

MOSFET – N-Channel, POWERTRENCH®

200 V, 62 A, 27 mΩ

FDP2614

General Description

This N-Channel MOSFET is produced using onsemi's advanced POWERTRENCH process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

Features

- $R_{DS(on)} = 22.9 \text{ m}\Omega$ (Typ.) @ $V_{GS} = 10 \text{ V}$, $I_D = 31 \text{ A}$
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- High Power and Current Handling Capability
- This Device is Pb-Free, Halide Free and is RoHS Compliant

Applications

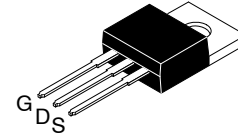
- Consumer Appliances
- Synchronous Rectification
- Battery Protection Circuit
- Motor Drives and Uninterruptible Power Supplies

MOSFET MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$, unless otherwise noted)

| Symbol | Parameter | Value | Unit |
|----------------------|--|--|---------------------|
| V_{DS} | Drain to Source Voltage | 200 | V |
| V_{GS} | Gate to Source Voltage | +30 | V |
| I_D | Drain Current | Continuous ($T_C = 25^\circ\text{C}$) | 62 |
| | | Continuous ($T_C = 100^\circ\text{C}$) | 39.3 |
| I_{DM} | Drain Current | Pulsed (Note 1) | see Figure 9 |
| E_{AS} | Single Pulse Avalanche Energy (Note 2) | 145 | mJ |
| dv/dt | Peak Diode Recovery dv/dt (Note 3) | 4.5 | V/ns |
| P_D | Power Dissipation ($T_C = 25^\circ\text{C}$) | 260 | W |
| | Derate above 25°C | 2.1 | W/ $^\circ\text{C}$ |
| T_J , T_{STG} | Operating and Storage Temperature | -55 to +150 | $^\circ\text{C}$ |
| T_L | Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds | 300 | $^\circ\text{C}$ |

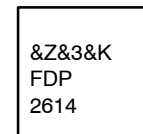
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

| V_{DS} | $R_{DS(on)}$ MAX | I_D MAX |
|----------|------------------|-----------|
| 200 V | 27 mΩ @ 10 V | 62 A |

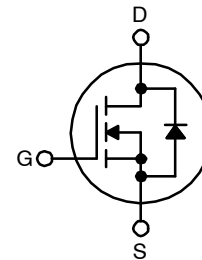


TO-220-3LD
CASE 340AT

MARKING DIAGRAM



- &Z = Assembly Plant Code
- &3 = 3-Digit Date Code
- &K = 2-Digits Lot Run Traceability Code
- FDP2614 = Specific Device Code



N-Channel

ORDERING INFORMATION

| Device | Package | Shipping |
|---------|------------|------------------|
| FDP2614 | TO-220-3LD | 800 Units / Tube |

FDP2614

THERMAL CHARACTERISTICS

| Symbol | Parameter | Value | Unit |
|-----------------|--|-------|------|
| $R_{\theta JC}$ | Thermal Resistance Junction to Case, Max. | 0.48 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance Junction to Ambient, Max. | 62.5 | °C/W |

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

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

OFF CHARACTERISTICS

| | | | | | | |
|--------------------------------------|---|---|-----|-----|------|------|
| B_{VDSS} | Drain-Source Breakdown Voltage | $V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}, T_J = 25^\circ\text{C}$ | 200 | - | - | V |
| $\frac{\Delta B_{VDSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\ \mu\text{A}$, Referenced to 25°C | - | 0.2 | - | V/°C |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 200\text{ V}, V_{GS} = 0\text{ V}$ | - | - | 10 | μA |
| | | $V_{DS} = 200\text{ V}, V_{GS} = 0\text{ V}, T_J = 125^\circ\text{C}$ | - | - | 500 | |
| I_{GSSF} | Gate-Body Leakage Current, Forward | $V_{GS} = 30\text{ V}, V_{DS} = 0\text{ V}$ | - | - | 100 | nA |
| I_{GSSR} | Gate-Body Leakage Current, Reverse | $V_{GS} = -30\text{ V}, V_{DS} = 0\text{ V}$ | - | - | -100 | nA |

