

MOSFET – N-Channel

UniFET™

250 V, 69 A, 41 mΩ

FDA69N25

Description

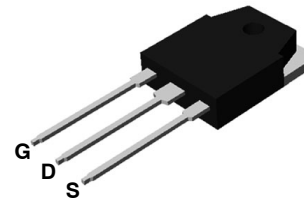
UniFET MOSFET is onsemi's high voltage MOSFET family based on planar stripe and DMOS technology. This MOSFET is tailored to reduce on-state resistance, and to provide better switching performance and higher avalanche energy strength. This device family is suitable for switching power converter applications such as power factor correction (PFC), flat panel display (FPD) TV power, ATX and electronic lamp ballasts.

Features

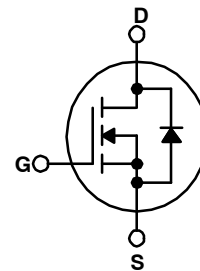
- $R_{DS(on)} = 34 \text{ m}\Omega$ (Typ.) @ $V_{GS} = 10 \text{ V}$, $I_D = 34.5 \text{ A}$
- Low Gate Charge (Typ. 77 nC)
- Low C_{rss} (Typ. 84 pF)

Applications

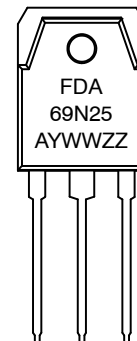
- PDP TV
- Uninterruptible Power Supply
- AC-DC Power Supply



TO-3P-3LD
CASE 340BZ



MARKING DIAGRAM



FDA69N25 = Specific Device Code
A = Assembly Location
YWW = Date Code (Year & Week)
ZZ = Assembly Lot

ORDERING INFORMATION

| Device | Package | Shipping† |
|----------|------------------------|------------------|
| FDA69N25 | TO-3P-3LD (Pb-Free) | 450 Units / Tube |

†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](#).

FDA69N25

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

| Symbol | Parameter | | Rating | Unit |
|-----------------------------------|--|---------------------------------------|-------------|------|
| V _{DSS} | Drain–Source Voltage | | 250 | V |
| V _{DS(Avalanche)} | Repetitive Avalanche Voltage (Notes 1, 2) | | 300 | V |
| I _D | Drain Current | – Continuous (T _C = 25°C) | 69 | A |
| | | – Continuous (T _C = 100°C) | 44.2 | |
| I _{DM} | Drain Current | – Pulsed (Note 1) | 276 | A |
| V _{GSS} | Gate–Source Voltage | | ±30 | V |
| E _{AS} | Single Pulsed Avalanche Energy (Note 2) | | 1894 | mJ |
| I _{AR} | Avalanche Current (Note 1) | | 69 | A |
| E _{AR} | Repetitive Avalanche Energy (Note 1) | | 48 | mJ |
| dv/dt | Peak Diode Recovery dv/dt (Note 3) | | 4.5 | V/ns |
| P _D | Power Dissipation | (T _C = 25°C) | 480 | W |
| | | – Derate Above 25°C | 3.84 | |
| 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 | | 300 | °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. L = 0.64 mH, I_{AS} = 69 A, V_{DD} = 50 V, R_G = 25 Ω, starting T_J = 25°C.
3. I_{SD} ≤ 69 A, di/dt ≤ 200 A/μs, V_{DD} ≤ BV_{DSS}, starting T_J = 25°C.

THERMAL CHARACTERISTICS

| Symbol | Parameter | Value | Unit |
|------------------|---|-------|------|
| R _{θJC} | Thermal Resistance, Junction–to–Case, Max. | 0.26 | °C/W |
| R _{θJA} | Thermal Resistance, Junction–to–Ambient, Max. | 40 | |

