

MOSFET – N-Channel, QFET

800 V, 12.6 A, 750 mΩ

FQA13N80-F109

Description

This N-Channel enhancement mode power MOSFET is produced using onsemi's proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state resistance, and to provide superior switching performance and high avalanche energy strength. These devices are suitable for switched mode power supplies, active power factor correction (PFC), and electronic lamp ballasts.

Features

- 12.6 A, 800 V, $R_{DS(on)} = 750\text{ m}\Omega$ (Max.) @ $V_{GS} = 10\text{ V}$, $I_D = 6.3\text{ A}$
- Low Gate Charge (Typ. 68 nC)
- Low C_{rss} (Typ. 30 pF)
- 100% Avalanche Tested
- This is Pb-Free and Halide Free Device

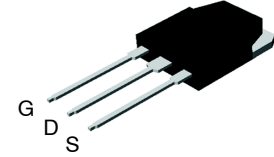
ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

| Symbol | Parameter | Value | Unit |
|----------------|---|---|------------------|
| V_{DSS} | Drain to Source Voltage | 800 | V |
| I_D | Drain Current | -Continuous ($T_C = 25^\circ\text{C}$) | 12.6 |
| | | -Continuous ($T_C = 100^\circ\text{C}$) | 8.0 |
| I_{DM} | Drain Current -Pulsed (Note 1) | 50.4 | A |
| V_{GSS} | Gate-Source Voltage | ± 30 | V |
| E_{AS} | Single Pulsed Avalanche Energy (Note 2) | 1100 | mJ |
| I_{AR} | Avalanche Current (Note 1) | 12.6 | A |
| E_{AR} | Repetitive Avalanche Energy (Note 1) | 30 | mJ |
| dv/dt | Peak Diode Recovery dv/dt (Note 3) | 4.0 | V/ns |
| P_D | Power Dissipation ($T_C = 25^\circ\text{C}$) | | 300 |
| | | -Derate Above 25°C | 2.38 |
| T_J, T_{STG} | Operating and Storage Temperature Range | -55 to +150 | $^\circ\text{C}$ |
| T_L | Maximum Lead Temperature for Soldering Purposes, 1/8" from Case for 5 seconds | 300 | $^\circ\text{C}$ |

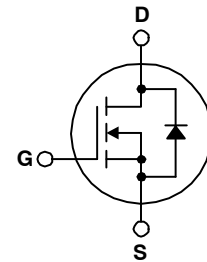
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. $L = 13\text{ mH}$, $I_{AS} = 12.6\text{ A}$, $V_{DD} = 50\text{ V}$, $R_G = 25\ \Omega$, Starting $T_J = 25^\circ\text{C}$.
3. $I_{SD} \leq 12.6\text{ A}$, $di/dt \leq 200\text{ A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$.

| V_{DSS} | $R_{DS(on)}$ MAX | I_D MAX |
|-----------|------------------|-----------|
| 800 V | 750 mΩ @ 10 V | 12.6 A |

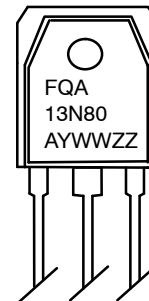


TO-3P-3LD
CASE 340BZ



N-CHANNEL MOSFET

MARKING DIAGRAM



FQA13N80 = Specific Device Code
A = Assembly Location
YWW = Date Code (Year & Week)
ZZ = Assembly Lot

ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

FQA13N80-F109

THERMAL CHARACTERISTICS

| Symbol | Parameter | Value | Unit |
|-----------------|---|-------|-----------------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case, Max. | 0.42 | $^{\circ}\text{C}/\text{W}$ |
| $R_{\theta CS}$ | Thermal Resistance, Case-to-Sink, Typ. | 0.24 | $^{\circ}\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient, Max. | 40 | $^{\circ}\text{C}/\text{W}$ |