ON CHARACTERISTICS

| | | | | | | |
|--------------|-----------------------------------|---|-----|------|-----|----|
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$ | 3.0 | 4.0 | 5.0 | V |
| $R_{DS(on)}$ | Static Drain-Source On-Resistance | $V_{GS} = 10\text{ V}, I_D = 31\text{ A}$ | - | 22.9 | 27 | mΩ |
| g_{FS} | Forward Transconductance | $V_{DS} = 10\text{ V}, I_D = 31\text{ A}$ | - | 72 | - | S |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|-----------|------------------------------|---|---|------|------|----|
| C_{iss} | Input Capacitance | $V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$ | - | 5435 | 7230 | pF |
| C_{oss} | Output Capacitance | | - | 505 | 675 | pF |
| C_{rss} | Reverse Transfer Capacitance | | - | 110 | 165 | pF |

SWITCHING CHARACTERISTICS

| | | | | | | |
|--------------|---------------------|--|---|-----|-----|----|
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD} = 100\text{ V}, I_D = 62\text{ A}, V_{GS} = 10\text{ V}, R_{GEN} = 25\ \Omega$ (Note 4) | - | 77 | 165 | ns |
| t_r | Turn-On Rise Time | | - | 284 | 560 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 103 | 220 | ns |
| t_f | Turn-Off Fall Time | | - | 162 | 335 | ns |
| Q_g | Total Gate Charge | $V_{DS} = 100\text{ V}, I_D = 62\text{ A}, V_{GS} = 10\text{ V}$ (Note 4) | - | 76 | 99 | nC |
| Q_{gs} | Gate-Source Charge | | - | 35 | - | nC |
| Q_{gd} | Gate-Drain Charge | | - | 18 | - | nC |

DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS

| | | | | | | |
|----------|---|--|---|------|-----|----|
| I_S | Maximum Continuous Drain-Source Diode Forward Current | - | - | 62 | A | |
| I_{SM} | Maximum Pulsed Drain-Source Diode Forward Current | - | - | 186 | A | |
| V_{SD} | Drain-Source Diode Forward Voltage | $V_{GS} = 0\text{ V}, I_S = 62\text{ A}$ | - | - | 1.2 | V |
| t_{rr} | Reverse Recovery Time | $V_{GS} = 0\text{ V}, I_S = 62\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$ | - | 145 | - | ns |
| Q_{rr} | Reverse Recovery Charge | | - | 0.81 | - | 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.

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $L = 1\text{ mH}, I_{AS} = 17\text{ A}, V_{DD} = 50\text{ V}, R_G = 25\ \Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 62\text{ A}, di/dt \leq 100\text{ A}/\text{ms}, V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$
4. Essentially Independent of Operating Temperature Typical Characteristics.

