# QT-Brightek Opto-Coupler Series

# 6-PIN DIP Phototransistor Optocoupler

## Part No.: 4N2X 4N3X H11AX Series

**Table of Contents:**

# Introduction

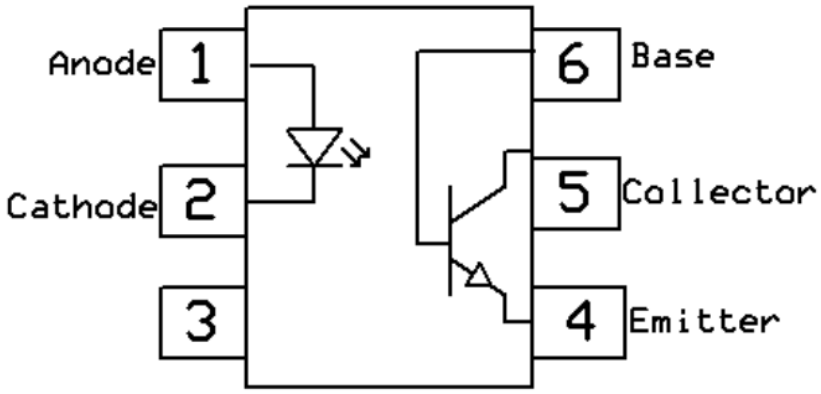
**Feature:**

- 4N2X: 4N25, 4N26, 4N27, 4N28
- 4N3X: 4N35, 4N36, 4N37, 4N38
- H11AX: H11A1, H11A2, H11A3, H11A4, H11A5
- High Isolation voltage (Viso = 5000 VRMS)
- Operating Temperature up to 100 ℃
- Meet all JEDEC specifications
- Available in standard DIP, Gullwing, and surface mount lead bend options.
- Conventional black housing package

**Certification & Compliance:**

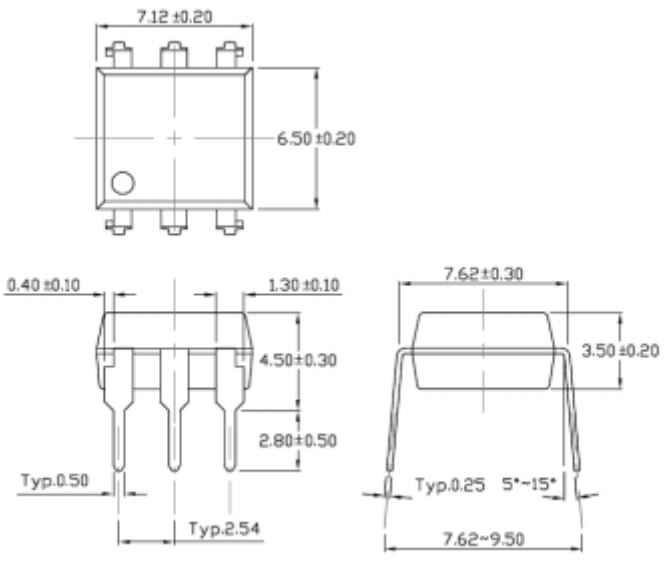
- Pb free and RoHS Compliant
- UL recognized (File #E338132)
- VDE recognized