FDA69N25

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

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

Off Characteristics

| | | | | | | |
|-------------------------------------|---|---|-----|------|------|------|
| B _{VDS} | Drain–Source Breakdown Voltage | V _{GS} = 0 V, I _D = 250 μA | 250 | – | – | V |
| $\frac{\Delta B_{VDS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | I _D = 250 μA, Referenced to 25°C | – | 0.25 | – | V/°C |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} = 250 V, V _{GS} = 0 V | – | – | 1 | μA |
| | | V _{DS} = 200 V, T _C = 125°C | – | – | 10 | μA |
| I _{GSSF} | Gate to Body Leakage Current, Forward | V _{GS} = 30 V, V _{DS} = 0 V | – | – | 100 | nA |
| I _{GSSR} | Gate to Body Leakage Current, Reverse | V _{GS} = –30 V, V _{DS} = 0 V | – | – | –100 | nA |

On Characteristics

| | | | | | | |
|---------------------|-----------------------------------|---|-----|-------|-------|---|
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} = V _{GS} , I _D = 250 μA | 3.0 | – | 5.0 | V |
| R _{DS(on)} | Static Drain–Source On–Resistance | V _{GS} = 10 V, I _D = 34.5 A | – | 0.034 | 0.041 | Ω |
| g _{FS} | Forward Transconductance | V _{DS} = 40 V, I _D = 34.5 A | – | 25 | – | S |

Dynamic Characteristics

| | | | | | | |
|------------------|------------------------------|--|---|------|------|----|
| C _{iss} | Input Capacitance | V _{DS} = 25 V, V _{GS} = 0 V, f = 1 MHz | – | 3570 | 4640 | pF |
| C _{oss} | Output Capacitance | | – | 750 | 980 | pF |
| C _{rss} | Reverse Transfer Capacitance | | – | 84 | 130 | pF |

Switching Characteristics

| | | | | | | |
|---------------------|---------------------|--|---|-----|------|----|
| t _{d(on)} | Turn–On Delay Time | V _{DD} = 125 V, I _D = 69 A, V _{GS} = 10 V, R _G = 25 Ω (Note 4) | – | 95 | 200 | ns |
| t _r | Turn–On Rise Time | | – | 855 | 1720 | ns |
| t _{d(off)} | Turn–Off Delay Time | | – | 130 | 270 | ns |
| t _f | Turn–Off Fall Time | | – | 220 | 450 | ns |
| Q _g | Total Gate Charge | V _{DS} = 200 V, I _D = 69 A, V _{GS} = 10 V (Note 4) | – | 77 | 100 | nC |
| Q _{gs} | Gate–Source Charge | | – | 24 | – | nC |
| Q _{gd} | Gate–Drain Charge | | – | 37 | – | nC |

Drain–Source Diode Characteristics and Maximum Ratings

| | | | | | | |
|-----------------|---|---|---|-----|-----|----|
| I _S | Maximum Continuous Drain–Source Diode Forward Current | | – | – | 34 | A |
| I _{SM} | Maximum Pulsed Drain–Source Diode Forward Current | | – | – | 136 | A |
| V _{SD} | Drain–Source Diode Forward Voltage | V _{GS} = 0 V, I _S = 69 A | – | – | 1.4 | V |
| t _{rr} | Reverse Recovery Time | V _{GS} = 0 V, I _S = 69 A, dI _F /dt = 100 A/μs | – | 210 | – | ns |
| Q _{rr} | Reverse Recovery Charge | | – | 5.7 | – | 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.

