# ON Semiconductor

# Is Now



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# MOSFET - Power, N-Channel, SUPERFET® III, FAST
## 650 V, 125 mΩ, 24 A

# NTMT125N65S3H

**ON Semiconductor®**

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### 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 $mm^2$). 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).

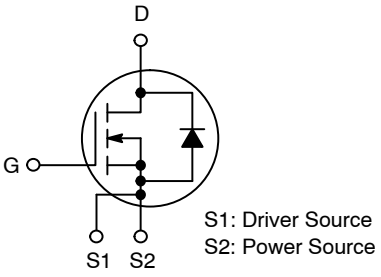
### Features

- 700 V @ $T_J$ = 150°C
- Typ. $R_{DS(on)}$ = 108 mΩ
- Ultra Low Gate Charge (Typ. $Q_g$ = 44 nC)
- Low Effective Output Capacitance (Typ. $C_{oss(eff.)}$ = 379 pF)
- 100% Avalanche Tested
- These Devices are Pb−Free and are RoHS Compliant

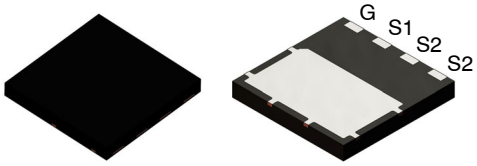
### Applications

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

| $V_{DSS}$ | $R_{DS(ON)}$ MAX | $I_D$ MAX |
|---|---|---|
| 650 V | 125 mΩ @ 10 V | 24 A |




**POWER MOSFET**




**TDFN4 8X8 2P**
**CASE 520AB**

### MARKING DIAGRAM




| | |
|---|---|
| NTMT125N65S3H | = 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.

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**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) | 24 | A |
| | | – Continuous ($T_C$ = 100°C) | 15 | |
| $I_{DM}$ | Drain Current | – Pulsed (Note 1) | 67 | A |
| $E_{AS}$ | Single Pulsed Avalanche Energy (Note 2) | | 216 | mJ |
| $I_{AS}$ | Avalanche Current (Note 2) | | 4.7 | A |
| $E_{AR}$ | Repetitive Avalanche Energy (Note 1) | | 1.71 | 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) | 171 | W |
| | | – Derate Above 25°C | 1.37 | 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. $I_{AS}$ = 4.7 A, $R_G$ = 25 Ω, starting $T_J$ = 25°C.
3. $I_{SD} \le$ 12 A, di/dt ≤ 200 A/μs, $V_{DD} \le$ 400 V, starting $T_J$ = 25°C.

## THERMAL CHARACTERISTICS

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case, Max. | 0.73 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient, Max. (Note 4) | 45 | |

4. Device on 1 $in^2$ 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† |
|---|---|---|---|---|---|
| NTMT125N65S3H | NTMT125N65S3H | 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.

