

# 3-Level NPC Inverter Module

## Product Preview

### NXH600N105H7F5S2HG, NXH600N105H7F5P2HG

The NXH600N105H7F5S2HG/P2HG is a power module in F5BP package containing an I-type neutral point clamped three-level inverter. The integrated field stop trench IGBTs and FRDs provide lower conduction and switching losses, enabling designers to achieve high efficiency, high power density and superior reliability.

#### Features

- I-type Neutral Point Clamped Three-level Inverter Module
- 1050 V Field Stop 7 IGBTs
- Low Inductive Layout
- Solder Pins and Press Fit Pins
- Integrated NTC Thermistor
- These Devices are Pb-Free, Halide Free and are RoHS Compliant

#### Typical Applications

- Energy Storage System
- Solar Inverter
- Uninterruptable Power Supplies Systems

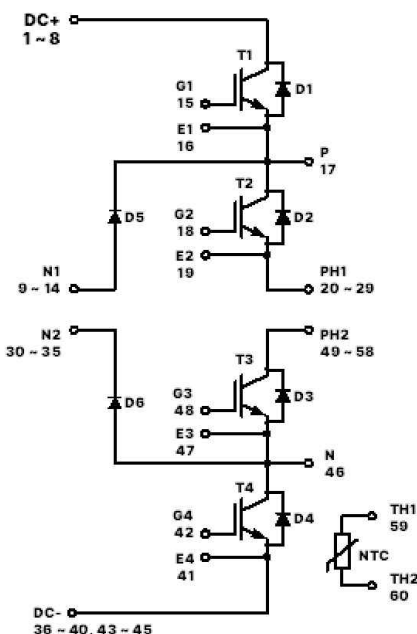
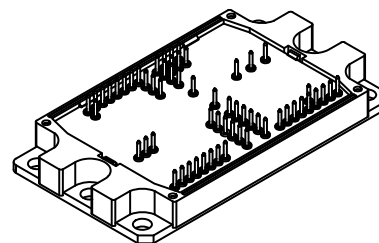
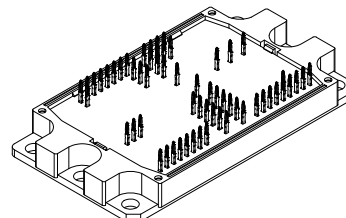


Figure 1. NXH600N105H7F5S2HG/P2HG Schematic Diagram

This document contains information on a product under development. onsemi reserves the right to change or discontinue this product without notice.

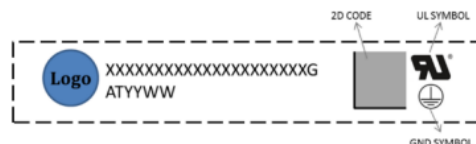


PIM60 112.00x62.00x12.00  
CASE 180CW



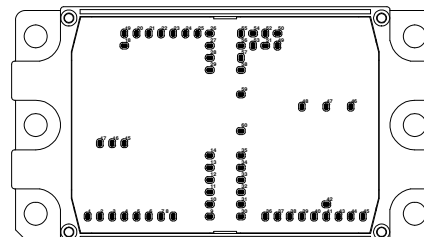
PIM60 112.00x62.00x12.00  
CASE 180HY

#### MARKING DIAGRAM



XXXXX = Device Code  
G = Pb-Free Package  
AT = Assembly & Test Site Code  
YYWW = Year and Work Week Code

#### PIN CONNECTIONS



#### ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

# NXH600N105H7F5S2HG, NXH600N105H7F5P2HG

## MODULE CHARACTERISTICS

|                                                   |            |            |           |
|---------------------------------------------------|------------|------------|-----------|
| Operating Temperature under Switching Condition   | $T_{VJOP}$ | -40 to 150 | °C        |
| Storage Temperature Range                         | $T_{stg}$  | -40 to 125 | °C        |
| Isolation Test Voltage, $t = 2$ s, 50 Hz (Note 1) | $V_{is}$   | 4800       | $V_{RMS}$ |
| Stray Inductance                                  | $L_s$ CE   | 15         | nH        |
| Terminal Connection Torque (M5, Screw)            | M          | 3 to 5     | Nm        |
| Weight                                            | G          | 245        | g         |
| Creepage Distance (Terminal to Heatsink)          |            | 17.46      | mm        |
| Creepage Distance (Terminal to Terminal)          |            | 6.48       | mm        |
| Clearance Distance (Terminal to Heatsink)         |            | 15.62      | mm        |
| Clearance Distance (Terminal to Terminal)         |            | 5.05       | mm        |
| Comparative Tracking Index                        | CTI        | >600       |           |

1. 4800  $V_{ACRMS}$  for 2 second duration is equivalent to 4000  $V_{ACRMS}$  for 1 minute duration.

## MAXIMUM RATINGS ( $T_J = 25$ °C unless otherwise noted)

| Symbol | Parameter | Value | Unit |
|--------|-----------|-------|------|
|--------|-----------|-------|------|

### OUTER IGBT (T1, T4)

|              |                                                                                                    |                |    |
|--------------|----------------------------------------------------------------------------------------------------|----------------|----|
| $V_{CES}$    | Collector-Emitter Voltage                                                                          | 1050           | V  |
| $V_{GE}$     | Gate-Emitter Voltage<br>Positive Transient Gate-Emitter Voltage ( $T_{pulse} = 5$ ms, $D < 0.10$ ) | $\pm 20$<br>30 | V  |
| $I_C$        | Continuous Collector Current @ $T_c = 80$ °C ( $T_J = 175$ °C)                                     | 429            | A  |
| $I_{Cpulse}$ | Pulsed Peak Collector Current @ $T_c = 80$ °C ( $T_J = 175$ °C), $T_{pulse} = 1$ ms                | 1287           | A  |
| $P_{tot}$    | Power Dissipation ( $T_J = 175$ °C, $T_c = 80$ °C)                                                 | 1080           | W  |
| $T_{JMIN}$   | Minimum Operating Junction Temperature                                                             | -40            | °C |
| $T_{JMAX}$   | Maximum Operating Junction Temperature                                                             | 175            | °C |

### INNER IGBT (T2, T3)

|              |                                                                                                    |           |    |
|--------------|----------------------------------------------------------------------------------------------------|-----------|----|
| $V_{CES}$    | Collector-Emitter Voltage                                                                          | 1050      | V  |
| $V_{GE}$     | Gate-Emitter Voltage<br>Positive Transient Gate-Emitter Voltage ( $T_{pulse} = 5$ ms, $D < 0.10$ ) | +20<br>30 | V  |
| $I_C$        | Continuous Collector Current @ $T_c = 80$ °C ( $T_J = 175$ °C)                                     | 433       | A  |
| $I_{Cpulse}$ | Pulsed Peak Collector Current @ $T_c = 80$ °C ( $T_J = 175$ °C), $T_{pulse} = 1$ ms                | 1299      | A  |
| $P_{tot}$    | Power Dissipation ( $T_J = 175$ °C, $T_c = 80$ °C)                                                 | 1080      | W  |
| $T_{JMIN}$   | Minimum Operating Junction Temperature                                                             | -40       | °C |
| $T_{JMAX}$   | Maximum Operating Junction Temperature                                                             | 175       | °C |

### SIC NEUTRAL POINT DIODE (D5, D6)

|            |                                                                       |      |    |
|------------|-----------------------------------------------------------------------|------|----|
| $V_{RRM}$  | Peak Repetitive Reverse Voltage                                       | 1050 | V  |
| $I_F$      | Continuous Forward Current @ $T_c = 80$ °C ( $T_J = 175$ °C)          | 192  | A  |
| $I_{FRM}$  | Repetitive Peak Forward Current ( $T_J = 175$ °C), $T_{pulse} = 1$ ms | 576  | A  |
| $P_{tot}$  | Maximum Power Dissipation @ $T_c = 80$ °C ( $T_J = 175$ °C)           | 419  | W  |
| $T_{JMIN}$ | Minimum Operating Junction Temperature                                | -40  | °C |
| $T_{JMAX}$ | Maximum Operating Junction Temperature                                | 175  | °C |

### INVERSE DIODES (D1, D2, D3, D4)

|           |                                                                       |      |   |
|-----------|-----------------------------------------------------------------------|------|---|
| $V_{RRM}$ | Peak Repetitive Reverse Voltage                                       | 1050 | V |
| $I_F$     | Continuous Forward Current @ $T_c = 80$ °C ( $T_J = 175$ °C)          | 196  | A |
| $I_{FRM}$ | Repetitive Peak Forward Current ( $T_J = 175$ °C), $T_{pulse} = 1$ ms | 588  | A |

# NXH600N105H7F5S2HG, NXH600N105H7F5P2HG

## MAXIMUM RATINGS (T<sub>J</sub> = 25 °C unless otherwise noted) (continued)

| Symbol                                 | Parameter                                                                    | Value | Unit |
|----------------------------------------|------------------------------------------------------------------------------|-------|------|
| <b>INVERSE DIODES (D1, D2, D3, D4)</b> |                                                                              |       |      |
| P <sub>tot</sub>                       | Maximum Power Dissipation @ T <sub>c</sub> = 80 °C (T <sub>J</sub> = 175 °C) | 434   | W    |
| T <sub>JMIN</sub>                      | Minimum Operating Junction Temperature                                       | -40   | °C   |
| T <sub>JMAX</sub>                      | Maximum Operating Junction Temperature                                       | 175   | °C   |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

2. Refer to ELECTRICAL CHARACTERISTICS, RECOMMENDED OPERATING RANGES and/or APPLICATION INFORMATION for Safe Operating parameters

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25 °C unless otherwise noted)

| Symbol                     | Parameter                             | Test Conditions                                                                                                                                                          | Min | Typ   | Max | Unit |
|----------------------------|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-------|-----|------|
| <b>OUTER IGBT (T1, T4)</b> |                                       |                                                                                                                                                                          |     |       |     |      |
| I <sub>CES</sub>           | Collector-Emitter Cutoff Current      | V <sub>GE</sub> = 0 V, V <sub>CE</sub> = 1050 V                                                                                                                          | –   | –     | 500 | μA   |
| V <sub>CE(sat)</sub>       | Collector-Emitter Saturation Voltage  | V <sub>GE</sub> = 15 V, I <sub>C</sub> = 600 A, T <sub>J</sub> = 25 °C                                                                                                   | –   | 1.6   | 2.3 | V    |
|                            |                                       | V <sub>GE</sub> = 15 V, I <sub>C</sub> = 600 A, T <sub>J</sub> = 150 °C                                                                                                  | –   | 2.0   | –   |      |
| V <sub>GE(TH)</sub>        | Gate-Emitter Threshold Voltage        | V <sub>GE</sub> = V <sub>CE</sub> , I <sub>C</sub> = 600 mA                                                                                                              | 4.0 | 5.5   | 6.9 | V    |
| I <sub>GES</sub>           | Gate Leakage Current                  | V <sub>GE</sub> = 20 V, V <sub>CE</sub> = 0 V                                                                                                                            | –   | –     | 1   | μA   |
| R <sub>g</sub>             | Internal Gate Resistor                |                                                                                                                                                                          | –   | 0.58  | –   | Ω    |
|                            | Turn-off safe operating area          | V <sub>CC</sub> < 800 V, R <sub>G (off)</sub> ≥ 30 Ω, T <sub>vj</sub> < 150 °C                                                                                           | –   | 800   | –   | A    |
| t <sub>d(on)</sub>         | Turn-on Delay Time                    | T <sub>J</sub> = 25 °C<br>V <sub>CE</sub> = 600 V, I <sub>C</sub> = 200 A<br>V <sub>GE</sub> = -9 V to +15 V, R <sub>G (on)</sub> = 9 Ω,<br>R <sub>G (off)</sub> = 18 Ω  | –   | 260   | –   | ns   |
| t <sub>r</sub>             | Rise Time                             |                                                                                                                                                                          | –   | 60    | –   |      |
| t <sub>d(off)</sub>        | Turn-off Delay Time                   |                                                                                                                                                                          | –   | 1264  | –   |      |
| t <sub>f</sub>             | Fall Time                             |                                                                                                                                                                          | –   | 15    | –   |      |
| E <sub>on</sub>            | Turn-on Switching Loss per Pulse      |                                                                                                                                                                          | –   | 6570  | –   | μJ   |
| E <sub>off</sub>           | Turn-off Switching Loss per Pulse     |                                                                                                                                                                          | –   | 9400  | –   |      |
| t <sub>d(on)</sub>         | Turn-on Delay Time                    | T <sub>J</sub> = 125 °C<br>V <sub>CE</sub> = 600 V, I <sub>C</sub> = 200 A<br>V <sub>GE</sub> = -9 V to +15 V, R <sub>G (on)</sub> = 9 Ω,<br>R <sub>G (off)</sub> = 18 Ω | –   | 230   | –   | ns   |
| t <sub>r</sub>             | Rise Time                             |                                                                                                                                                                          | –   | 63    | –   |      |
| t <sub>d(off)</sub>        | Turn-off Delay Time                   |                                                                                                                                                                          | –   | 1369  | –   |      |
| t <sub>f</sub>             | Fall Time                             |                                                                                                                                                                          | –   | 9.8   | –   |      |
| E <sub>on</sub>            | Turn-on Switching Loss per Pulse      |                                                                                                                                                                          | –   | 7130  | –   | μJ   |
| E <sub>off</sub>           | Turn-off Switching Loss per Pulse     |                                                                                                                                                                          | –   | 11860 | –   |      |
| C <sub>ies</sub>           | Input Capacitance                     | V <sub>CE</sub> = 20 V, V <sub>GE</sub> = 0 V, f = 100 kHz                                                                                                               | –   | 48843 | –   | pF   |
| C <sub>oes</sub>           | Output Capacitance                    |                                                                                                                                                                          | –   | 1767  | –   |      |
| C <sub>res</sub>           | Reverse Transfer Capacitance          |                                                                                                                                                                          | –   | 281   | –   |      |
| Q <sub>g</sub>             | Total Gate Charge                     | V <sub>CE</sub> = 600 V, I <sub>C</sub> = 57 A, V <sub>GE</sub> = -15/+20 V                                                                                              | –   | 2988  | –   | nC   |
| R <sub>thJH</sub>          | Thermal Resistance – Chip-to-heatsink | Thermal grease, Thickness = 2 Mil ±2%,<br>λ = 2.87 W/mK                                                                                                                  | –   | 0.139 | –   | °C/W |
| R <sub>thJC</sub>          | Thermal Resistance – Chip-to-case     |                                                                                                                                                                          | –   | 0.088 | –   | °C/W |

