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MOSFET - Power, N-Channel, SUPERFET® III, FAST 650 V, 95 mΩ, 30 A



NTMT095N65S3H

Description

SUPERFET III MOSFET is ON Semiconductor's brand-new high voltage super-junction (SJ) MOSFET family that is utilizing charge balance technology for outstanding low on-resistance and lower gate charge performance. This advanced technology is tailored to minimize conduction loss, provide superior switching performance, and withstand extreme dv/dt rate. Consequently, SUPERFET III FAST MOSFET is suitable for various AC/DC power conversion for system miniaturization and higher efficiency.

The Power88 package is an ultra-slim surface-mount package (1 mm high) with a low profile and small footprint (8 x 8 mm²). SUPERFET III MOSFET in a Power88 package offers excellent switching performance due to lower parasitic source inductance and separated power and drive sources. Power88 offers Moisture Sensitivity Level 1 (MSL 1).

Features

- 700 V @ $T_J = 150^\circ\text{C}$
- Typ. $R_{DS(on)} = 77 \text{ m}\Omega$
- Ultra Low Gate Charge (Typ. $Q_g = 58 \text{ nC}$)
- Low Effective Output Capacitance (Typ. $C_{oss(\text{eff.})} = 522 \text{ pF}$)
- 100% Avalanche Tested
- These Devices are Pb-Free and are RoHS Compliant

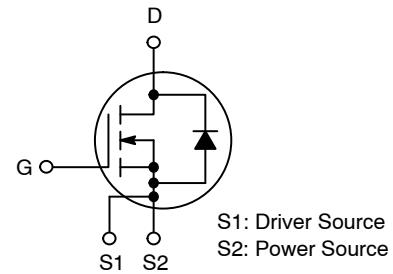
Applications

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

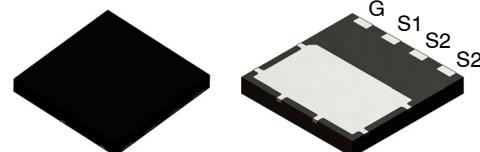
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| V_{DSS} | $R_{DS(\text{ON}) \text{ MAX}}$ | $I_D \text{ MAX}$ |
|-----------|---------------------------------|-------------------|
| 650 V | 95 mΩ @ 10 V | 30 A |

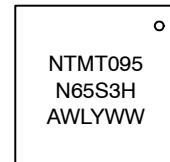


POWER MOSFET



TDFN4 8x8 2P
CASE 520AB

MARKING DIAGRAM



NTMT095N65S3H = Specific Device Code
A = Assembly Location
WL = Wafer Lot
Y = Year
WW = Work Week

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

NTMT095N65S3H

ABSOLUTE MAXIMUM RATINGS (T_C = 25°C, Unless otherwise noted)

| Symbol | Parameter | | Value | Unit |
|-----------------------------------|--|---------------------------------------|-------------|------|
| V _{DSS} | Drain to Source Voltage | | 650 | V |
| V _{GSS} | Gate to Source Voltage | – DC | ±30 | V |
| | | – AC (f > 1 Hz) | ±30 | |
| I _D | Drain Current | – Continuous (T _C = 25°C) | 30 | A |
| | | – Continuous (T _C = 100°C) | 18 | |
| I _{DM} | Drain Current | – Pulsed (Note 1) | 84 | A |
| E _{AS} | Single Pulsed Avalanche Energy (Note 2) | | 284 | mJ |
| I _{AS} | Avalanche Current (Note 2) | | 5.5 | A |
| E _{AR} | Repetitive Avalanche Energy (Note 1) | | 2.08 | mJ |
| dv/dt | MOSFET dv/dt | | 120 | V/ns |
| | Peak Diode Recovery dv/dt (Note 3) | | 20 | |
| P _D | Power Dissipation | (T _C = 25°C) | 208 | W |
| | | – Derate Above 25°C | 1.67 | W/°C |
| T _J , T _{STG} | Operating and Storage Temperature Range | | –55 to +150 | °C |
| T _L | Maximum Lead Temperature for Soldering, 1/8" from Case for 5 seconds | | 260 | °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_{AS} = 5.5 A, R_G = 25 Ω, starting T_J = 25°C.
3. I_{SD} ≤ 15 A, di/dt ≤ 200 A/μs, V_{DD} ≤ 400 V, starting T_J = 25°C.