**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 |
| $\Delta BV_{DSS}/\Delta T_J$ | 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 | – | 1.3 | – | |
| $I_{GSS}$ | Gate to Body Leakage Current | $V_{GS}$ = ±30 V, $V_{DS}$ = 0 V | – | – | ±100 | nA |
| **ON CHARACTERISTICS** | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$ = $V_{DS}$, $I_D$ = 2.1 mA | 2.4 | – | 4.0 | V |
| $R_{DS(on)}$ | Static Drain to Source On Resistance | $V_{GS}$ = 10 V, $I_D$ = 12 A | – | 108 | 125 | mΩ |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$ = 20 V, $I_D$ = 12 A | – | 26 | – | S |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = 400 V, $V_{GS}$ = 0 V, f = 250 kHz | – | 2200 | – | pF |
| $C_{oss}$ | Output Capacitance | | – | 34 | – | pF |
| $C_{oss(eff.)}$ | Effective Output Capacitance | $V_{DS}$ = 0 V to 400 V, $V_{GS}$ = 0 V | – | 379 | – | pF |
| $C_{oss(er.)}$ | Energy Related Output Capacitance | $V_{DS}$ = 0 V to 400 V, $V_{GS}$ = 0 V | – | 56 | – | pF |
| $Q_{g(tot)}$ | Total Gate Charge at 10V | $V_{DS}$ = 400 V, $I_D$ = 12 A, $V_{GS}$ = 10 V (Note 4) | – | 44 | – | nC |
| $Q_{gs}$ | Gate to Source Gate Charge | | – | 11 | – | nC |
| $Q_{gd}$ | Gate to Drain “Miller” Charge | | – | 12 | – | nC |
| ESR | Equivalent Series Resistance | f = 1 MHz | – | 1.1 | – | Ω |
| **SWITCHING CHARACTERISTICS** | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD}$ = 400 V, $I_D$ = 12 A, $V_{GS}$ = 10 V, $R_g$ = 7.5 Ω (Note 4) | – | 23 | – | ns |
| $t_r$ | Turn-On Rise Time | | – | 8 | – | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | – | 70 | – | ns |
| $t_f$ | Turn-Off Fall Time | | – | 2.7 | – | ns |
| **SOURCE-DRAIN DIODE CHARACTERISTICS** | | | | | | |
| $I_S$ | Maximum Continuous Source to Drain Diode Forward Current | | – | – | 24 | A |
| $I_{SM}$ | Maximum Pulsed Source to Drain Diode Forward Current | | – | – | 67 | A |
| $V_{SD}$ | Source to Drain Diode Forward Voltage | $V_{GS}$ = 0 V, $I_{SD}$ = 12 A | – | – | 1.2 | V |
| $t_{rr}$ | Reverse Recovery Time | $V_{DD}$ = 400 V, $I_{SD}$ = 12 A, $dI_F/dt$ = 100 A/μs | – | 302 | – | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | – | 4.3 | – | 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°C unless otherwise noted)

