



June 2014

FQA140N10

N-Channel QFET[®] MOSFET

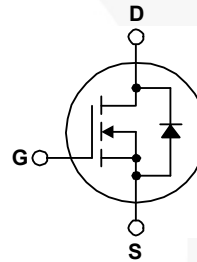
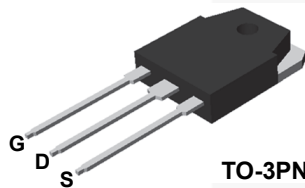
100 V, 140 A, 10 mΩ

Description

This N-Channel enhancement mode power MOSFET is produced using Fairchild Semiconductor'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, audio amplifier, DC motor control, and variable switching power applications.

Features

- 140 A, 100 V, $R_{DS(on)} = 10\text{ m}\Omega$ (Max.) @ $V_{GS} = 10\text{ V}$, $I_D = 70\text{ A}$
- Low Gate Charge (Typ. 220 nC)
- Low Crss (Typ. 470 pF)
- 100% Avalanche Tested
- 175°C Maximum Junction Temperature Rating



Absolute Maximum Ratings T_C = 25°C unless otherwise noted.

| Symbol | Parameter | FQA140N10 | Unit |
|-----------------------------------|---|-------------|------|
| V _{DSS} | Drain-Source Voltage | 100 | V |
| I _D | Drain Current - Continuous (T _C = 25°C) - Continuous (T _C = 100°C) | 140 | A |
| | | 99 | A |
| I _{DM} | Drain Current - Pulsed (Note 1) | 560 | A |
| V _{GSS} | Gate-Source Voltage | ± 25 | V |
| E _{AS} | Single Pulsed Avalanche Energy (Note 2) | 1500 | mJ |
| I _{AR} | Avalanche Current (Note 1) | 140 | A |
| E _{AR} | Repetitive Avalanche Energy (Note 1) | 37.5 | mJ |
| dv/dt | Peak Diode Recovery dv/dt (Note 3) | 6.5 | V/ns |
| P _D | Power Dissipation (T _C = 25°C) - Derate above 25°C | 375 | W |
| | | 2.5 | W/°C |
| T _J , T _{STG} | Operating and Storage Temperature Range | -55 to +175 | °C |
| T _L | Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds. | 300 | °C |

Thermal Characteristics

| Symbol | Parameter | FQA140N10 | Unit |
|------------------|---|-----------|------|
| R _{θJC} | Thermal Resistance, Junction-to-Case, Max. | 0.4 | °C/W |
| R _{θJA} | Thermal Resistance, Junction-to-Ambient, Max. | 40 | °C/W |

FQA140N10 — N-Channel QFET[®] MOSFET

Package Marking and Ordering Information

| Part Number | Top Mark | Package | Packing Method | Reel Size | Tape Width | Quantity |
|-------------|-----------|---------|----------------|-----------|------------|----------|
| FQA140N10 | FQA140N10 | TO-3PN | Tube | N/A | N/A | 30 units |

Electrical Characteristics

$T_C = 25^\circ\text{C}$ unless otherwise noted.

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

Off Characteristics

| | | | | | | |
|--------------------------------|---|---|-----|------|------|---------------------|
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$ | 100 | -- | -- | V |
| $\Delta BV_{DSS} / \Delta T_J$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\ \mu\text{A}$, Referenced to 25°C | -- | 0.08 | -- | V/ $^\circ\text{C}$ |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 80\text{ V}, V_{GS} = 0\text{ V}$ | -- | -- | 1 | μA |
| | | $V_{DS} = 64\text{ V}, T_C = 150^\circ\text{C}$ | -- | -- | 10 | μA |
| I_{GSSF} | Gate-Body Leakage Current, Forward | $V_{GS} = 25\text{ V}, V_{DS} = 0\text{ V}$ | -- | -- | 100 | nA |
| I_{GSSR} | Gate-Body Leakage Current, Reverse | $V_{GS} = -25\text{ V}, V_{DS} = 0\text{ V}$ | -- | -- | -100 | nA |