## SIC NEUTRAL POINT DIODE (D5, D6)

|                  |                                       |                                                                                                                                         |   |     |      |      |
|------------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|---|-----|------|------|
| V <sub>F</sub>   | Diode Forward Voltage                 | I <sub>F</sub> = 200 A, T <sub>J</sub> = 25 °C                                                                                          | – | 1.6 | 1.75 | V    |
|                  |                                       | I <sub>F</sub> = 200 A, T <sub>J</sub> = 150 °C                                                                                         | – | 2.1 | –    |      |
| t <sub>rr</sub>  | Reverse Recovery Time                 | T <sub>J</sub> = 25 °C<br>V <sub>CE</sub> = 600 V, I <sub>C</sub> = 200 A<br>V <sub>GE</sub> = -9 V to +15 V, R <sub>G (on)</sub> = 9 Ω | – | 20  | –    | ns   |
| Q <sub>rr</sub>  | Reverse Recovery Charge               |                                                                                                                                         | – | 400 | –    | nC   |
| I <sub>RRM</sub> | Peak Reverse Recovery Current         |                                                                                                                                         | – | 24  | –    | A    |
| di/dt            | Peak Rate of Fall of Recovery Current |                                                                                                                                         | – | 2.5 | –    | A/ns |
| E <sub>rr</sub>  | Reverse Recovery Energy               |                                                                                                                                         | – | 117 | –    | μJ   |

# NXH600N105H7F5S2HG, NXH600N105H7F5P2HG

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25 °C unless otherwise noted) (continued)

| Symbol                                  | Parameter                             | Test Conditions                                                                                                                           | Min | Typ   | Max | Unit |
|-----------------------------------------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|-----|-------|-----|------|
| <b>SIC NEUTRAL POINT DIODE (D5, D6)</b> |                                       |                                                                                                                                           |     |       |     |      |
| t <sub>rr</sub>                         | Reverse Recovery Time                 | T <sub>J</sub> = 125 °C<br>V <sub>CE</sub> = 600 V, I <sub>C</sub> = 200 A<br>V <sub>GE</sub> = -9 V to +15 V, R <sub>G (off)</sub> = 9 Ω | –   | 23    | –   | ns   |
| Q <sub>rr</sub>                         | Reverse Recovery Charge               |                                                                                                                                           | –   | 500   | –   | nC   |
| I <sub>RRM</sub>                        | Peak Reverse Recovery Current         |                                                                                                                                           | –   | 29    | –   | A    |
| di/dt                                   | Peak Rate of Fall of Recovery Current |                                                                                                                                           | –   | 2.4   | –   | A/ns |
| E <sub>rr</sub>                         | Reverse Recovery Energy               |                                                                                                                                           | –   | 150   | –   | μJ   |
| R <sub>thJH</sub>                       | Thermal Resistance – Chip-to-heatsink | Thermal grease, Thickness = 2 Mil ±2%,<br>λ = 2.87 W/mK                                                                                   | –   | 0.297 | –   | K/W  |
| R <sub>thJC</sub>                       | Thermal Resistance – Chip-to-case     |                                                                                                                                           | –   | 0.227 | –   | °C/W |

## INNER IGBT (T2, T3)

|                      |                                       |                                                                                                                                                                          |     |       |     |      |
|----------------------|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-------|-----|------|
| I <sub>CES</sub>     | Collector-Emitter Cutoff Current      | V <sub>GE</sub> = 0 V, V <sub>CE</sub> = 1050 V                                                                                                                          | –   | –2    | 500 | μA   |
| V <sub>CE(sat)</sub> | Collector-Emitter Saturation Voltage  | V <sub>GE</sub> = 15 V, I <sub>C</sub> = 600 A, T <sub>J</sub> = 25 °C                                                                                                   | –   | 1.6   | 2.3 | V    |
|                      |                                       | V <sub>GE</sub> = 15 V, I <sub>C</sub> = 600 A, T <sub>J</sub> = 150 °C                                                                                                  | –   | 2.0   | –   |      |
| V <sub>GE(TH)</sub>  | Gate-Emitter Threshold Voltage        | V <sub>GE</sub> = V <sub>CE</sub> , I <sub>C</sub> = 600 mA                                                                                                              | 4.0 | 5.5   | 6.9 | V    |
| I <sub>GES</sub>     | Gate Leakage Current                  | V <sub>GE</sub> = 20 V, V <sub>CE</sub> = 0 V                                                                                                                            | –   | –0.02 | 1   | μA   |
| R <sub>g</sub>       | Internal Gate Resistor                |                                                                                                                                                                          | –   | 0.58  | –   | Ω    |
|                      | Turn-off Safe Operating Area          | V <sub>CC</sub> < 800V, R <sub>G (off)</sub> ≥ 35 Ω, T <sub>vj</sub> < 150 °C                                                                                            | –   | 800   | –   | A    |
| t <sub>d(on)</sub>   | Turn-on Delay Time                    | T <sub>J</sub> = 25 °C<br>V <sub>CE</sub> = 600 V, I <sub>C</sub> = 200 A<br>V <sub>GE</sub> = -9 V to +15 V, R <sub>G (on)</sub> = 7 Ω,<br>R <sub>G (off)</sub> = 31 Ω  | –   | 233   | –   | ns   |
| t <sub>r</sub>       | Rise Time                             |                                                                                                                                                                          | –   | 57    | –   |      |
| t <sub>d(off)</sub>  | Turn-off Delay Time                   |                                                                                                                                                                          | –   | 2200  | –   |      |
| t <sub>f</sub>       | Fall Time                             |                                                                                                                                                                          | –   | 18    | –   |      |
| E <sub>on</sub>      | Turn-on Switching Loss per Pulse      |                                                                                                                                                                          | –   | 8640  | –   | μJ   |
| E <sub>off</sub>     | Turn-off Switching Loss per Pulse     |                                                                                                                                                                          | –   | 11800 | –   |      |
| t <sub>d(on)</sub>   | Turn-on Delay Time                    | T <sub>J</sub> = 125 °C<br>V <sub>CE</sub> = 600 V, I <sub>C</sub> = 200 A<br>V <sub>GE</sub> = -9 V to +15 V, R <sub>G (on)</sub> = 7 Ω,<br>R <sub>G (off)</sub> = 31 Ω | –   | 210   | –   | ns   |
| t <sub>r</sub>       | Rise Time                             |                                                                                                                                                                          | –   | 62    | –   |      |
| t <sub>d(off)</sub>  | Turn-off Delay Time                   |                                                                                                                                                                          | –   | 2350  | –   |      |
| t <sub>f</sub>       | Fall Time                             |                                                                                                                                                                          | –   | 18    | –   |      |
| E <sub>on</sub>      | Turn-on Switching Loss per Pulse      |                                                                                                                                                                          | –   | 12510 | –   | μJ   |
| E <sub>off</sub>     | Turn-off Switching Loss per Pulse     |                                                                                                                                                                          | –   | 14500 | –   |      |
| C <sub>ies</sub>     | Input Capacitance                     | V <sub>CE</sub> = 20 V, V <sub>GE</sub> = 0 V, f = 100 kHz                                                                                                               | –   | 47927 | –   | pF   |
| C <sub>oes</sub>     | Output Capacitance                    |                                                                                                                                                                          | –   | 1871  | –   |      |
| C <sub>res</sub>     | Reverse Transfer Capacitance          |                                                                                                                                                                          | –   | 304   | –   |      |
| Q <sub>g</sub>       | Total Gate Charge                     | V <sub>CE</sub> = 600 V, I <sub>C</sub> = 57 A, V <sub>GE</sub> = -15/+20 V                                                                                              | –   | 2940  | –   | nC   |
| R <sub>thJH</sub>    | Thermal Resistance – Chip-to-heatsink | Thermal grease, Thickness = 2 Mil ±2%,<br>λ = 2.87 W/mK                                                                                                                  | –   | 0.139 | –   | °C/W |
| R <sub>thJC</sub>    | Thermal Resistance – Chip-to-case     |                                                                                                                                                                          | –   | 0.088 | –   | °C/W |

## INVERSE DIODES (D1, D2, D3, D4)

|                |                       |                                                 |   |     |     |   |
|----------------|-----------------------|-------------------------------------------------|---|-----|-----|---|
| V <sub>F</sub> | Diode Forward Voltage | I <sub>F</sub> = 300 A, T <sub>J</sub> = 25 °C  | – | 2.5 | 3.4 | V |
|                |                       | I <sub>F</sub> = 300 A, T <sub>J</sub> = 150 °C | – | 2.3 | –   |   |

# NXH600N105H7F5S2HG, NXH600N105H7F5P2HG

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25 °C unless otherwise noted) (continued)

| Symbol                                 | Parameter                             | Test Conditions                                                                                                                          | Min | Typ   | Max | Unit |
|----------------------------------------|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-----|-------|-----|------|
| <b>INVERSE DIODES (D1, D2, D3, D4)</b> |                                       |                                                                                                                                          |     |       |     |      |
| t <sub>rr</sub>                        | Reverse Recovery Time                 | T <sub>J</sub> = 25 °C<br>V <sub>CE</sub> = 600 V, I <sub>C</sub> = 200 A<br>V <sub>GE</sub> = -9 V to +15 V, R <sub>G (on)</sub> = 7 Ω  | –   | 100   | –   | ns   |
| Q <sub>rr</sub>                        | Reverse Recovery Charge               |                                                                                                                                          | –   | 5580  | –   | nC   |
| I <sub>RRM</sub>                       | Peak Reverse Recovery Current         |                                                                                                                                          | –   | 135   | –   | A    |
| di/dt                                  | Peak Rate of Fall of Recovery Current |                                                                                                                                          | –   | 2.8   | –   | A/ns |
| E <sub>rr</sub>                        | Reverse Recovery Energy               |                                                                                                                                          | –   | 1664  | –   | μJ   |
| t <sub>rr</sub>                        | Reverse Recovery Time                 | T <sub>J</sub> = 125 °C<br>V <sub>CE</sub> = 600 V, I <sub>C</sub> = 200 A<br>V <sub>GE</sub> = -9 V to +15 V, R <sub>G (on)</sub> = 7 Ω | –   | 187   | –   | ns   |
| Q <sub>rr</sub>                        | Reverse Recovery Charge               |                                                                                                                                          | –   | 16903 | –   | nC   |
| I <sub>RRM</sub>                       | Peak Reverse Recovery Current         |                                                                                                                                          | –   | 201   | –   | A    |
| di/dt                                  | Peak Rate of Fall of Recovery Current |                                                                                                                                          | –   | 2.6   | –   | A/ns |
| E <sub>rr</sub>                        | Reverse Recovery Energy               |                                                                                                                                          | –   | 6485  | –   | μJ   |
| R <sub>thJH</sub>                      | Thermal Resistance – Chip-to-heatsink | Thermal grease, Thickness = 2 Mil ±2%,<br>λ = 2.87 W/mK                                                                                  | –   | 0.277 | –   | °C/W |
| R <sub>thJC</sub>                      | Thermal Resistance – Chip-to-case     |                                                                                                                                          | –   | 0.220 | –   | °C/W |