**Schematic:**

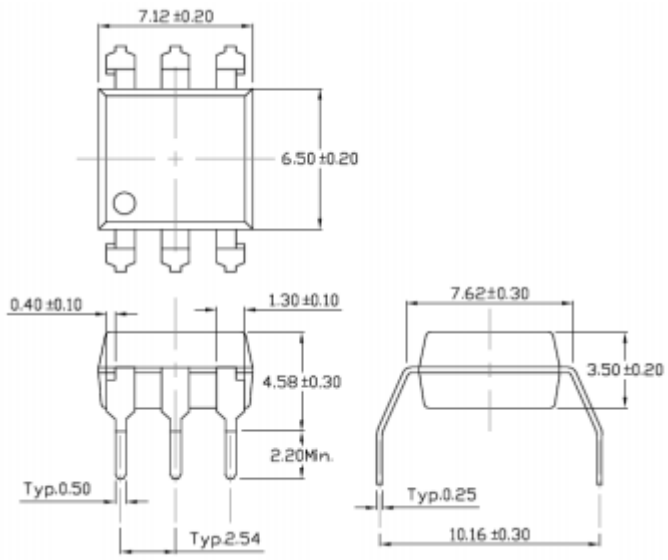


**Dimension: (Dot location indicates pin 1)**

**6-Pin DIP Through Hole (Standard):**

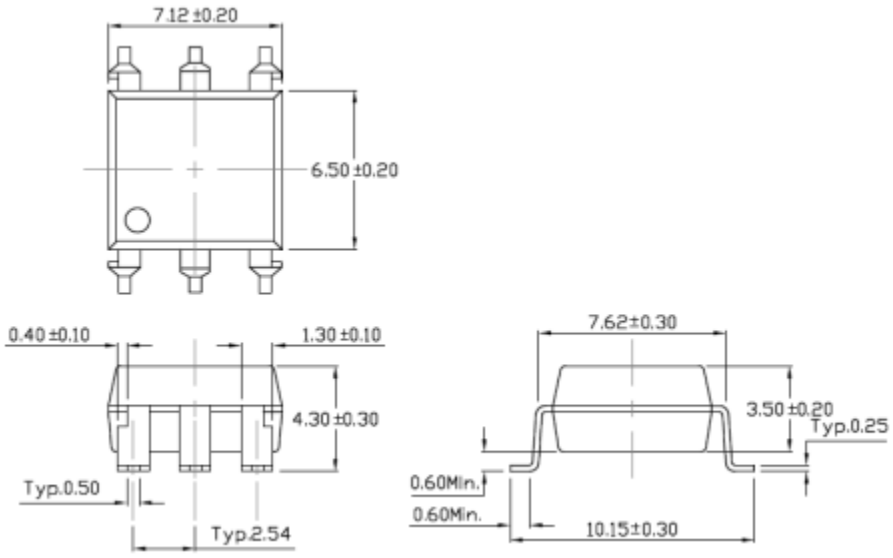



**Gullwing Lead Bend Through Hole (Option M):**

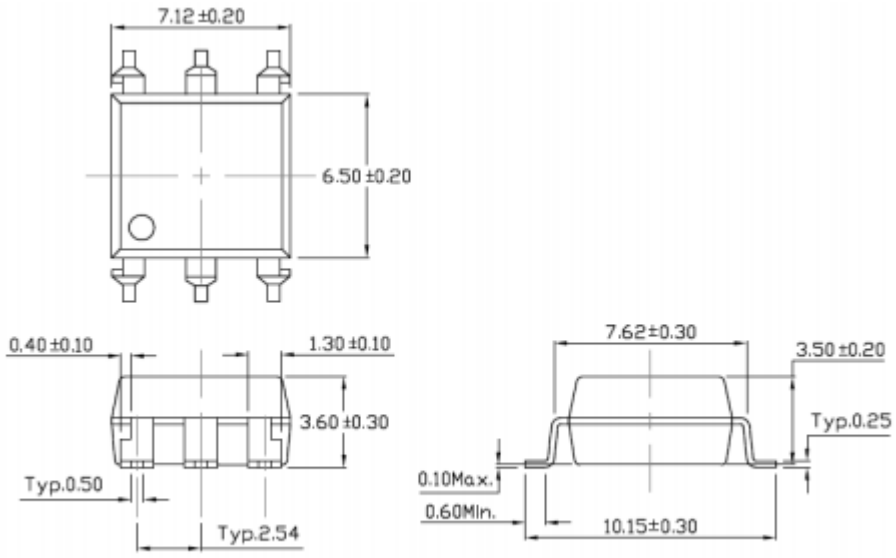



All dimensions are in mm

**SMD Lead Bend (Option S):**




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




All Dimensions are in mm

## Absolute Maximum Rating

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| $T_{STG}$ | Storage Temperature | -55 ~ +150 | ºC |
| $T_{OPR}$ | Operating Temperature | -55 ~ +110 | ºC |
| $T_{SOL}$ | Lead Solder Temperature | 260 | ºC |
| $V_{ISO}$ | Isolation voltage | 5000 | $V_{RMS}$ |
| **EMITTER** | | | |
| $I_F$ | Continuous Forward Current | 60 | mA |
| $I_{PF}$ | Peak Forward Current (300us pulse, ≤1 µs P.W) | 1 | A |
| $V_R$ | Reverse Voltage | 6 | V |
| $P_D$ | Power Dissipation | 100 | mW |
| **DETECTOR** | | | |
| $B_{VCEO}$ | Collector-Emitter Breakdown Voltage | 80 | V |
| $B_{VEBO}$ | Collector-Base Breakdown Voltage | 80 | V |
| $B_{VECO}$ | Emitter-Collector Breakdown Voltage | 7 | V |
| $B_{VEBO}$ | Emitter-Base Breakdown Voltage | 7 | V |
| $P_D$ | Power Dissipation | 150 | mW |

# Electrical Characteristic: (Ta=25°C)

## Emitter

| Symbol | Characteristic | Device | Test Condition | Range | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | |
| $V_F$ | Forward voltage | 4N2X 4N3X H11AX | $I_F$=10mA | - | 1.24 | 1.4 | V |
| $I_R$ | Reverse current | | $V_R$=6V | - | - | 5 | µA |
| $C_{IN}$ | Input Capacitance | | F=1MHz | - | 45 | - | pF |

