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# FDA38N30

## N-Channel UniFET™ MOSFET

300 V, 38 A, 85 mΩ

### Features

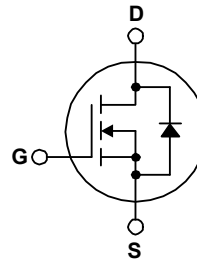
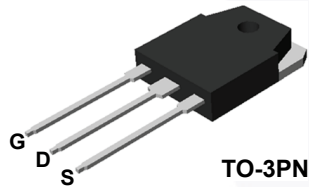
- $R_{DS(on)} = 70\text{ m}\Omega$  (Typ.) @  $V_{GS} = 10\text{ V}$ ,  $I_D = 19\text{ A}$
- Low Gate Charge (Typ. 60 nC)
- Low  $C_{rss}$  (Typ. 60 pF)
- 100% Avalanche Tested
- ESD Improved Capability
- RoHS Compliant

### Applications

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

### Description

UniFET™ MOSFET is Fairchild Semiconductor'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.



### MOSFET Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter		FDA38N30	Unit
$V_{DSS}$	Drain to Source Voltage		300	V
$V_{GSS}$	Gate to Source Voltage		$\pm 30$	V
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ\text{C}$ )	38	A
		- Continuous ( $T_C = 100^\circ\text{C}$ )	22	
$I_{DM}$	Drain Current	- Pulsed (Note 1)	150	A
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)		1200	mJ
$I_{AR}$	Avalanche Current (Note 1)		38	A
$E_{AR}$	Repetitive Avalanche Energy (Note 1)		31	mJ
$dv/dt$	Peak Diode Recovery $dv/dt$ (Note 3)		4.5	V/ns
$P_D$	Power Dissipation	( $T_C = 25^\circ\text{C}$ )	312	W
		- Derate Above $25^\circ\text{C}$	2.5	
$T_J, T_{STG}$	Operating and Storage Temperature Range		-55 to +150	$^\circ\text{C}$
$T_L$	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds		300	$^\circ\text{C}$

### Thermal Characteristics

Symbol	Parameter	FDA38N30	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.4	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	40	

## Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDA38N30	FDA38N30	TO-3PN	Tube	N/A	N/A	30 units

## Electrical Characteristics T<sub>C</sub> = 25°C unless otherwise noted.

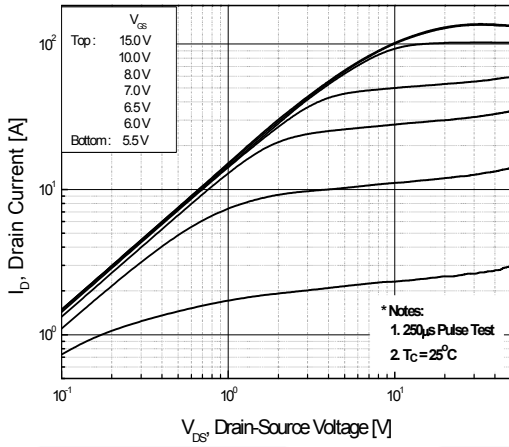
Symbol	Parameter	Conditions	Min.	Typ.	Max	Unit
<b>Off Characteristics</b>						
