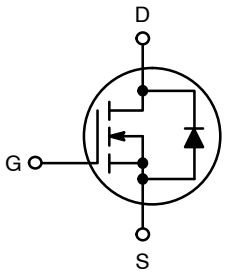
MOSFET – N-Channel, UniFET™

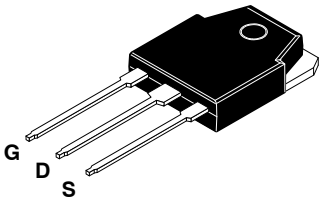
500 V, 16.5 A, 380 mΩ

FDA16N50-F109

V_{DS}	$R_{DS(on)}$ MAX	I_D MAX
500 V	380 mΩ @ 10 V	16.5 A



N–Channel



TO–3P–3LD
CASE 340BZ

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.

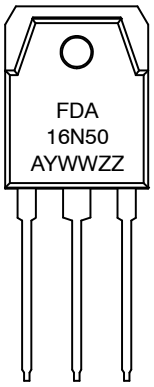
Features

- $R_{DS(on)}$ = 380 mΩ (Max.) @ V_{GS} = 10 V, I_D = 8.3 A
- Low Gate Charge (Typ. 32 nC)
- Low C_{rss} (Typ. 20 pF)
- 100% Avalanche Tested
- This is a Pb–Free Device

Applications

- PDP TV
- Uninterruptible Power Supply

MARKING DIAGRAM



FDA16N50	= Specific Device Code
A	= Assembly Location
YWW	= Date Code (Year & Week)
ZZ	= Assembly Lot

ORDERING INFORMATION

Device	Package	Shipping
FDA16N50–F109	TO–3P–3LD (Pb–Free)	450 Units / Tube

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

Symbol	Parameter		FDA16N50−F109	Unit
V_{DSS}	Drain−Source Voltage		500	V
I_D	Drain Current −	−Continuous (T_C = 25°C) −Continuous (T_C = 100°C)	16.5 9.9	A A
I_{DM}	Drain Current	−Pulsed (Note 1)	66	A
V_{GSS}	Gate−Source Voltage		±30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)		780	mJ
I_{AR}	Avalanche Current (Note 1)		16.5	A
E_{AR}	Repetitive Avalanche Energy (Note 1)		20.5	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		4.5	V/ns
P_D	Power Dissipation	(T_C = 25°C) −Derate Above 25°C	205 2.1	W W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		−55 to +150	°C
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8″ from Case for 5 Second		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 = 5.1 mH, I_{AS} = 16.5 A, V_{DD} = 50 V, R_G = 25 Ω, Starting T_J = 25 °C.
3. I_{SD} ≤ 16.5 A, di/dt ≤ 200 A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25 °C.

THERMAL CHARACTERISTICS

Symbol	Parameter	FDA16N50−F109	Unit
$R_{\theta JC}$	Thermal Resistance, Junction−to−Case, Max.	0.6	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction−to−Ambient, Max.	40	

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
BV_{DSS}	Drain−Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 μA	500	–	–	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	–	0.5	–	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 500 V, V_{GS} = 0 V	–	–	1	μA
		V_{DS} = 400 V, T_C = 125°C	–	–	10	μA
I_{GSSF}	Gate−Body Leakage Current, Forward	V_{GS} = 30 V, V_{DS} = 0 V	–	–	100	nA
I_{GSSR}	Gate−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 = 8.3 A	–	0.31	0.38	Ω
g_{FS}	Forward Transconductance	V_{DS} = 40 V, I_D = 8.3 A	–	23	–	S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1 MHz	–	1495	1945	pF
C_{oss}	Output Capacitance		–	235	310	pF
C_{rss}	Reverse Transfer Capacitance		–	20	30	pF
SWITCHING CHARACTERISTICS						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 250 V, I_D = 16 A, R_G = 25 Ω (Note 4)	–	40	90	ns
t_r	Turn−On Rise Time		–	150	310	ns
$t_{d(off)}$	Turn-Off Delay Time		–	65	140	ns
t_f	Turn−Off Fall Time		–	80	170	ns
Q_g	Total Gate Charge	V_{DS} = 400 V, I_D = 16 A, V_{GS} = 10 V (Note 4)	–	32	45	nC
Q_{gs}	Gate−Source Charge		–	8.5	–	nC
Q_{gd}	Gate−Drain Charge		–	14	–	nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
I_S	Maximum Continuous Drain−Source Diode Forward Current		–	–	9.2	A
I_{SM}	Maximum Pulsed Drain−Source Diode Forward Current		–	–	37	A
V_{SD}	Drain−Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 16.5 A	–	–	1.4	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_S = 16 A, dI_F/dt = 100 A/μs	–	490	–	ns
Q_{rr}	Reverse Recovery Charge		–	5.0	–	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 CHARACTERISTICS