## Detector

| Symbol | Characteristic | Device | Test Condition | Range | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | |
| $B_{VCEO}$ | Collector-Emitter Breakdown voltage | 4N2X 4N3X H11AX | $I_C$=0.1mA | 80 | - | - | V |
| $B_{VECO}$ | Emitter-Collector Breakdown | | $I_E$=0.1mA | 7 | - | - | V |
| $BV_{CBO}$ | Collector-Base Breakdown | | $I_C$=0.1mA | 80 | - | - | V |
| $BV_{EBO}$ | Emitter-Base Breakdown voltage | | $I_E$=0.1mA | 7 | - | - | V |
| $I_{CEO}$ | Collector-Emitter Dark current | 4N25, 4N26, 4N27, 4N28 H11A1, H11A2, H11A3, H11A4, H11A5 | $V_{CE}$=10V, $I_F$=0mA | - | - | 50 | nA |
| | | 4N35, 4N36, 4N37, 4N38 | $V_{CE}$=60V, $I_F$=0mA | - | - | 50 | nA |
| $I_{CBO}$ | Collector-Base Dark Current | 4N2X, 4N3X, H11AX | $V_{CB}$=10V, $I_F$=0mA | - | - | 20 | nA |

## DC Transfer Characteristic

| Symbol | Characteristic | Device | Test Condition | Range | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | |
| CTR | Current Transfer Ratio | 4N35, 4N36, 4N37 | $I_F$=10mA, $V_{CE}$=10V | 100 | - | - | % |
| | | 4N25, 4N26, 4N38, H11A2, H11A3 | | 20 | - | - | |
| | | 4N27, 4N28, H11A4 | | 10 | - | - | |
| | | H11A1 | | 50 | - | - | |
| | | H11A5 | | 30 | - | - | |
| $V_{CE(Sat)}$ | Collector-Emitter Saturation Voltage | 4N25,4N26, 4N27,4N28 | $I_F$=50mA, $I_C$=2mA | - | - | 0.5 | V |
| | | 4N35,4N36,4N37 | $I_F$=10mA, $I_C$=0.5mA | - | - | 0.3 | |
| | | H11A1, H11A2, H11A3, H11A4, H11A5 | | - | - | 0.4 | |
| | | 4N38 | $I_F$=20mA, $I_C$=4mA | - | - | 1.0 | |
| $R_{IO}$ | Isolation Resistance | 4N2X, 4N3X, H11AX | $V_{IO}$=500VDC | $1x10^{11}$ | | | Ω |
| $C_{IO}$ | Isolation Capacitance | 4N2X, 4N3X, H11AX | f=1MHz | - | 0.25 | - | pF |

## AC Switching Characteristics

| Symbol | Characteristic | Device | Test Condition | Range | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | |
| $T_{on}$ | Turn on time | 4N25, 4N26, 4N27, 4N28, H11A1, H11A2, H11A3, H11A4, H11A5 | $I_F$=10mA, $V_{CC}$=10V, $R_L$=100Ω | - | 4.3 | 9.8 | µs |
| | | 4N35, 4N36, 4N37, 4N38 | $I_C$=2mA, $V_{CC}$=10V, $R_L$=100Ω | - | 9.8 | 11.5 | |
| $T_{off}$ | Turn off time | 4N25, 4N26, 4N27, 4N28 H11A1, H11A2, H11A3, H11A4 H11A5 | $V_{CC}$=10V, $I_C$=10mA, $R_L$=100Ω | - | 3.9 | 9.8 | µs |
| | | 4N35, 4N36, 4N37, 4N38 | $V_{CC}$=10V, Ic=10mA, $R_L$=100Ω | - | 6.9 | 11.5 | |