TYPICAL PERFORMANCE CHARACTERISTICS

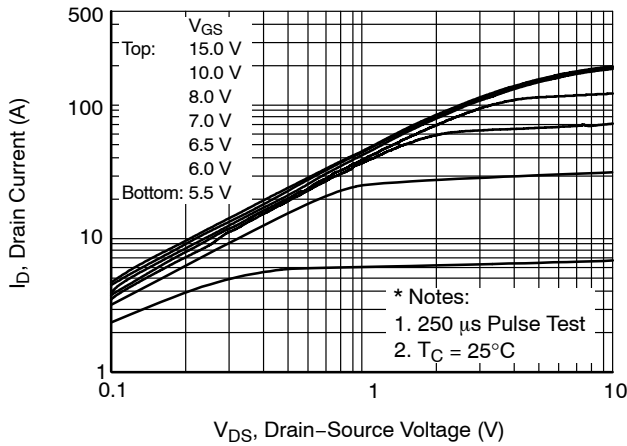


Figure 1. On-Region Characteristics

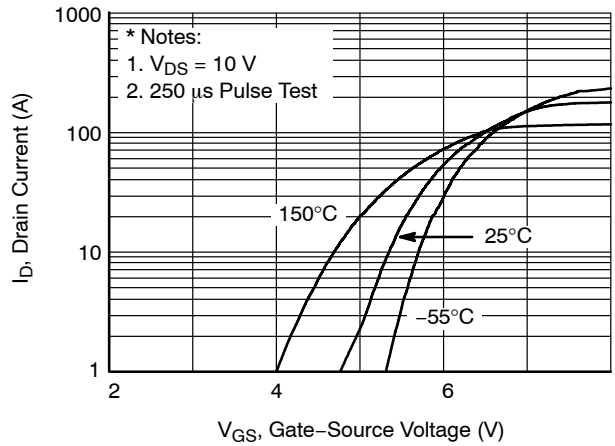


Figure 2. Transfer Characteristics

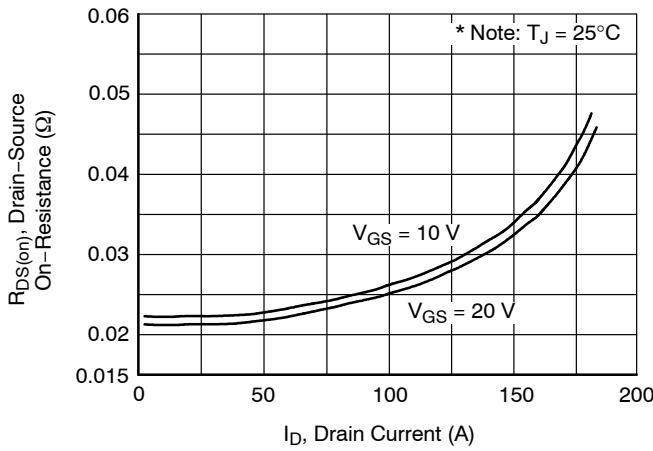


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