## THERMISTOR CHARACTERISTICS

|                  |                            |                         |    |       |   |      |
|------------------|----------------------------|-------------------------|----|-------|---|------|
| R <sub>25</sub>  | Nominal Resistance         | T = 25 °C               | –  | 5     | – | kΩ   |
| R <sub>100</sub> | Nominal Resistance         | T = 100 °C              | –  | 492.2 | – | Ω    |
| R/R              | Deviation of R25           |                         | –1 | –     | 1 | %    |
| P <sub>D</sub>   | Power Dissipation          |                         | –  | 5     | – | mW   |
|                  | Power Dissipation Constant |                         | –  | 1.3   | – | mW/K |
|                  | B-value                    | B(25/85), tolerance ±1% | –  | 3430  | – | K    |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

## ORDERING INFORMATION

| Orderable Part Number | Marking            | Package                                                         | Shipping               |
|-----------------------|--------------------|-----------------------------------------------------------------|------------------------|
| NXH600N105H7F5S2HG    | NXH600N105H7F5S2HG | F5 – PIM60 112x62 (SOLDER PIN)<br>(Pb-Free / Halide Free)       | 8 Units / Blister Tray |
| NXH600N105H7F5P2HG    | NXH600N105H7F5P2HG | F5 – PIM60 112x62 (PRESS FIT<br>PIN)<br>(Pb-Free / Halide Free) | 8 Units / Blister Tray |

# NXH600N105H7F5S2HG, NXH600N105H7F5P2HG

## TYPICAL CHARACTERISTICS – IGBT T1/T4 AND D5/D6 DIODE

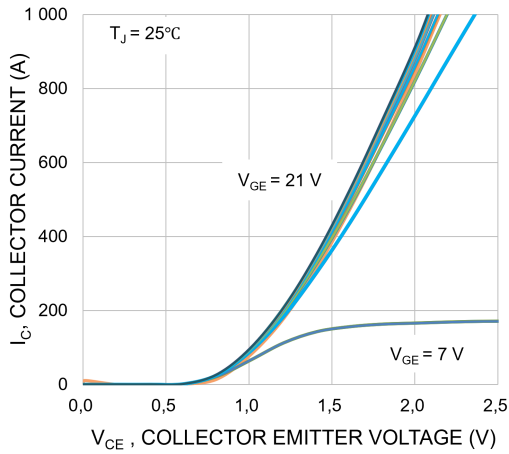


Figure 2. Typical Output Characteristics – IGBT

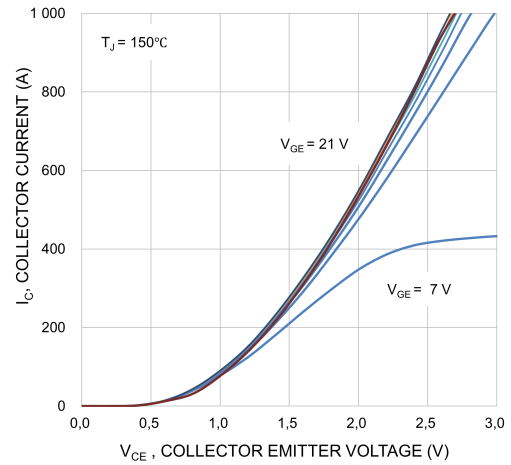


Figure 3. Typical Output Characteristics – IGBT

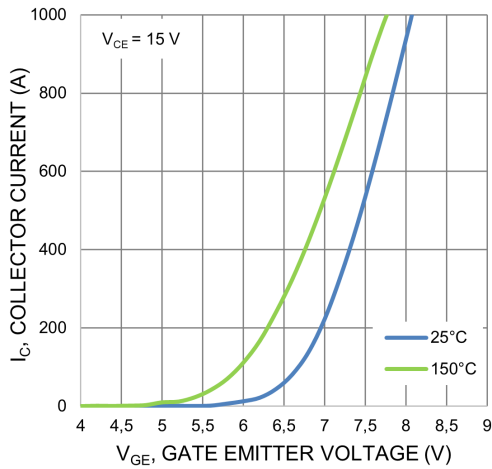


Figure 4. Transfer Characteristics – IGBT

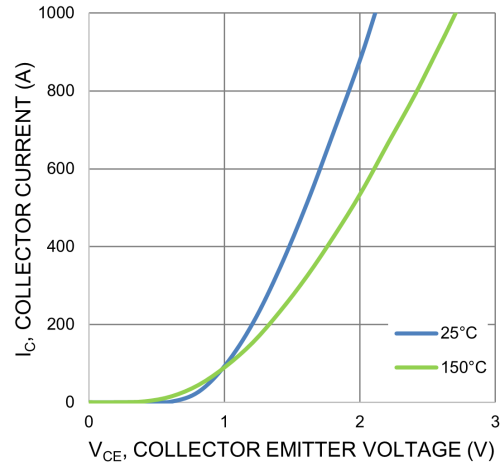


Figure 5. Saturation Voltage Characteristic – IGBT

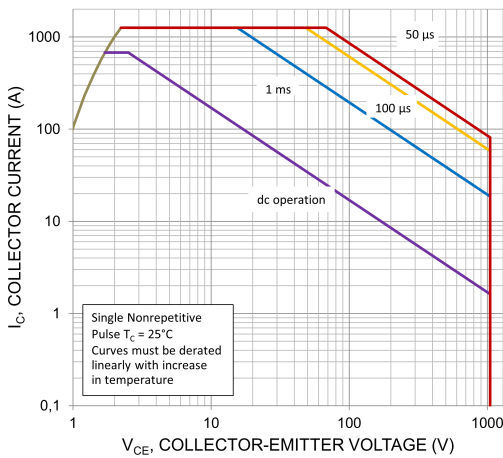


Figure 6. FBSOA

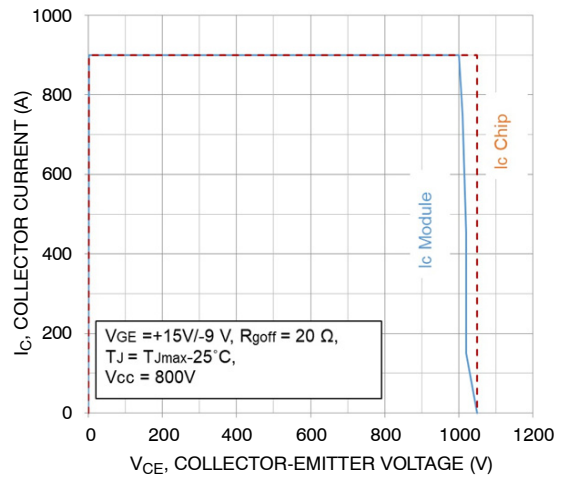


Figure 7. RBSOA (T1/T4)