On Characteristics

| | | | | | | |
|--------------|-----------------------------------|---|-----|-------|------|----------|
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$ | 2.0 | -- | 4.0 | V |
| $R_{DS(on)}$ | Static Drain-Source On-Resistance | $V_{GS} = 10\text{ V}, I_D = 70\text{ A}$ | -- | 0.008 | 0.01 | Ω |
| g_{FS} | Forward Transconductance | $V_{DS} = 30\text{ V}, I_D = 70\text{ A}$ | -- | 80 | -- | S |

Dynamic Characteristics

| | | | | | | |
|-----------|------------------------------|--|----|------|------|----|
| C_{iss} | Input Capacitance | $V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$ | -- | 6100 | 7900 | pF |
| C_{oss} | Output Capacitance | | -- | 2000 | 2600 | pF |
| C_{rss} | Reverse Transfer Capacitance | | -- | 420 | 550 | pF |

Switching Characteristics

| | | | | | | | |
|--------------|---------------------|---|----------|-----|------|-----|----|
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD} = 40\text{ V}, I_D = 140\text{ A},$ $R_G = 25\ \Omega$ | -- | 75 | 160 | ns | |
| t_r | Turn-On Rise Time | | -- | 940 | 1890 | ns | |
| $t_{d(off)}$ | Turn-Off Delay Time | | (Note 4) | -- | 350 | 710 | ns |
| t_f | Turn-Off Fall Time | | (Note 4) | -- | 360 | 730 | ns |
| Q_g | Total Gate Charge | $V_{DS} = 64\text{ V}, I_D = 140\text{ A},$ $V_{GS} = 10\text{ V}$ | -- | 220 | 285 | nC | |
| Q_{gs} | Gate-Source Charge | | (Note 4) | -- | 39 | -- | nC |
| Q_{gd} | Gate-Drain Charge | | (Note 4) | -- | 114 | -- | nC |

Drain-Source Diode Characteristics and Maximum Ratings

| | | | | | | |
|----------|---|--|----|-----|-----|----|
| I_S | Maximum Continuous Drain-Source Diode Forward Current | (Note 5) | -- | -- | 140 | A |
| I_{SM} | Maximum Pulsed Drain-Source Diode Forward Current | | -- | -- | 560 | A |
| V_{SD} | Drain-Source Diode Forward Voltage | $V_{GS} = 0\text{ V}, I_S = 140\text{ A}$ | -- | -- | 1.5 | V |
| t_{rr} | Reverse Recovery Time | $V_{GS} = 0\text{ V}, I_S = 140\text{ A},$ | -- | 140 | -- | ns |
| Q_{rr} | Reverse Recovery Charge | $di_F / dt = 100\text{ A}/\mu\text{s}$ | -- | 730 | -- | nC |

Notes:

1. Repetitive rating : pulse-width limited by maximum junction temperature.
2. $L = 0.115\text{ mH}, I_{AS} = 140\text{ A}, V_{DD} = 25\text{ V}, R_G = 25\ \Omega$, starting $T_J = 25^\circ\text{C}$.
3. $I_{SD} \leq 140\text{ A}, di/dt \leq 300\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, starting $T_J = 25^\circ\text{C}$.
4. Essentially independent of operating temperature.
5. Continuous drain current calculated by maximum junction temperature : limited by package.