THERMAL CHARACTERISTICS

| Symbol | Parameter | Value | Unit |
|------------------|--|-------|------|
| R _{θJC} | Thermal Resistance, Junction to Case, Max. | 0.60 | °C/W |
| R _{θJA} | Thermal Resistance, Junction to Ambient, Max. (Note 4) | 45 | |

4. Device on 1 in² pad 2 oz copper pad on 1.5 x 1.5 in. board of FR-4 material.

PACKAGE MARKING AND ORDERING INFORMATION

| Part Number | Top Marking | Package | Reel Size | Tape Width | Shipping Quantity [†] |
|---------------|---------------|---------|-----------|------------|--------------------------------|
| NTMT095N65S3H | NTMT095N65S3H | TDFN4 | 13" | 13.3 mm | 3000 Units / Tape & Reel |

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

NTMT095N65S3H

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

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

OFF CHARACTERISTICS

| | | | | | | |
|-------------------------------------|---|--|-----|------|------|------|
| BV _{DSS} | Drain to Source Breakdown Voltage | V _{GS} = 0 V, I _D = 1 mA, T _J = 25°C | 650 | – | – | V |
| | | V _{GS} = 0 V, I _D = 1 mA, T _J = 150°C | 700 | – | – | V |
| ΔBV _{DSS} /ΔT _J | Breakdown Voltage Temperature Coefficient | I _D = 10 mA, Referenced to 25°C | – | 0.63 | – | V/°C |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} = 650 V, V _{GS} = 0 V | – | – | 10 | μA |
| | | V _{DS} = 520 V, T _C = 125°C | – | 1.8 | – | |
| I _{GSS} | Gate to Body Leakage Current | V _{GS} = ±30 V, V _{DS} = 0 V | – | – | ±100 | nA |

ON CHARACTERISTICS

| | | | | | | |
|---------------------|--------------------------------------|---|-----|----|-----|----|
| V _{GS(th)} | Gate Threshold Voltage | V _{GS} = V _{DS} , I _D = 2.8 mA | 2.4 | – | 4.0 | V |
| R _{D(on)} | Static Drain to Source On Resistance | V _{GS} = 10 V, I _D = 15 A | – | 77 | 95 | mΩ |
| g _{FS} | Forward Transconductance | V _{DS} = 20 V, I _D = 15 A | – | 30 | – | S |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|------------------------|-----------------------------------|--|---|------|---|----|
| C _{iss} | Input Capacitance | V _{DS} = 400 V, V _{GS} = 0 V, f = 250 kHz | – | 2833 | – | pF |
| C _{oss} | Output Capacitance | | – | 43 | – | pF |
| C _{oss(eff.)} | Effective Output Capacitance | V _{DS} = 0 V to 400 V, V _{GS} = 0 V | – | 522 | – | pF |
| C _{oss(er.)} | Energy Related Output Capacitance | V _{DS} = 0 V to 400 V, V _{GS} = 0 V | – | 75 | – | pF |
| Q _{g(tot)} | Total Gate Charge at 10V | V _{DS} = 400 V, I _D = 15 A, V _{GS} = 10 V (Note 4) | – | 58 | – | nC |
| | Gate to Source Gate Charge | | – | 14 | – | nC |
| | Gate to Drain "Miller" Charge | | – | 15 | – | nC |
| ESR | Equivalent Series Resistance | f = 1 MHz | – | 1.2 | – | Ω |

SWITCHING CHARACTERISTICS

| | | | | | | |
|---------------------|---------------------|---|---|-----|---|----|
| t _{d(on)} | Turn-On Delay Time | V _{DD} = 400 V, I _D = 15 A, V _{GS} = 10 V, R _g = 4.7 Ω (Note 4) | – | 23 | – | ns |
| t _r | Turn-On Rise Time | | – | 6.5 | – | ns |
| t _{d(off)} | Turn-Off Delay Time | | – | 69 | – | ns |
| t _f | Turn-Off Fall Time | | – | 2.5 | – | ns |

SOURCE-DRAIN DIODE CHARACTERISTICS

| | | | | | | |
|-----------------|--|--|---|-----|-----|----|
| I _S | Maximum Continuous Source to Drain Diode Forward Current | – | – | 30 | A | |
| I _{SM} | Maximum Pulsed Source to Drain Diode Forward Current | – | – | 84 | A | |
| V _{SD} | Source to Drain Diode Forward Voltage | V _{GS} = 0 V, I _{SD} = 15 A | – | – | 1.2 | V |
| t _{rr} | Reverse Recovery Time | V _{DD} = 400 V, I _{SD} = 15 A, dI _F /dt = 100 A/μs | – | 352 | – | ns |
| Q _{rr} | Reverse Recovery Charge | | – | 5.8 | – | μC |

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.