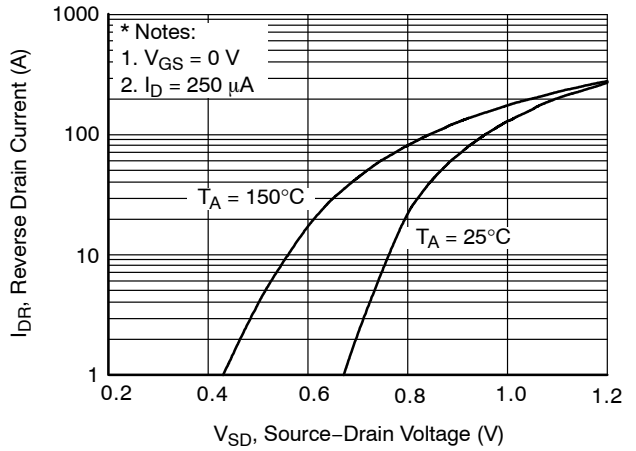


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

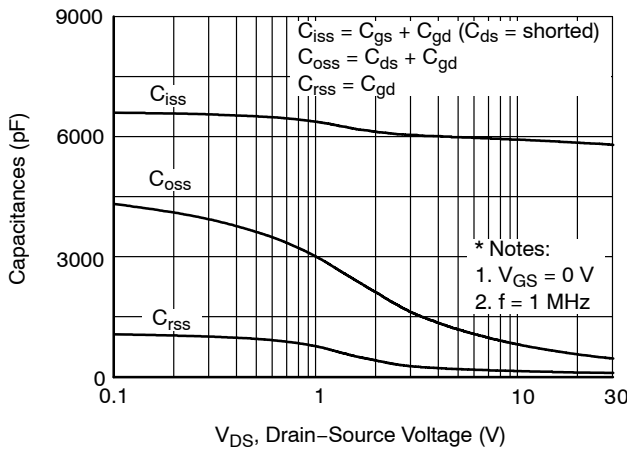


Figure 5. Capacitance Characteristics

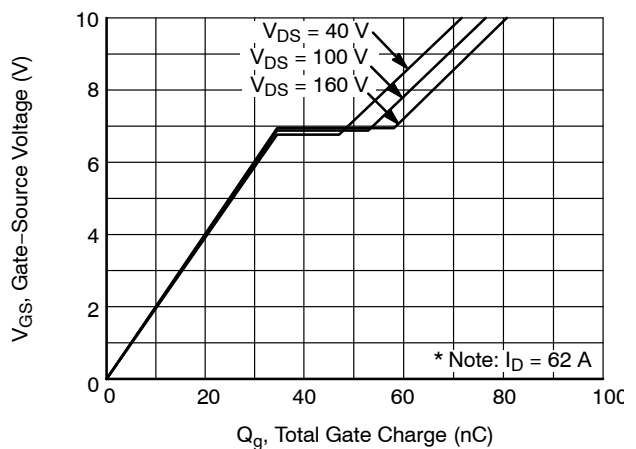


Figure 6. Gate Charge Characteristics

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