Typical Characteristics

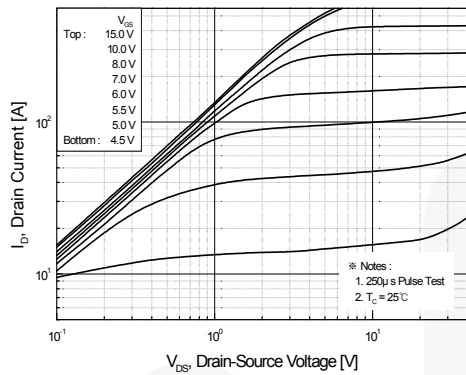


Figure 1. On-Region Characteristics

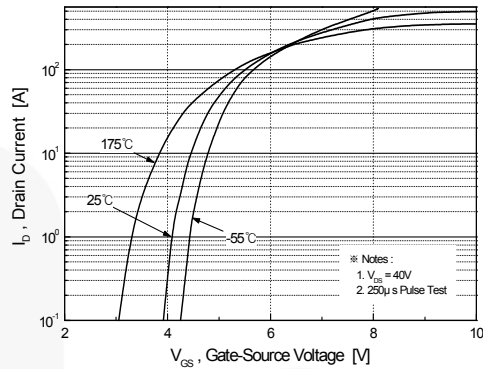


Figure 2. Transfer Characteristics

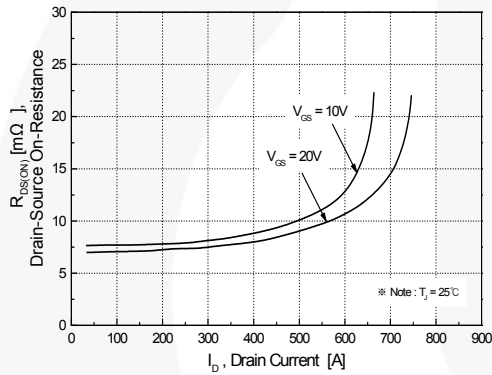


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

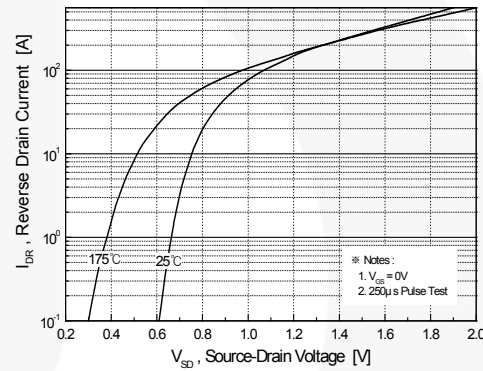


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