5. Essentially independent of operating temperature typical characteristics.

TYPICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

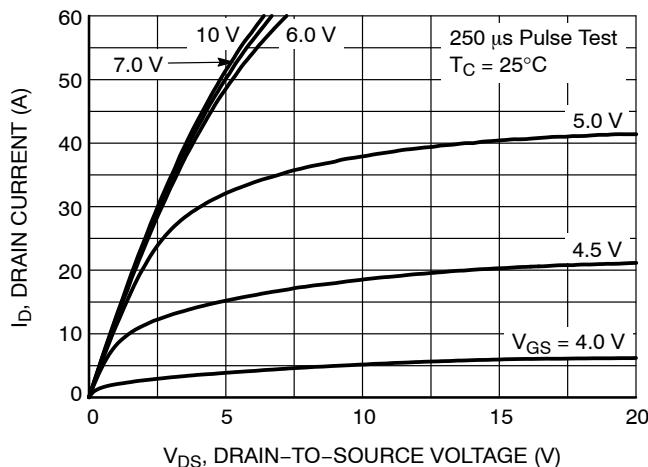


Figure 1. On-Region Characteristics

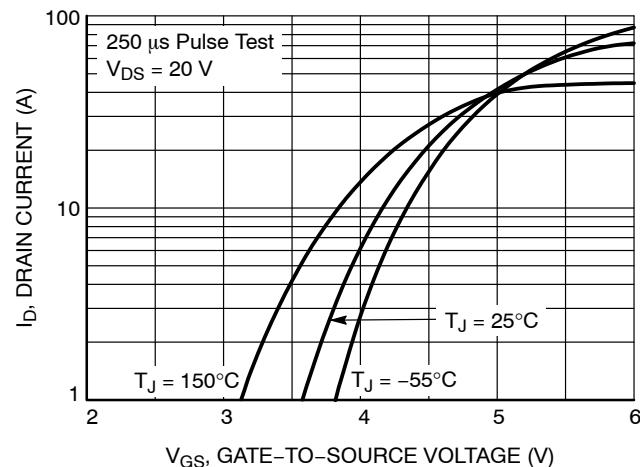


Figure 2. Transfer Characteristics

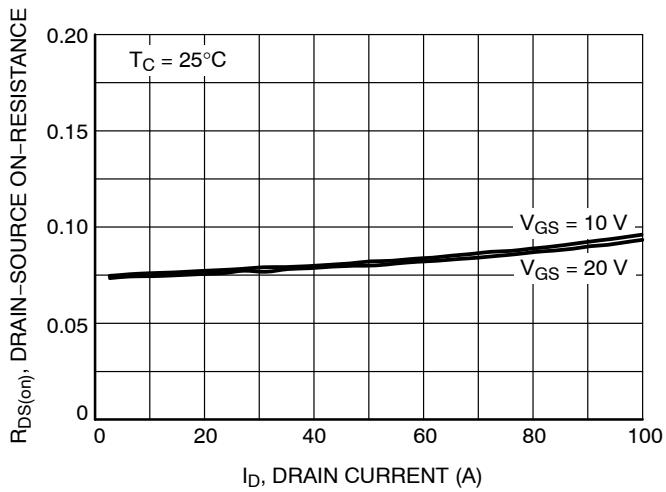


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

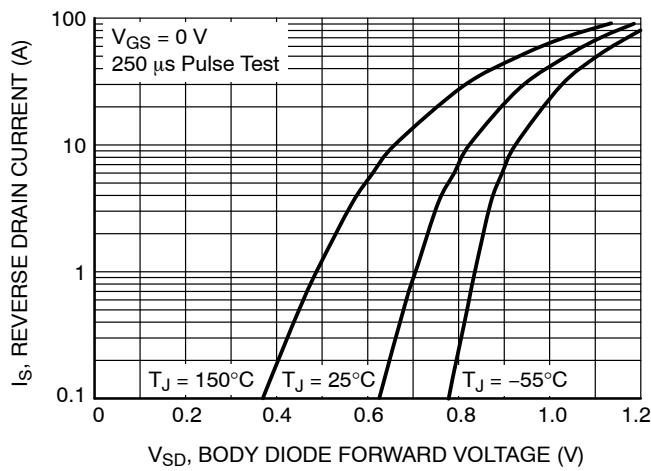


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