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

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

OFF CHARACTERISTICS

| | | | | | | |
|--------------------------------|---|--|-----|------|------|-----------------------------|
| BV_{DSS} | Drain-Source Breakdown Voltage | $I_D = 250 \mu\text{A}, V_{GS} = 0 \text{V}$ | 800 | - | - | V |
| $\Delta BV_{DSS} / \Delta T_J$ | Breakdown Voltage Temperature Coefficient | $I_D = 250 \mu\text{A}$, Referenced to 25°C | - | 0.95 | - | $\text{V}/^{\circ}\text{C}$ |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 800 \text{V}, V_{GS} = 0 \text{V}$ | - | - | 10 | μA |
| | | $V_{DS} = 640 \text{V}, T_C = 125^{\circ}\text{C}$ | - | - | 100 | μA |
| 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 | - | 5.0 | V |
| $R_{DS(on)}$ | Static Drain-Source On-Resistance | $V_{GS} = 10 \text{V}, I_D = 6.3 \text{A}$ | - | 0.58 | 0.75 | Ω |
| g_{FS} | Forward Transconductance | $V_{DS} = 50 \text{V}, I_D = 6.3 \text{A}$ | - | 13 | - | S |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|-----------|------------------------------|---|---|------|------|----|
| C_{iss} | Input Capacitance | $V_{DS} = 25 \text{V}, V_{GS} = 0 \text{V}, f = 1 \text{MHz}$ | - | 2700 | 3500 | pF |
| C_{oss} | Output Capacitance | | - | 275 | 360 | pF |
| C_{rss} | Reverse Transfer Capacitance | | - | 30 | 39 | pF |

SWITCHING CHARACTERISTICS

| | | | | | | |
|--------------|---------------------|--|---|-----|-----|----|
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD} = 400 \text{V}, I_D = 12.6 \text{A}, R_G = 25 \Omega$ (Note 4) | - | 60 | 130 | ns |
| t_r | Turn-On Rise Time | | - | 150 | 310 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 155 | 320 | ns |
| t_f | Turn-Off Fall Time | | - | 110 | 230 | ns |
| Q_g | Total Gate Charge | $V_{DS} = 640 \text{V}, I_D = 12.6 \text{A}, V_{GS} = 10 \text{V}$ (Note 4) | - | 68 | 88 | nC |
| Q_{gs} | Gate-Source Charge | | - | 15 | - | nC |
| Q_{gd} | Gate-Drain Charge | | - | 32 | - | nC |

DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS

| | | | | | | |
|----------|---|--|---|------|-----|---------------|
| I_S | Maximum Continuous Drain-Source Diode Forward Current | - | - | 12.6 | A | |
| I_{SM} | Maximum Pulsed Drain-Source Diode Forward Current | - | - | 50.4 | A | |
| V_{SD} | Drain-Source Diode Forward Voltage | $V_{GS} = 0 \text{V}, I_S = 12.6 \text{A}$ | - | - | 1.4 | V |
| t_{rr} | Reverse Recovery Time | $V_{GS} = 0 \text{V}, I_S = 12.6 \text{A}, dI_F/dt = 100 \text{A}/\mu\text{s}$ | - | 850 | - | ns |
| Q_{rr} | Reverse Recovery Charge | | - | 11.3 | - | 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.