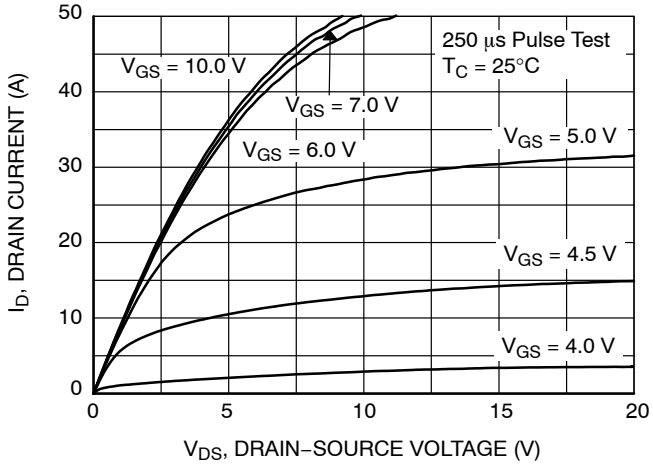



**Figure 1. On−Region Characteristics**

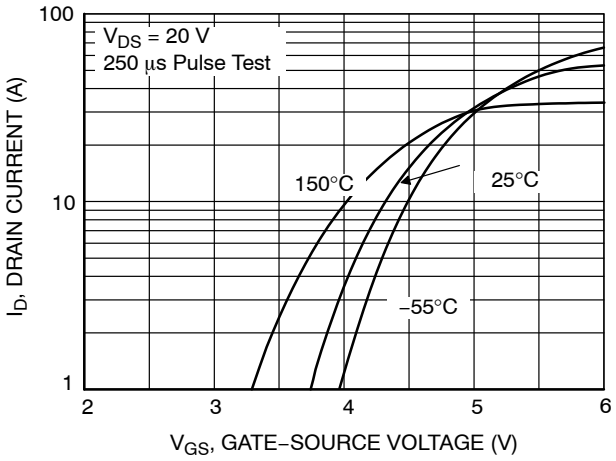



**Figure 2. Transfer Characteristics**

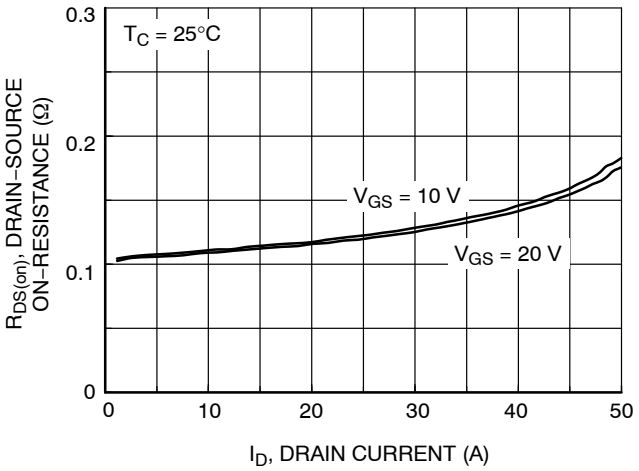



**Figure 3. On−Resistance Variation vs. Drain Current and Gate Voltage**

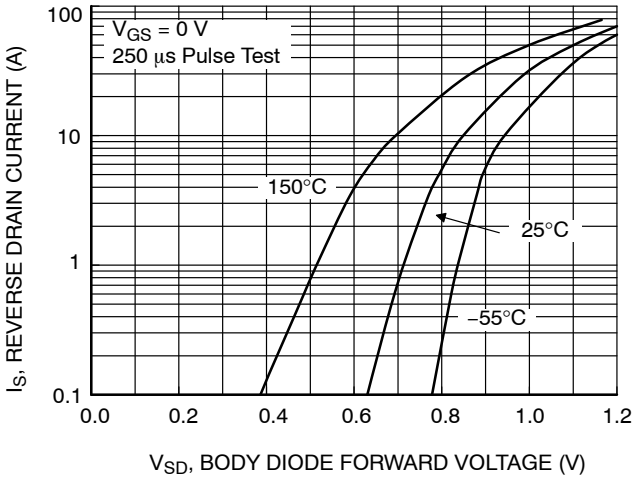



**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**

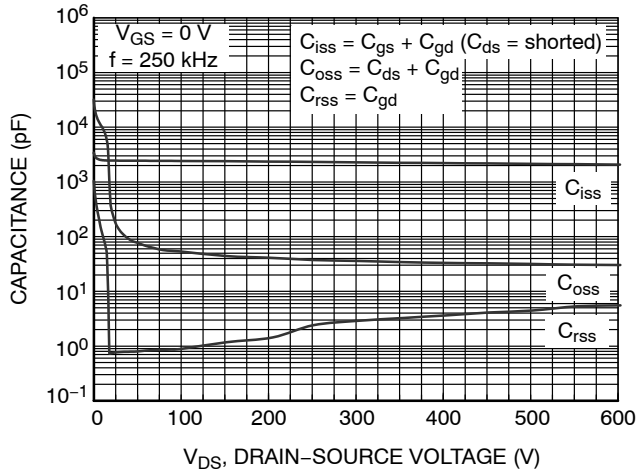