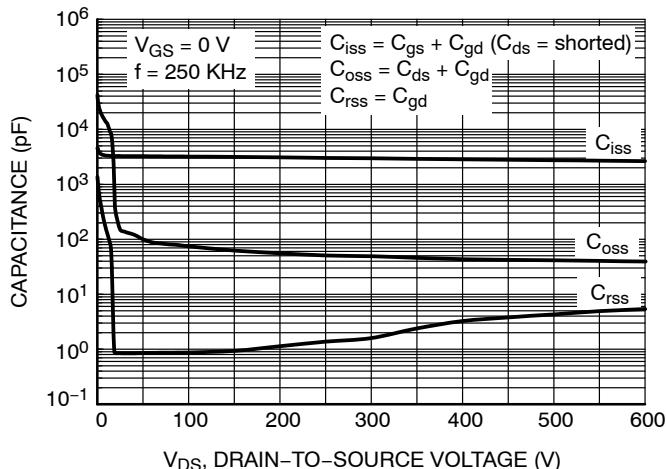


Figure 5. Capacitance Characteristics

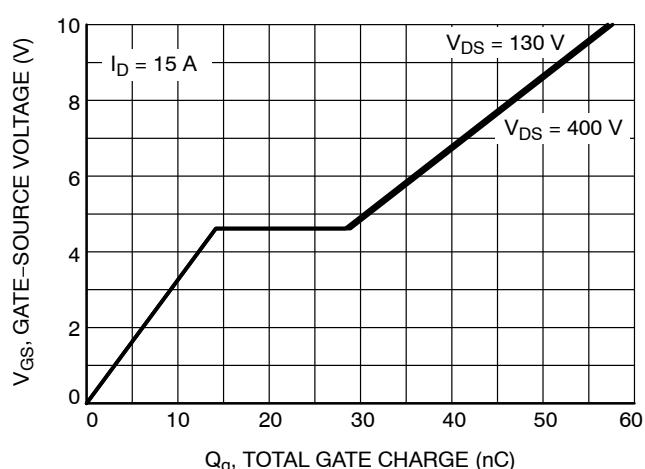


Figure 6. Gate Charge Characteristics

TYPICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

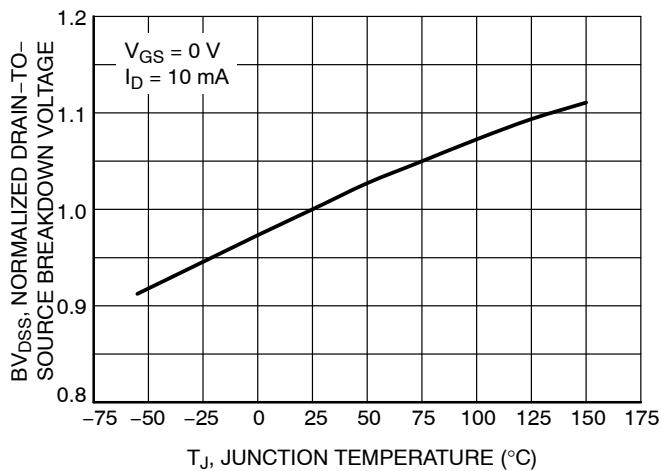


Figure 7. Breakdown Voltage Variation vs. Temperature

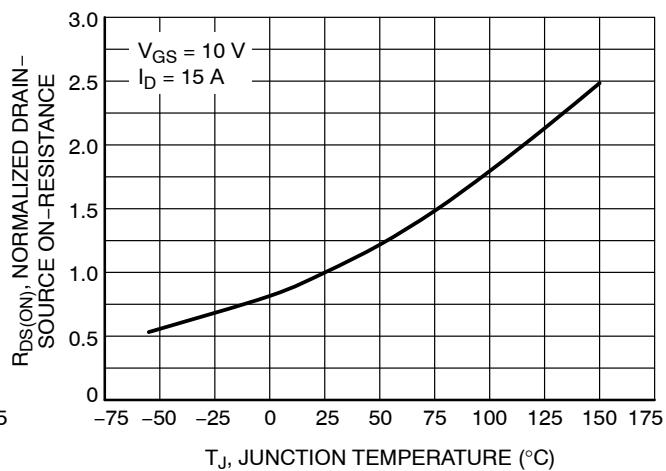


Figure 8. On-Resistance Variation vs. Temperature

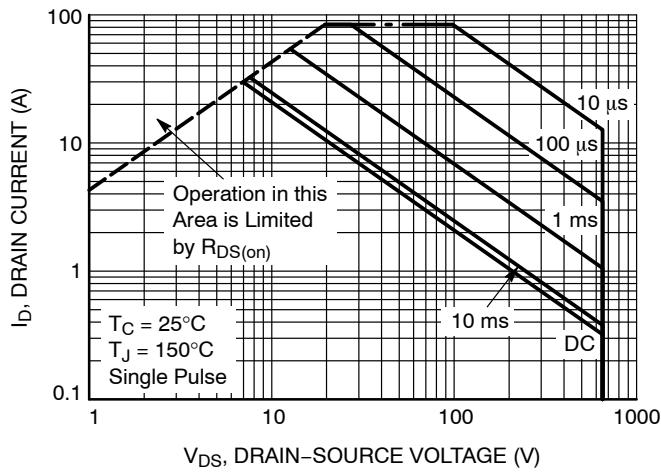


Figure 9. Maximum Safe Operating Area