# NXH600N105H7F5S2HG, NXH600N105H7F5P2HG

## TYPICAL CHARACTERISTICS – IGBT T1/T4 AND D5/D6 DIODE (CONTINUED)

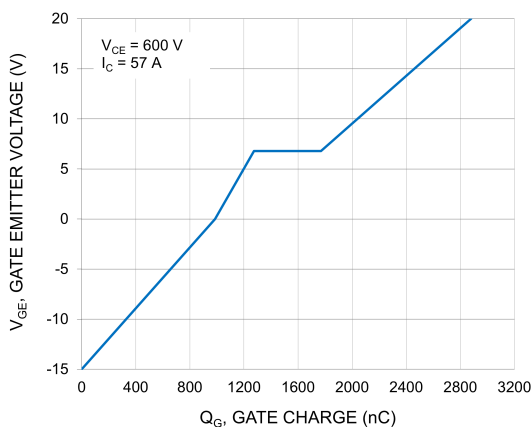


Figure 8. Gate Voltage vs. Gate Charge

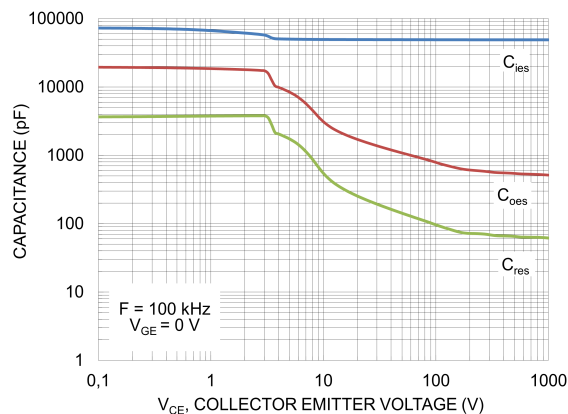


Figure 9. Capacitance

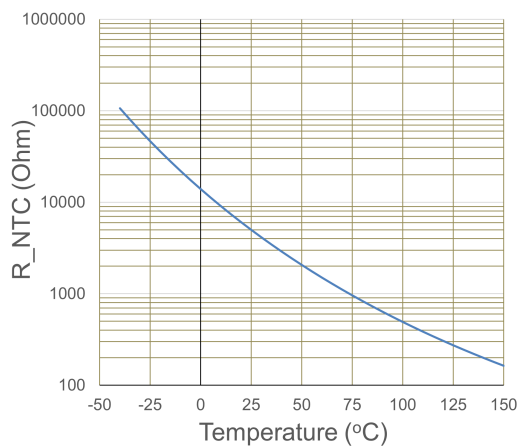


Figure 10. Temperature vs. NTC Value

## TYPICAL CHARACTERISTICS – IGBT T2/T3 AND D3/D4, D1/D2 DIODE

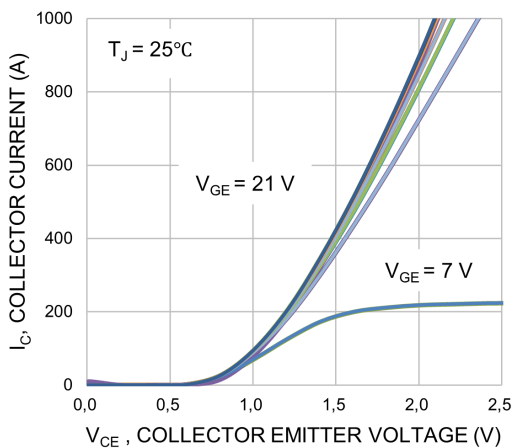


Figure 11. Typical Output Characteristics

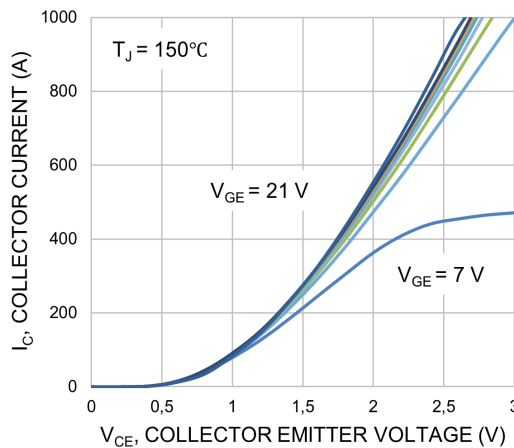


Figure 12. Typical Output Characteristics

# NXH600N105H7F5S2HG, NXH600N105H7F5P2HG

## TYPICAL CHARACTERISTICS – IGBT T2/T3 AND D3/D4, D1/D2 DIODE (CONTINUED)

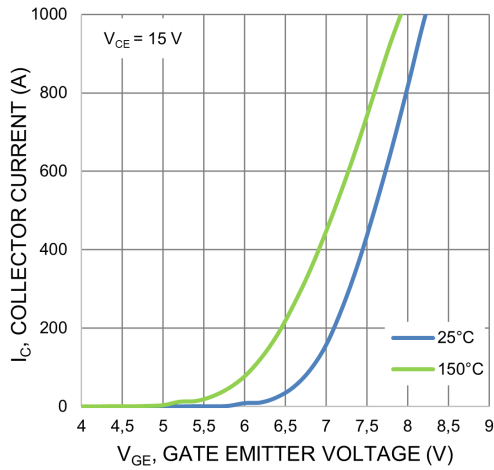


Figure 13. Transfer Characteristics – IGBT

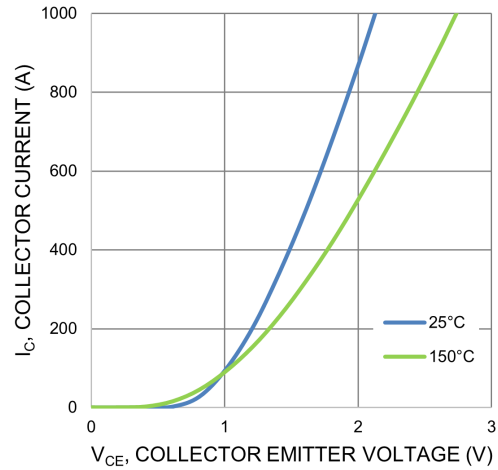


Figure 14. Saturation Voltage Characteristic – IGBT

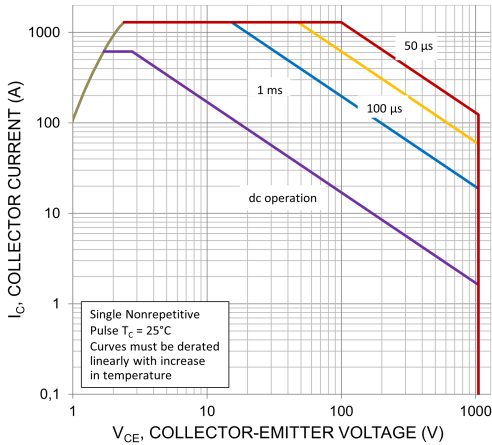


Figure 15. FBSOA

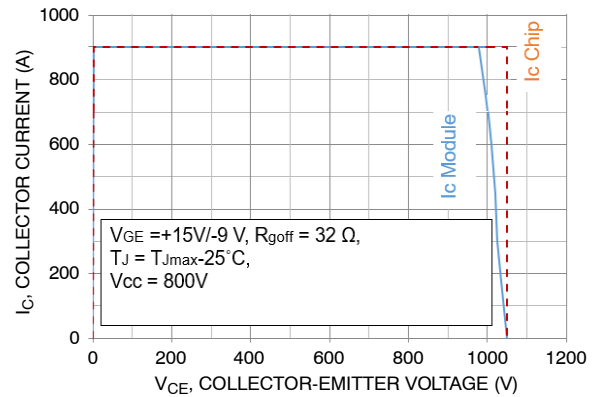


Figure 16. RBSOA (T2/T3)

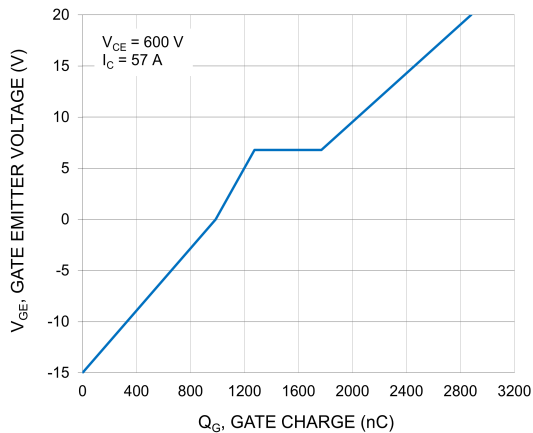


Figure 17. Gate Voltage vs. Gate Charge

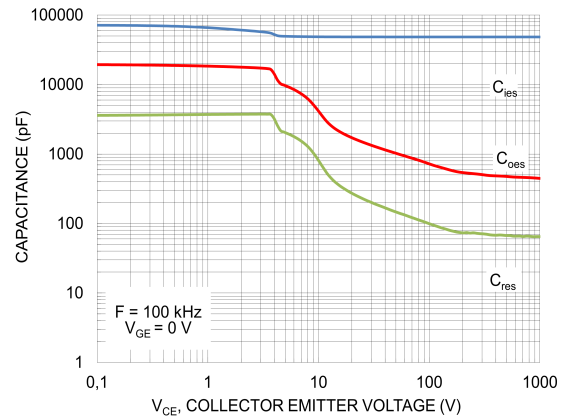


Figure 18. Capacitance vs.  $V_{CE}$



# NXH600N105H7F5S2HG, NXH600N105H7F5P2HG

## TYPICAL CHARACTERISTICS – IGBT T2/T3 AND D3/D4, D1/D2 DIODE (CONTINUED)

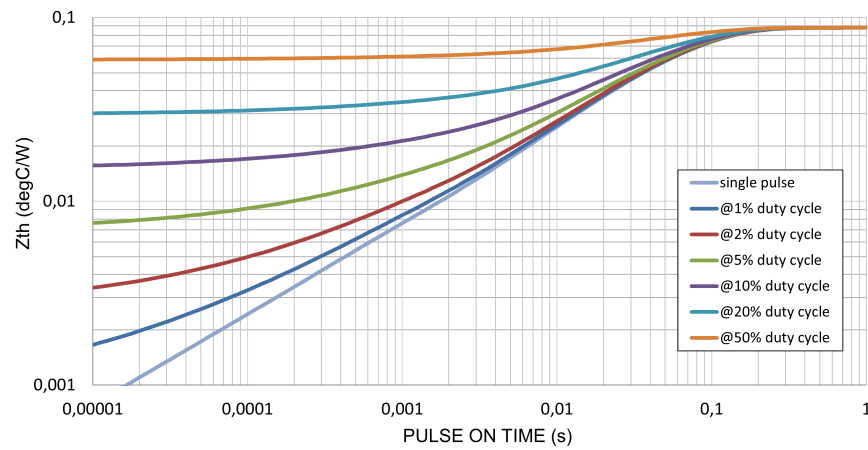


Figure 19. Transient Thermal Impedance (IGBT)

## TYPICAL CHARACTERISTIC – D2, D3 (SIC INVERSE DIODE)

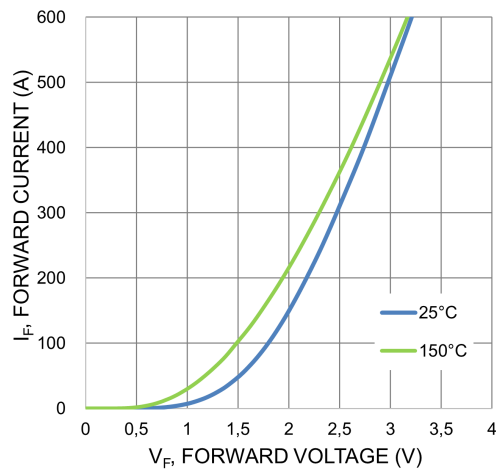


Figure 20. Inverse Diode Forward Characteristics

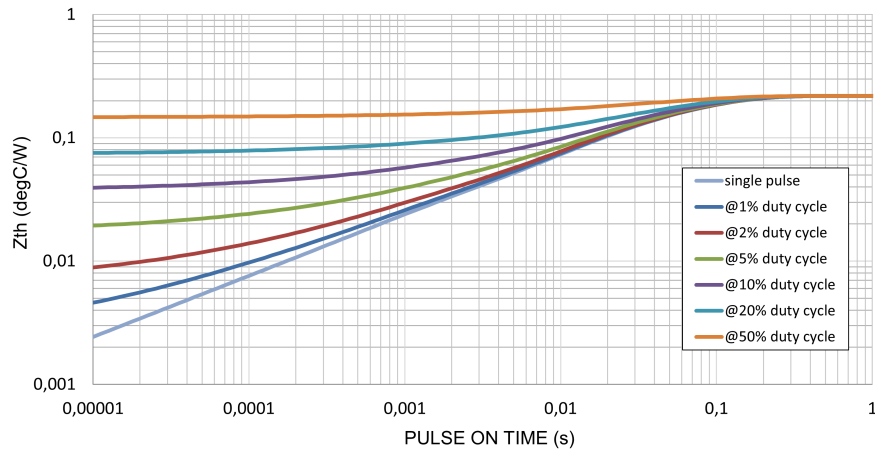


Figure 21. Transient Thermal Impedance (Inverse Diode)

# NXH600N105H7F5S2HG, NXH600N105H7F5P2HG

## TYPICAL CHARACTERISTIC – D5/D6 (NEUTRAL POINT DIODE)

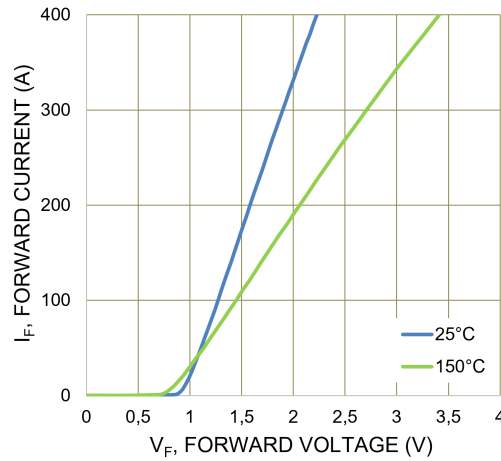


Figure 22. Neutral Diode Forward Characteristics

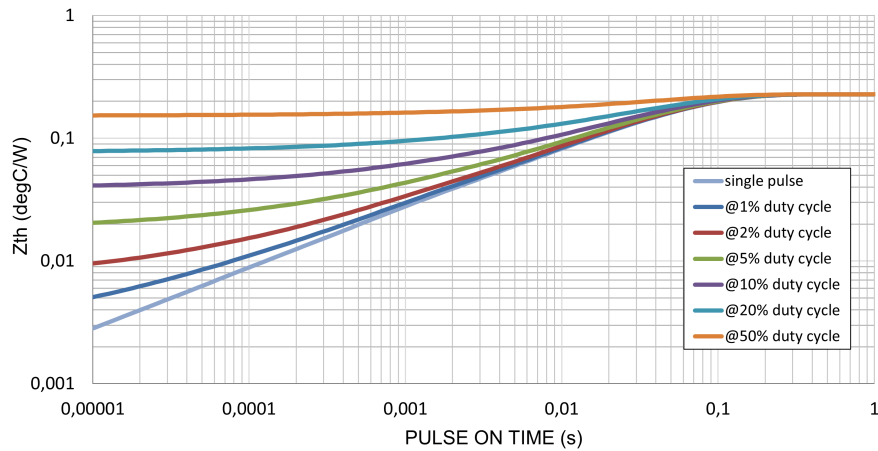


Figure 23. Transient Thermal Impedance (Neutral Point Diode)