4. Essentially Independent of Operating Temperature.

TYPICAL CHARACTERISTICS

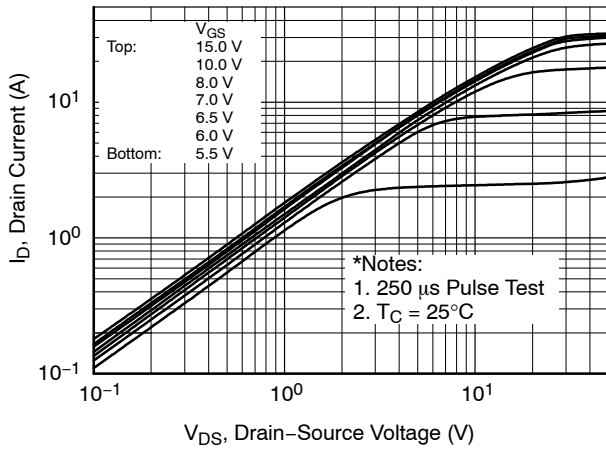


Figure 1. On-Region Characteristics

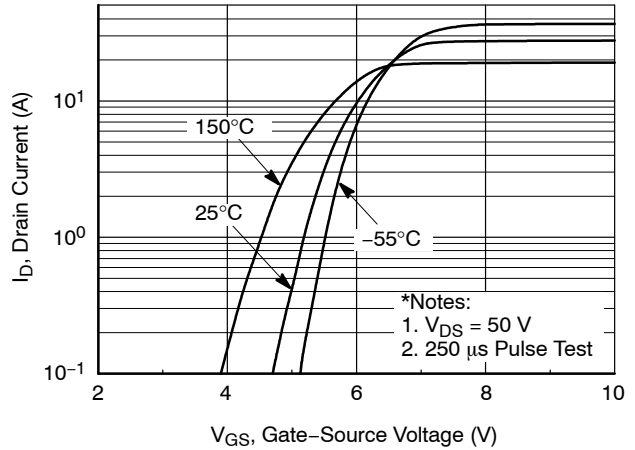


Figure 2. Transfer Characteristics

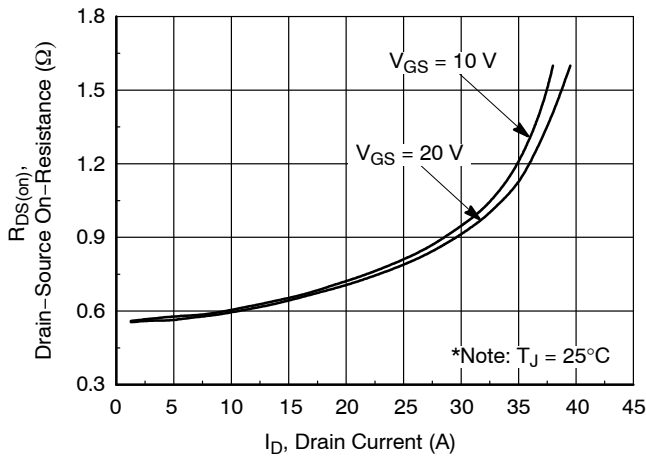


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

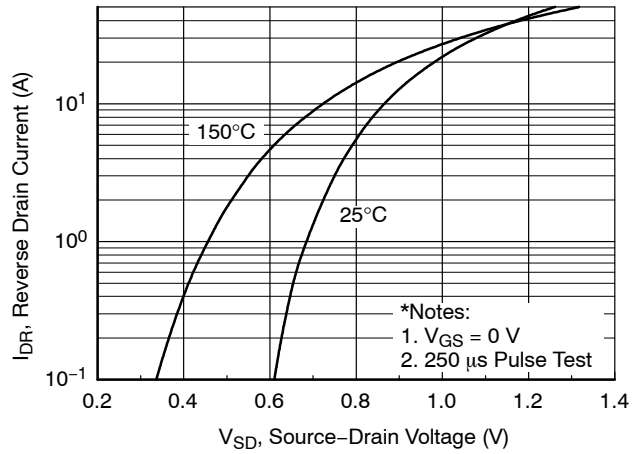