4. Essentially independent of operating temperature typical characteristics.

TYPICAL PERFORMANCE CHARACTERISTICS

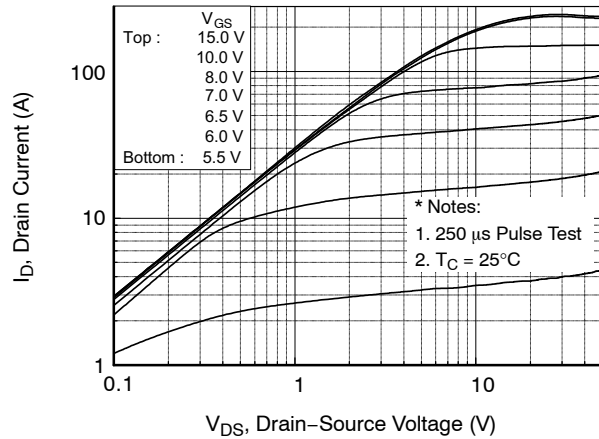


Figure 1. On-Region Characteristics

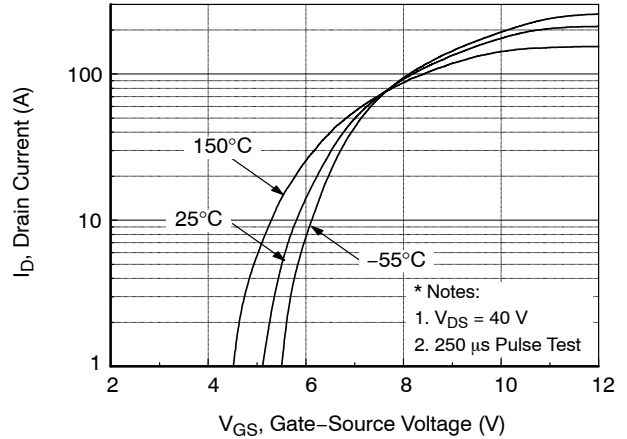


Figure 2. Transfer Characteristics

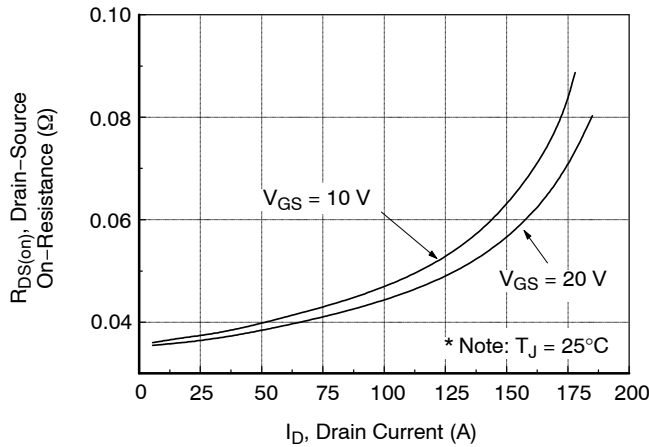


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

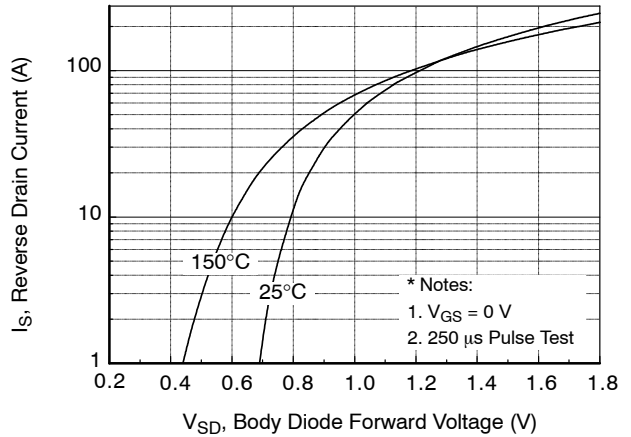


Figure 4. Body Diode Forward Voltage Variation vs. Source Current And Temperature

