

# MOSFET - Power, Single N-Channel, SUPERFET<sup>®</sup>, FAST, TO220

600 V, 125 mΩ, 22 A

**NTP125N60S5H**

## Description

The SUPERFET V MOSFET FAST series helps maximize system efficiency by the extremely low switching losses in hard switching application.

## Features

- 650 V @  $T_J = 150^\circ\text{C}$  / Typ.  $R_{DS(on)} = 100\text{ m}\Omega$
- 100% Avalanche Tested
- Pb-Free, Halogen Free / BFR Free and RoHS Compliant

## Applications

- Telecom / Server Power Supplies
- EV Charger / UPS / Solar / Industrial Power Supplies

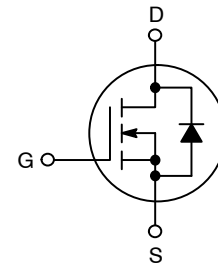
## MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

| Parameter                                                               | Symbol                                       | Value                     | Unit             |
|-------------------------------------------------------------------------|----------------------------------------------|---------------------------|------------------|
| Drain-to-Source Voltage                                                 | $V_{DS}$                                     | 600                       | V                |
| Gate-to-Source Voltage                                                  | $V_{GS}$                                     | DC                        | $\pm 30$         |
|                                                                         |                                              | AC ( $f > 1\text{ Hz}$ )  | $\pm 30$         |
| Continuous Drain Current                                                | $I_D$                                        | $T_C = 25^\circ\text{C}$  | 22               |
|                                                                         |                                              | $T_C = 100^\circ\text{C}$ | 13               |
| Power Dissipation                                                       | $T_C = 25^\circ\text{C}$                     | $P_D$                     | 152              |
| Pulsed Drain Current (Note 1)                                           | $T_C = 25^\circ\text{C}$                     | $I_{DM}$                  | 77               |
| Pulsed Source Current (Body Diode) (Note 1)                             |                                              | $I_{SM}$                  | 77               |
| Operating Junction and Storage Temperature Range                        | $T_J, T_{stg}$                               | -55 to +150               | $^\circ\text{C}$ |
| Source Current (Body Diode)                                             | $I_S$                                        | 22                        | A                |
| Single Pulse Avalanche Energy                                           | $I_L = 4.5\text{ A}, R_G = 25\text{ }\Omega$ | $E_{AS}$                  | 184              |
| Avalanche Current                                                       | $I_{AS}$                                     | 4.5                       | A                |
| Repetitive Avalanche Energy (Note 1)                                    | $E_{AR}$                                     | 1.52                      | mJ               |
| MOSFET dv/dt                                                            | dv/dt                                        | 120                       | V/ns             |
| Peak Diode Recovery dv/dt (Note 2)                                      |                                              | 20                        |                  |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 seconds) | $T_L$                                        | 260                       | $^\circ\text{C}$ |

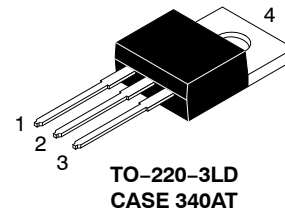
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2.  $I_{SD} \leq 11\text{ A}$ ,  $di/dt \leq 200\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq 400\text{ V}$ , starting  $T_J = 25^\circ\text{C}$ .

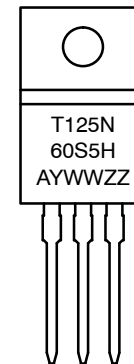
| $V_{(BR)DSS}$ | $R_{DS(on)}\text{ MAX}$ | $I_D\text{ MAX}$ |
|---------------|-------------------------|------------------|
| 600 V         | 125 mΩ @ 10 V           | 22 A             |



N-CHANNEL MOSFET



## MARKING DIAGRAM



T125N60S5H = Specific Device Code  
A = Assembly Location  
YWW = Date Code (Year & Week)  
ZZ = Assembly Lot

## ORDERING INFORMATION

| Device       | Package | Shipping        |
|--------------|---------|-----------------|
| NTP125N60S5H | TO220   | 50 Units / Tube |

# NTP125N60S5H

## THERMAL CHARACTERISTICS

| Parameter                               | Symbol          | Value | Unit |
|-----------------------------------------|-----------------|-------|------|
| Thermal Resistance, Junction-to-Case    | $R_{\theta JC}$ | 0.82  | °C/W |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 62.5  |      |

## ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ unless otherwise specified)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|-----------|--------|-----------------|-----|-----|-----|------|
|-----------|--------|-----------------|-----|-----|-----|------|

### OFF CHARACTERISTICS

|                                                           |                                   |                                                                      |     |     |      |       |
|-----------------------------------------------------------|-----------------------------------|----------------------------------------------------------------------|-----|-----|------|-------|
| Drain-to-Source Breakdown Voltage                         | $V_{(BR)DSS}$                     | $V_{GS} = 0\text{ V}, I_D = 10\text{ mA}, T_J = 25^\circ\text{C}$    | 600 | –   | –    | V     |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $\Delta V_{(BR)DSS} / \Delta T_J$ | $I_D = 10\text{ mA}$ , Referenced to $25^\circ\text{C}$              | –   | 630 | –    | mV/°C |
| Zero Gate Voltage Drain Current                           | $I_{DSS}$                         | $V_{GS} = 0\text{ V}, V_{DS} = 600\text{ V}, T_J = 25^\circ\text{C}$ | –   | –   | 1    | μA    |
| Gate-to-Source Leakage Current                            | $I_{GSS}$                         | $V_{GS} = \pm 30\text{ V}, V_{DS} = 0\text{ V}$                      | –   | –   | ±100 | nA    |

### ON CHARACTERISTICS

|                               |              |                                                                   |     |      |     |    |
|-------------------------------|--------------|-------------------------------------------------------------------|-----|------|-----|----|
| Drain-to-Source On Resistance | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 11\text{ A}, T_J = 25^\circ\text{C}$ | –   | 100  | 125 | mΩ |
| Gate Threshold Voltage        | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = 2.1\text{ mA}, T_J = 25^\circ\text{C}$    | 2.7 | –    | 4.3 | V  |
| Forward Transconductance      | $g_{FS}$     | $V_{DS} = 20\text{ V}, I_D = 11\text{ A}$                         | –   | 21.7 | –   | S  |

### CHARGES, CAPACITANCES & GATE RESISTANCE

|                                   |               |                                                                                 |   |      |   |    |
|-----------------------------------|---------------|---------------------------------------------------------------------------------|---|------|---|----|
| Input Capacitance                 | $C_{ISS}$     | $V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}, f = 250\text{ kHz}$                | – | 2036 | – | pF |
| Output Capacitance                | $C_{OSS}$     |                                                                                 | – | 31.4 | – |    |
| Time Related Output Capacitance   | $C_{OSS(tr)}$ | $I_D = \text{Constant}, V_{DS} = 0\text{ to }400\text{ V}, V_{GS} = 0\text{ V}$ | – | 485  | – |    |
| Energy Related Output Capacitance | $C_{OSS(er)}$ |                                                                                 | – | 52.5 | – |    |
| Total Gate Charge                 | $Q_{G(TOT)}$  | $V_{DD} = 400\text{ V}, I_D = 11\text{ A}, V_{GS} = 10\text{ V}$                | – | 37.3 | – | nC |
| Gate-to-Source Charge             | $Q_{GS}$      |                                                                                 | – | 9.92 | – |    |
| Gate-to-Drain Charge              | $Q_{GD}$      |                                                                                 | – | 10.4 | – |    |
| Gate Resistance                   | $R_G$         | $f = 1\text{ MHz}$                                                              | – | 1.08 | – | Ω  |

### SWITCHING CHARACTERISTICS

|                     |              |                                                                                             |   |      |   |    |
|---------------------|--------------|---------------------------------------------------------------------------------------------|---|------|---|----|
| Turn-On Delay Time  | $t_{d(ON)}$  | $V_{GS} = 0/10\text{ V}, V_{DD} = 400\text{ V}, I_D = 11\text{ A}, R_G = 7.5\text{ }\Omega$ | – | 21   | – | ns |
| Rise Time           | $t_r$        |                                                                                             | – | 6.02 | – |    |
| Turn-Off Delay Time | $t_{d(OFF)}$ |                                                                                             | – | 59.8 | – |    |
| Fall Time           | $t_f$        |                                                                                             | – | 2.66 | – |    |

### SOURCE-TO-DRAIN DIODE CHARACTERISTICS

|                         |          |                                                                                                      |   |      |     |    |
|-------------------------|----------|------------------------------------------------------------------------------------------------------|---|------|-----|----|
| Forward Diode Voltage   | $V_{SD}$ | $I_{SD} = 11\text{ A}, V_{GS} = 0\text{ V}, T_J = 25^\circ\text{C}$                                  | – | –    | 1.2 | V  |
| Reverse Recovery Time   | $t_{RR}$ | $V_{GS} = 0\text{ V}, I_{SD} = 11\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, V_{DD} = 400\text{ V}$ | – | 337  | –   | ns |
| Reverse Recovery Charge | $Q_{RR}$ |                                                                                                      | – | 4529 | –   | nC |

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.