## TYPICAL CHARACTERISTIC – T1||D5 OR T4||D6

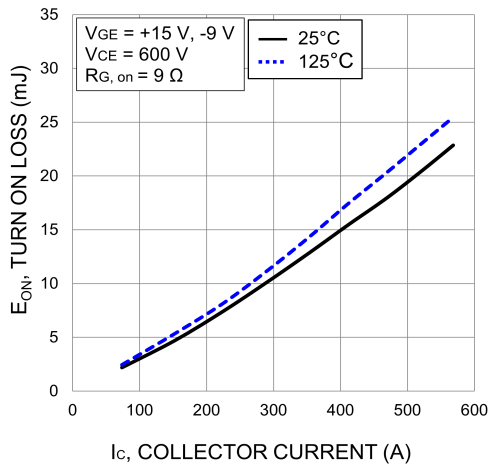


Figure 24. Typical Turn On Loss vs.  $I_C$

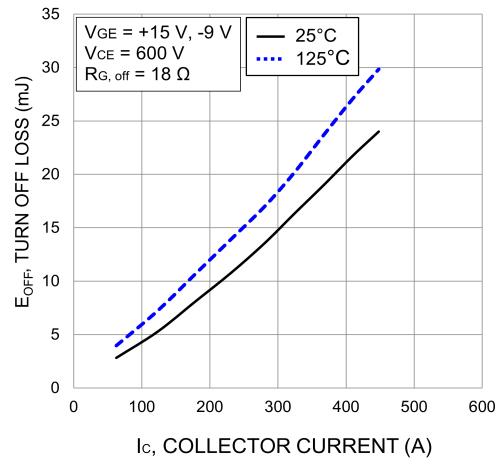


Figure 25. Typical Turn Off Loss vs.  $I_C$

# NXH600N105H7F5S2HG, NXH600N105H7F5P2HG

## TYPICAL CHARACTERISTIC – T1||D5 OR T4||D6 (CONTINUED)

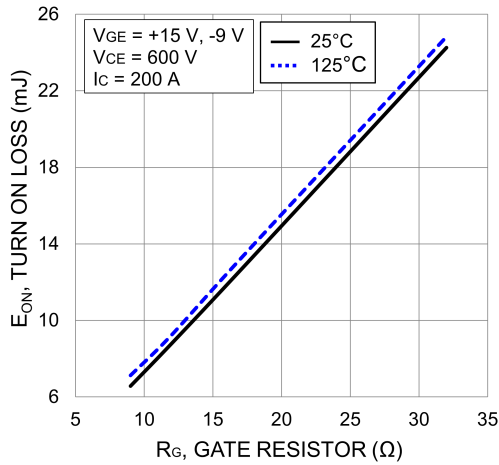


Figure 26. Typical Turn On Loss vs.  $R_G$

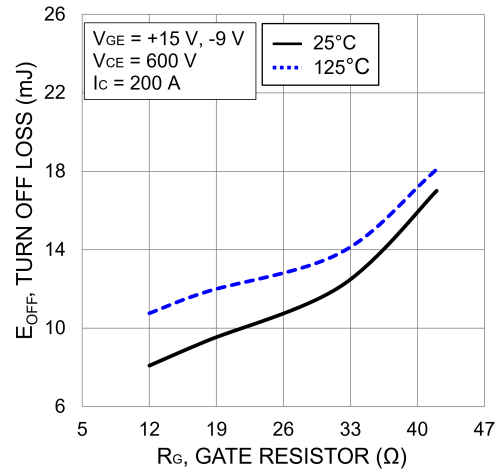


Figure 27. Typical Turn Off Loss vs.  $R_G$

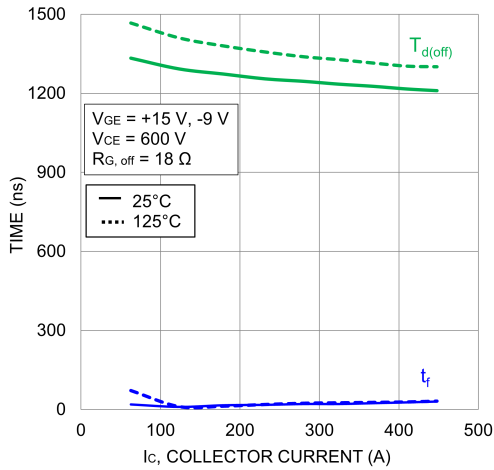


Figure 28. Typical Turn-Off Switching Time vs.  $I_C$

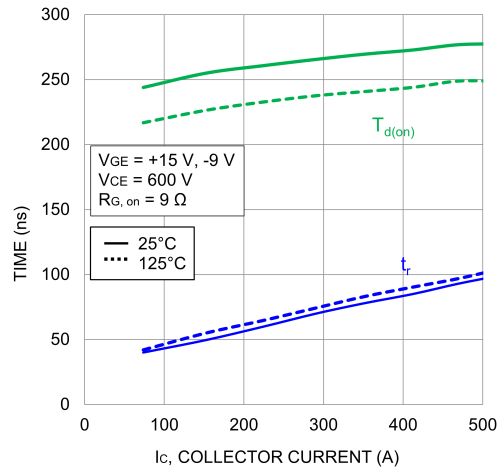


Figure 29. Typical Turn-On Switching Time vs.  $I_C$

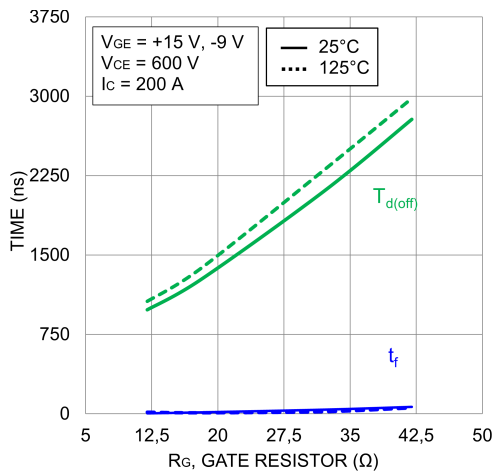


Figure 30. Typical Turn-Off Switching Time vs.  $R_G$

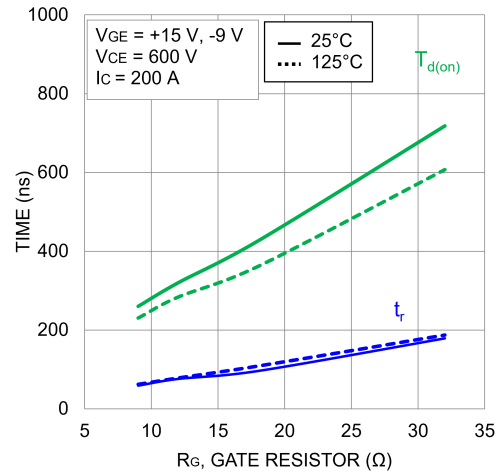


Figure 31. Typical Turn-On Switching Time vs.  $R_G$

TYPICAL CHARACTERISTIC – D5/D6 (NEUTRAL POINT DIODE)

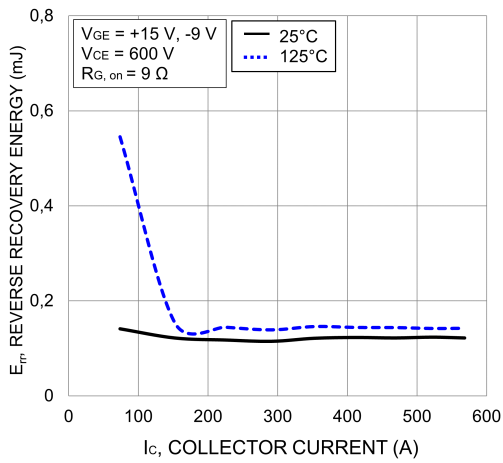


Figure 32. Typical Reverse Recovery Energy Loss vs.  $I_C$

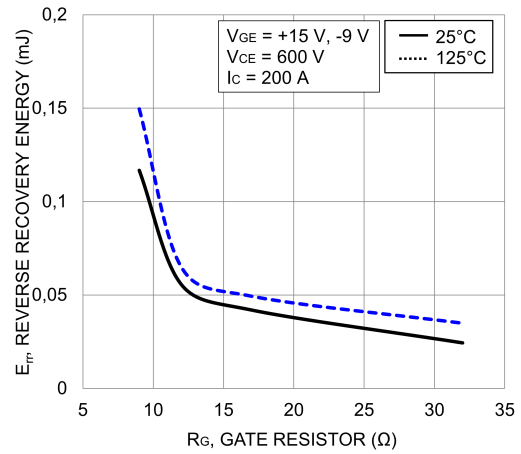


Figure 33. Typical Reverse Recovery Energy Loss vs.  $R_G$

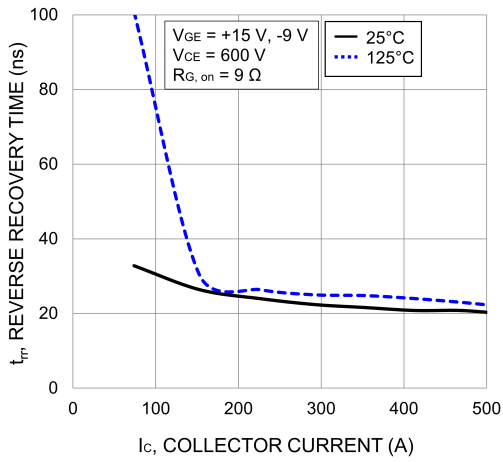


Figure 34. Typical Reverse Recovery Time vs.  $I_C$

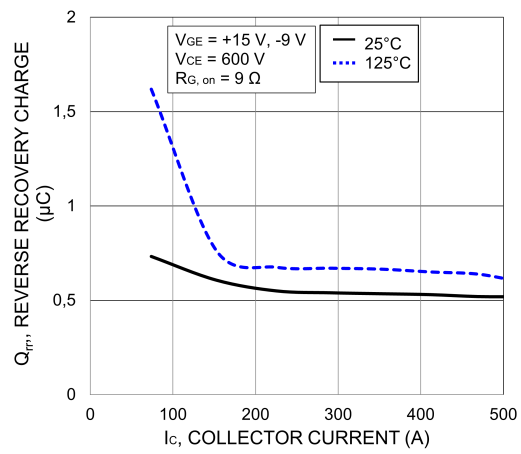


Figure 35. Typical Reverse Recovery Charge vs.  $I_C$

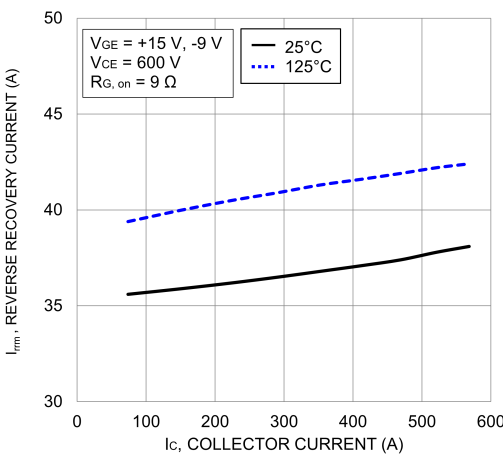


Figure 36. Typical Reverse Recovery Current vs.  $I_C$

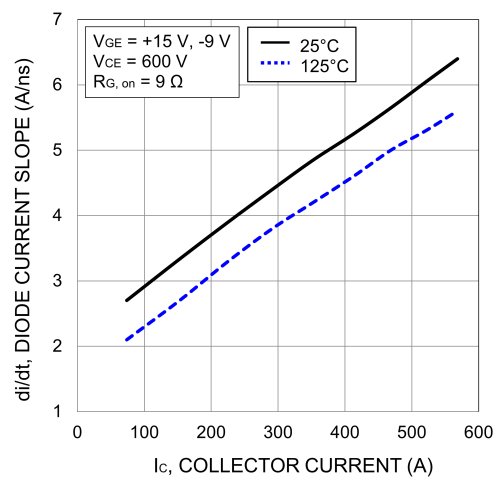


Figure 37. Typical Diode Current Slope vs.  $I_C$

TYPICAL CHARACTERISTIC – D5/D6 (NEUTRAL POINT DIODE) (CONTINUED)