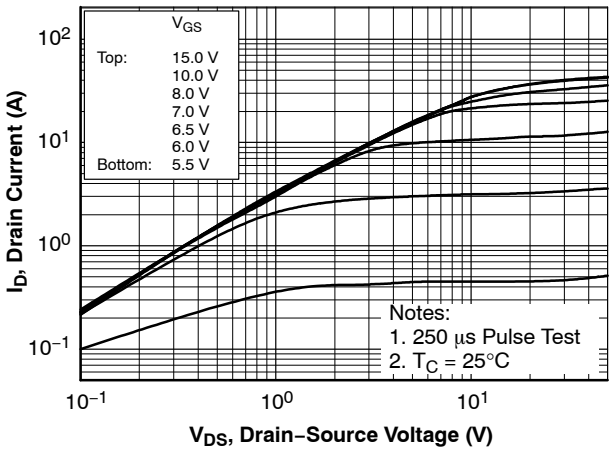


Figure 1. On−Region Characteristics

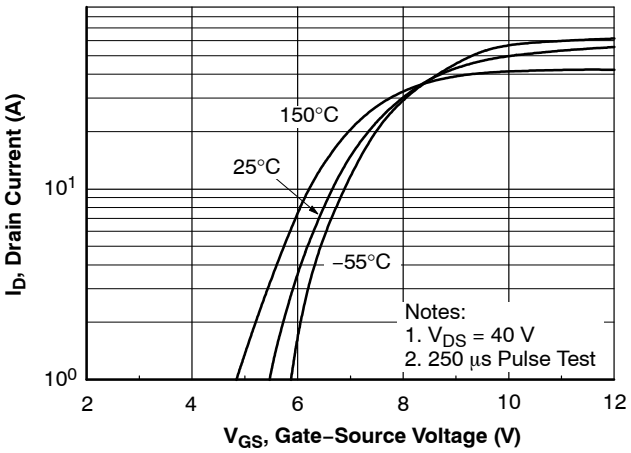


Figure 2. Transfer Characteristics

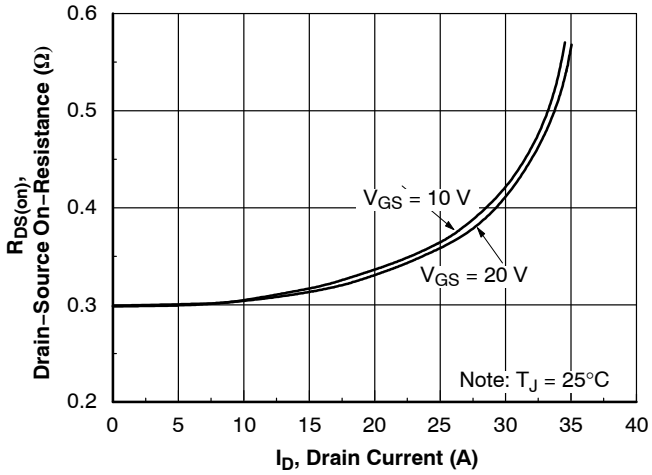


Figure 3. On−Resistance Variation vs. Drain Current and Gate Voltage

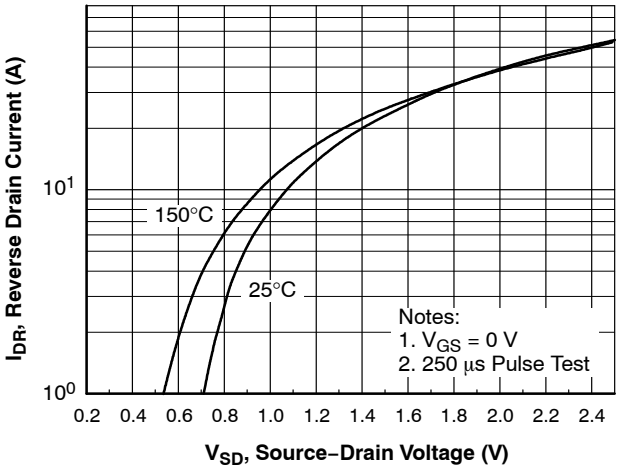


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

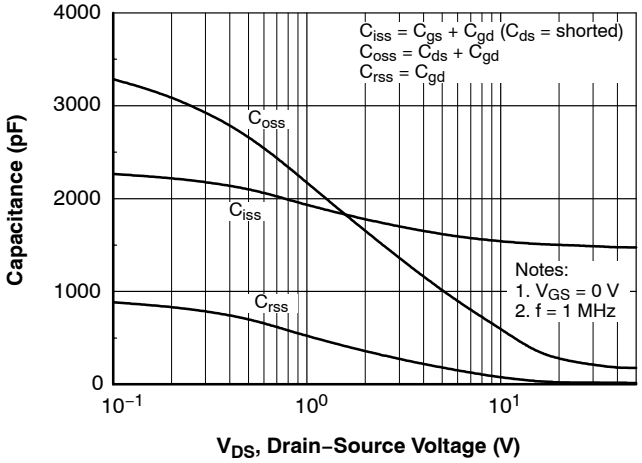