TYPICAL CHARACTERISTICS

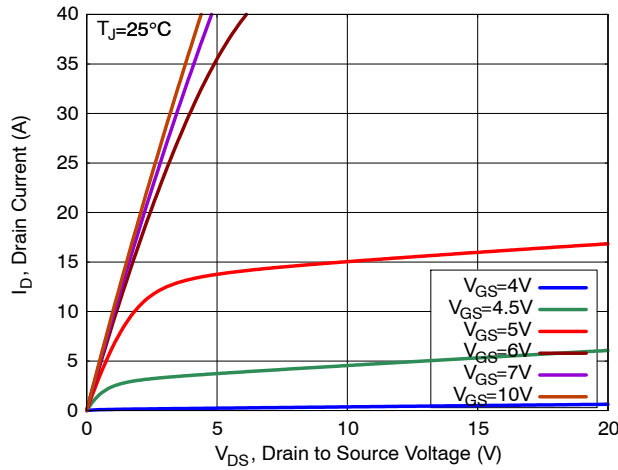


Figure 1. On-Region Characteristics

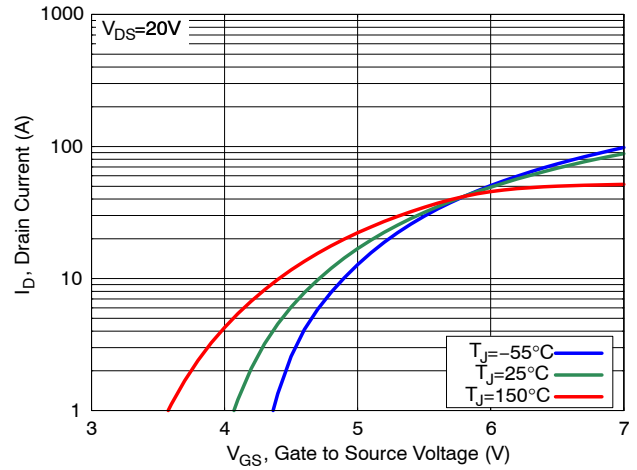


Figure 2. Transfer Characteristics

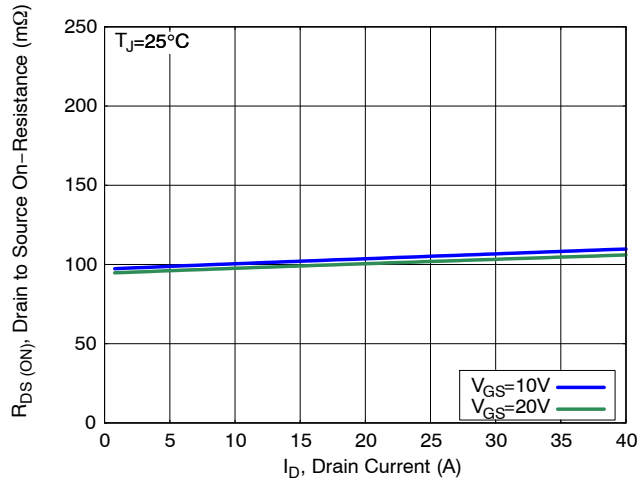


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

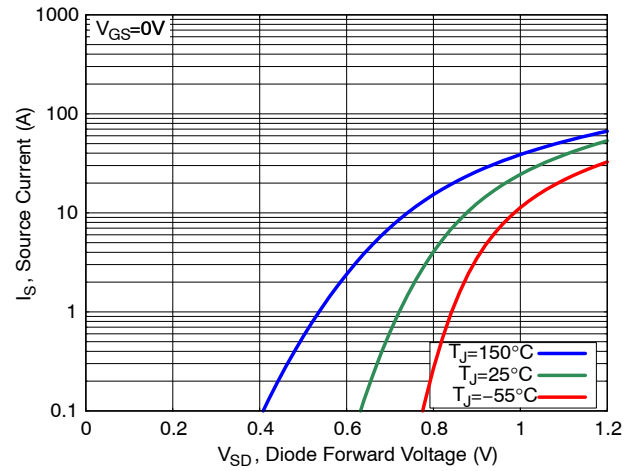


Figure 4. Diode Forward Voltage vs. Source Current

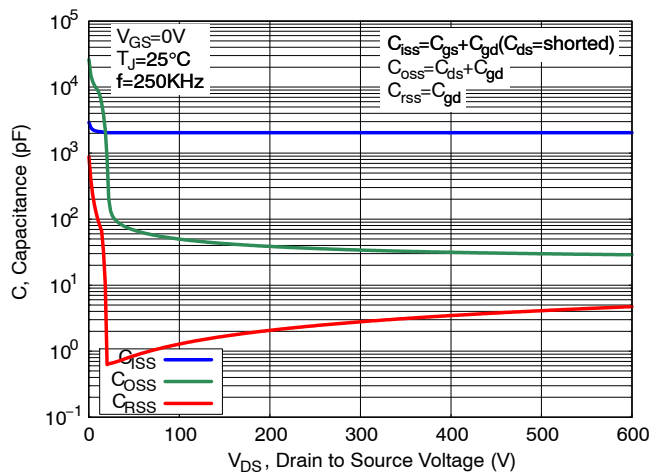


Figure 5. Capacitance Characteristics

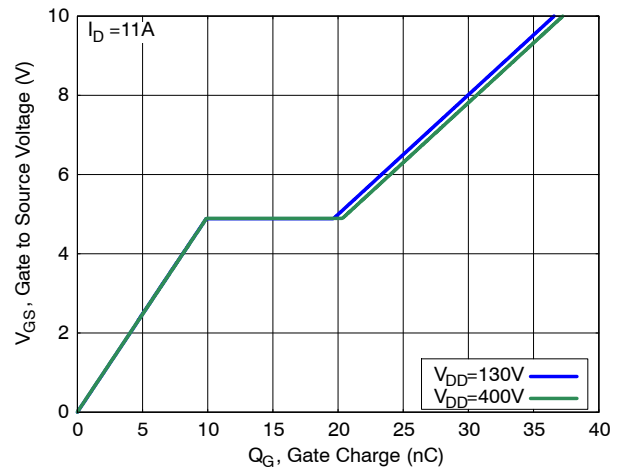


Figure 6. Gate Charge Characteristics

TYPICAL CHARACTERISTICS

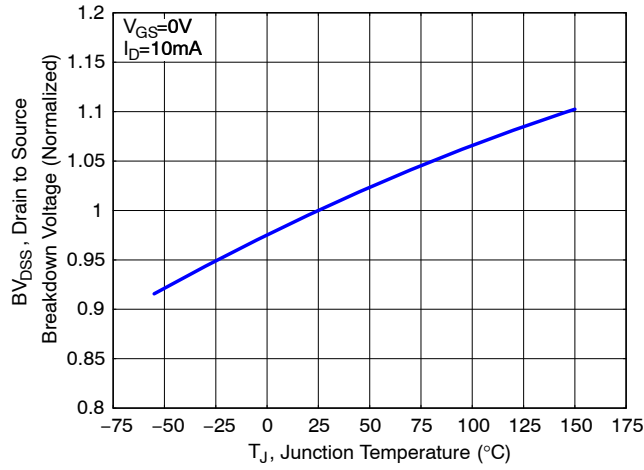


Figure 7. Breakdown Voltage Variation vs. Temperature

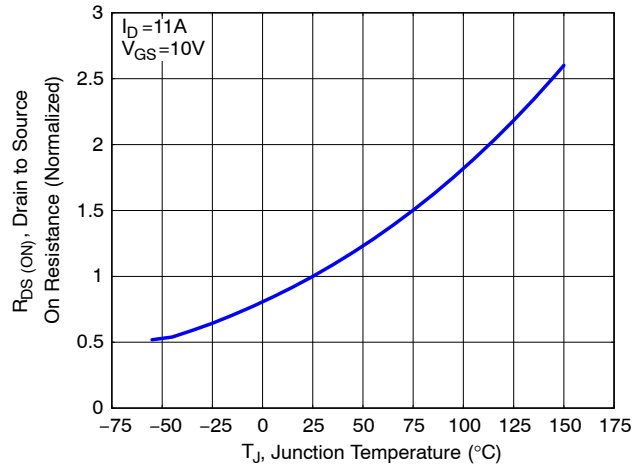


Figure 8. On-Resistance Variation vs. Temperature

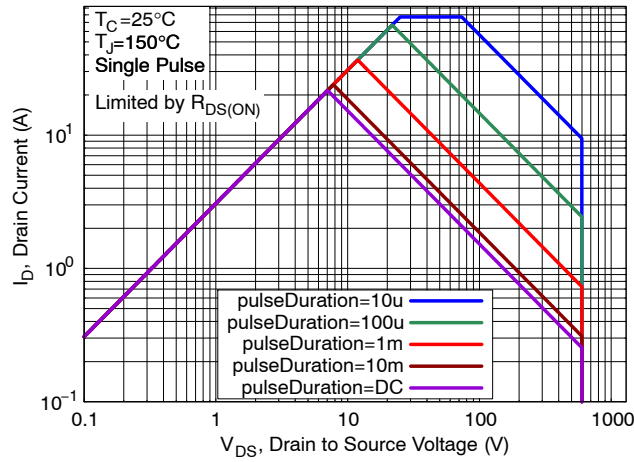


Figure 9. Maximum Safe Operating Area