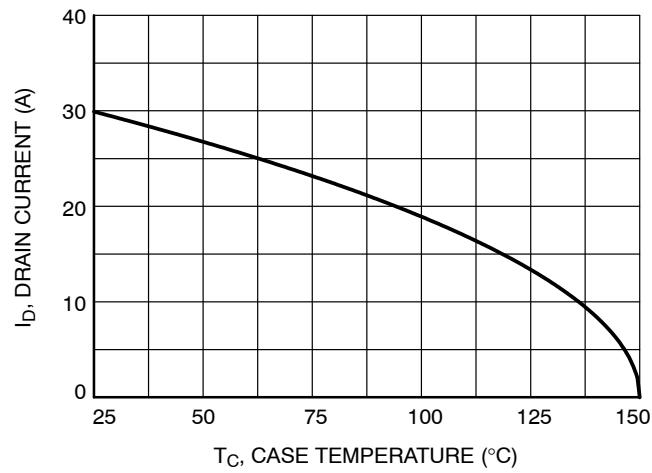


Figure 10. Maximum Drain Current vs. Case Temperature

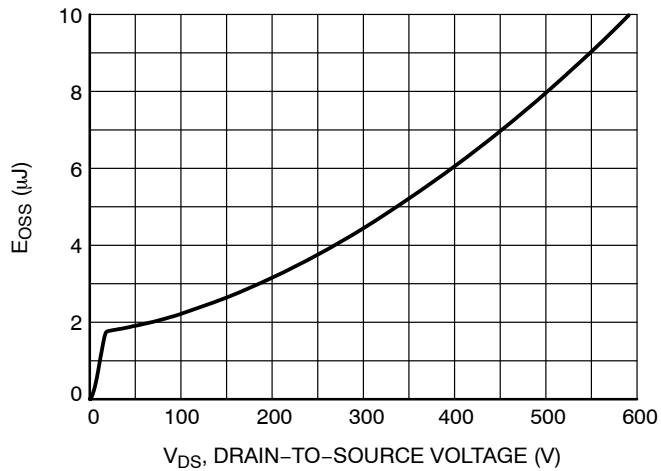


Figure 11. E_{oss} vs. Drain to Source Voltage

NTMT095N65S3H

TYPICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

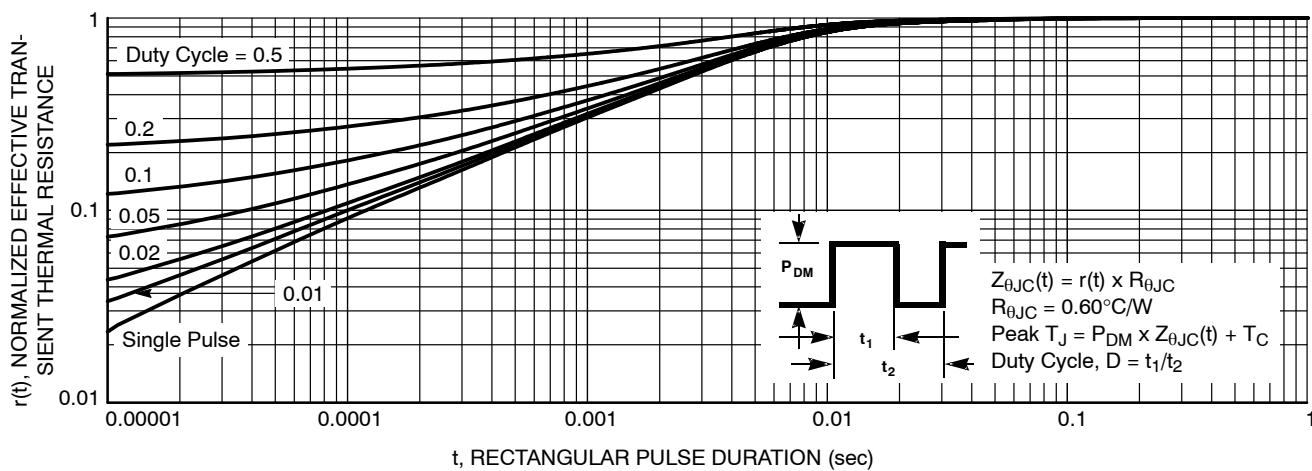


Figure 12. Transient Thermal Impedance

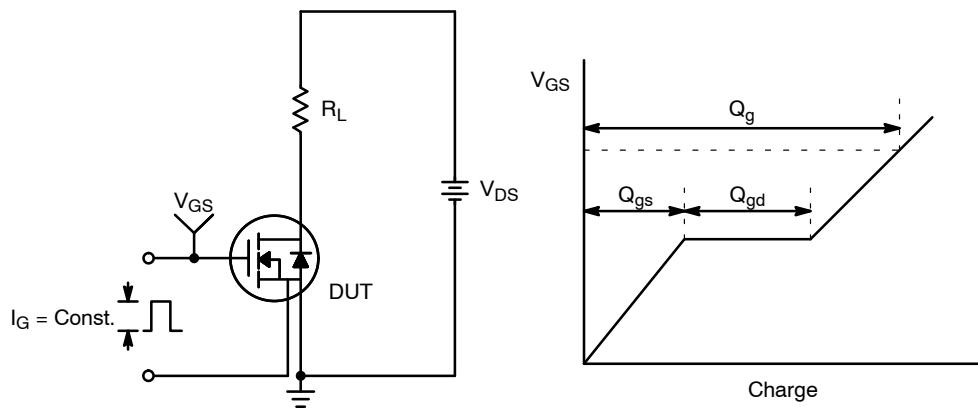


Figure 13. Gate Charge Test Circuit & Waveform

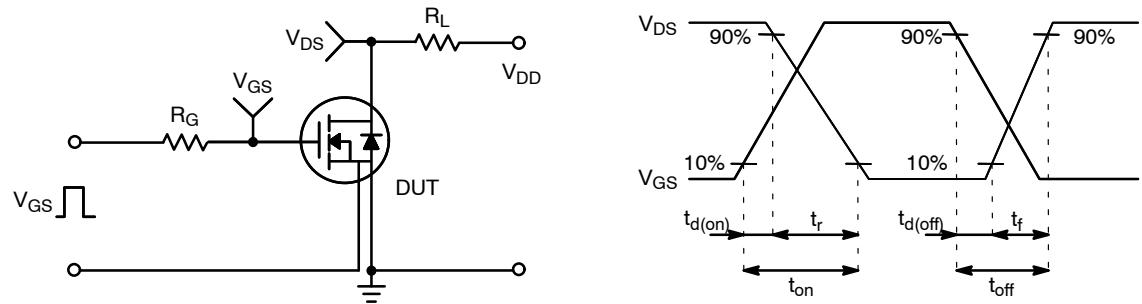