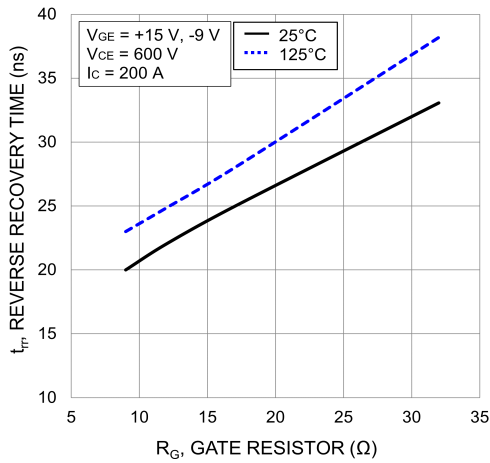


Figure 38. Typical Reverse Recovery Time vs.  $R_G$

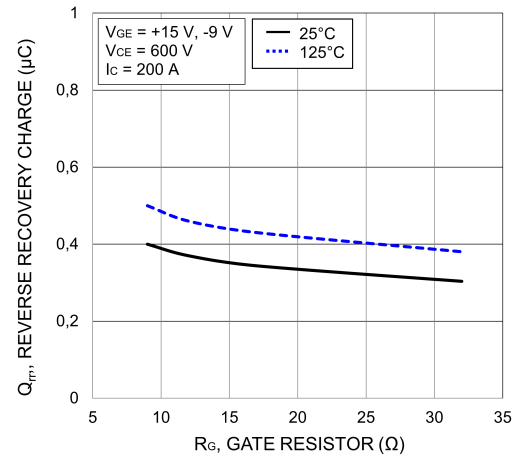


Figure 39. Typical Reverse Recovery Charge vs.  $R_G$

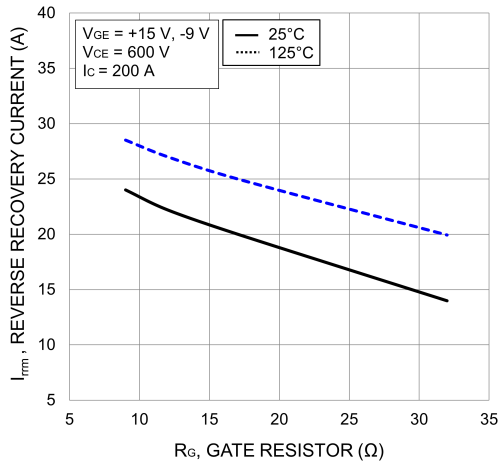


Figure 40. Typical Reverse Recovery Current vs.  $R_G$

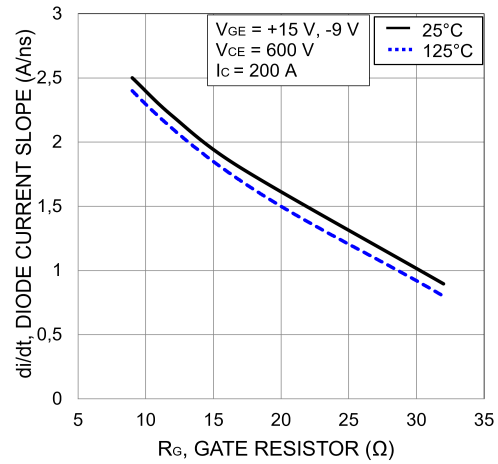


Figure 41. Typical Diode Current Slope vs.  $R_G$

TYPICAL CHARACTERISTIC – T2||D3 + D4 OR T3||D1 + D2

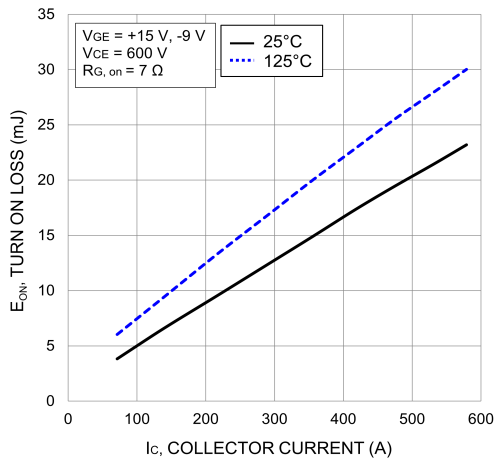


Figure 42. Typical Turn On Loss vs.  $I_C$

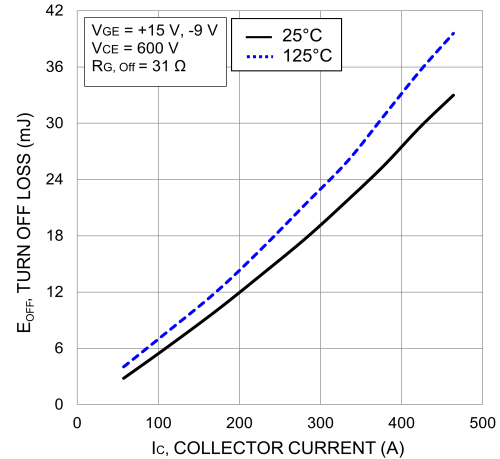


Figure 43. Typical Turn Off Loss vs.  $I_C$

# NXH600N105H7F5S2HG, NXH600N105H7F5P2HG

## TYPICAL CHARACTERISTIC – T2||D3 + D4 OR T3||D1 + D2 (CONTINUED)

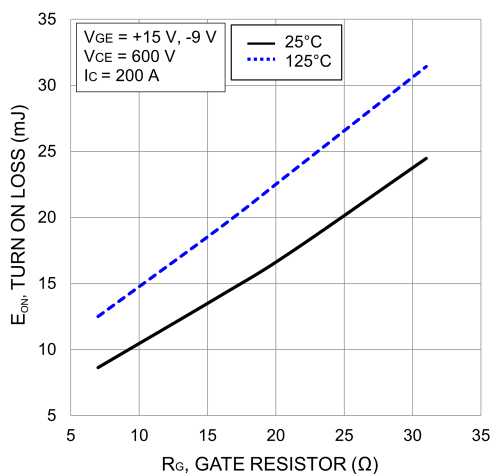


Figure 44. Typical Turn On Loss vs.  $R_G$

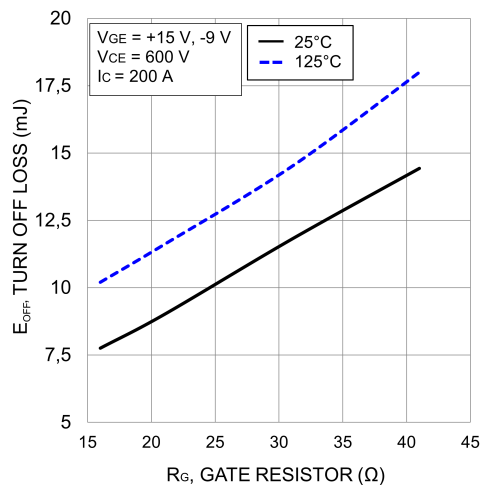


Figure 45. Typical Turn Off Loss vs.  $R_G$

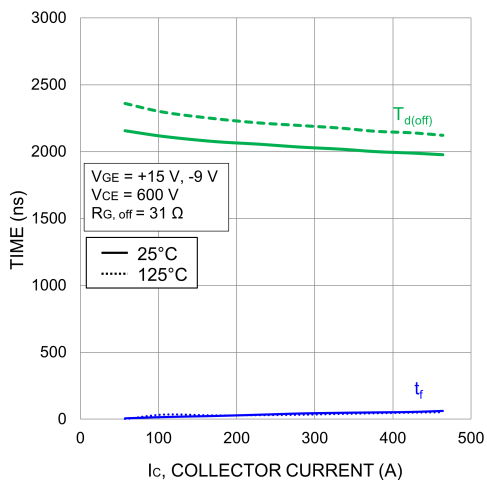


Figure 46. Typical Turn-Off Switching Time vs.  $I_C$

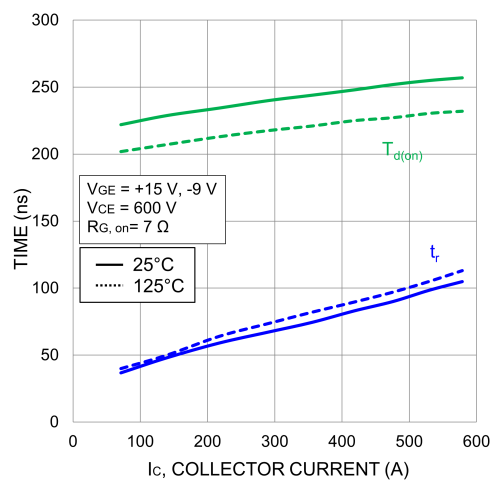


Figure 47. Typical Turn-On Switching Time vs.  $I_C$

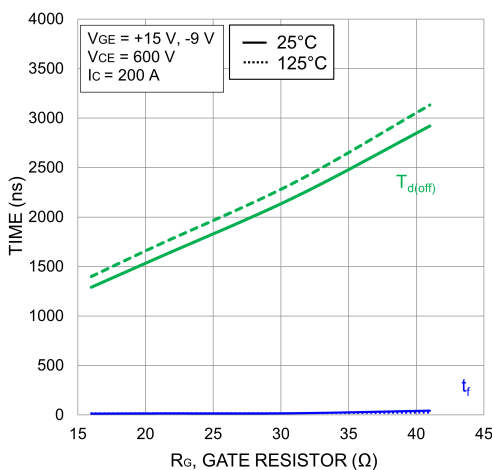


Figure 48. Typical Turn-Off Switching Time vs.  $R_G$

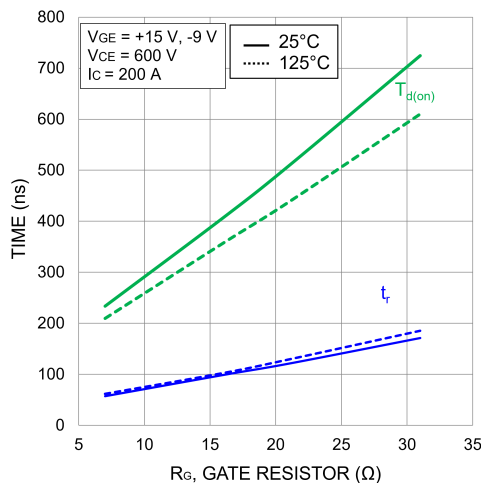


Figure 49. Typical Turn-On Switching Time vs.  $R_G$

TYPICAL CHARACTERISTIC – T2||D3 + D4 OR T3||D1 + D2 (CONTINUED)