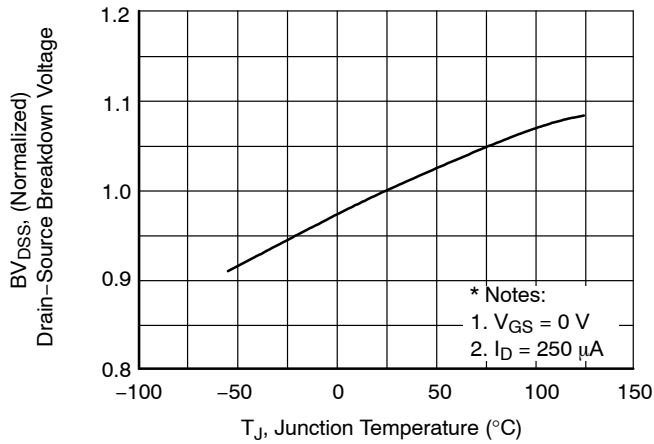


Figure 7. Breakdown Voltage Variation vs. Temperature

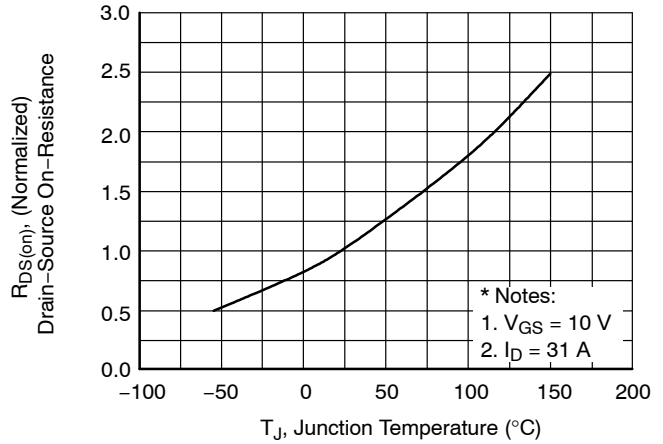


Figure 8. On-Resistance Variation vs. Temperature

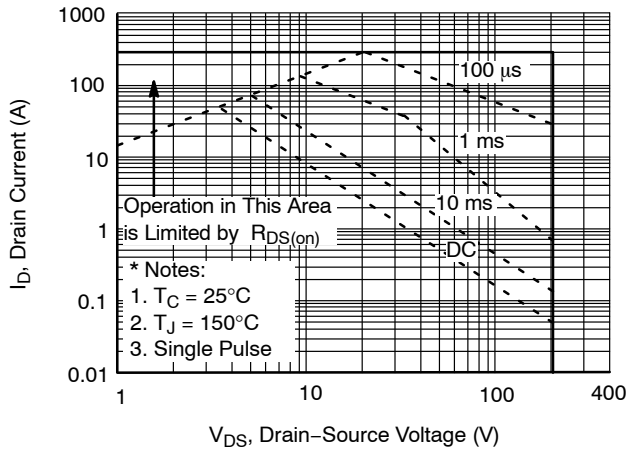


Figure 9. Maximum Safe Operating Area