BV <sub>DSS</sub>	Drain to Source Breakdown Voltage	I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0 V, T <sub>C</sub> = 25°C	300	-	-	V
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, Referenced to 25°C	-	0.3	-	V/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 300 V, V <sub>GS</sub> = 0 V	-	-	1	μA
		V <sub>DS</sub> = 240 V, T <sub>C</sub> = 125°C	-	-	10	
I <sub>GSS</sub>	Gate-Body Leakage Current	V <sub>GS</sub> = ±30 V, V <sub>DS</sub> = 0 V	-	-	±100	nA
<b>On Characteristics</b>						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	3.0	-	5.0	V
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 19 A	-	0.070	0.085	Ω
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 20 V, I <sub>D</sub> = 19 A	-	6.3	-	S
<b>Dynamic Characteristics</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1 MHz	-	2600	-	pF
C <sub>oss</sub>	Output Capacitance		-	500	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		-	60	-	pF
Q <sub>g(tot)</sub>	Total Gate Charge at 10V	V <sub>DS</sub> = 240 V, I <sub>D</sub> = 38 A, V <sub>GS</sub> = 10 V	-	60	-	nC
Q <sub>gs</sub>	Gate to Source Gate Charge		-	17	-	nC
Q <sub>gd</sub>	Gate to Drain "Miller" Charge		(Note 4)	-	28	-
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = 150 V, I <sub>D</sub> = 38 A, R <sub>G</sub> = 25 Ω, V <sub>GS</sub> = 10 V	-	53	69	ns
t <sub>r</sub>	Turn-On Rise Time		-	110	143	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		-	118	153	ns
t <sub>f</sub>	Turn-Off Fall Time		(Note 4)	-	54	70
<b>Drain-Source Diode Characteristics</b>						
I <sub>S</sub>	Maximum Continuous Drain to Source Diode Forward Current		-	-	38	A
I <sub>SM</sub>	Maximum Pulsed Drain-Source Diode Forward Current		-	-	150	A
V <sub>SD</sub>	Drain to Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>SD</sub> = 38 A	-	-	1.4	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0 V, I <sub>SD</sub> = 38 A, dI <sub>F</sub> /dt = 100 A/μs	-	315	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	4.0	-	μC

