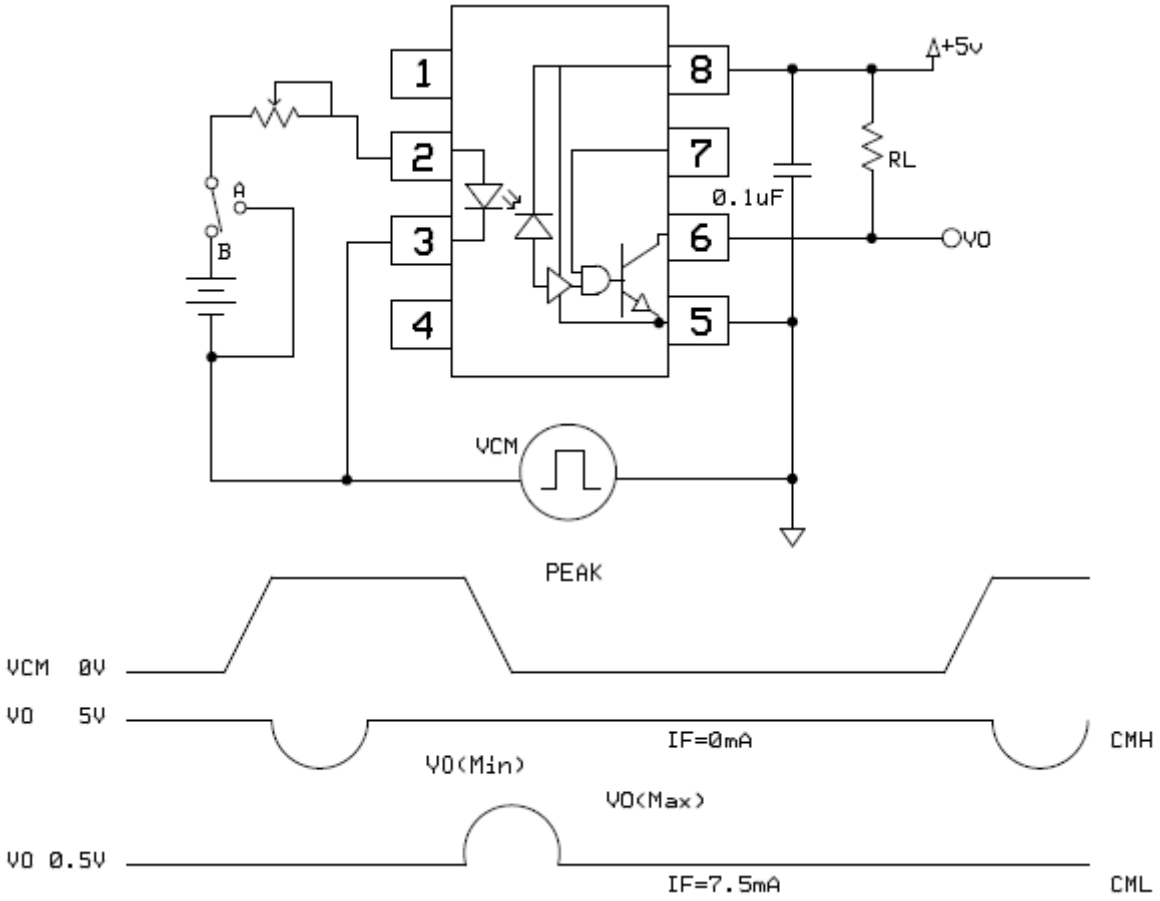
## Test Circuits




Switching Time Test Circuit

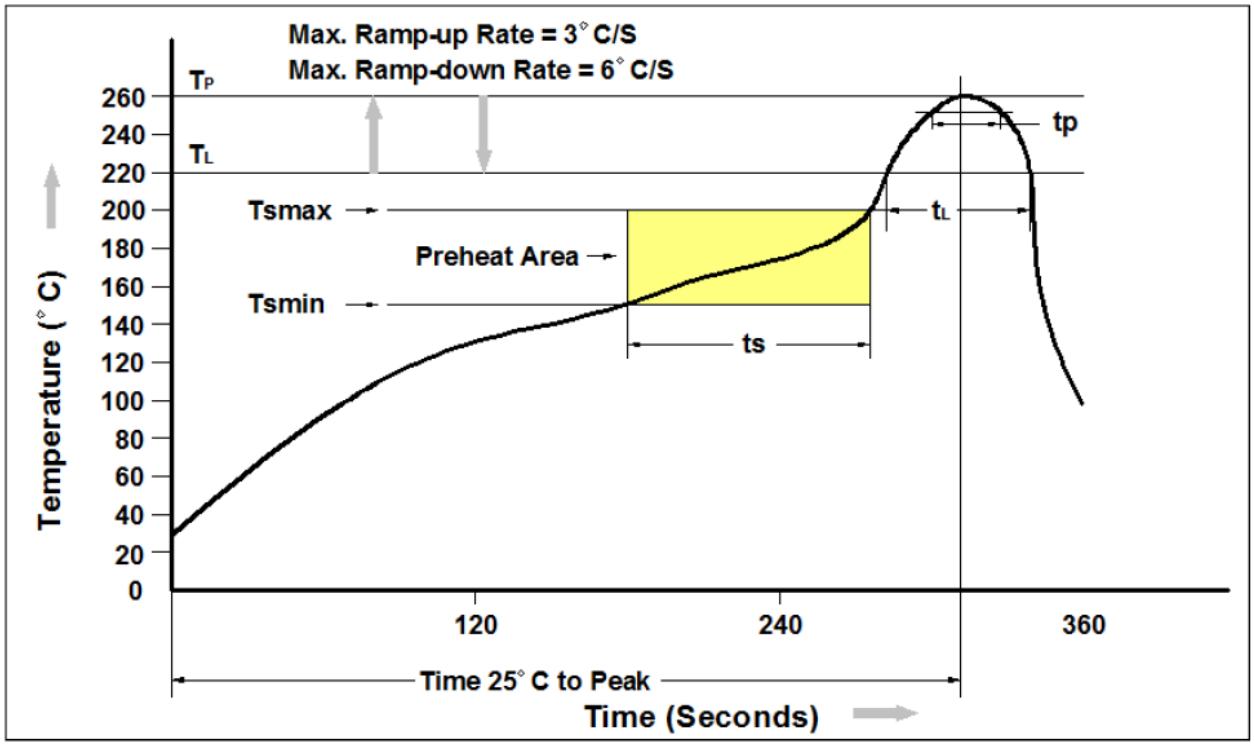



**Enable Switching Time Test Circuit**

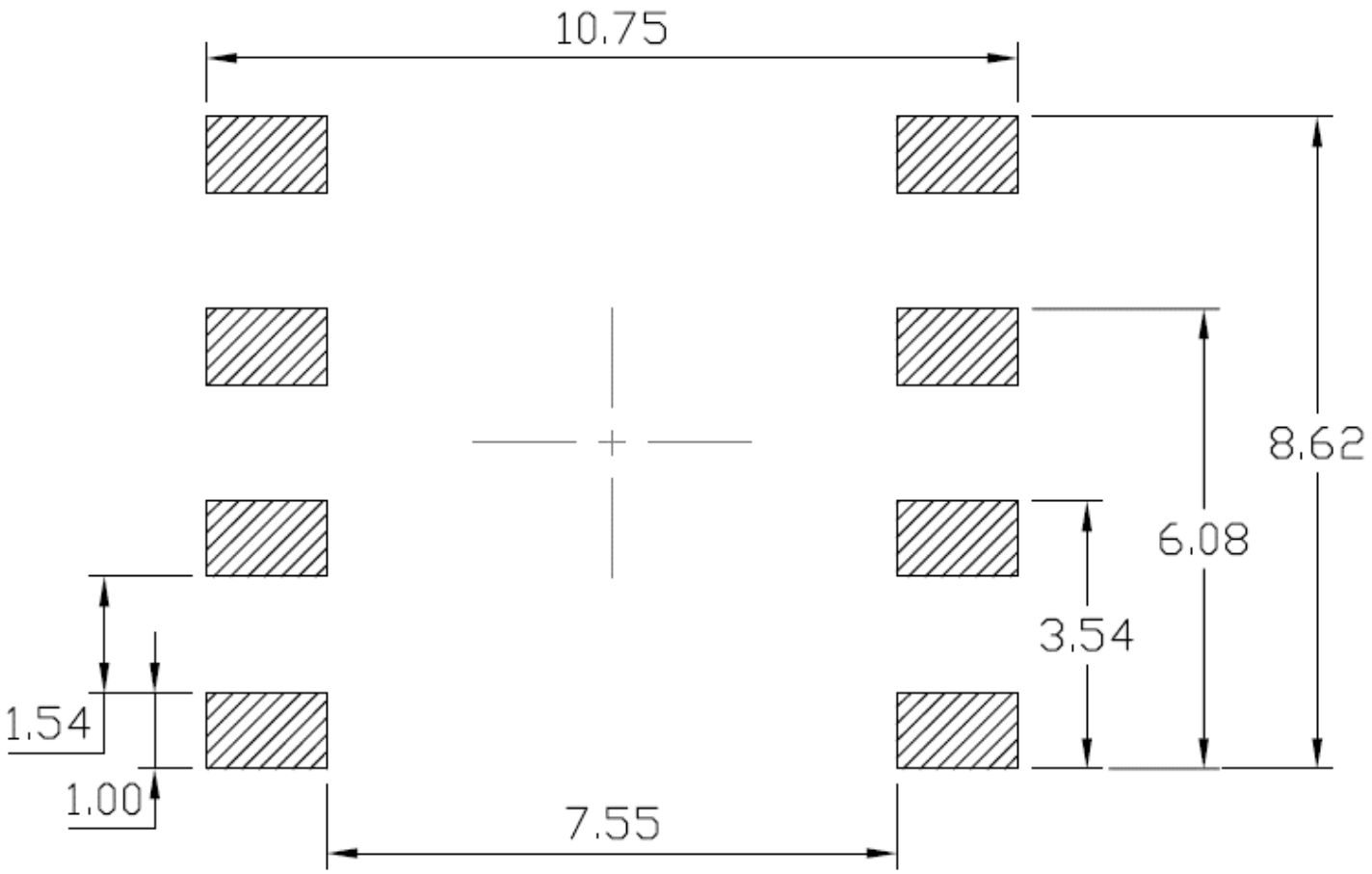



CMR Test Circuit

## Solder Profile & Footprint




| Profile Feature | Pb-Free Assembly Profile |
|---|---|
| Temperature Min. (Tsmin) | 150℃ |
| Temperature Max. (Tsmax) | 200℃ |
| Time (ts) from (Tsmin to Tsmax) | 60-120 seconds |
| Ramp-up Rate ($t_L$ to $t_P$) | 3℃/second max. |
| Liquidous Temperature ($T_L$) | 217℃ |
| Time ($t_L$) Maintained Above ($T_L$) | 60 – 150 seconds |
| Peak Body Package Temperature | 260℃ +0℃ / -5℃ |
| Time ($t_P$) within 5℃ of 260℃ | 30 seconds |
| Ramp-down Rate ($T_P$ to $T_L$) | 6℃/second max |
| Time 25℃ to Peak Temperature | 8 minutes max. |