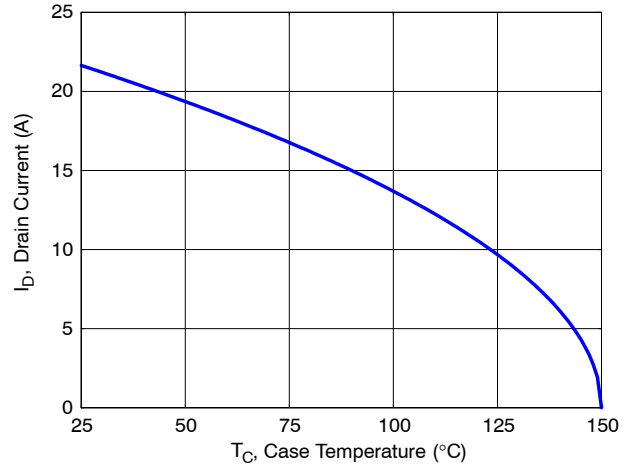


Figure 10. Maximum Drain Current vs. Case Temperature

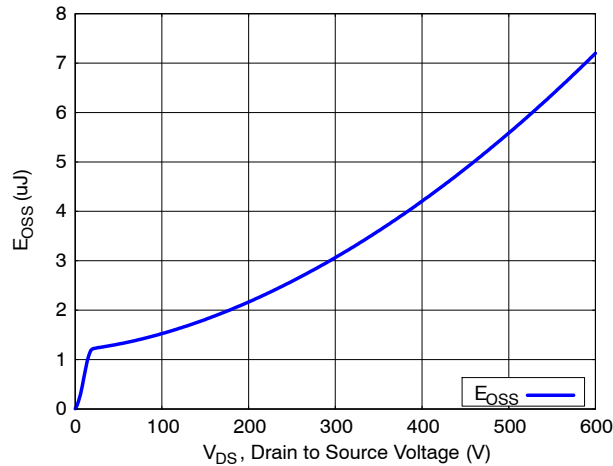


Figure 11. E<sub>oss</sub> vs. Drain-to-Source Voltage

TYPICAL CHARACTERISTICS

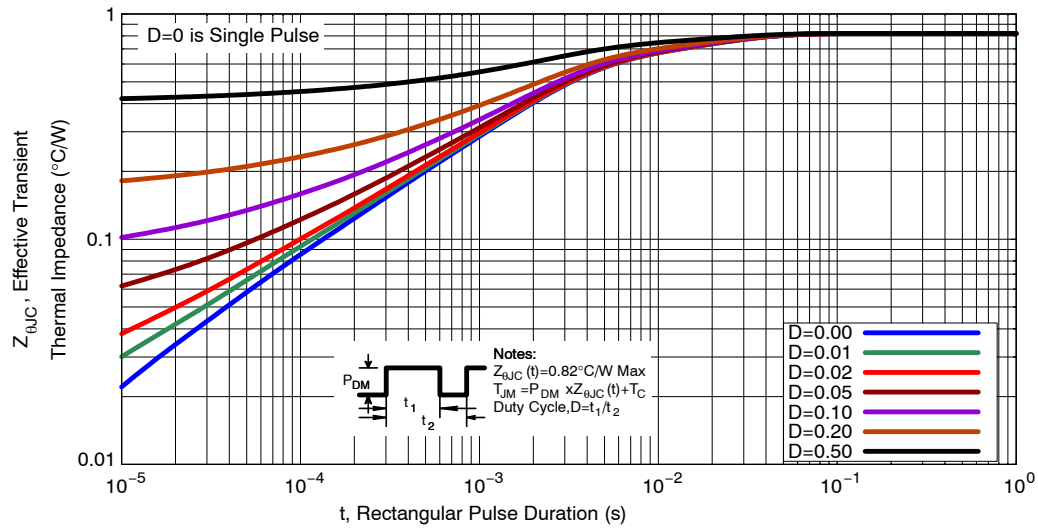


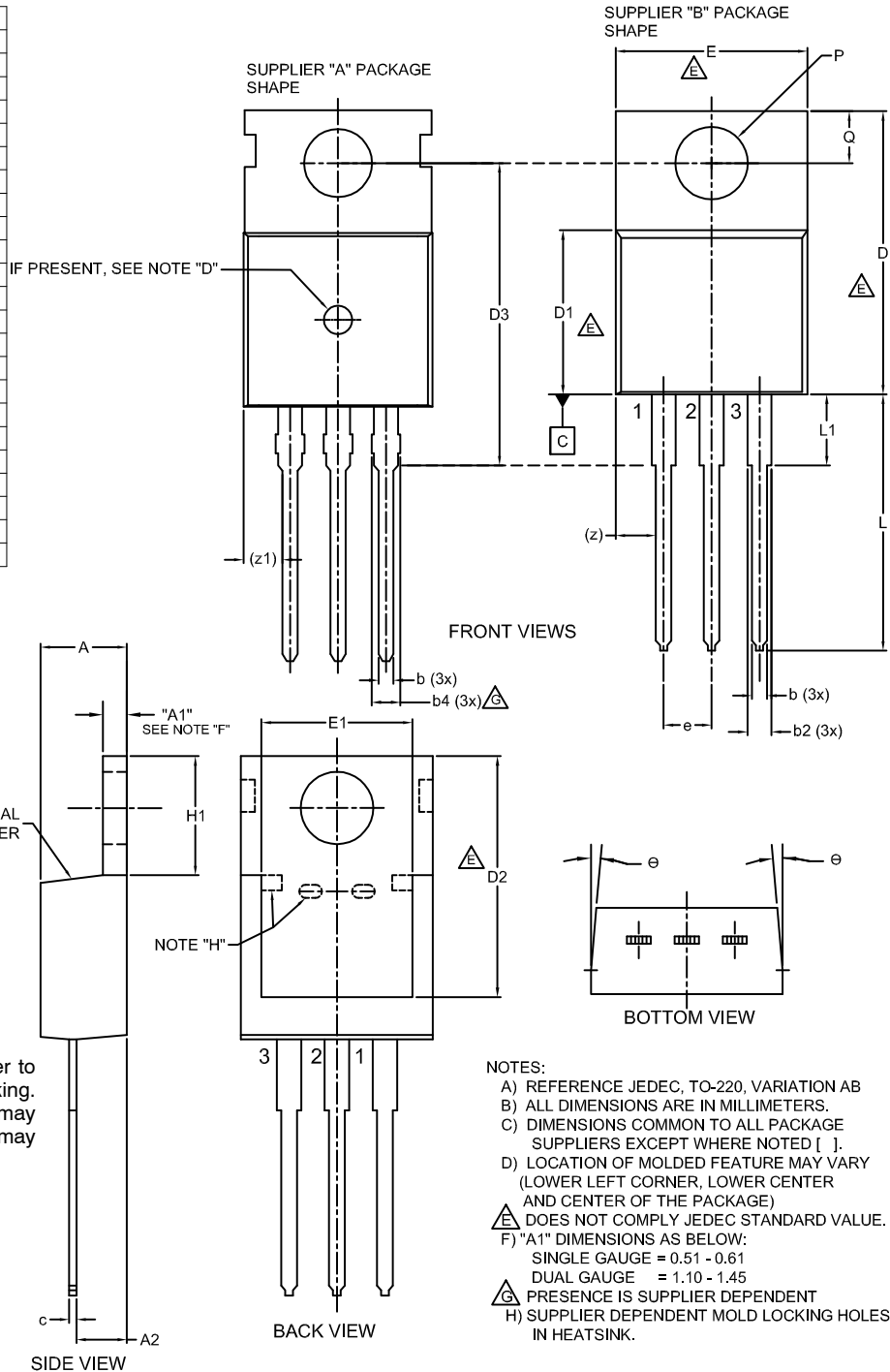
Figure 12. Transient Thermal Impedance

# NTP125N60S5H

## PACKAGE DIMENSIONS

TO-220-3LD  
CASE 340AT  
ISSUE B

| DIM | MILLIMETERS  |      |       |
|-----|--------------|------|-------|
|     | MIN.         | NOM. | MAX.  |
| A   | 4.00         | --   | 4.70  |
| A1  | SEE NOTE "F" |      |       |
| A2  | 2.10         | --   | 2.85  |
| b   | 0.55         | --   | 1.00  |
| b2  | 1.10         | --   | 1.62  |
| b4  | 1.42         | --   | 1.62  |
| c   | 0.36         | --   | 0.60  |