### Notes:

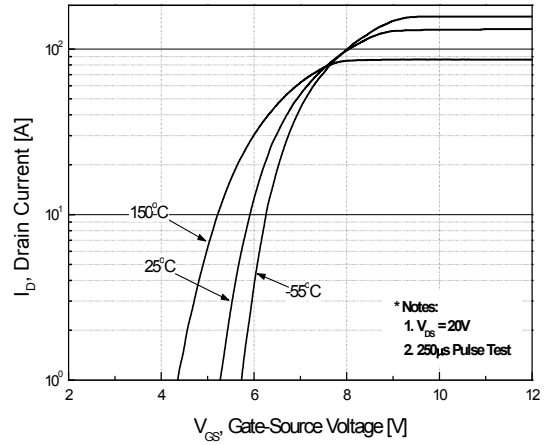
1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. L = 1.7 mH, I<sub>AS</sub> = 38 A, V<sub>DD</sub> = 50 V, R<sub>G</sub> = 25 Ω, starting T<sub>J</sub> = 25°C.
3. I<sub>SD</sub> ≤ 38 A, di/dt ≤ 200 A/μs, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, starting T<sub>J</sub> = 25°C.
4. Essentially independent of operating temperature typical characteristics.

## Typical Performance Characteristics

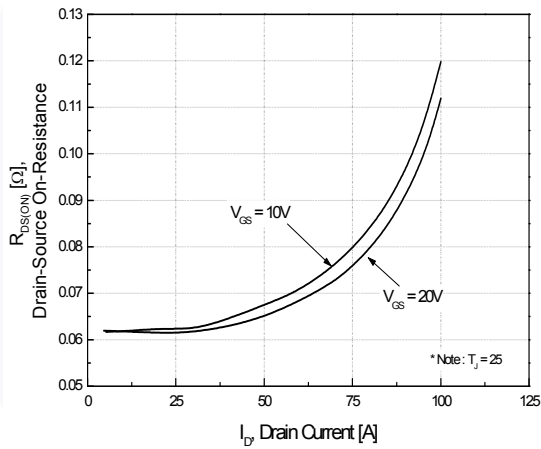
**Figure 1. On-Region Characteristics**



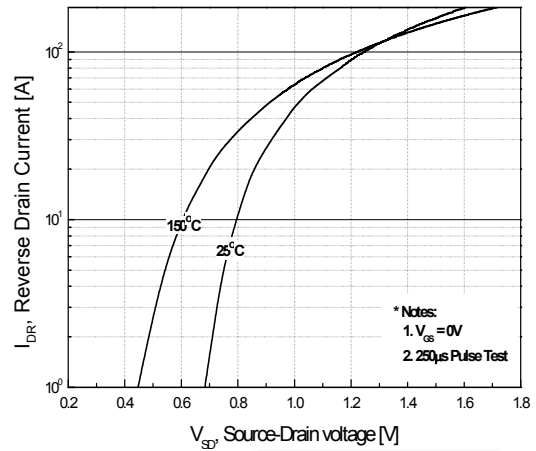
**Figure 2. Transfer Characteristics**



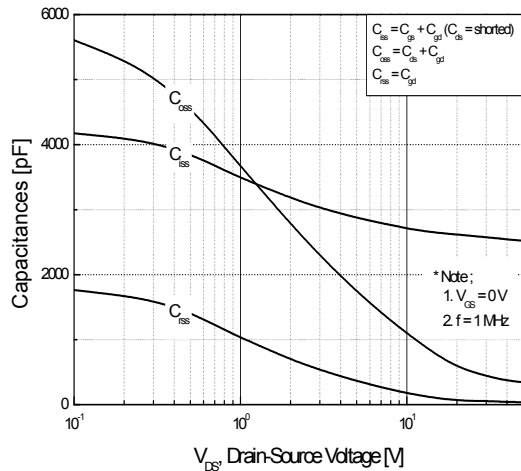
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



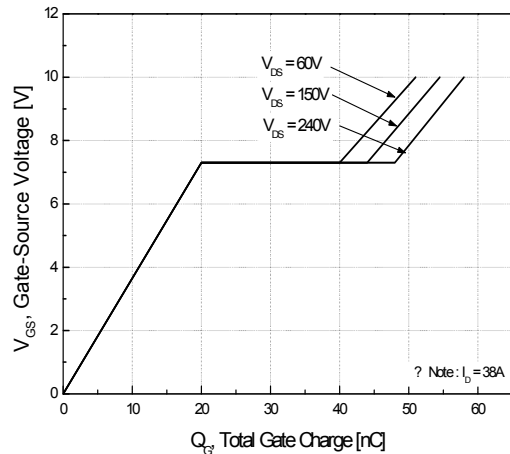
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**