## Characteristic Curves

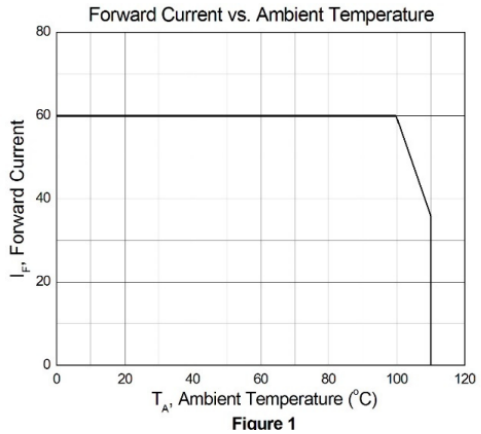


Figure 1

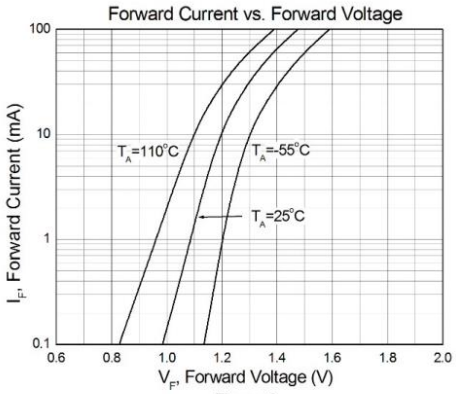


Figure 2

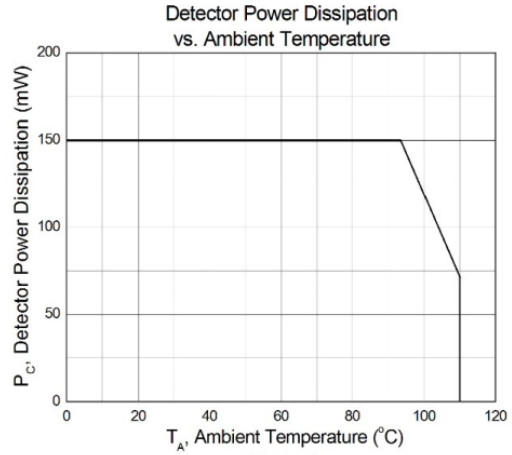


Figure 3

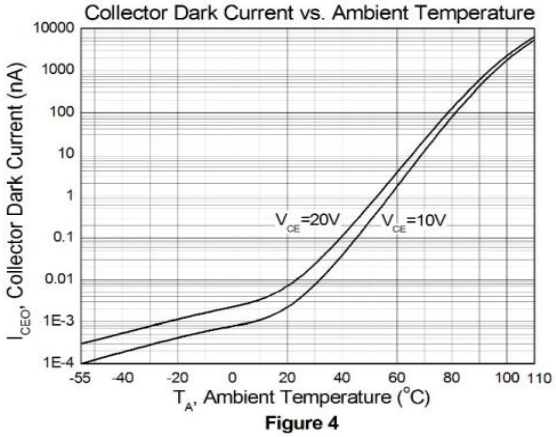


Figure 4

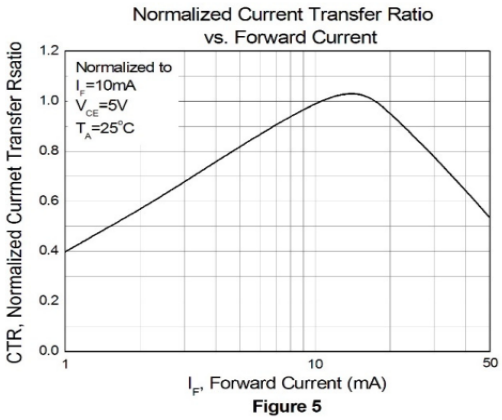