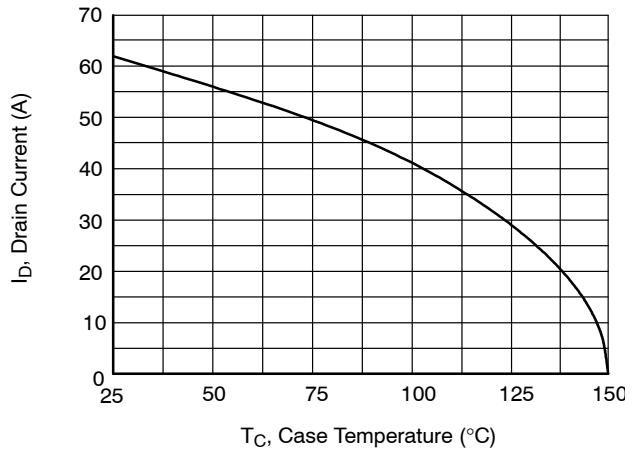


Figure 10. Maximum Drain Current vs. Case Temperature

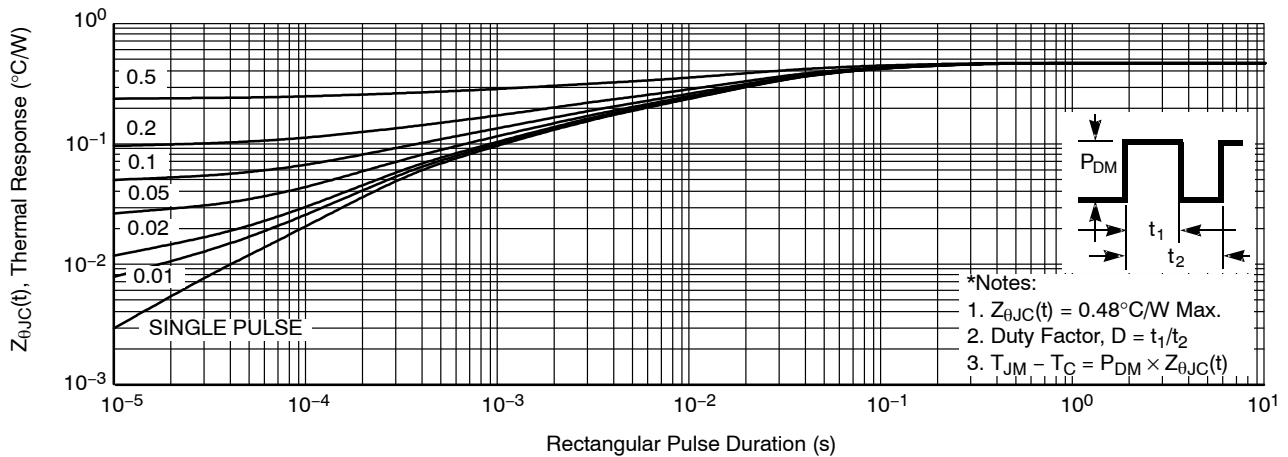


Figure 11. Transient Thermal Response Curve

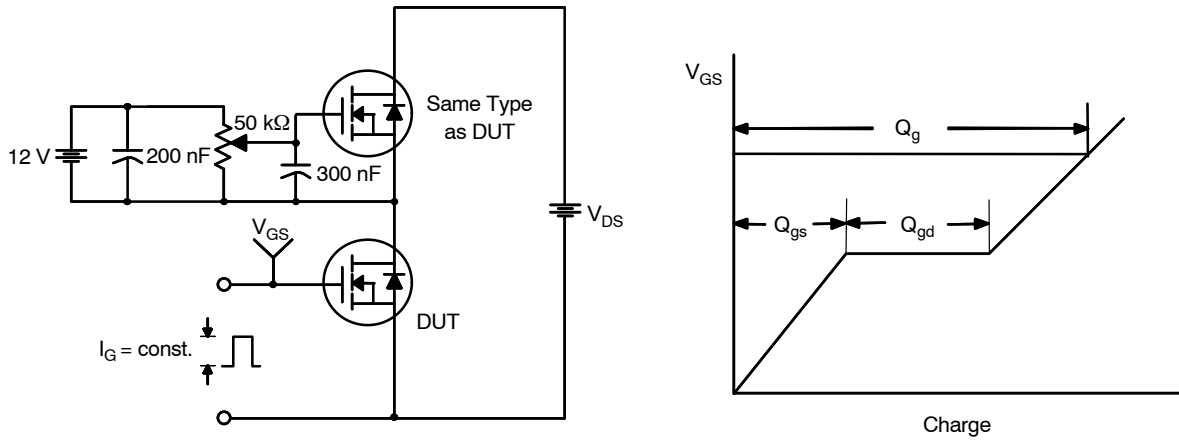


Figure 12. Gate Charge Test Circuit & Waveform

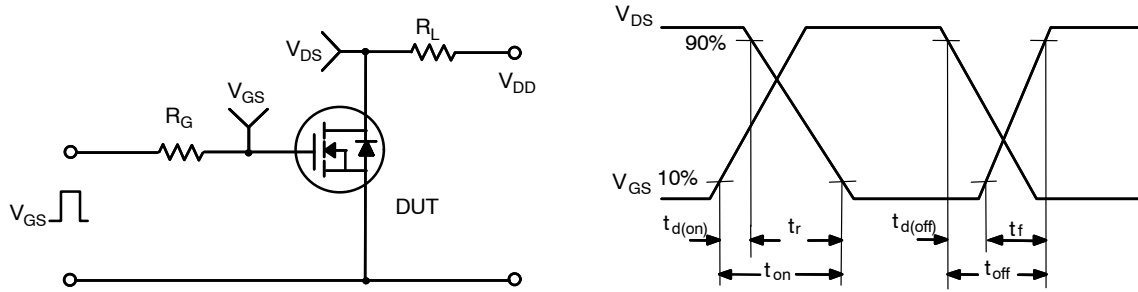