**Figure 5. Capacitance Characteristics**

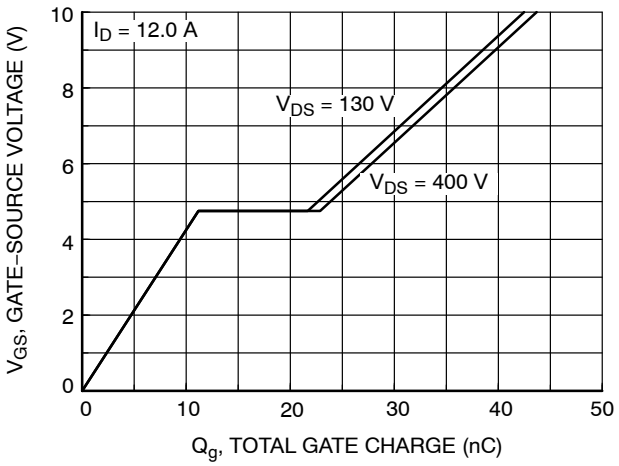



**Figure 6. Gate Charge Characteristics**

## TYPICAL CHARACTERISTICS ($T_C$ = 25°C unless otherwise noted) (continued)

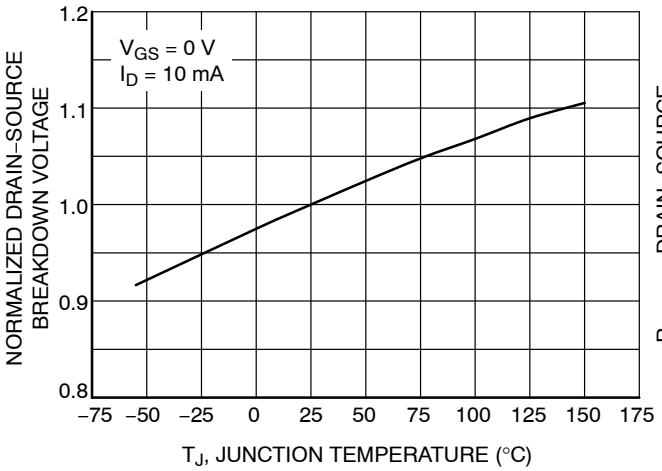



**Figure 7. Breakdown Voltage Variation vs. Temperature**

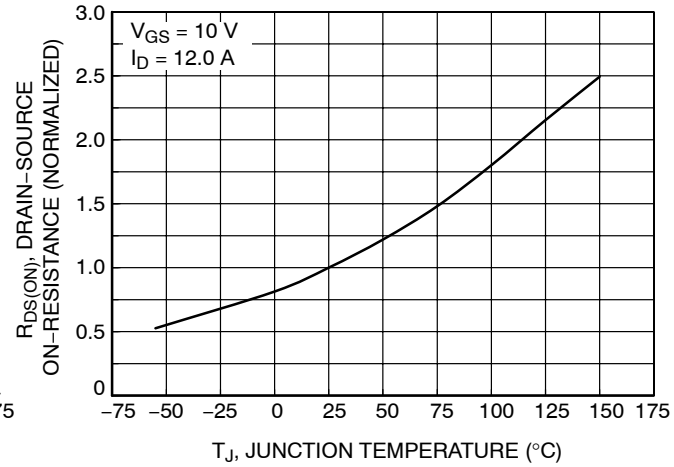