**Figure 6. Gate Charge Characteristics**



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

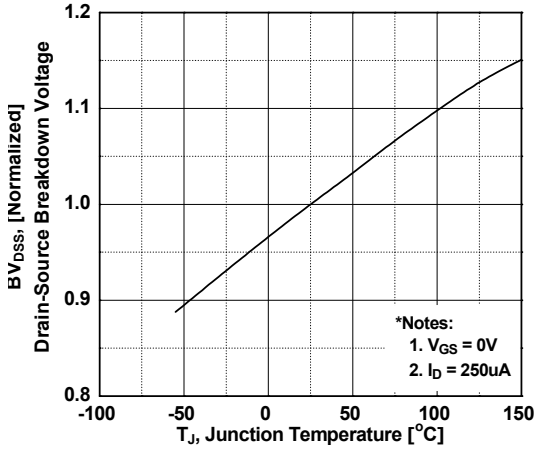


Figure 8. On-Resistance Variation vs. Temperature

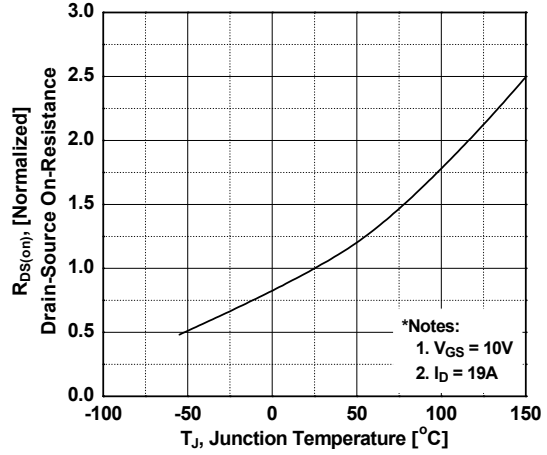


Figure 9. Maximum Safe Operating Area

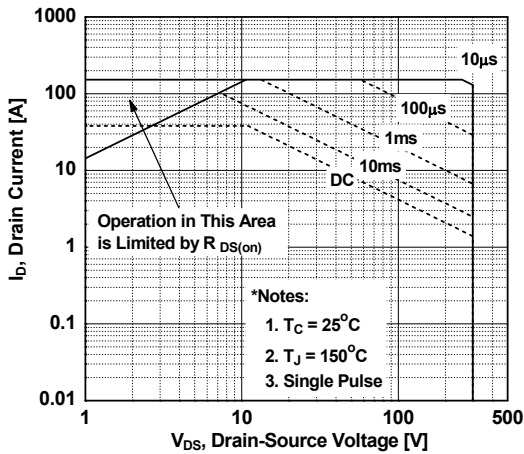


Figure 10. Maximum Drain Current vs. Case Temperature

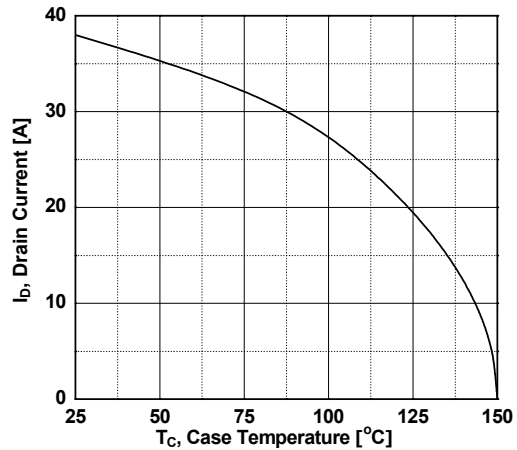
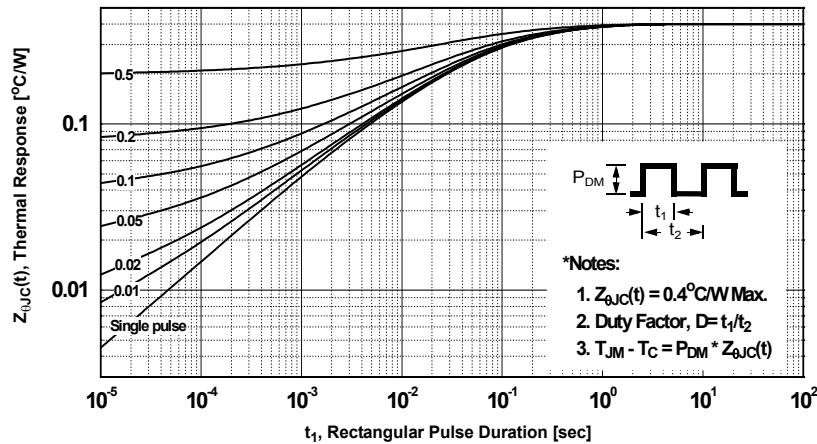