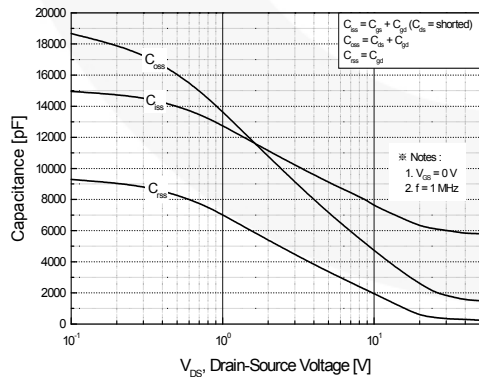


Figure 5. Capacitance Characteristics

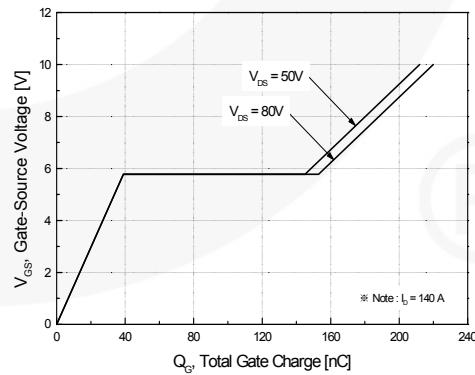


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

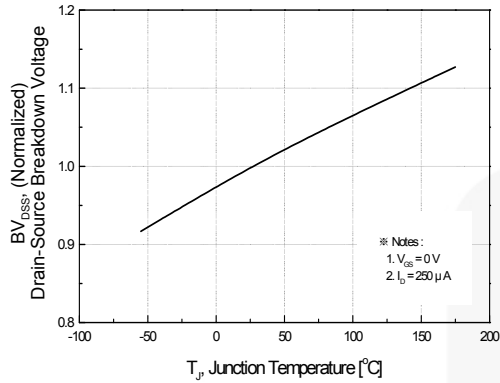


Figure 7. Breakdown Voltage Variation vs. Temperature

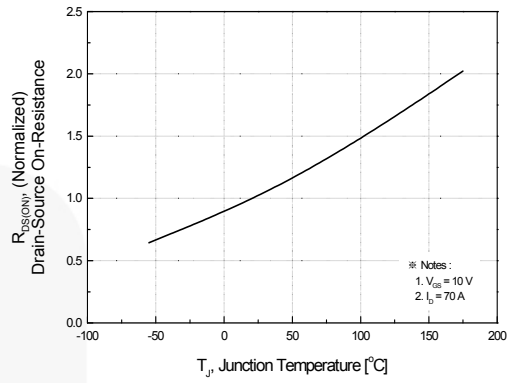