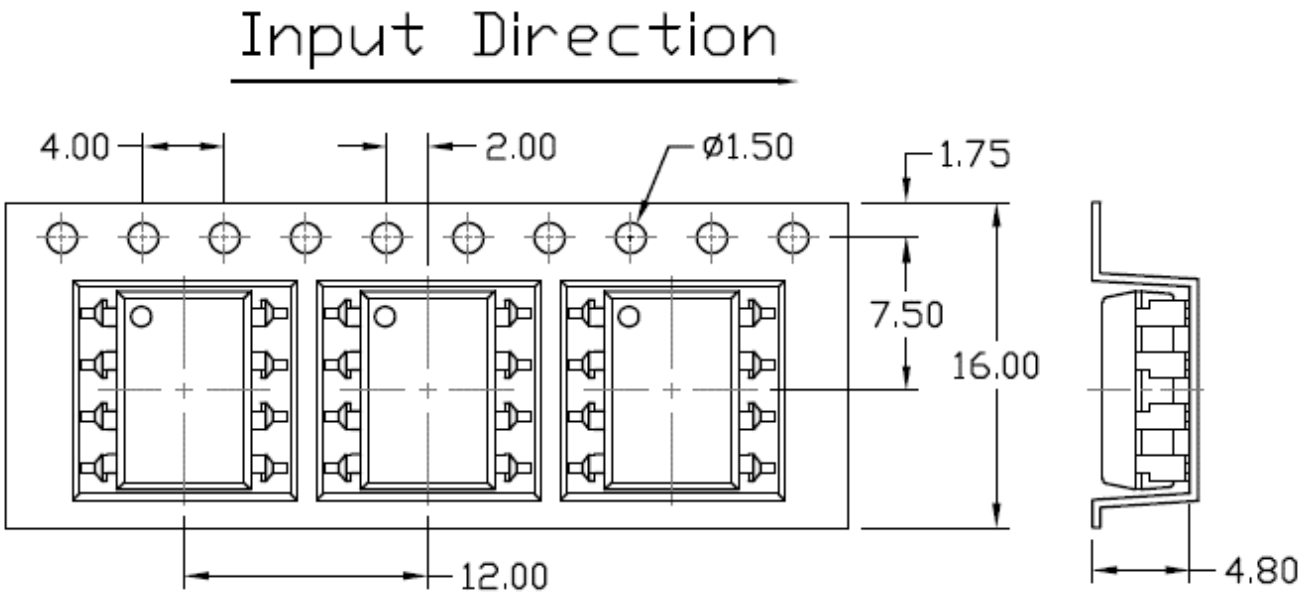

Recommended Solder Footprint for SMD Leadform

Units: mm tolerance: +/- 0.1mm

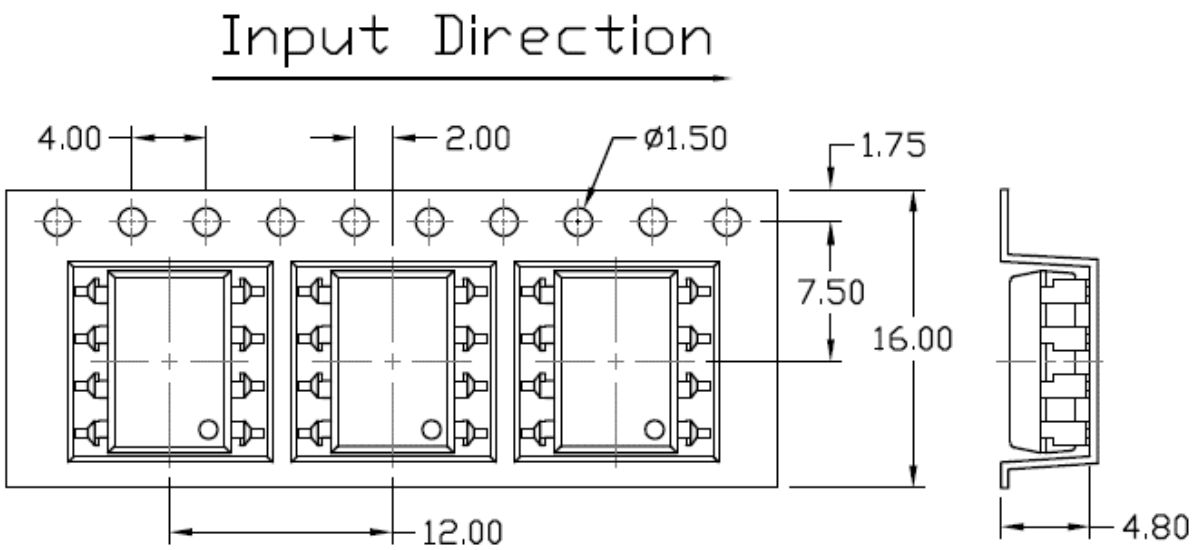
## Packing & Labeling

## Tape Dimension:

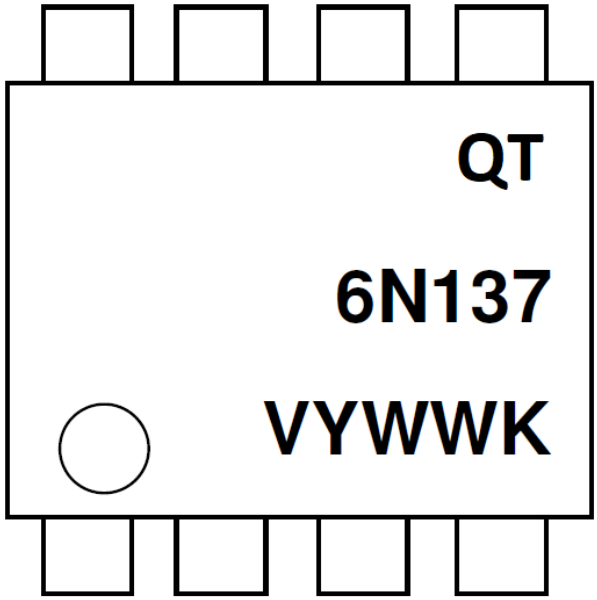
## Option ST1 & SLT1

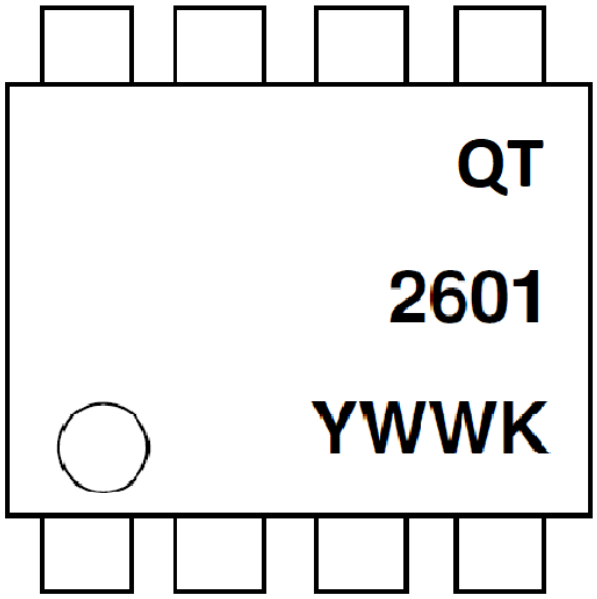



## Option ST2 & SLT2



## Device Marking




QT = QT-Brightek Corporation
6N135 or 2601 = part number
Y = Year
WW = Week
V = VDE Option
K= Manufacturing code

## Ordering Information

6N137VYZ or QT2601VYZ
V = VDE option (V or None)
Y = Lead form option (S, SL, M or none)
Z=Tape and reel option (T1 or T2)

| Option | Description | Quantity |
|---|---|---|
| None | Standard 8-Pin DIP | 40 Units/Tube |
| M | Gullwing | 40 Units/Tube |
| ST1 | Surface Mount Lead Forming – with Option 1 Taping | 1000 pcs/ reel |
| ST2 | Surface Mount Lead Forming – with Option 2 Taping | 1000 pcs/ reel |
| SLT1 | SMD (Low Profile) Lead Forming – with Option 1 Taping | 1000 pcs/ reel |
| SLT2 | SMD (Low Profile) Lead Forming – with Option 2 Taping | 1000 pcs/ reel |

## Revision History

| Description: | Revision # | Revision Date |
|---|---|---|
| Initial release of 6N137_QT2601 | 1.0 | 02/12/2018 |
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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.