Figure 11. Transient Thermal Response Curve



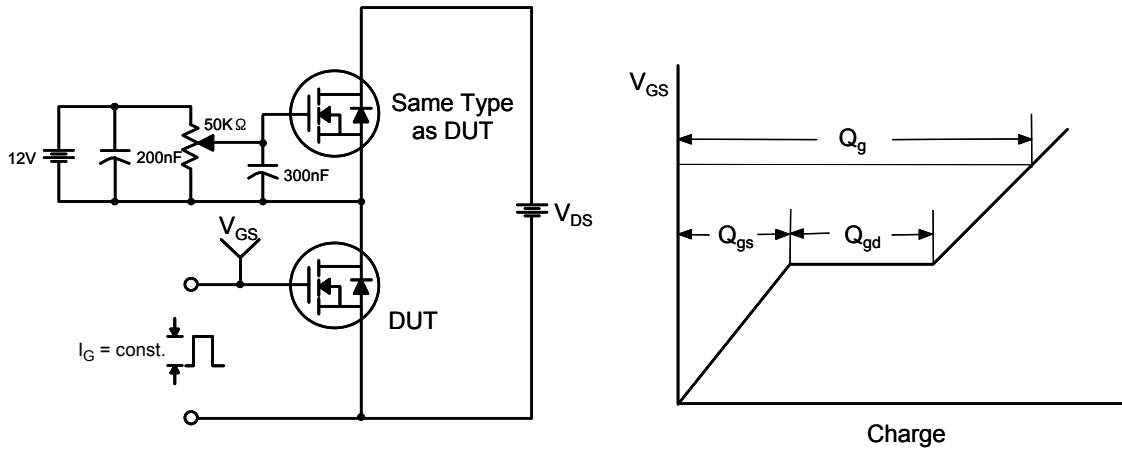


Figure 12. Gate Charge Test Circuit & Waveform



Figure 13. Resistive Switching Test Circuit & Waveforms



Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

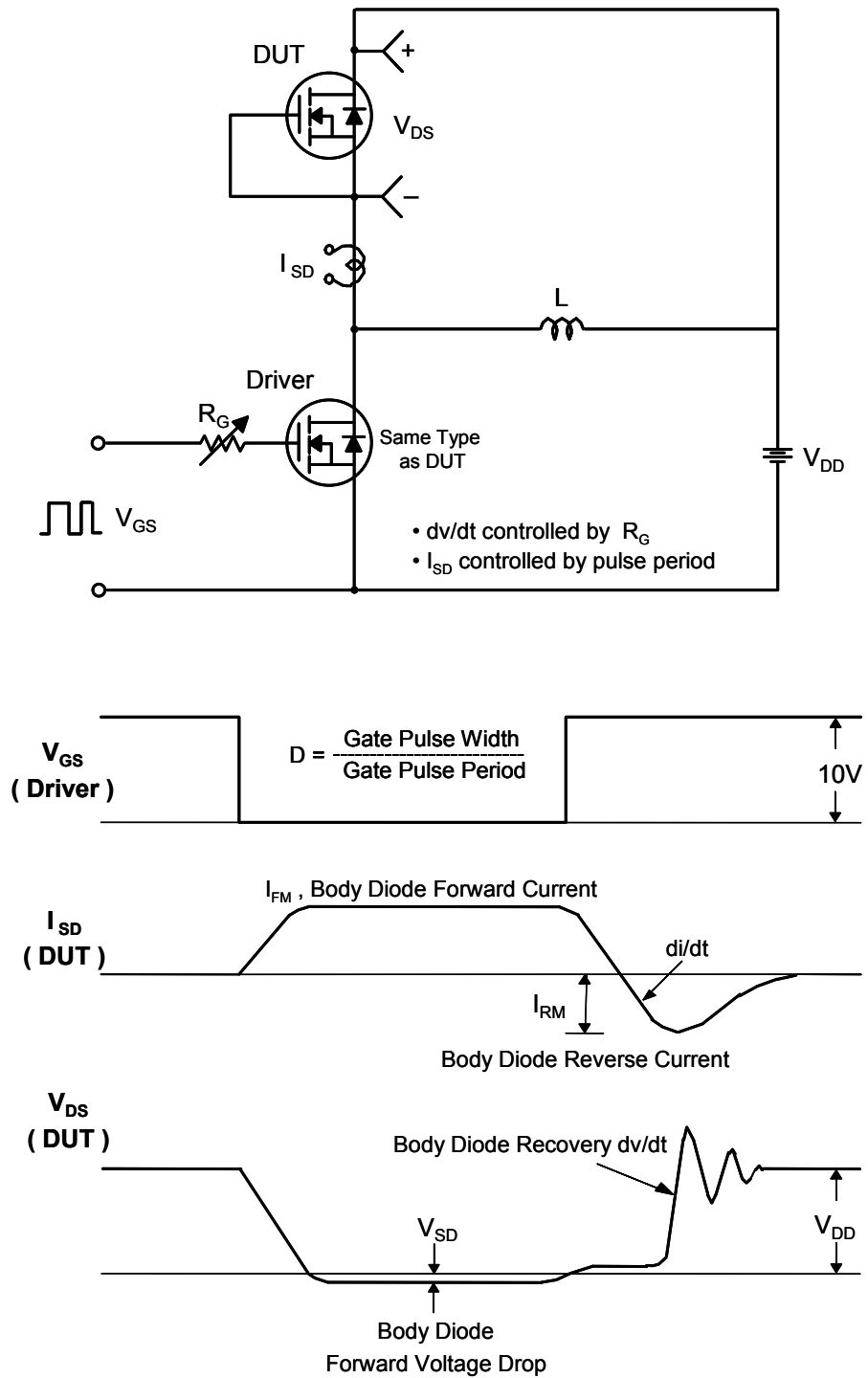