Figure 5

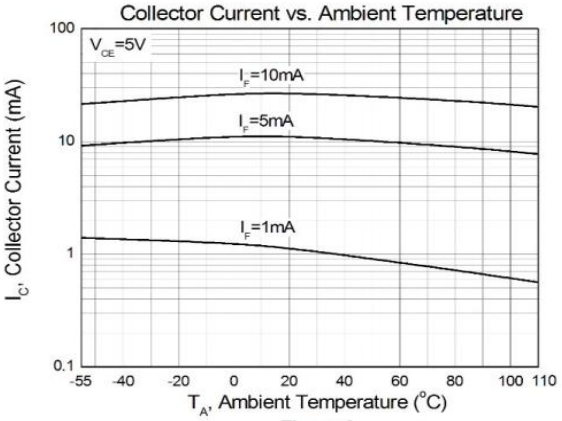


Figure 6

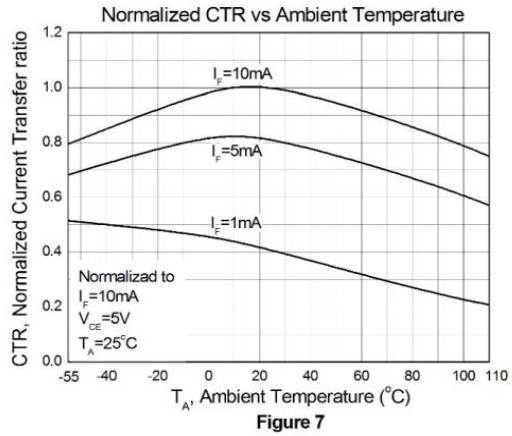



**Figure 7**

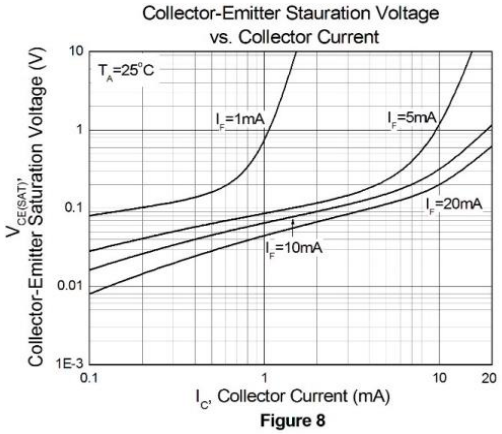



**Figure 8**

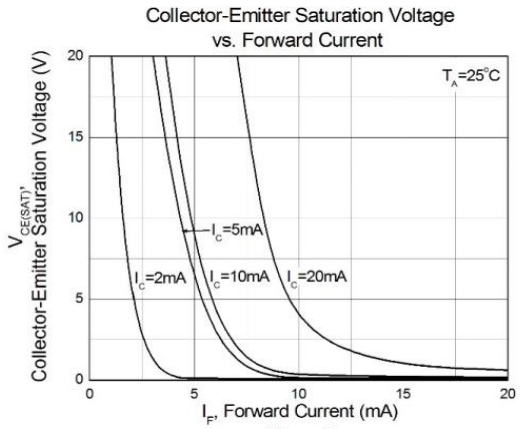



**Figure 9**

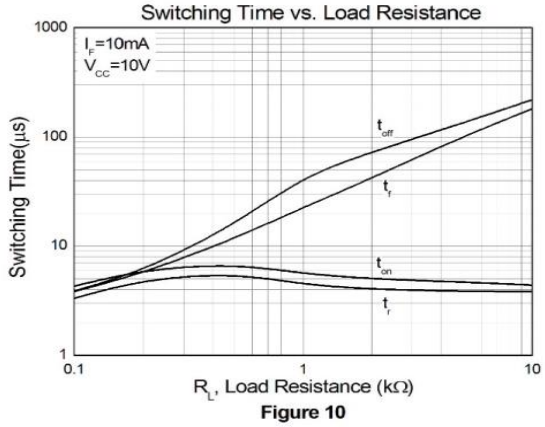