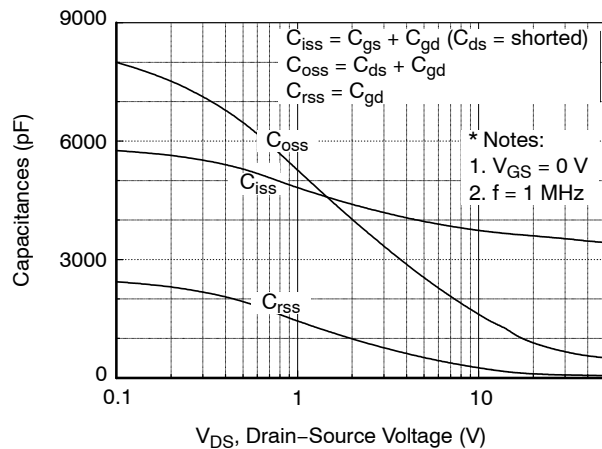


Figure 5. Capacitance Characteristics

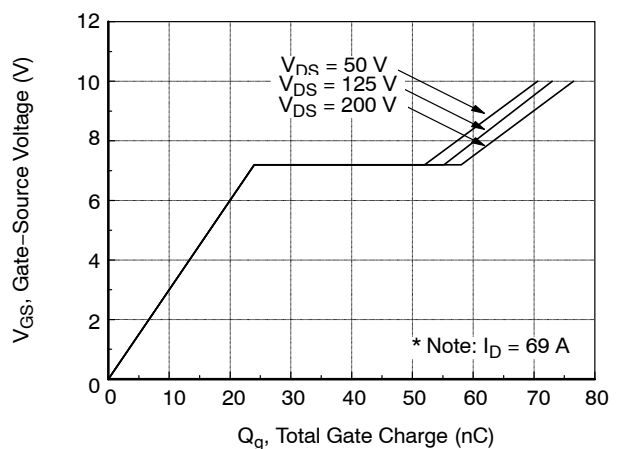


Figure 6. Gate Charge Characteristics

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

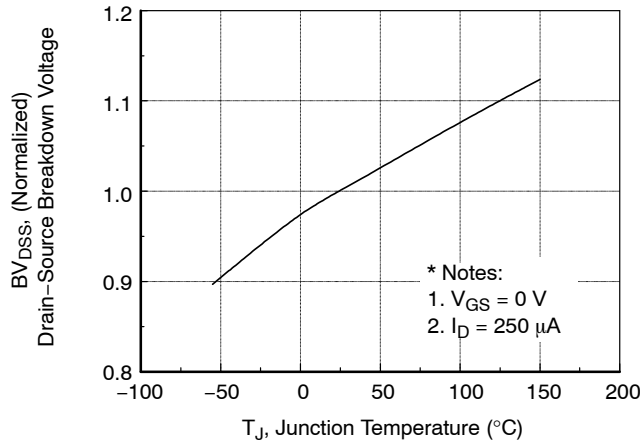


Figure 7. Breakdown Voltage Variation vs. Temperature

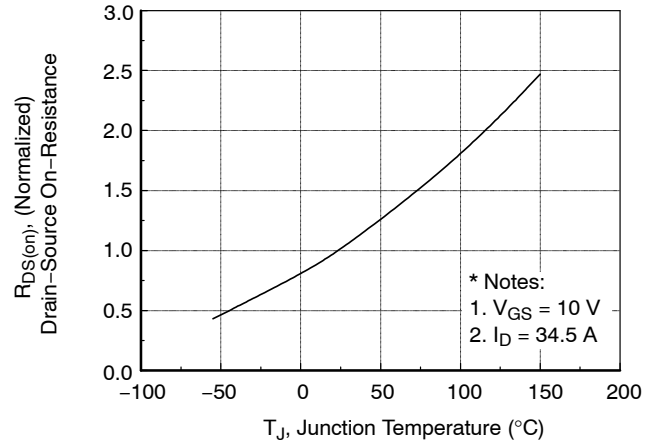


Figure 8. On-Resistance Variation vs. Temperature

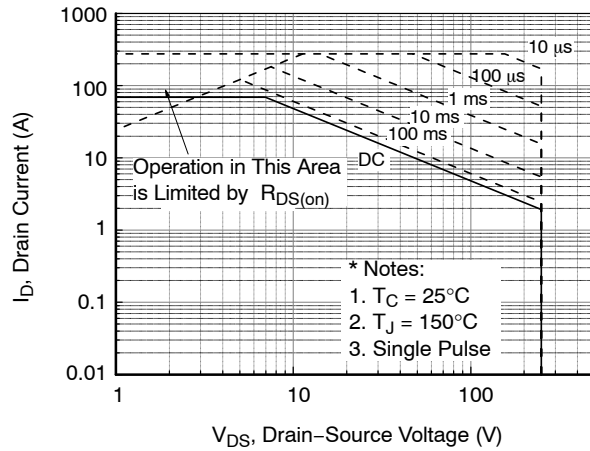


Figure 9. Maximum Safe Operating Area

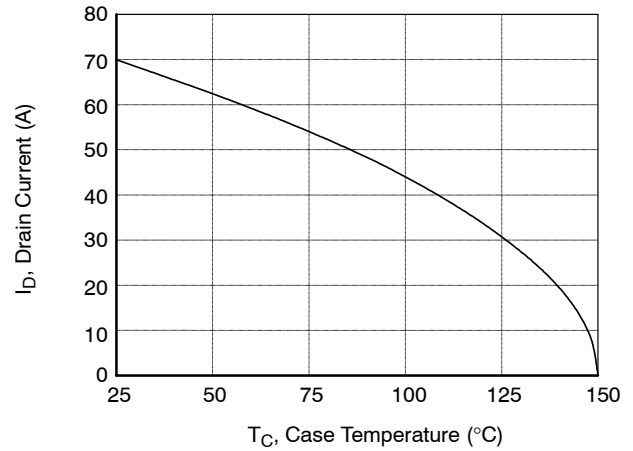


Figure 10. Maximum Drain Current vs. Case Temperature

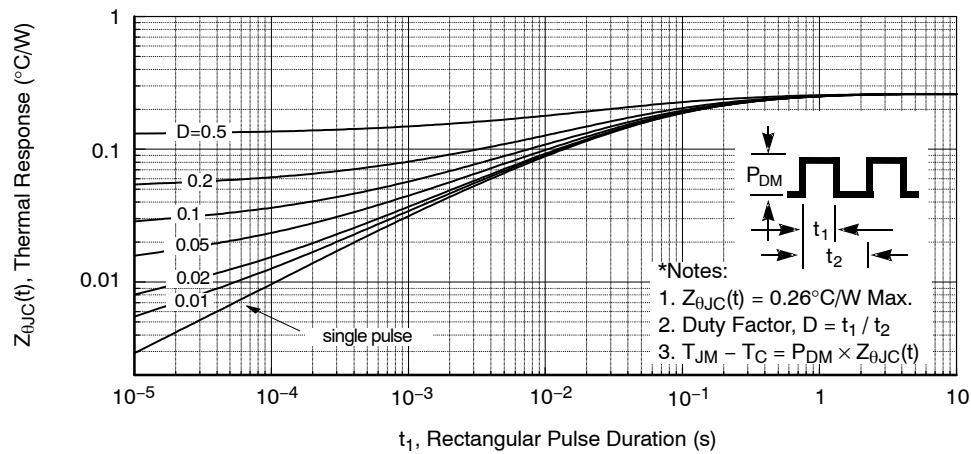


Figure 11. Transient Thermal Response Curve

The figure consists of two parts. The left part is a circuit diagram for characterizing a two-terminal device (DUT). A 12V DC source is connected in series with a 200nF capacitor and a 50KΩ resistor. This network is connected to the gate of a MOSFET (labeled 'Same Type as DUT'). The source of this MOSFET is connected to the gate of the DUT. The DUT's source is connected to ground, and its drain is connected to the drain of the first MOSFET. A 300nF capacitor is connected between the gate and drain of the first MOSFET. The DUT's gate is driven by a pulse source labeled $I_G = \text{const.}$. The drain-source voltage of the DUT is labeled V_{DS} .

The right part is a graph of V_{GS} versus Charge. The graph shows a piecewise linear relationship. The first segment is a line with a positive slope. The second segment is a horizontal line. The third segment is a line with a positive slope. The total charge for the first segment is labeled Q_g . The charge for the second segment is labeled Q_{gs} , and the charge for the third segment is labeled Q_{gd} .

The figure consists of two parts. The left part is a schematic diagram of a MOSFET switching circuit. A MOSFET, labeled 'DUT', has its gate connected to a square-wave input V_{GS} through a resistor R_G . The drain is connected to a load resistor R_L and a supply voltage V_{DD} . The source is connected to ground. The output voltage V_{DS} is taken from the drain. The right part is a timing diagram showing the waveforms of V_{GS} and V_{DS} . V_{GS} is a square wave switching between 10% and 90% of V_{DD} . V_{DS} is a trapezoidal wave. Key timing parameters are marked: $t_{d(on)}$ (delay to turn-on), t_r (rise time), t_{on} (total turn-on time), $t_{d(off)}$ (delay to turn-off), and t_f (fall time).