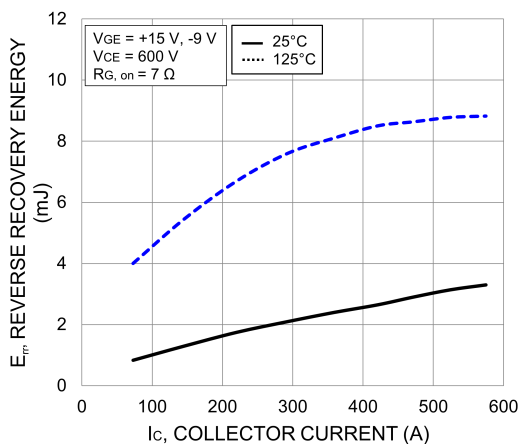


Figure 50. Typical Reverse Recovery Energy Loss vs.  $I_C$

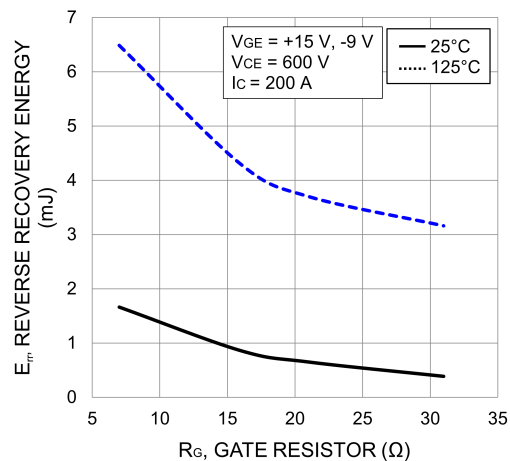


Figure 51. Typical Reverse Recovery Energy Loss vs.  $R_G$

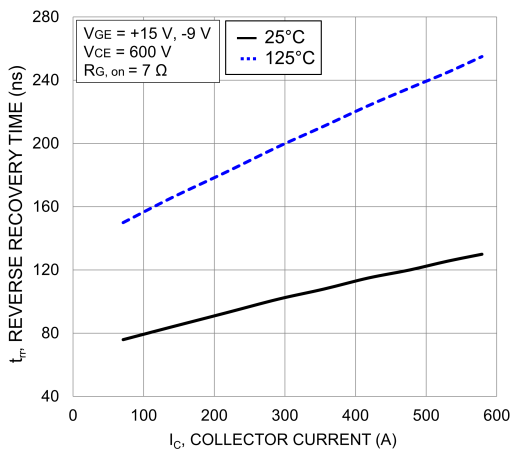


Figure 52. Typical Reverse Recovery Time vs.  $I_C$

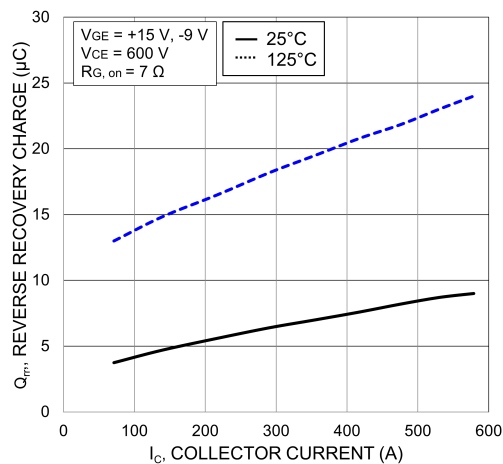


Figure 53. Typical Reverse Recovery Charge vs.  $I_C$

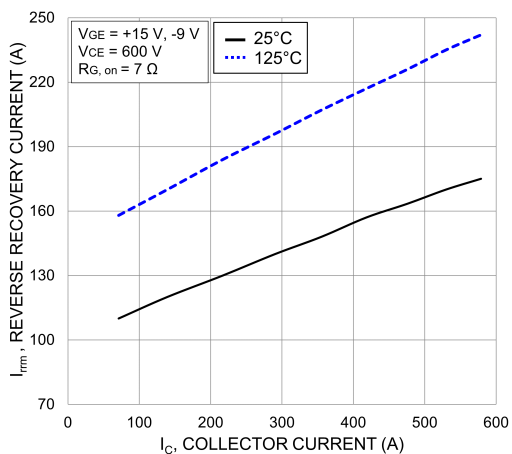


Figure 54. Typical Reverse Recovery Current vs.  $I_C$

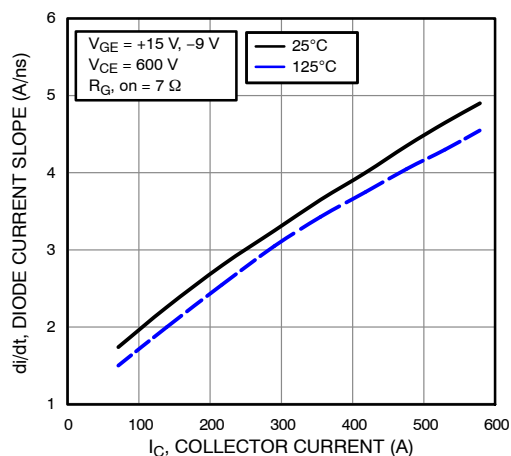


Figure 55. Typical  $di/dt$  vs.  $I_C$

# NXH600N105H7F5S2HG, NXH600N105H7F5P2HG

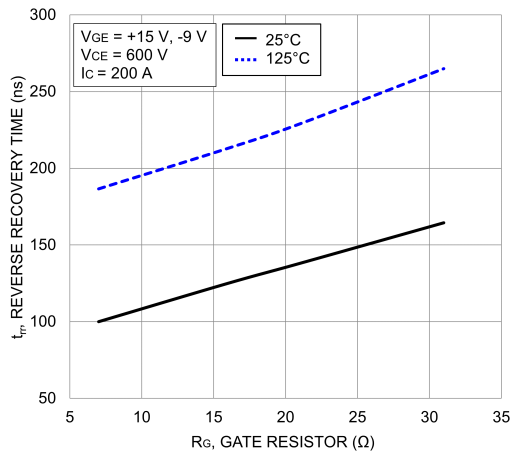


Figure 56. Typical Reverse Recovery Time vs.  $R_G$

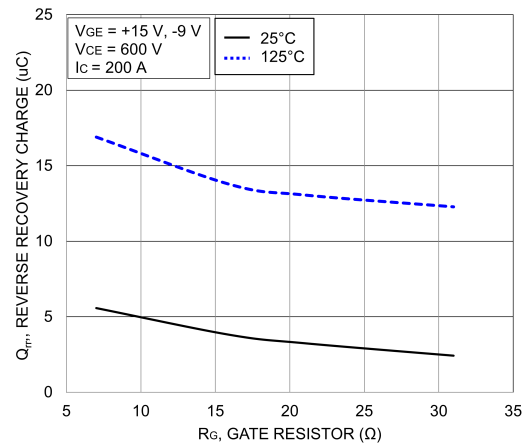


Figure 57. Typical Reverse Recovery Charge vs.  $R_G$

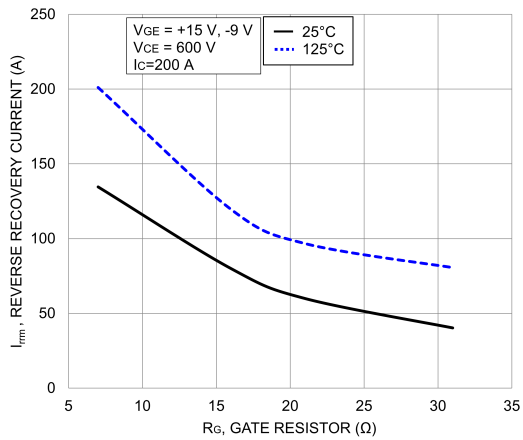


Figure 58. Typical Reverse Recovery Peak Current vs.  $R_G$

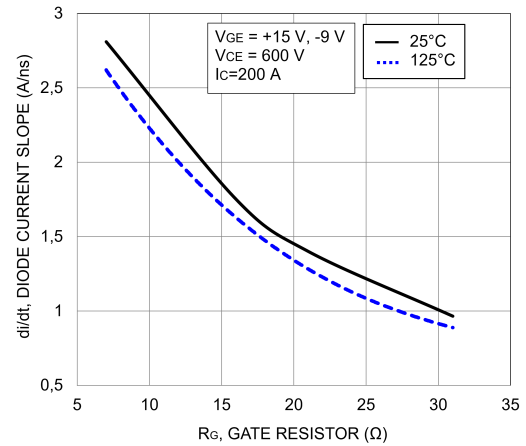


Figure 59. Typical  $di/dt$  vs.  $R_G$

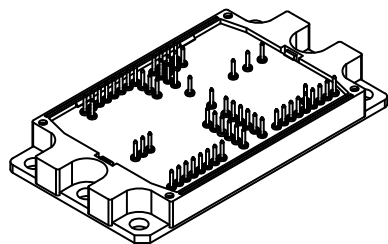


## NXH600N105H7F5S2HG, NXH600N105H7F5P2HG

### REVISION HISTORY

| Revision | Description of Changes                                                                                                    | Date      |
|----------|---------------------------------------------------------------------------------------------------------------------------|-----------|
| P3       | Figure 7. RBSOA (T1/T4) and Figure 16. RBSOA (T2/T3) updated.                                                             | 6/20/2025 |
| P4       | Updated TYP value of RthJH parameter in the Electrical Characteristics Table (SiC NEUTRAL POINT DIODE section) on page 4. | 7/1/2025  |

This document has undergone updates prior to the inclusion of this revision history table. The changes tracked here only reflect updates made on the noted approval dates.

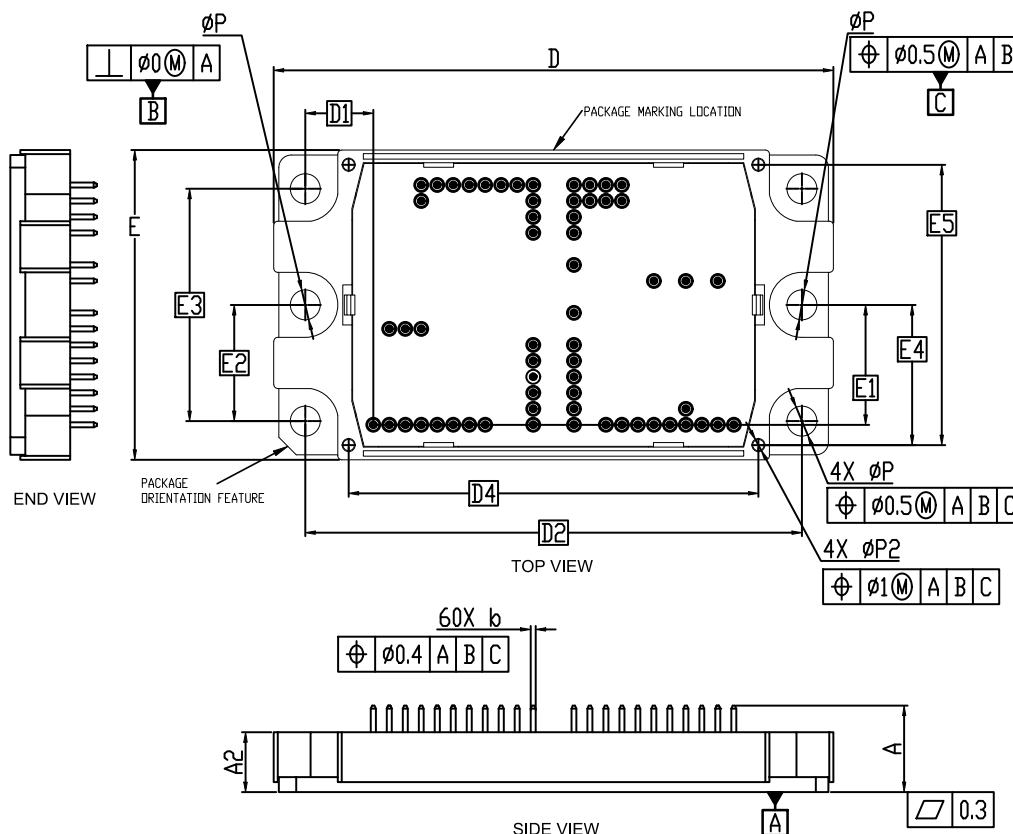


PIM60 112.00x62.00x12.00  
CASE 180CW  
ISSUE O

DATE 30 JUL 2024

NOTES:

1. Dimensioning and tolerancing conform to ASME Y14.5
2. All dimensions are in millimeters.
3. Pin-grid is 3.2mm.
4. Package marking is located on the side opposite the package orientation feature.
5. The pins are gold-plated solder pin.



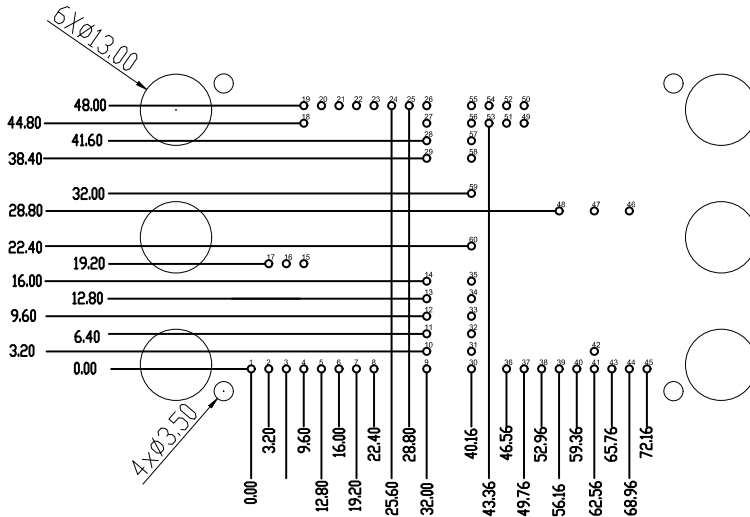
| DIM | MILLIMETERS |        |        |
|-----|-------------|--------|--------|
|     | MIN.        | NOM.   | MAX.   |
| A   | 17.00       | 17.40  | 17.80  |
| A2  | 11.70       | 12.00  | 12.30  |
| b   | 0.95        | 1.00   | 1.05   |
| D   | 111.60      | 112.00 | 112.40 |
| D1  | 13.62 BSC   |        |        |
| D2  | 99.40 BSC   |        |        |
| D4  | 82.00 BSC   |        |        |
| E   | 61.60       | 62.00  | 62.40  |
| E1  | 24.00 BSC   |        |        |
| E2  | 23.25 BSC   |        |        |
| E3  | 46.50 BSC   |        |        |
| E4  | 28.05 BSC   |        |        |
| E5  | 56.10 BSC   |        |        |
| P   | 5.90        | 6.00   | 6.10   |
| P2  | 2.20        | 2.30   | 2.40   |

|                  |                          |                                                                                                                                                                                     |
|------------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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| DESCRIPTION:     | PIM60 112.00x62.00x12.00 | PAGE 1 OF 2                                                                                                                                                                         |

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PIM60 112.00x62.00x12.00  
CASE 180CW  
ISSUE O

DATE 30 JUL 2024



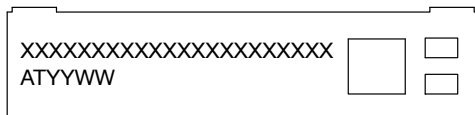
RECOMMENDED  
MOUNTING PATTERN

\* For additional information on our Pb-Free strategy and soldering details, please download the Onsemi Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