**Figure 10**

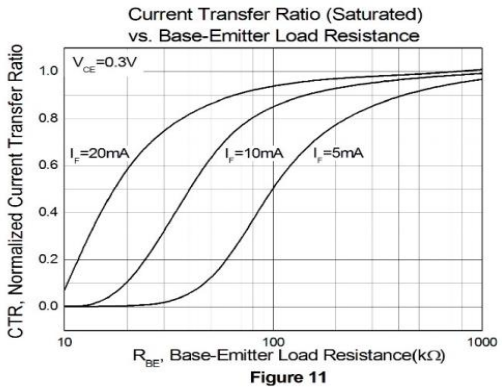



**Figure 11**

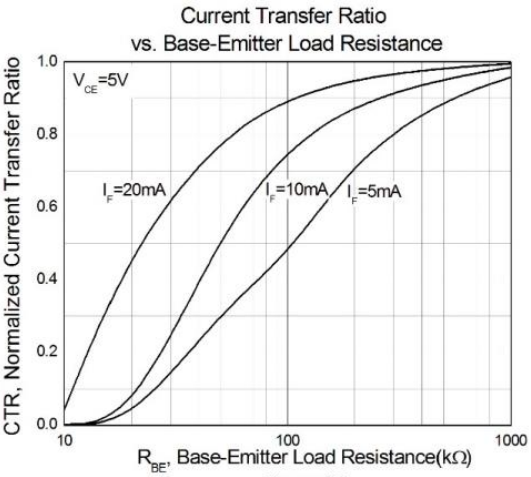



**Figure 12**

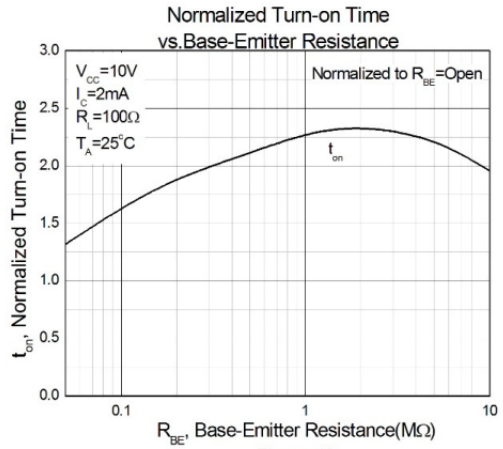



**Figure 13**

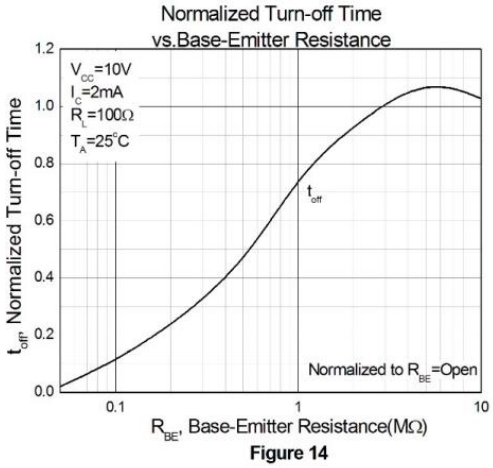
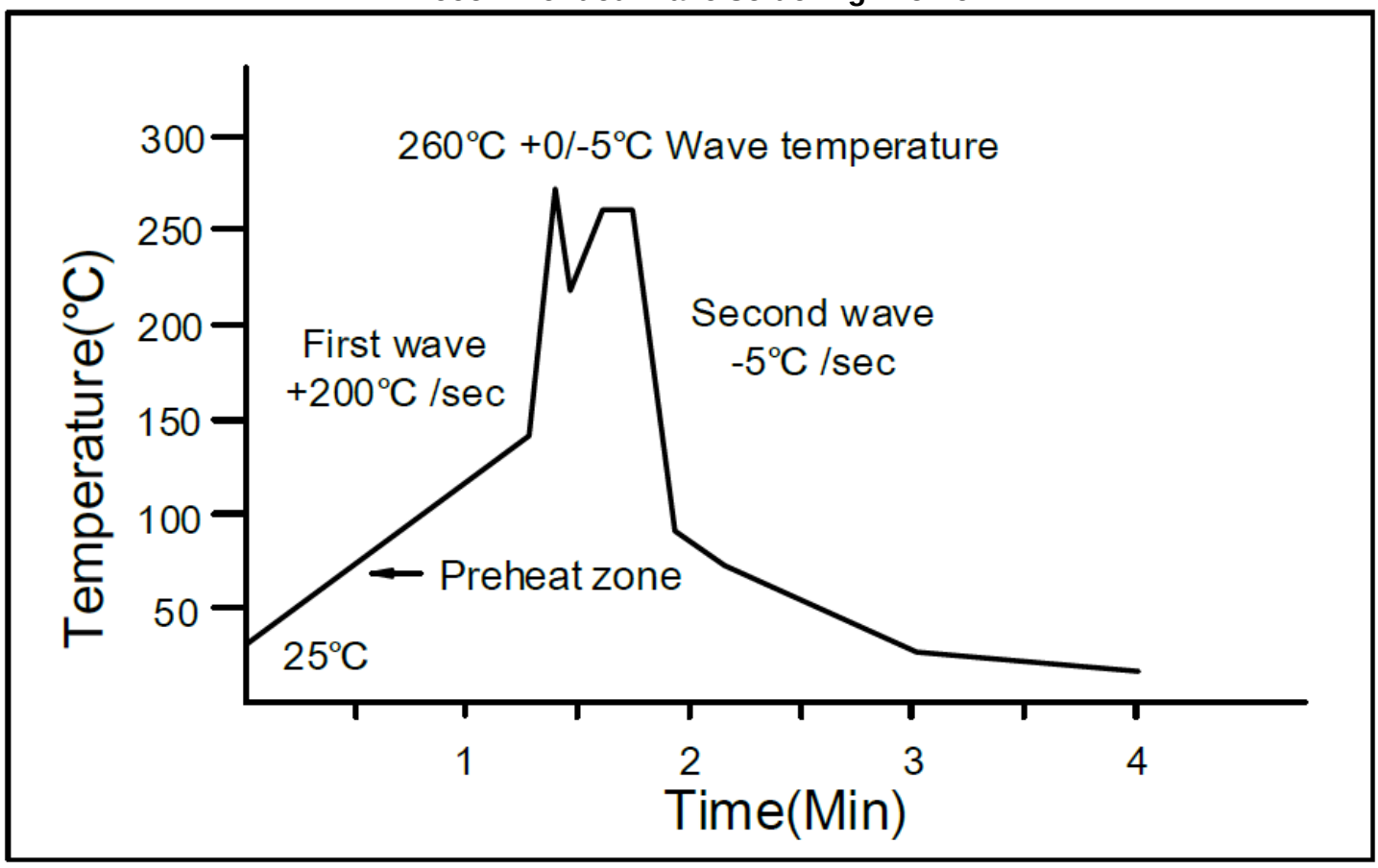