Figure 13. Resistive Switching Test Circuit & Waveforms

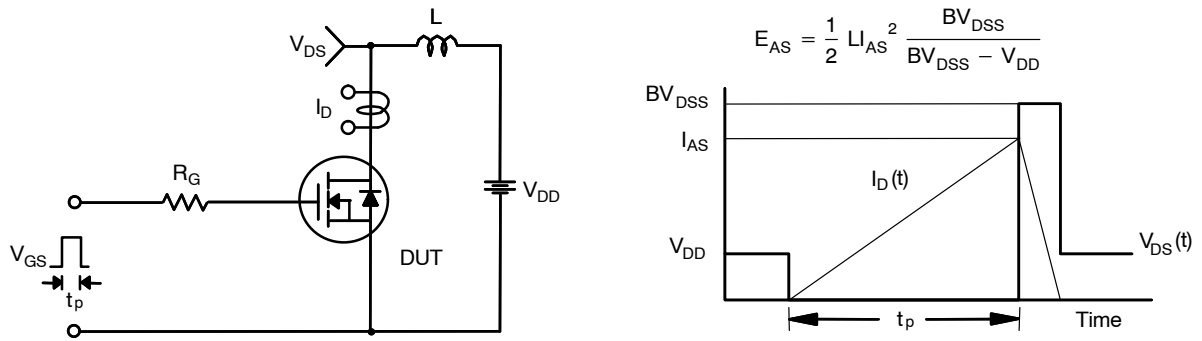


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

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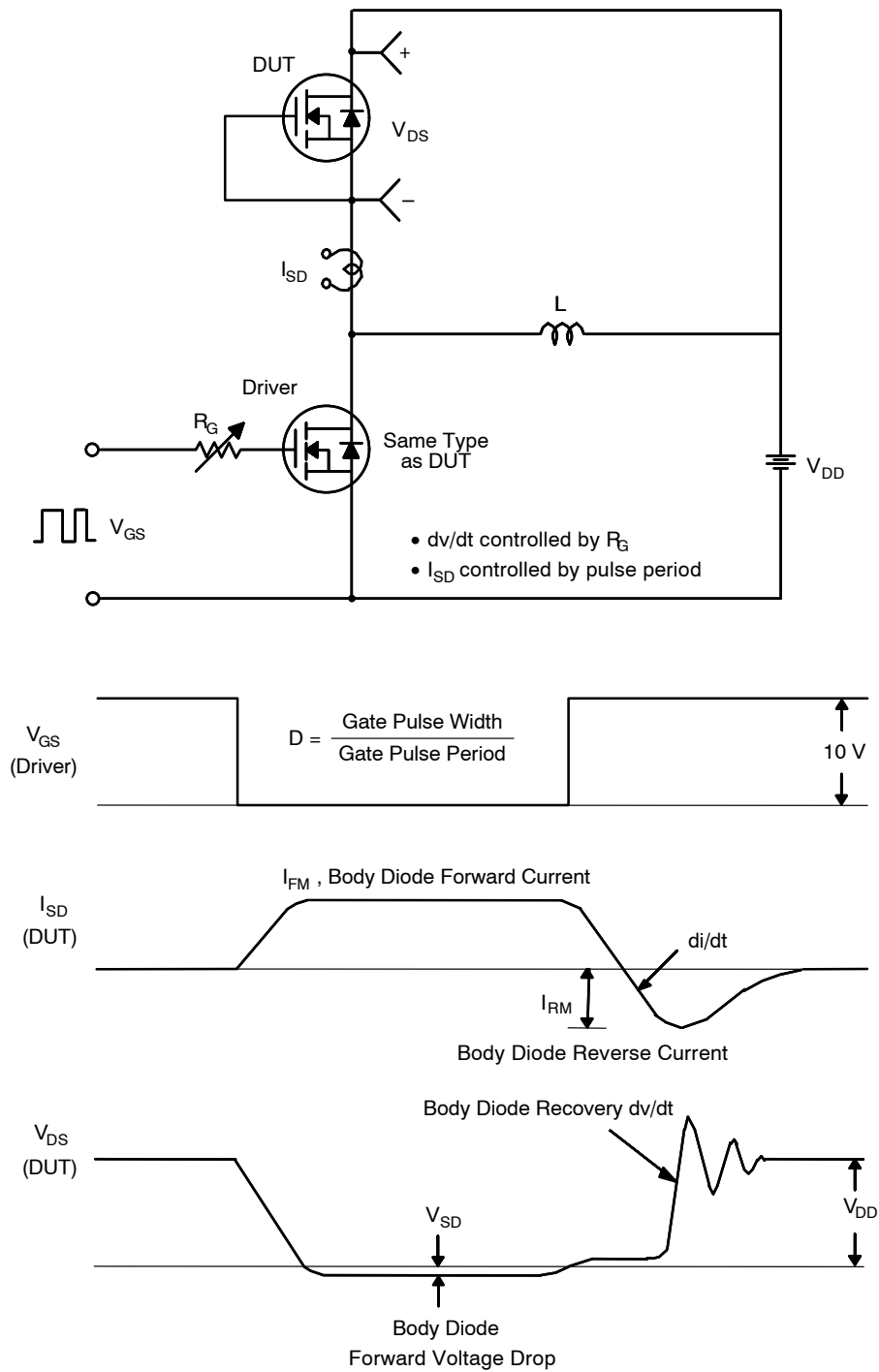
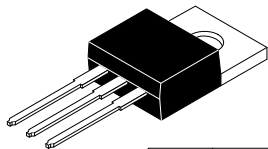