Figure 8. On-Resistance Variation vs. Temperature

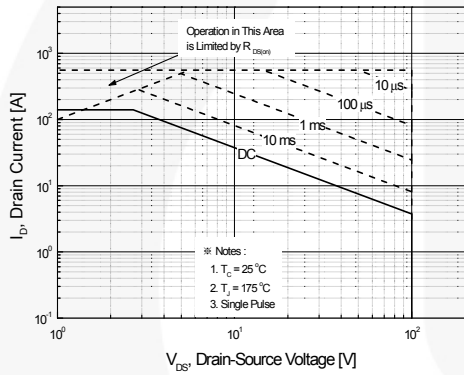


Figure 9. Maximum Safe Operating Area

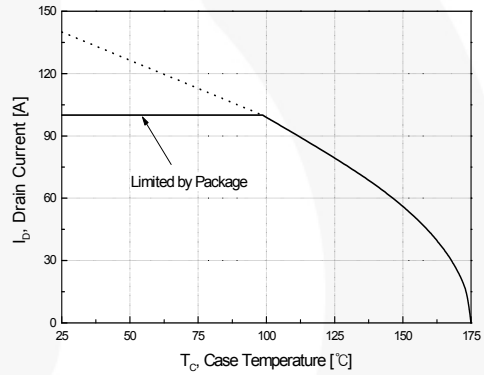


Figure 10. Maximum Drain Current vs. Case Temperature

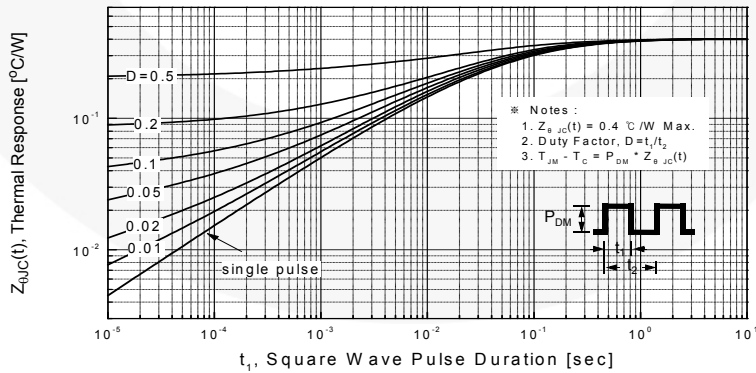


Figure 11. Transient Thermal Response Curve

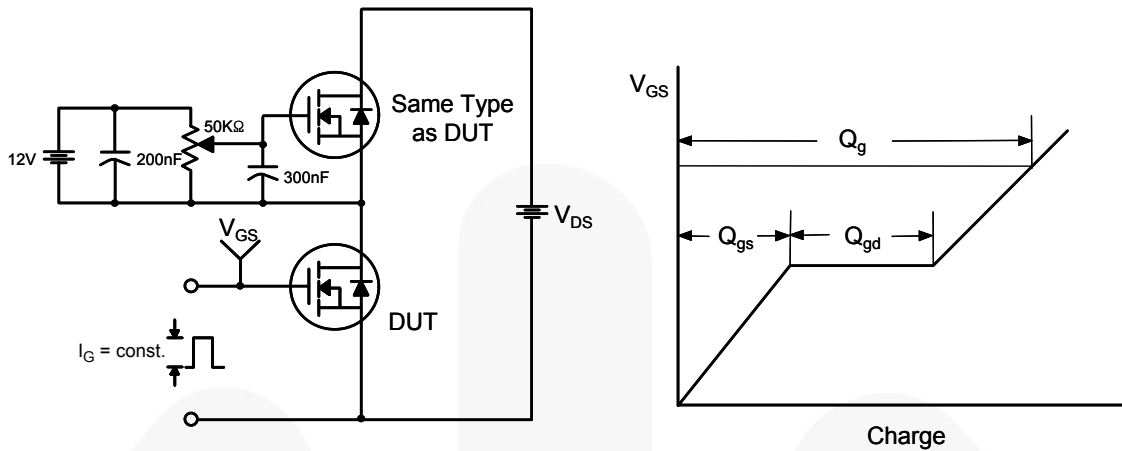