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

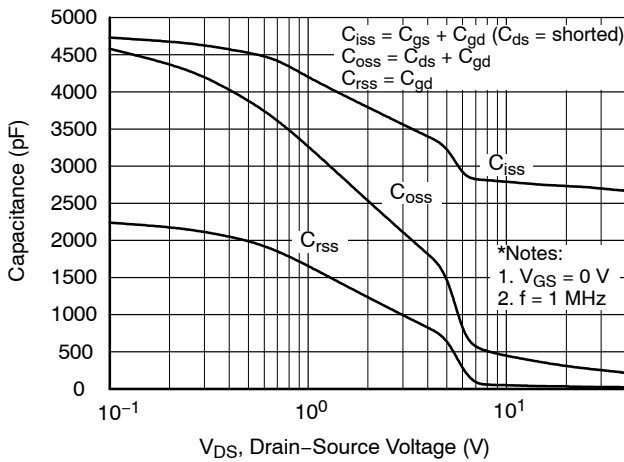


Figure 5. Capacitance Characteristics

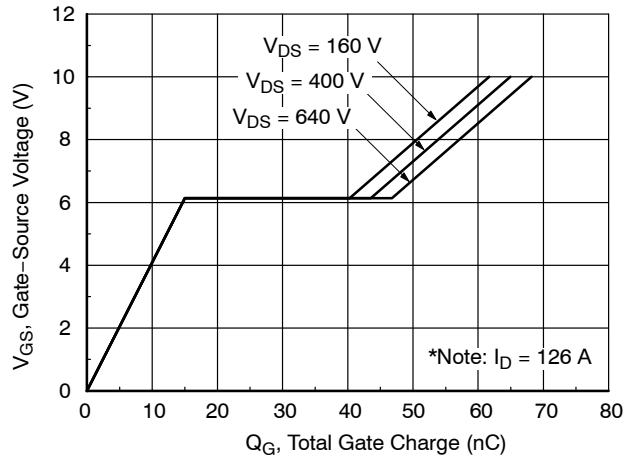


Figure 6. Gate Charge Characteristics

TYPICAL CHARACTERISTICS

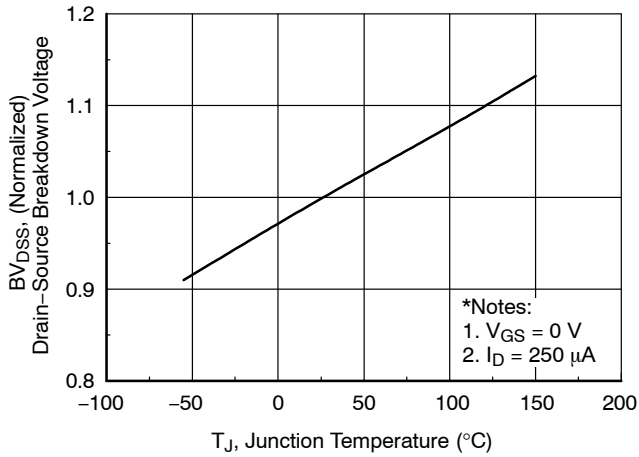


Figure 7. Breakdown Voltage Variation vs. Temperature