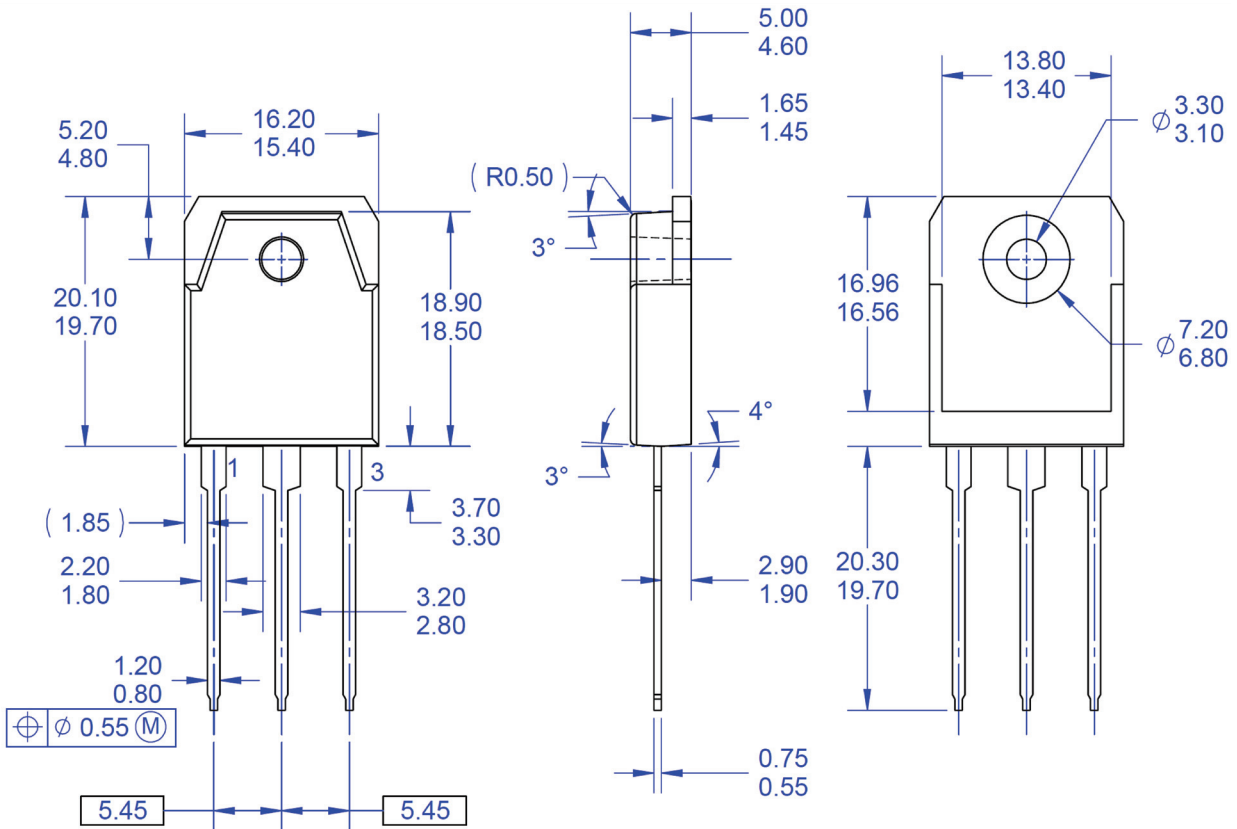


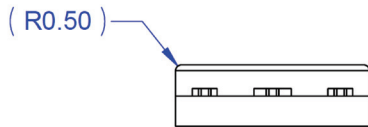
Figure 15. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms

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

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