Figure 14. Resistive Switching Test Circuit & Waveforms

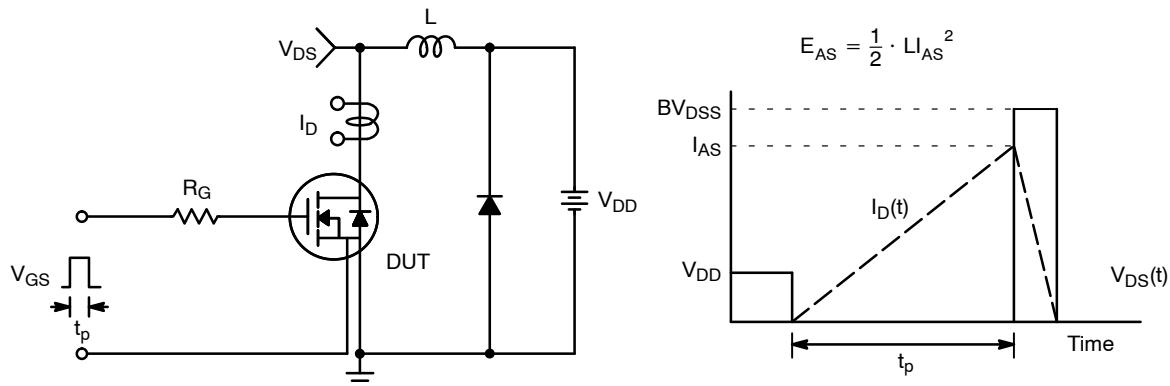


Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms

NTMT095N65S3H

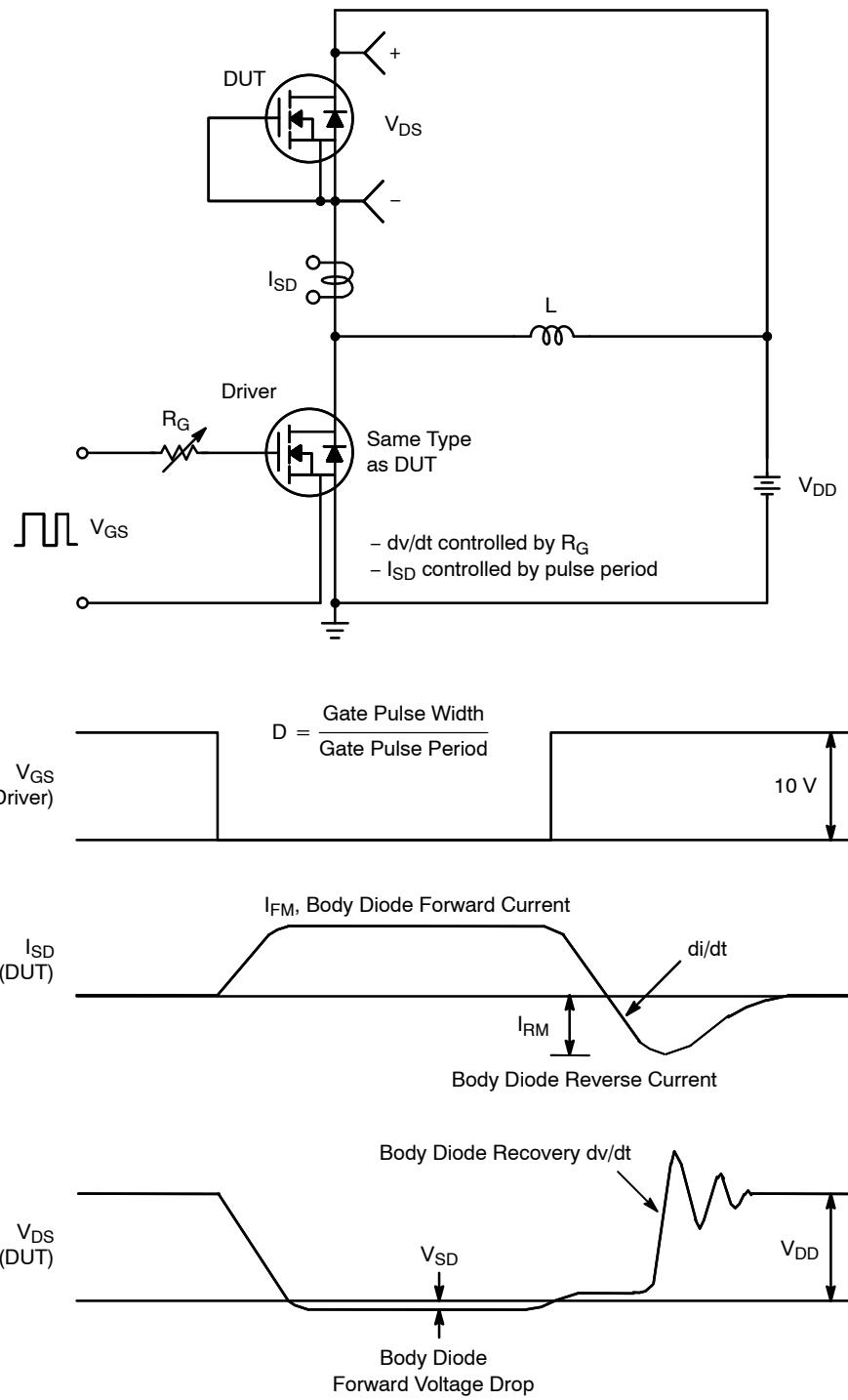


Figure 16. Peak Diode Recovery dv/dt Test Circuit & Waveforms

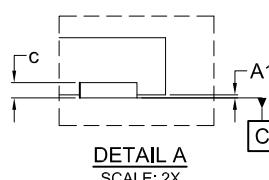
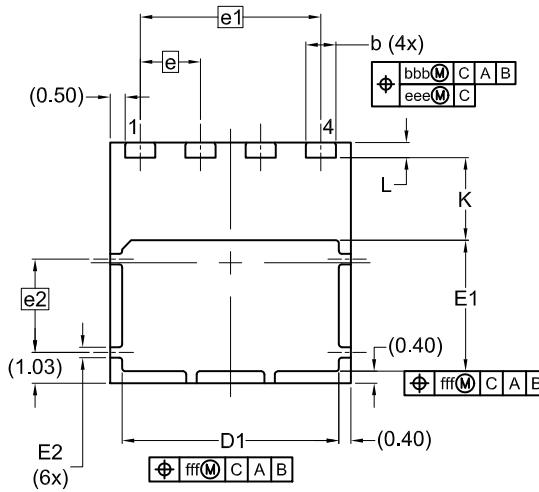
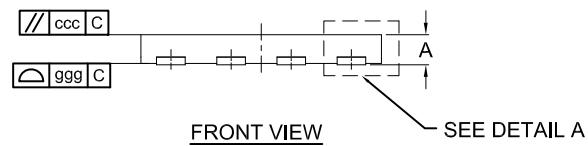
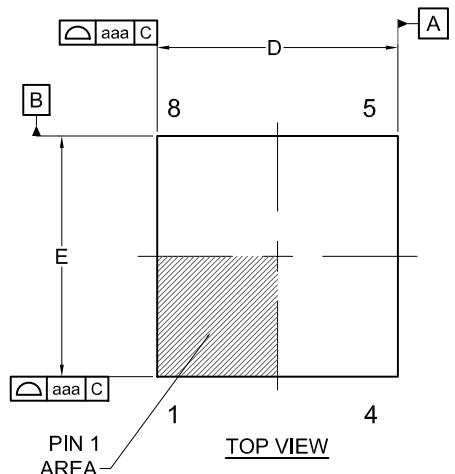
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PACKAGE DIMENSIONS