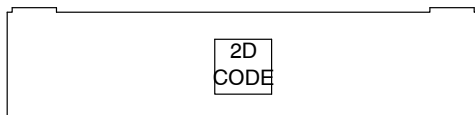
NOTE 2:

| Pin POSITION |       |       |     |       |       |     |       |       |
|--------------|-------|-------|-----|-------|-------|-----|-------|-------|
| Pin          | X     | Y     | Pin | X     | Y     | Pin | X     | Y     |
| 1            | 0.00  | 0.00  | 24  | 25.60 | 48.00 | 47  | 62.56 | 28.80 |
| 2            | 3.20  | 0.00  | 25  | 28.80 | 48.00 | 48  | 56.16 | 28.80 |
| 3            | 6.40  | 0.00  | 26  | 32.00 | 48.00 | 49  | 49.76 | 44.80 |
| 4            | 9.60  | 0.00  | 27  | 32.00 | 44.80 | 50  | 49.76 | 48.00 |
| 5            | 12.80 | 0.00  | 28  | 32.00 | 41.60 | 51  | 46.56 | 44.80 |
| 6            | 16.00 | 0.00  | 29  | 32.00 | 38.40 | 52  | 46.56 | 48.00 |
| 7            | 19.20 | 0.00  | 30  | 40.16 | 0.00  | 53  | 43.36 | 44.80 |
| 8            | 22.40 | 0.00  | 31  | 40.16 | 3.20  | 54  | 43.36 | 48.00 |
| 9            | 32.00 | 0.00  | 32  | 40.16 | 6.40  | 55  | 40.16 | 48.00 |
| 10           | 32.00 | 3.20  | 33  | 40.16 | 9.60  | 56  | 40.16 | 44.80 |
| 11           | 32.00 | 6.40  | 34  | 40.16 | 12.80 | 57  | 40.16 | 41.60 |
| 12           | 32.00 | 9.60  | 35  | 40.16 | 16.00 | 58  | 40.16 | 38.40 |
| 13           | 32.00 | 12.80 | 36  | 46.56 | 0.00  | 59  | 40.16 | 32.00 |
| 14           | 32.00 | 16.00 | 37  | 49.76 | 0.00  | 60  | 40.16 | 22.40 |
| 15           | 9.60  | 19.20 | 38  | 52.96 | 0.00  |     |       |       |
| 16           | 6.40  | 19.20 | 39  | 56.16 | 0.00  |     |       |       |
| 17           | 3.20  | 19.20 | 40  | 59.36 | 0.00  |     |       |       |
| 18           | 9.60  | 44.80 | 41  | 62.56 | 0.00  |     |       |       |
| 19           | 9.60  | 48.00 | 42  | 62.56 | 3.20  |     |       |       |
| 20           | 12.80 | 48.00 | 43  | 65.76 | 0.00  |     |       |       |
| 21           | 16.00 | 48.00 | 44  | 68.96 | 0.00  |     |       |       |
| 22           | 19.20 | 48.00 | 45  | 72.16 | 0.00  |     |       |       |
| 23           | 22.40 | 48.00 | 46  | 68.96 | 28.80 |     |       |       |

GENERIC  
MARKING DIAGRAM\*



FRONTSIDE MARKING



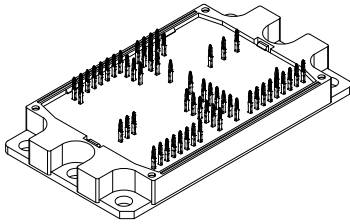
BACKSIDE MARKING

XXXXX = Specific Device Code  
AT = Assembly & Test Site Code  
YYWW = Year and Work Week Code

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

|                  |                          |                                                                                                                                                                                  |
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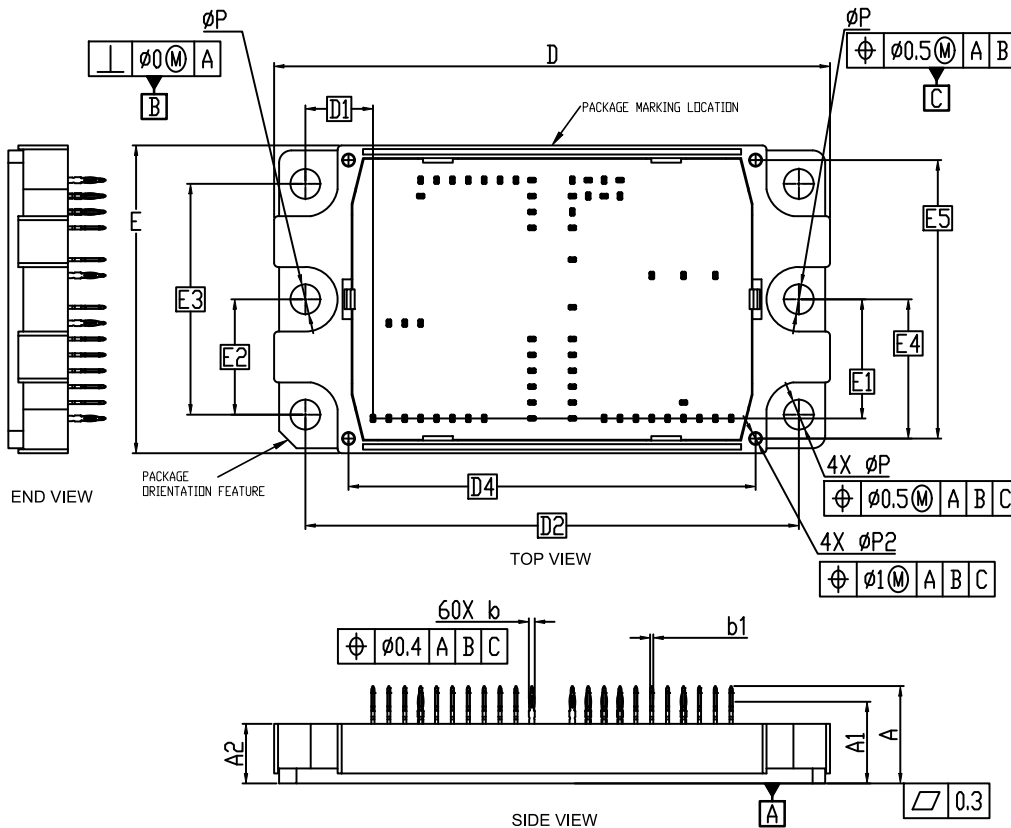


PIM60 112.00x62.00x12.00  
CASE 180HY  
ISSUE O

DATE 30 JUL 2024

NOTES:

1. Dimensioning and tolerancing conform to ASME Y14.5
2. All dimensions are in millimeters.
3. Dimensions b and b1 apply to the plated terminals and are measured at dimension A1
4. Pin-grid is 3.2mm.
5. Package marking is located on the side opposite the package orientation feature.
6. The pins are Sn plated press fit pin.



| DIM | MILLIMETERS |        |        |
|-----|-------------|--------|--------|
|     | MIN.        | NOM.   | MAX.   |
| A   | 19.20       | 19.60  | 20.00  |
| A1  | 16.25       | 16.45  | 16.65  |
| A2  | 11.70       | 12.00  | 12.30  |
| b   | 1.15        | 1.20   | 1.25   |
| b1  | 0.59        | 0.64   | 0.69   |
| D   | 111.60      | 112.00 | 112.40 |
| D1  | 13.62 BSC   |        |        |
| D2  | 99.40 BSC   |        |        |
| D4  | 82.00 BSC   |        |        |
| E   | 61.60       | 62.00  | 62.40  |
| E1  | 24.00 BSC   |        |        |
| E2  | 23.25 BSC   |        |        |
| E3  | 46.50 BSC   |        |        |
| E4  | 28.05 BSC   |        |        |
| E5  | 56.10 BSC   |        |        |
| P   | 5.90        | 6.00   | 6.10   |
| P2  | 2.20        | 2.30   | 2.40   |

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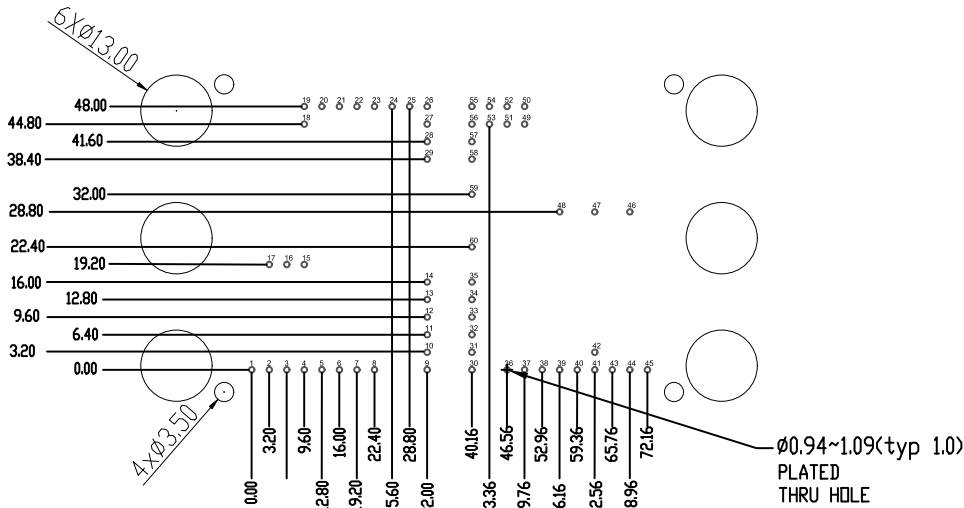
DESCRIPTION: PIM60 112.00x62.00x12.00

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CASE 180HY  
ISSUE O

DATE 30 JUL 2024



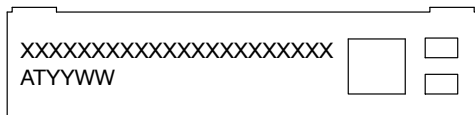
RECOMMENDED  
MOUNTING PATTERN

\* For additional Information on our Pb-Free strategy and soldering details, please download the Onsemi Soldering and Mounting Techniques Reference Manual, SOLDERM/D.

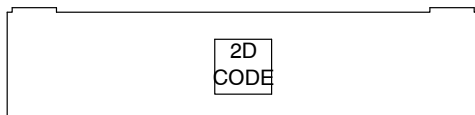
NOTE 2:

| Pin POSITION |       |       |     |       |       |     |       |       |
|--------------|-------|-------|-----|-------|-------|-----|-------|-------|
| Pin          | X     | Y     | Pin | X     | Y     | Pin | X     | Y     |
| 1            | 0.00  | 0.00  | 24  | 25.60 | 48.00 | 47  | 62.56 | 28.80 |
| 2            | 3.20  | 0.00  | 25  | 28.80 | 48.00 | 48  | 56.16 | 28.80 |
| 3            | 6.40  | 0.00  | 26  | 32.00 | 48.00 | 49  | 49.76 | 44.80 |
| 4            | 9.60  | 0.00  | 27  | 32.00 | 44.80 | 50  | 49.76 | 48.00 |
| 5            | 12.80 | 0.00  | 28  | 32.00 | 41.60 | 51  | 46.56 | 44.80 |
| 6            | 16.00 | 0.00  | 29  | 32.00 | 38.40 | 52  | 46.56 | 48.00 |
| 7            | 19.20 | 0.00  | 30  | 40.16 | 0.00  | 53  | 43.36 | 44.80 |
| 8            | 22.40 | 0.00  | 31  | 40.16 | 3.20  | 54  | 43.36 | 48.00 |
| 9            | 32.00 | 0.00  | 32  | 40.16 | 6.40  | 55  | 40.16 | 48.00 |
| 10           | 32.00 | 3.20  | 33  | 40.16 | 9.60  | 56  | 40.16 | 44.80 |
| 11           | 32.00 | 6.40  | 34  | 40.16 | 12.80 | 57  | 40.16 | 41.60 |
| 12           | 32.00 | 9.60  | 35  | 40.16 | 16.00 | 58  | 40.16 | 38.40 |
| 13           | 32.00 | 12.80 | 36  | 46.56 | 0.00  | 59  | 40.16 | 32.00 |
| 14           | 32.00 | 16.00 | 37  | 49.76 | 0.00  | 60  | 40.16 | 22.40 |
| 15           | 9.60  | 19.20 | 38  | 52.96 | 0.00  |     |       |       |
| 16           | 6.40  | 19.20 | 39  | 56.16 | 0.00  |     |       |       |
| 17           | 3.20  | 19.20 | 40  | 59.36 | 0.00  |     |       |       |
| 18           | 9.60  | 44.80 | 41  | 62.56 | 0.00  |     |       |       |
| 19           | 9.60  | 48.00 | 42  | 62.56 | 3.20  |     |       |       |
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| 21           | 16.00 | 48.00 | 44  | 68.96 | 0.00  |     |       |       |
| 22           | 19.20 | 48.00 | 45  | 72.16 | 0.00  |     |       |       |
| 23           | 22.40 | 48.00 | 46  | 68.96 | 28.80 |     |       |       |

GENERIC  
MARKING DIAGRAM\*



FRONTSIDE MARKING



BACKSIDE MARKING

XXXXX = Specific Device Code  
AT = Assembly & Test Site Code  
YYWW = Year and Work Week Code

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

|                  |                          |                                                                                                                                                                                  |
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