6

FDA69N25

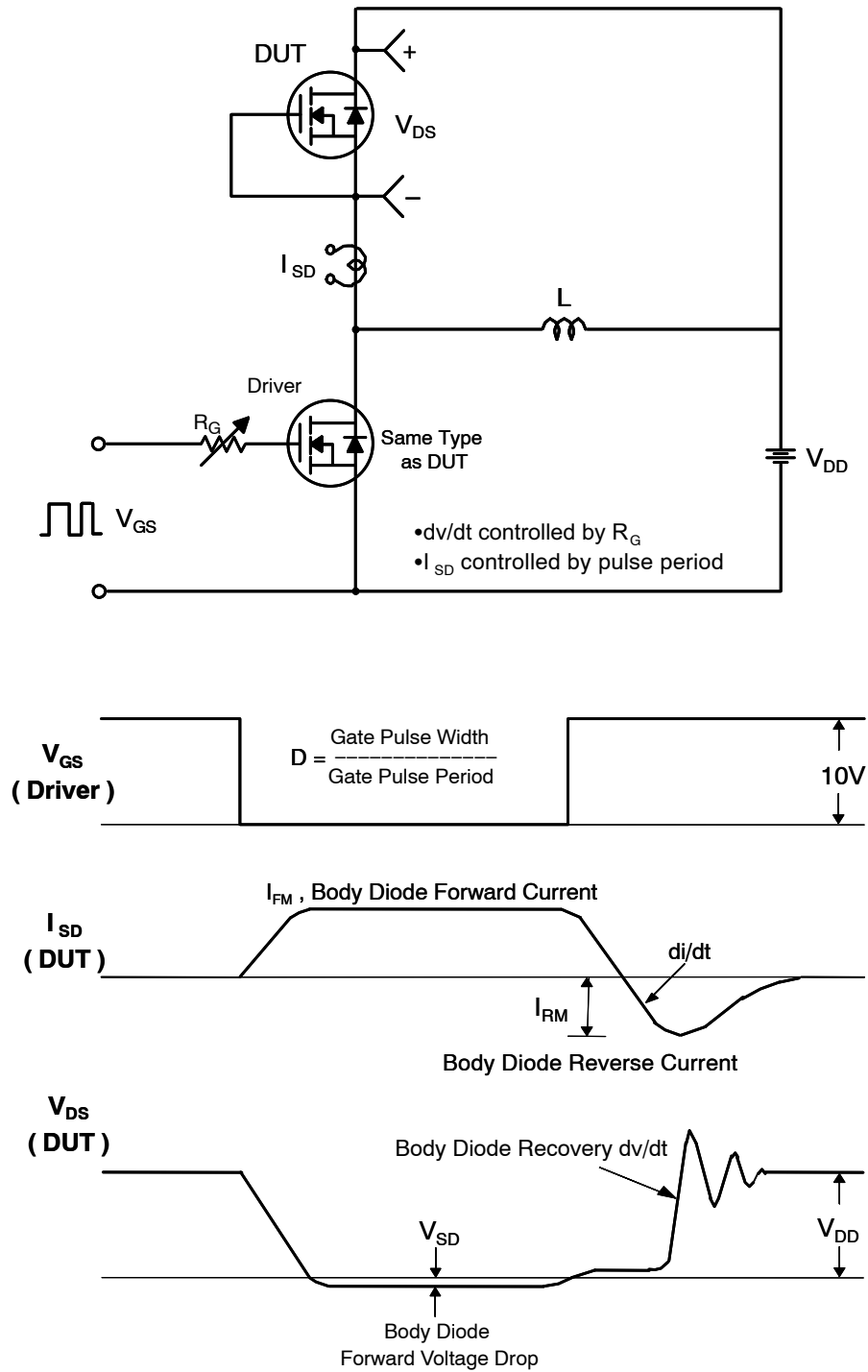
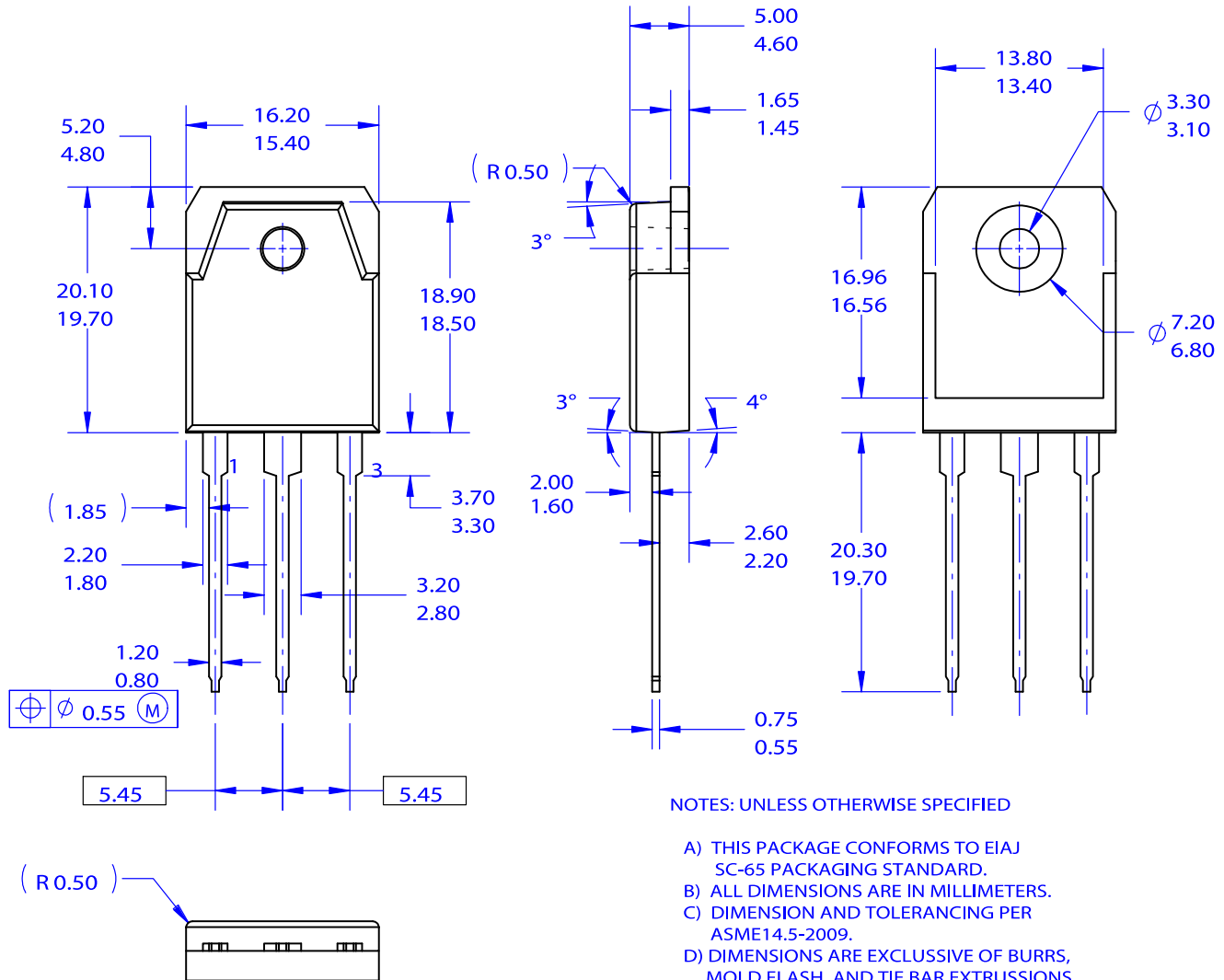


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

TO-3P-3LD / EIAJ SC-65, ISOLATED
CASE 340BZ
ISSUE O

DATE 31 OCT 2016



| | | |
|-------------------------|---|---|
| DOCUMENT NUMBER: | 98AON13862G | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| DESCRIPTION: | TO-3P-3LD / EIAJ SC-65, ISOLATED | PAGE 1 OF 1 |

onsemi and Onsemi are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the 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. onsemi does not convey any license under its patent rights nor the rights of others.

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. **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.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:

Technical Library: www.onsemi.com/design/resources/technical-documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support

For additional information, please contact your local Sales Representative at
www.onsemi.com/support/sales