**Figure 14**

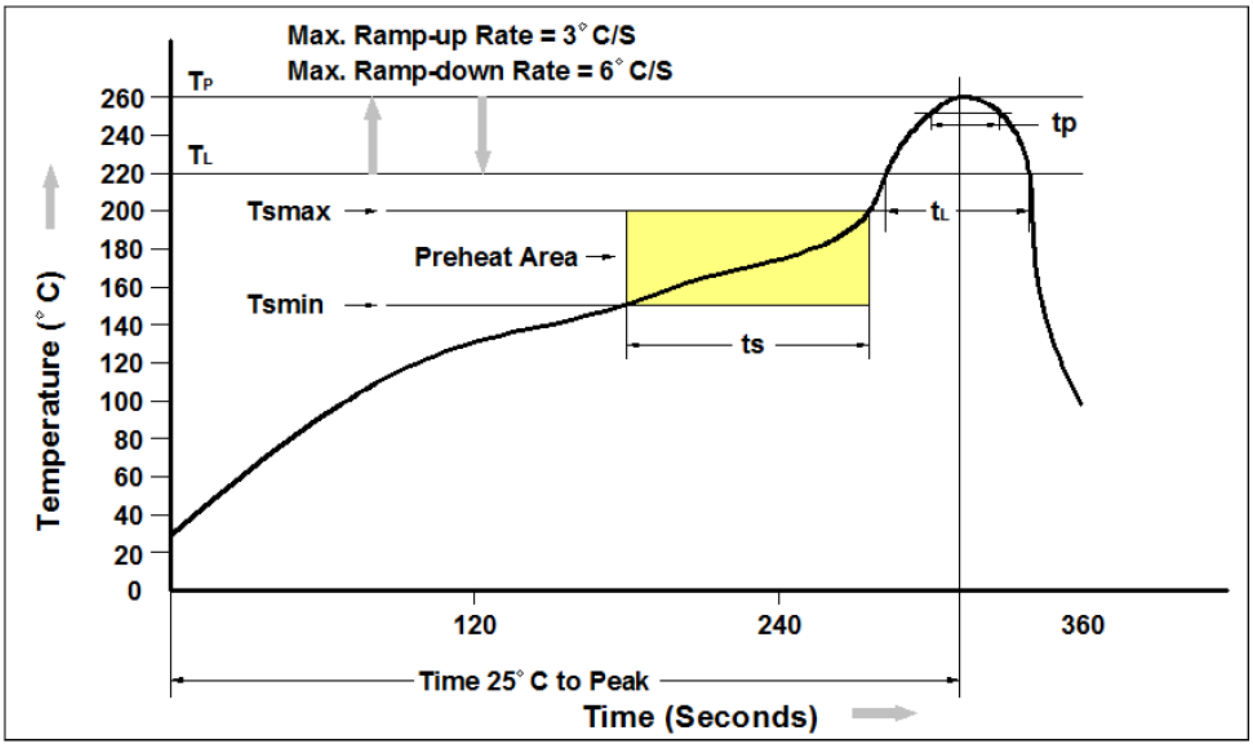
## Solder Profile & Footprint

**Recommended Wave soldering Profile**




Temperature: 260 +0/-5 $^{o}$C
Time: 10 sec
Preheat temperature: 25 to 140 $^{o}$C
Preheat time: 30 to 80 sec.