**Figure 8. On−Resistance Variation vs. Temperature**

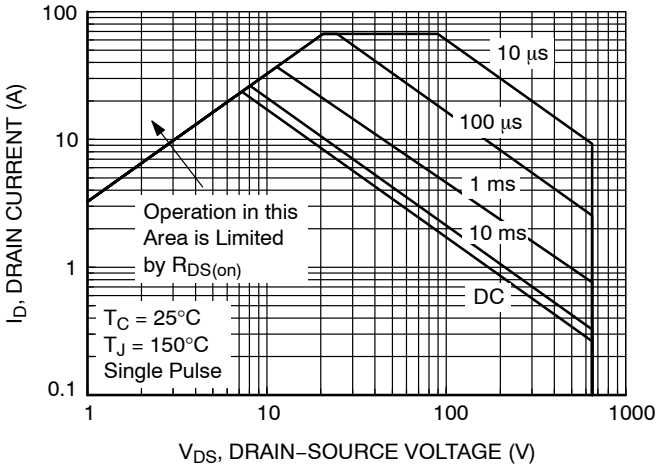



**Figure 9. Maximum Safe Operating Area**

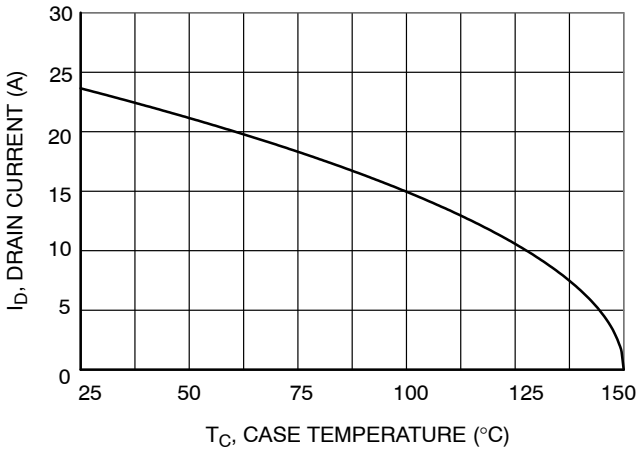



**Figure 10. Maximum Drain Current vs. Case Temperature**

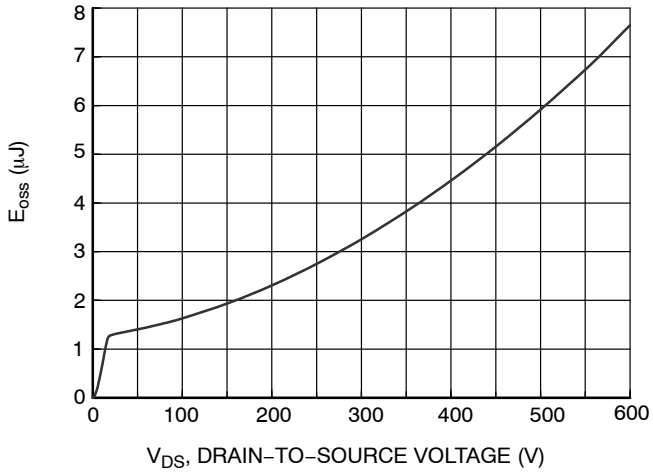



**Figure 11. $E_{OSS}$ vs. Drain to Source Voltage**

**TYPICAL CHARACTERISTICS** ($T_C$ = 25°C unless otherwise noted) (continued)

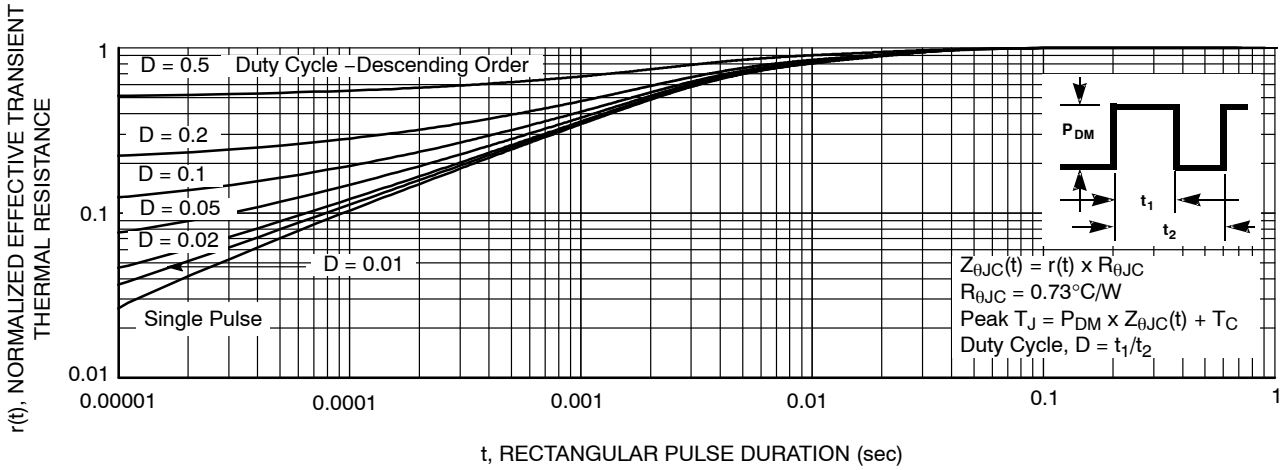



**Figure 12. Transient Thermal Response Curve**

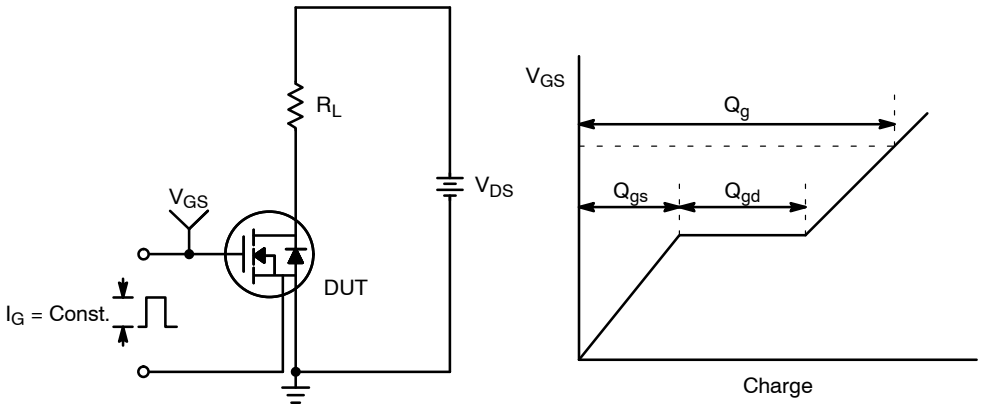



**Figure 13. Gate Charge Test Circuit & Waveform**

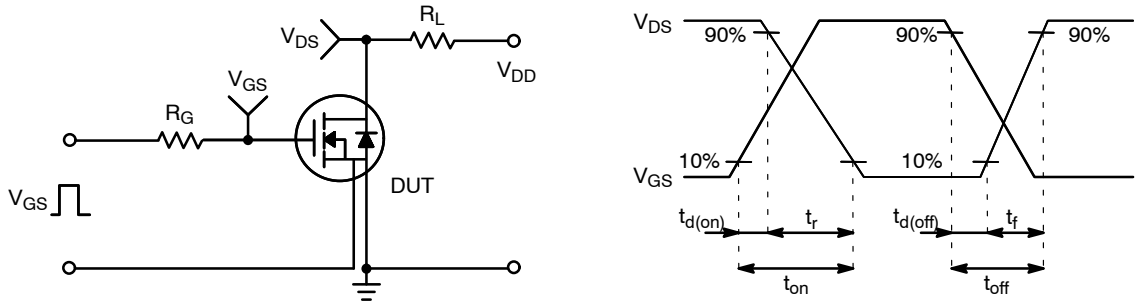



**Figure 14. Resistive Switching Test Circuit & Waveforms**

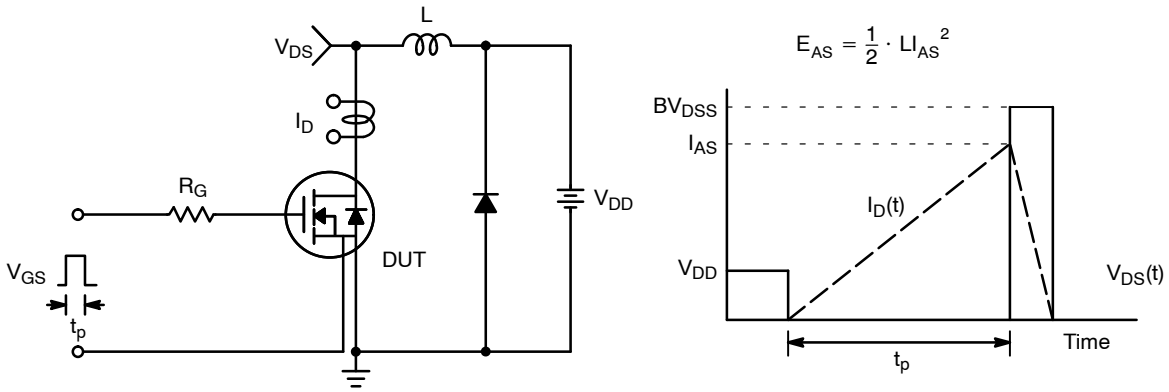



**Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms**

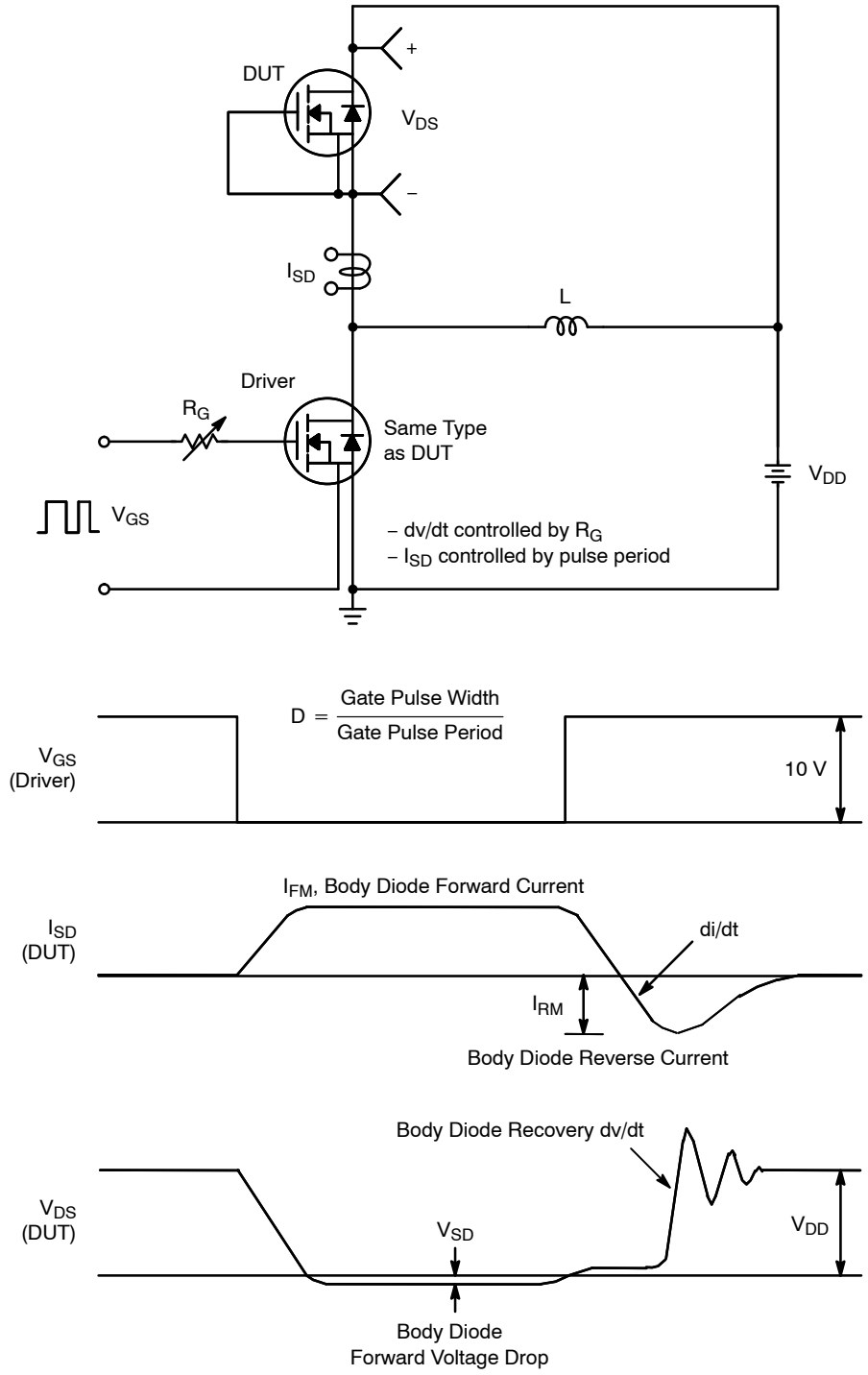



**Figure 16. Peak Diode Recovery dv/dt Test Circuit & Waveforms**

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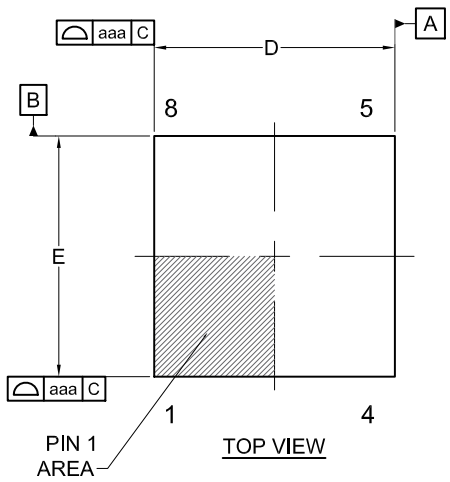
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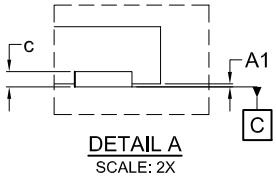
## PACKAGE DIMENSIONS