Figure 12. Gate Charge Test Circuit & Waveform

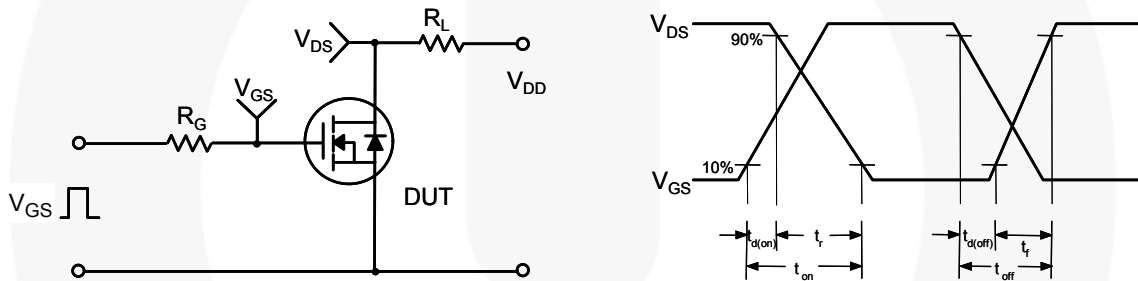


Figure 13. Resistive Switching Test Circuit & Waveforms

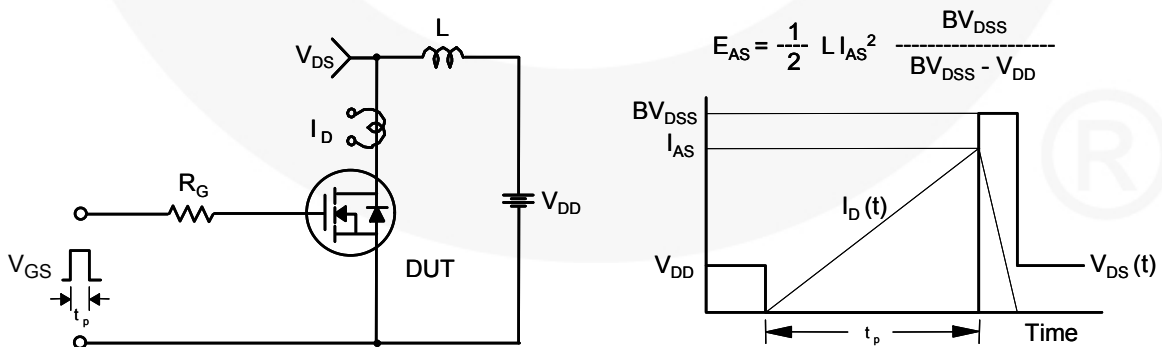


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

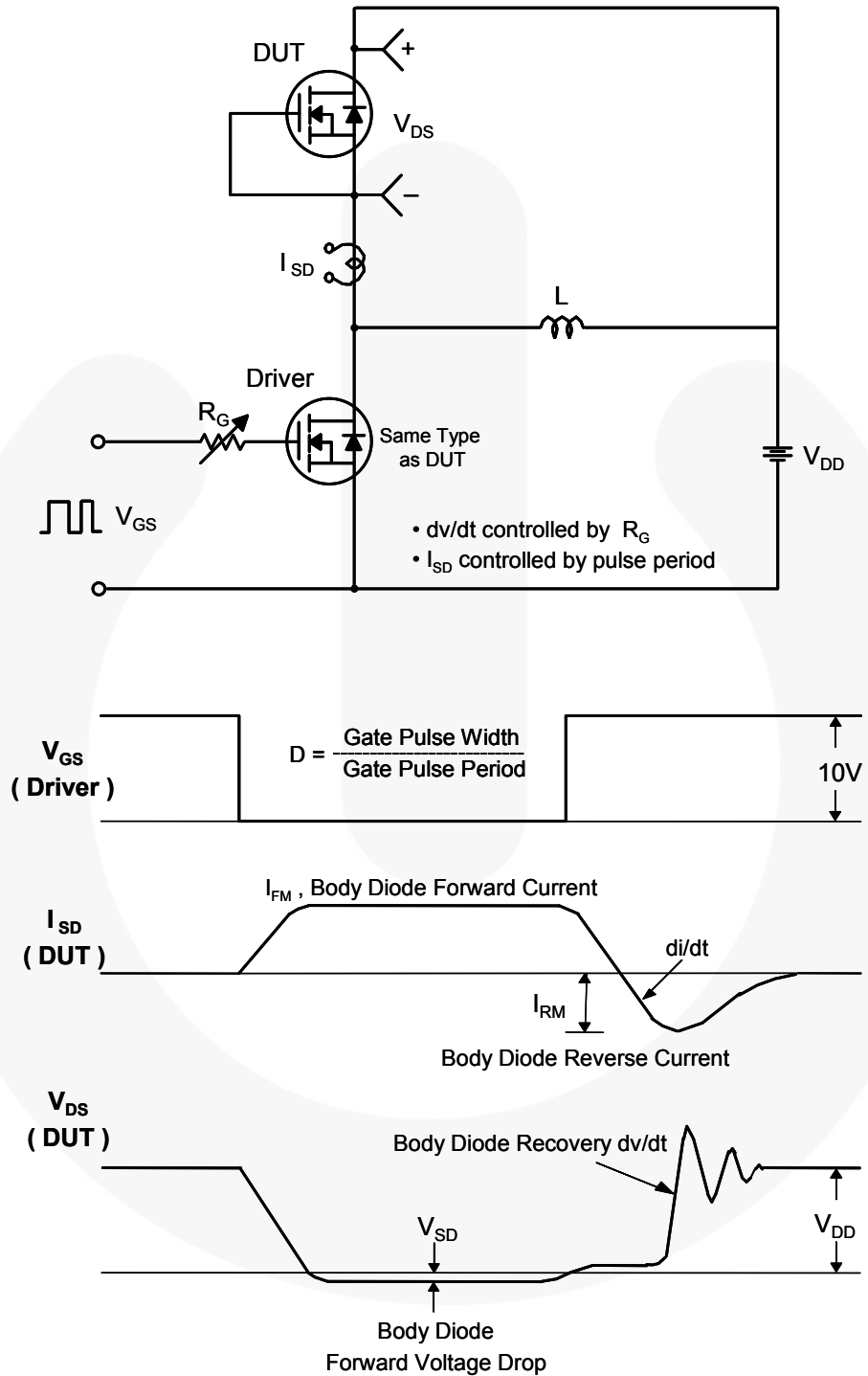
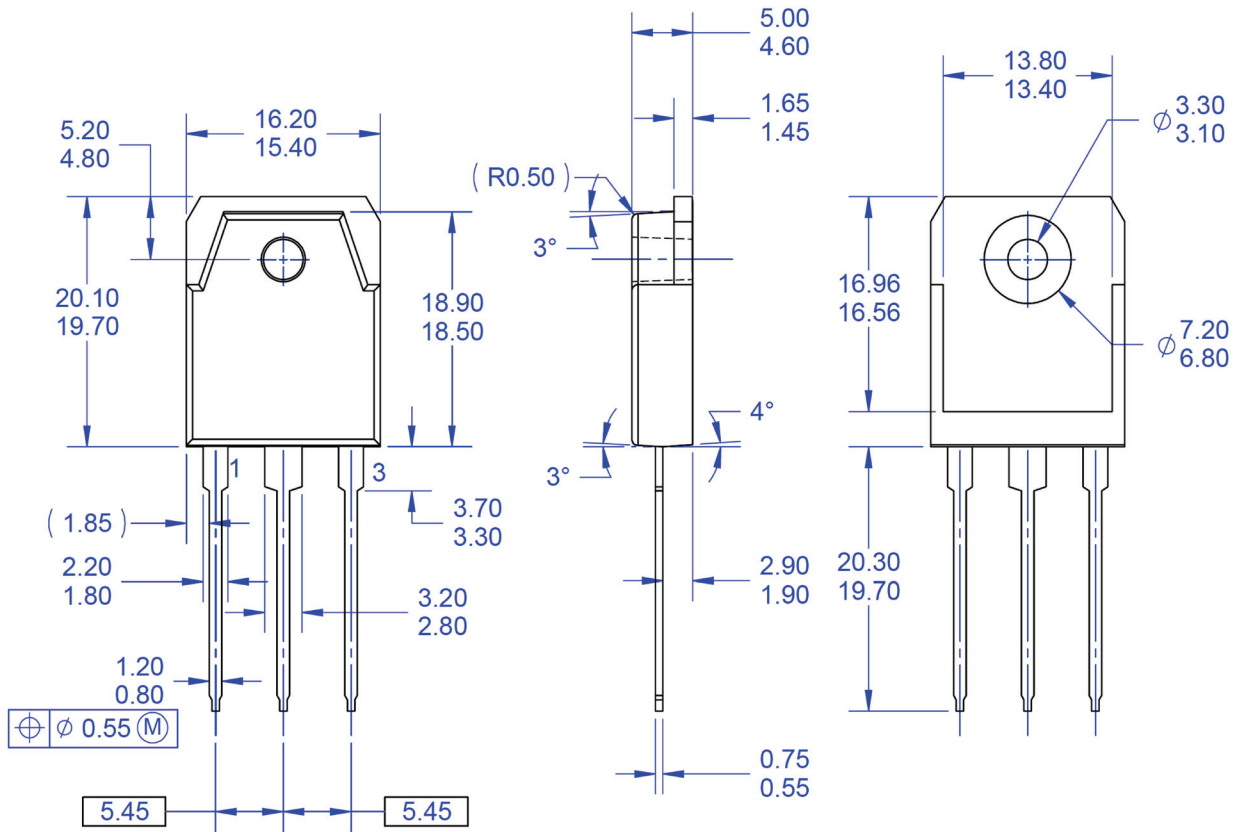


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions



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.
- E) DRAWING FILE NAME: TO3PN03AREV1.
- F) FAIRCHILD SEMICONDUCTOR.

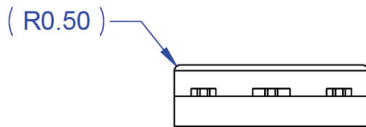


Figure 16. TO3PN, 3-Lead, Plastic, EIAJ SC-65

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




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