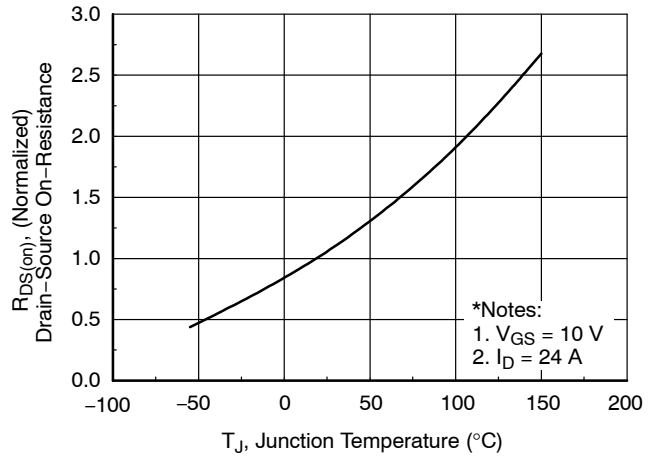


Figure 8. On-Resistance Variation vs. Temperature

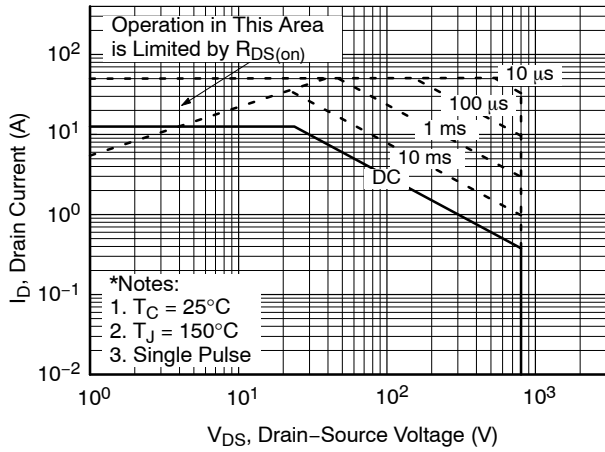


Figure 9. Maximum Safe Operating Area

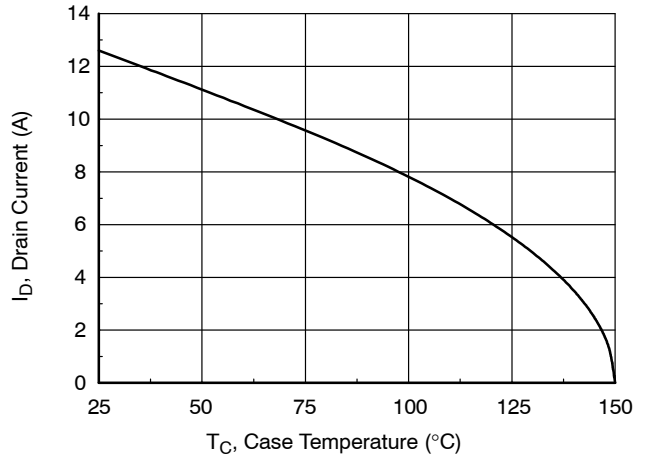


Figure 10. Maximum Drain Current vs. Case Temperature

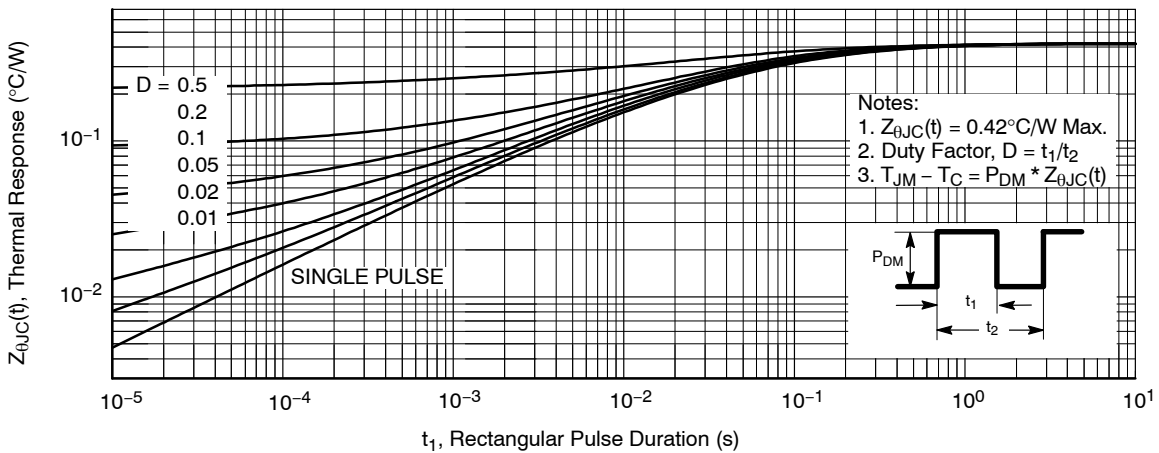


Figure 11. Transient Thermal Response Curve

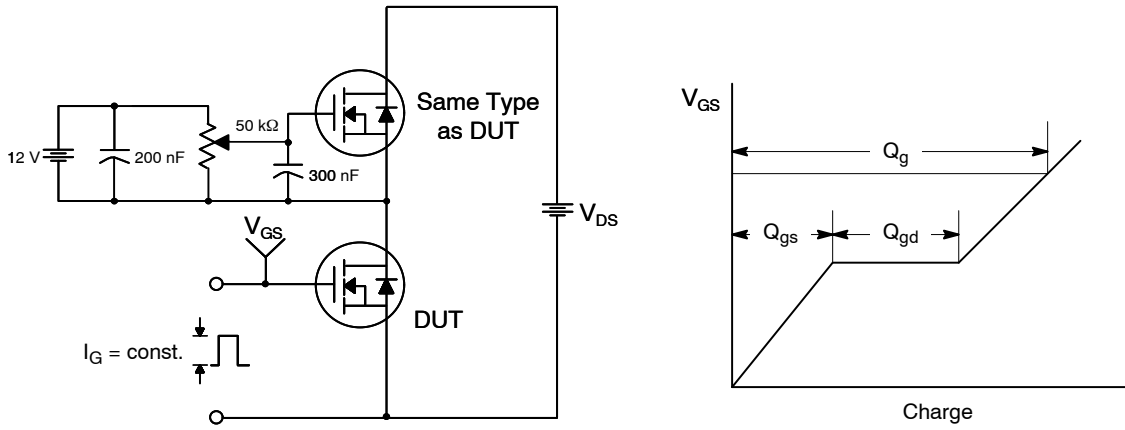