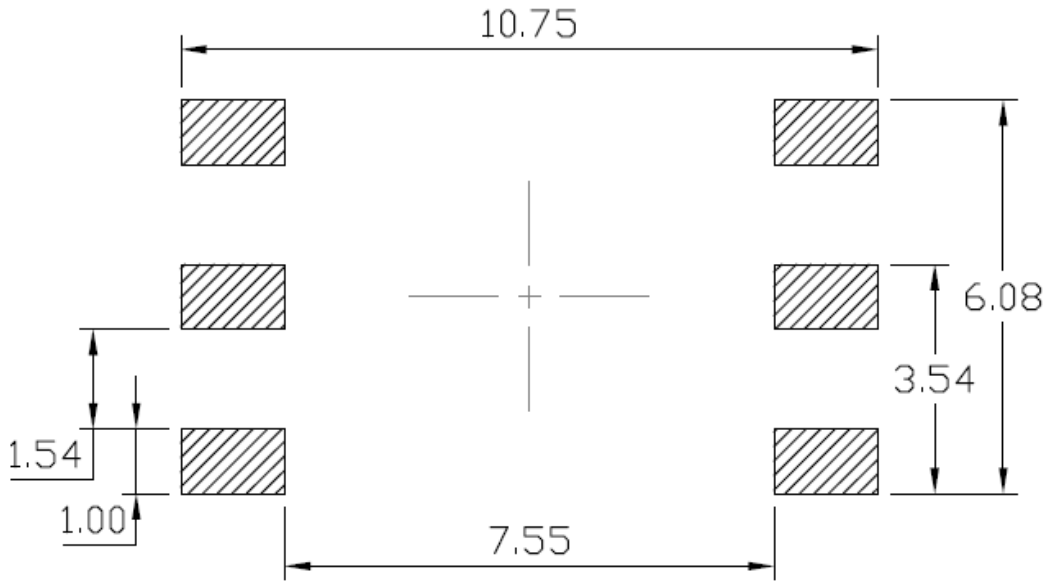
## Recommended Reflow soldering Profile




| 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. |

## Solder Profile & Footprint

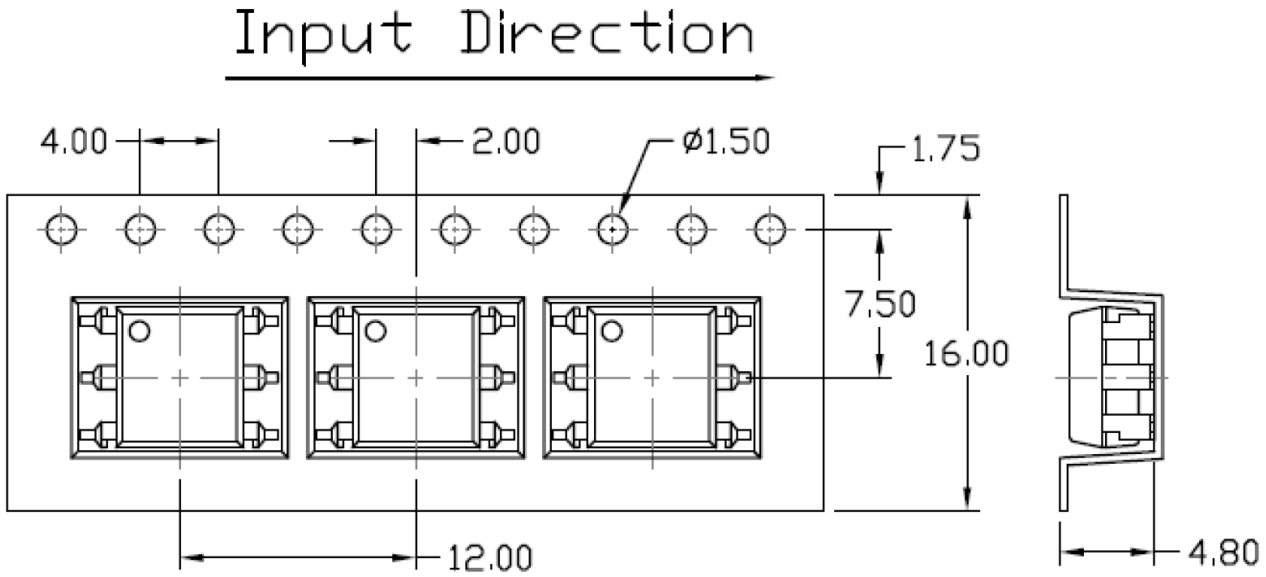
**Recommended Solder Pattern for SMD**



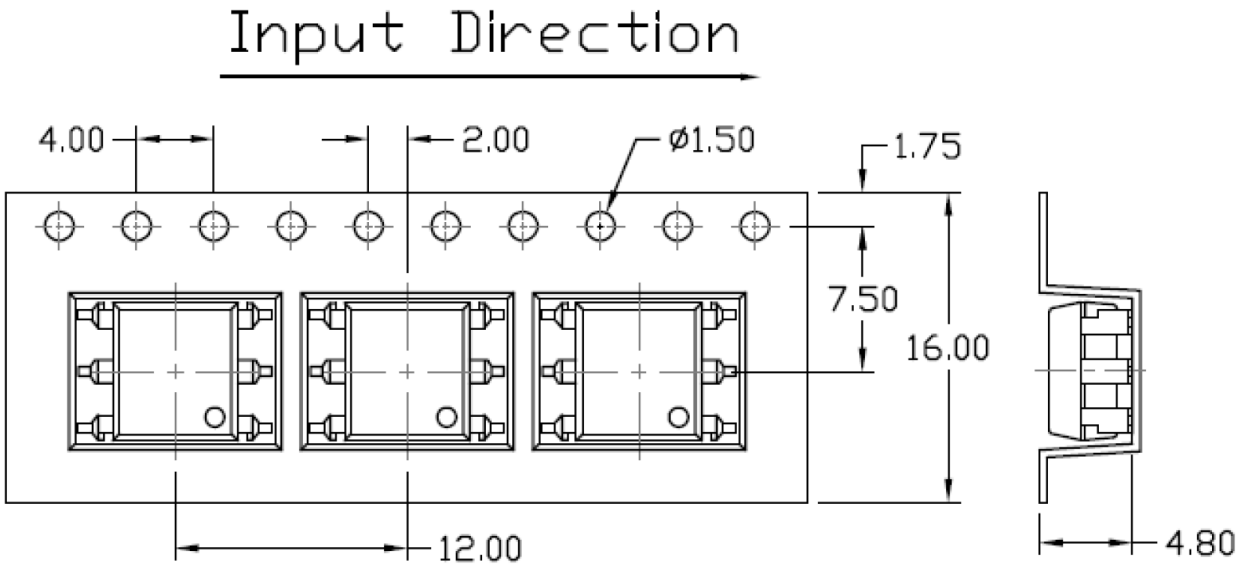

Units: mm

## Packing & Labeling

### Option 1: ST1 & SLT1

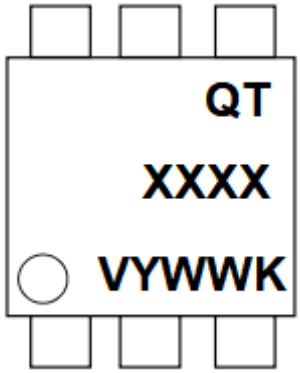



### Option 2: ST2 & SLT2



## Device Marking

**Example**




QT = QT-Brightek Corporation
XXXX = Part Number (4N25, 4N26, 4N27, 4N28, 4N35, 4N36, 4N37, 4N38, H11A1, H11A2, H11A3, H11A4, H11A5)
V = VDE Option
WW = Week
K = Manufacturing code

## Ordering Information

4N2XVYZ, 4N3XVYZ
X = Part number (X=5, 6, 7 or 8)
V = VDE option (V or None)
Y = Lead form option (S, SL, M or none)
Z = Tape and reel option (T1 or T2 or none)

H11AXVYZ
X = Part number (X=1, 2, 3, 4 or 5)
V = VDE option (V or None)
Y = Lead form option (S, SL, M or none)
Z = Tape and reel option (T1 or T2 or none)

| Option | Description | Quantity |
|---|---|---|
| None | Standard 6-Pin DIP | 50 units/tube |
| M | Gullwing Lead Bend | 50 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 4N25, 4N26, 4N27, 4N28, 4N35, 4N36, 4N37, 4N38, H11A1, H11A2, H11A3, H11A4, H11A5 series | 1.0 | 4/27/2010 |
| Feature, certification & compliance and ordering information updates | 1.1 | 02/01/2011 |
| Update specs, format, and packing method | 2.0 | 02/28/2018 |
| | | |
| | | |

## Disclaimer

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1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.

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.