| D   | 13.90        | --   | 16.30 |
| D1  | 8.13         | --   | 9.40  |
| D2  | 11.50        | --   | 14.30 |
| D3  | 15.42        | --   | 16.51 |
| E   | 9.65         | --   | 10.67 |
| E1  | 7.59         | --   | 8.65  |
| e   | 2.40         | --   | 2.67  |
| H1  | 6.06         | --   | 6.69  |
| L   | 12.70        | --   | 14.04 |
| L1  | 2.70         | --   | 4.10  |
| P   | 3.50         | --   | 4.00  |
| Q   | 2.50         | --   | 3.40  |
| z   | 2.13 REF     |      |       |
| z1  | 2.06 REF     |      |       |
| θ   | 3°           | --   | 5°    |



### GENERIC MARKING DIAGRAM\*



XXXX = Specific Device Code  
A = Assembly Location  
Y = Year  
WW = Work Week  
ZZ = Assembly Lot 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.

# NTP125N60S5H

**onsemi**, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## PUBLICATION ORDERING INFORMATION

### LITERATURE FULFILLMENT:

Email Requests to: [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

**onsemi Website:** [www.onsemi.com](http://www.onsemi.com)

### TECHNICAL SUPPORT

**North American Technical Support:**

Voice Mail: 1 800-282-9855 Toll Free USA/Canada

Phone: 011 421 33 790 2910

**Europe, Middle East and Africa Technical Support:**

Phone: 00421 33 790 2910

For additional information, please contact your local Sales Representative

## X-ON Electronics

Largest Supplier of Electrical and Electronic Components

*Click to view similar products for [MOSFETs](#) category:*

*Click to view products by [ON Semiconductor](#) manufacturer:*

Other Similar products are found below :