Figure 12. Gate Charge Test Circuit & Waveform

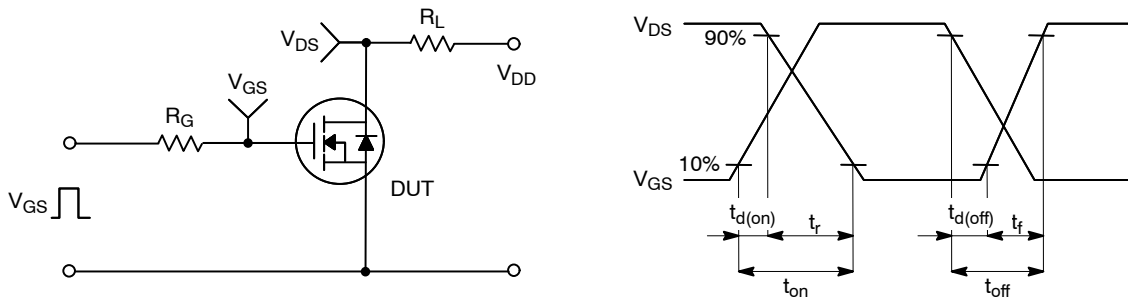


Figure 13. Resistive Switching Test Circuit & Waveforms

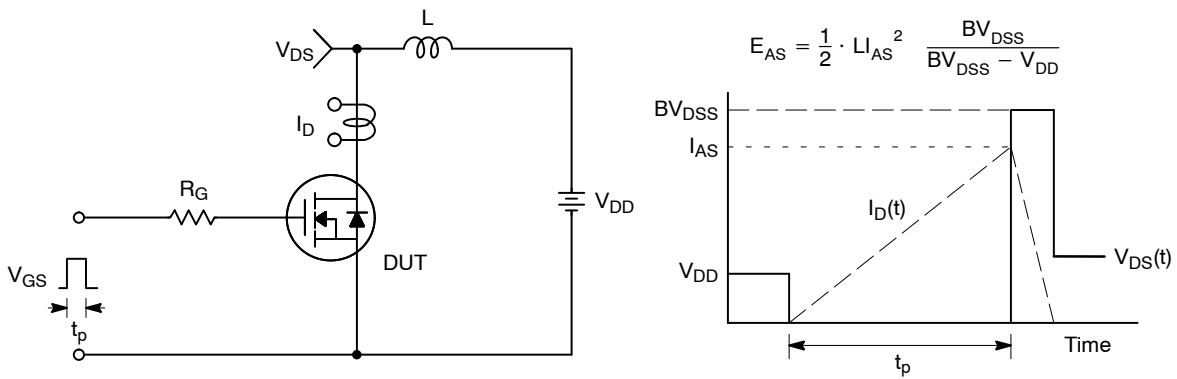


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

FQA13N80-F109

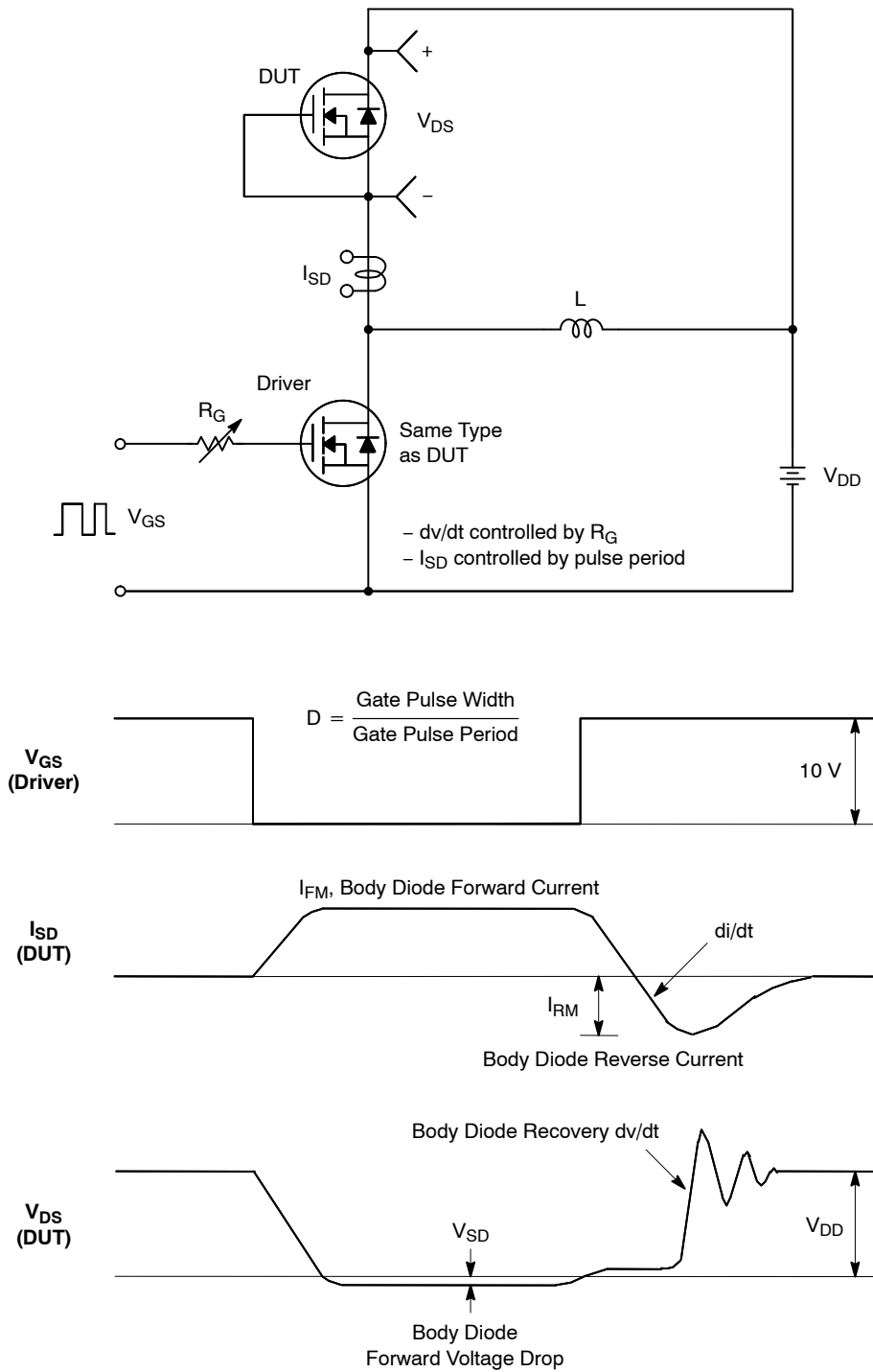


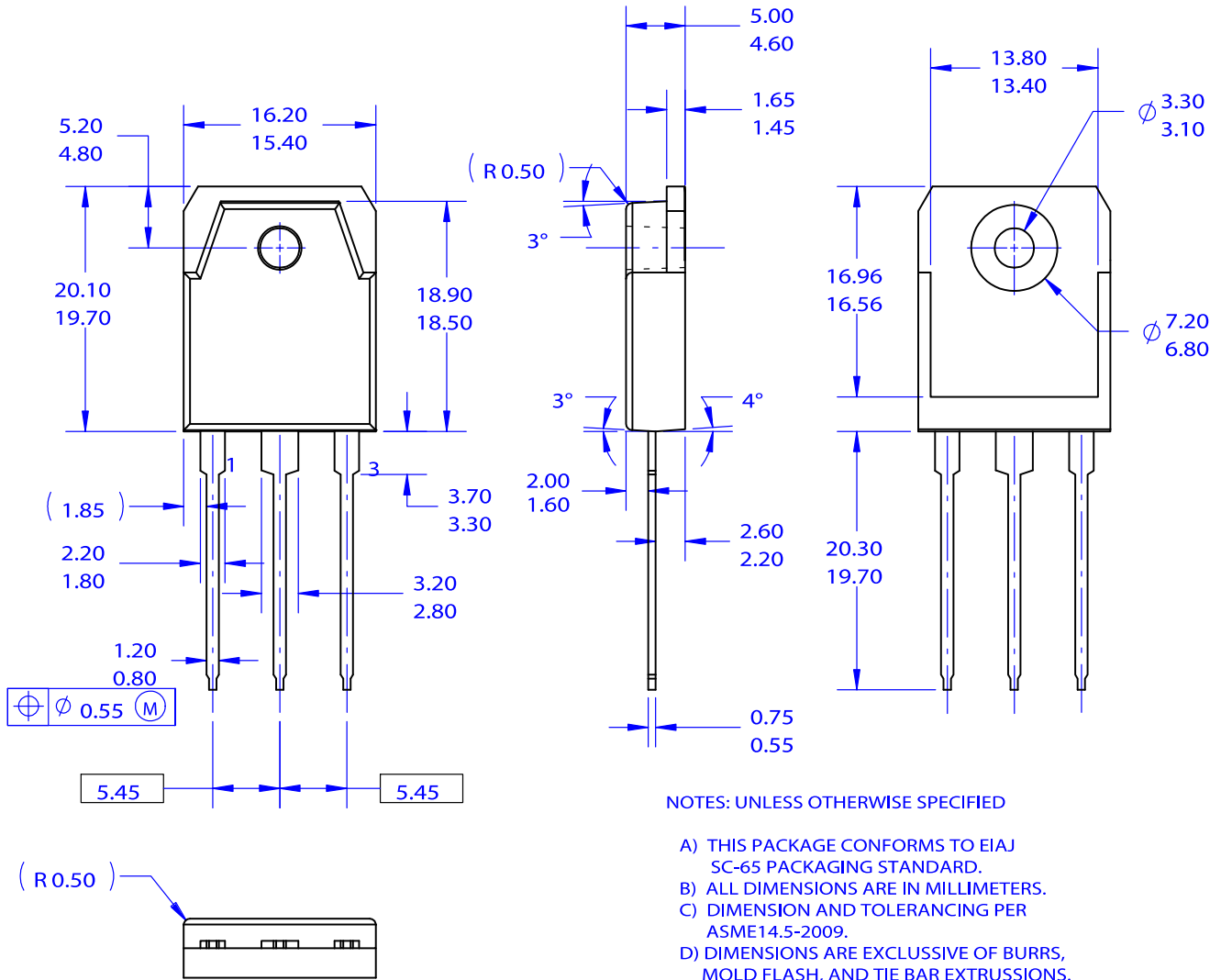
Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

PACKAGE MARKING AND ORDERING INFORMATION

| Part Number | Top Mark | Package | Package Method | Reel Size | Tape Width | Quantity |
|---------------|----------|-----------|----------------|-----------|------------|-----------------|
| FQA13N80-F109 | FQA13N80 | TO-3P-3LD | Tube | N/A | N/A | 450 Units /Tube |

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

DATE 31 OCT 2016



NOTES: UNLESS OTHERWISE SPECIFIED

- A) THIS PACKAGE CONFORMS TO EIAJ SC-65 PACKAGING STANDARD.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSION AND TOLERANCING PER ASME14.5-2009.
- D) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

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