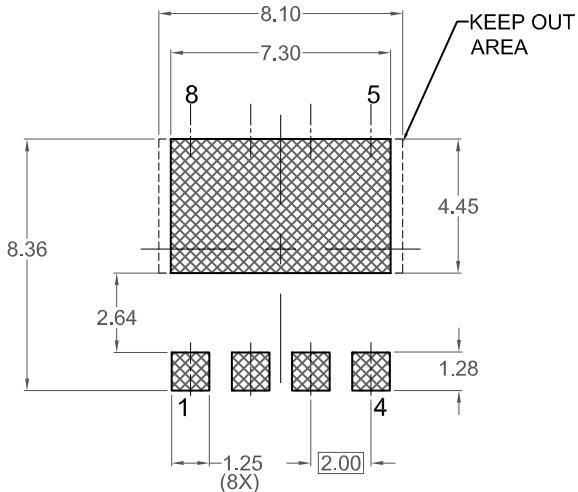
TDFN4 8x8, 2P
CASE 520AB
ISSUE 0

NOTES: UNLESS OTHERWISE SPECIFIED

- A) DOES NOT FULLY CONFORM TO JEDEC
REGISTRATION MO-220.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD
FLASH. MOLD FLASH OR BURRS DOES NOT
EXCEED 0.10MM.
- D) IT IS RECOMMENDED TO HAVE NO TRACES OR
VIAS WITHIN THE KEEP OUT AREA.



| DIM | MILLIMETERS | | |
|-----|-------------|------|------|
| | MIN. | NOM. | MAX. |
| A | 0.90 | 1.00 | 1.10 |
| A1 | 0.00 | — | 0.05 |
| b | 0.90 | 1.00 | 1.10 |
| c | 0.10 | 0.20 | 0.30 |
| D | 7.90 | 8.00 | 8.10 |
| D1 | 7.10 | 7.20 | 7.30 |
| E | 7.90 | 8.00 | 8.10 |
| E1 | 4.25 | 4.35 | 4.45 |
| E2 | 0.15 | 0.25 | 0.35 |
| e | 2.00 BSC | | |
| e1 | 6.00 BSC | | |
| e2 | 3.10 BSC | | |
| K | (2.75) | | |
| L | 0.40 | 0.50 | 0.60 |
| aaa | 0.10 | | |
| bbb | 0.10 | | |
| ccc | 0.05 | | |
| eee | 0.05 | | |
| fff | 0.10 | | |
| ggg | 0.15 | | |



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