[MCH6422-TL-E](#) [IRFD120](#) [IRFY240C](#) [JANTX2N5237](#) [2SJ277-DL-E](#) [2SK2267\(Q\)](#) [BUK455-60A/B](#) [TK100A10N1,S4X\(S](#) [MIC4420CM-TR](#)  
[IRFS350](#) [VN1206L](#) [NDP4060](#) [IPS70R2K0CEAKMA1](#) [AON6932A](#) [2N4352](#) [TS19452CS RL](#) [TK31J60W5,S1VQ\(O](#) [TK16J60W,S1VQ\(O](#)  
[2SK2614\(Te16L1,Q\)](#) [JANTX2N6798](#) [DMN1017UCP3-7](#) [EFC2J004NUZTDG](#) [DMN1053UCP4-7](#) [SCM040600](#) [NTE2384](#) [2N7000TA](#)  
[DMN2080UCB4-7](#) [DMN61D9UWQ-13](#) [US6M2GTR](#) [DMN31D5UDJ-7](#) [DMP22D4UFO-7B](#) [DMN1006UCA6-7](#) [DMN16M9UCA6-7](#)  
[STF5N65M6](#) [IRF40H233XTMA1](#) [STU5N65M6](#) [DMN6022SSD-13](#) [DMN13M9UCA6-7](#) [DMTH10H4M6SPS-13](#) [DMN2990UFB-7B](#)  
[2N7002W-G](#) [MCAC30N06Y-TP](#) [MCQ7328-TP](#) [IPB45P03P4L11ATMA2](#) [BXP2N20L](#) [BXP2N65D](#) [BXT330N06D](#) [TSM60NB380CP](#) [ROG](#)  
[RQ7L055BGTCTCR](#) [SLF10N65ABV2](#)