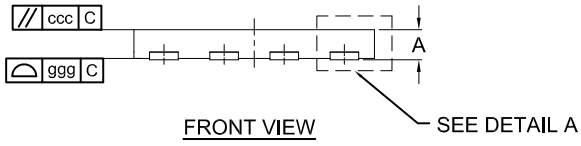
**TDFN4 8x8, 2P**
CASE 520AB
ISSUE O

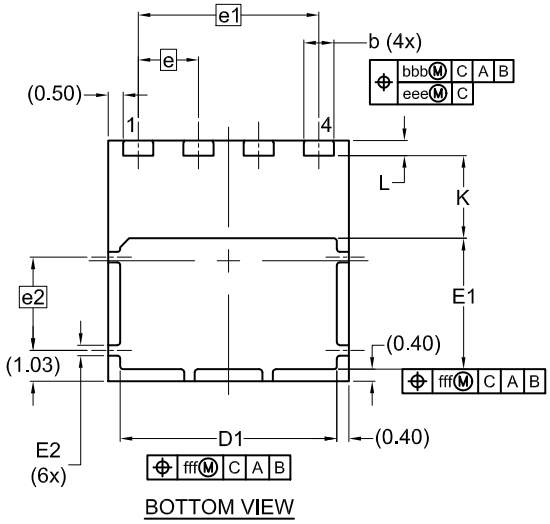
NOTES: UNLESS OTHERWISE SPECIFIED
A) DOES NOT FULLY CONFORM TO JEDEC REGISTRATION MO-220.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
D) IT IS RECOMMENDED TO HAVE NO TRACES OR VIAS WITHIN THE KEEP OUT AREA.

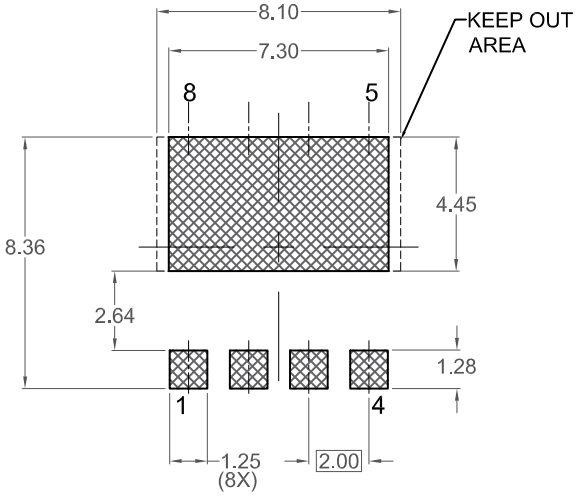
| DIM | MILLIMETERS | | |
|---|---|---|---|
| | MIN. | NOM. | MAX. |
| A | 0.90 | 1.00 | 1.10 |
| A1 | 0.00 | --- | 0.05 |
| b | 0.90 | 1.00 | 1.10 |
| c | 0.10 | 0.20 | 0.30 |
| D | 7.90 | 8.00 | 8.10 |
| D1 | 7.10 | 7.20 | 7.30 |
| E | 7.90 | 8.00 | 8.10 |
| E1 | 4.25 | 4.35 | 4.45 |
| E2 | 0.15 | 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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ENTEGRECİ

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# Elektronik komponent tedarikinde Entegreci

Entegreci, Eskişehir merkezli, Türkiye geneline satış yapan bir elektronik komponent mağazasıdır. Entegreler (IC), mikrodenetleyiciler, transistörler, diyotlar, pasif elemanlar, konnektörler, modüller ve geliştirme kartları tek adetten seri üretim adetlerine kadar satılır. Ürün sayfalarında güncel stok durumunu, fiyatı ve datasheet bağlantısını bulabilirsiniz.

### Parça koduyla arama

Üretici parça numarasını yazın; stok ve fiyatı hemen görün.

**www.entegreci.com**

### Ürün kategorileri

Entegreden kapasitöre tüm elektronik komponent kategorileri.

**Kategorilere göz atın**

### Üreticiler

Aradığınız üreticinin ürünlerini tek sayfada inceleyin.

**Üreticileri görün**

### Toplu alım ve teklif

Listede olmayan ya da yüksek adetli parçalar için teklif isteyin.

**Teklif isteyin**

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