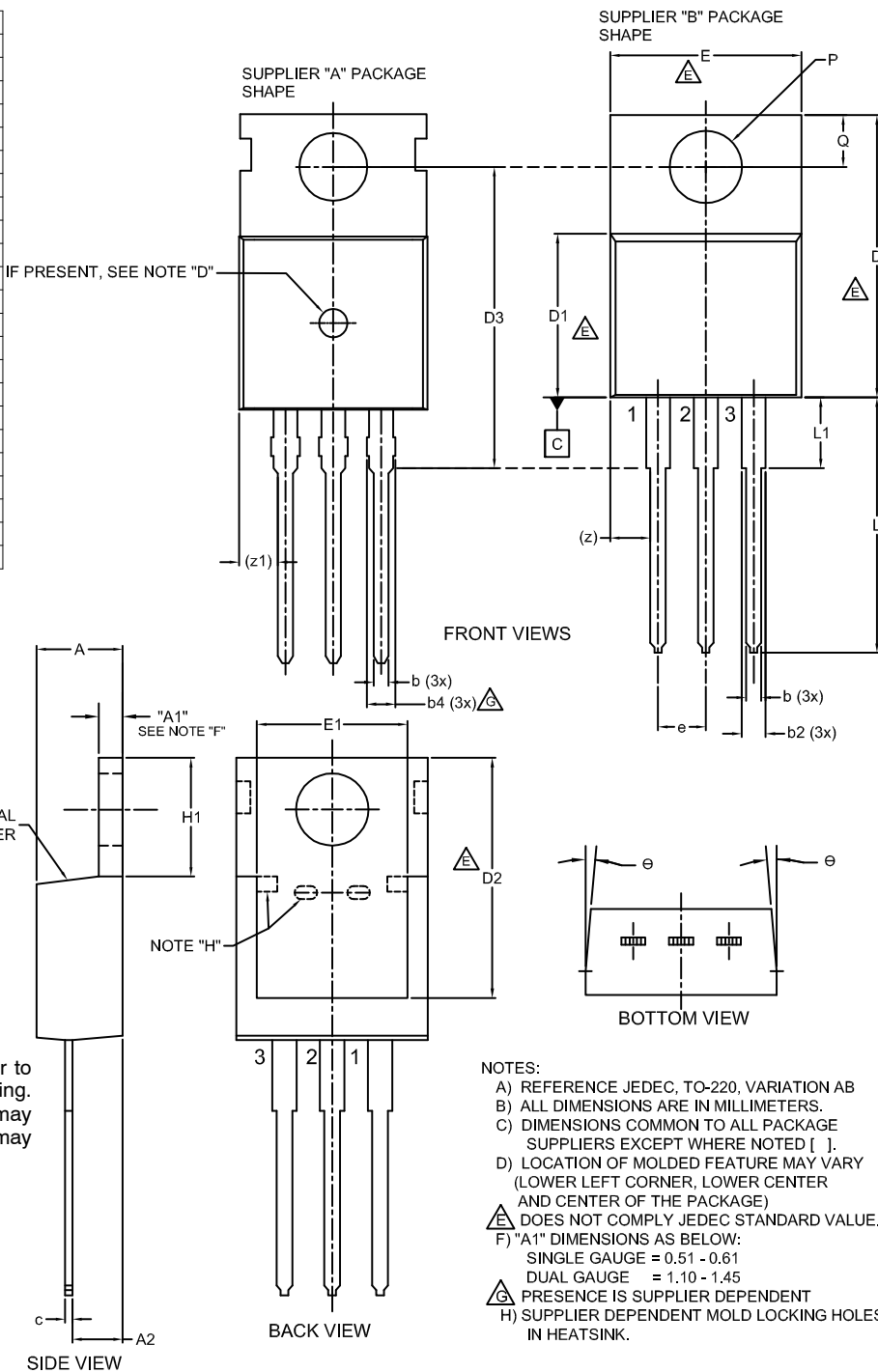
Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



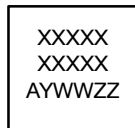
TO-220-3LD
CASE 340AT
ISSUE B

DATE 08 AUG 2022

| 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.

NOTES:

- A) REFERENCE JEDEC, TO-220, VARIATION AB
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS COMMON TO ALL PACKAGE SUPPLIERS EXCEPT WHERE NOTED [].
- D) LOCATION OF MOLDED FEATURE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF THE PACKAGE)
- E) DOES NOT COMPLY JEDEC STANDARD VALUE.
- F) "A1" DIMENSIONS AS BELOW:
 SINGLE GAUGE = 0.51 - 0.61
 DUAL GAUGE = 1.10 - 1.45
- H) SUPPLIER DEPENDENT MOLD LOCKING HOLES IN HEATSINK.

| | | |
|------------------|-------------|---|
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