Figure 5. Capacitance Characteristics

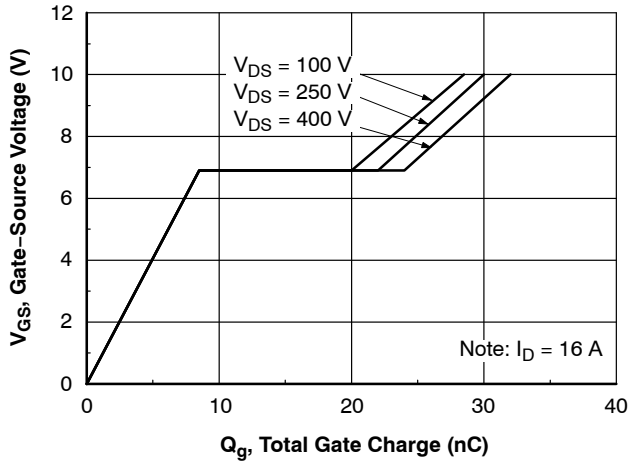


Figure 6. Gate Charge Characteristics

TYPICAL CHARACTERISTICS (Continued)

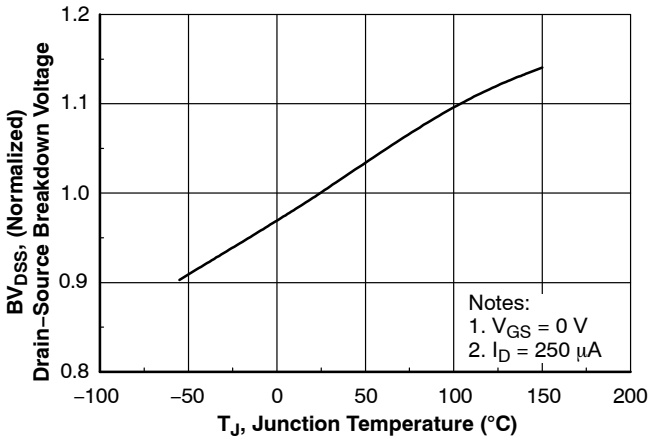


Figure 7. Breakdown Voltage Variation vs. Temperature

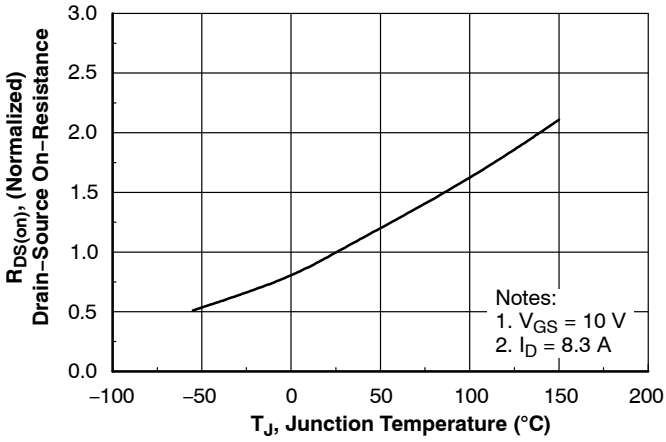


Figure 8. On−Resistance Variation vs. Temperature

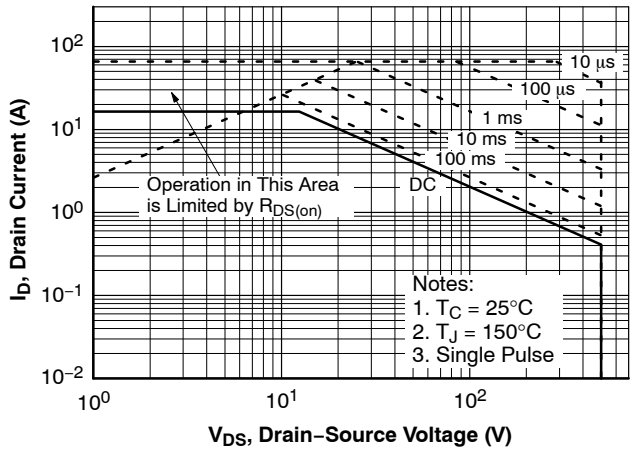


Figure 9. Maximum Safe Operating Area

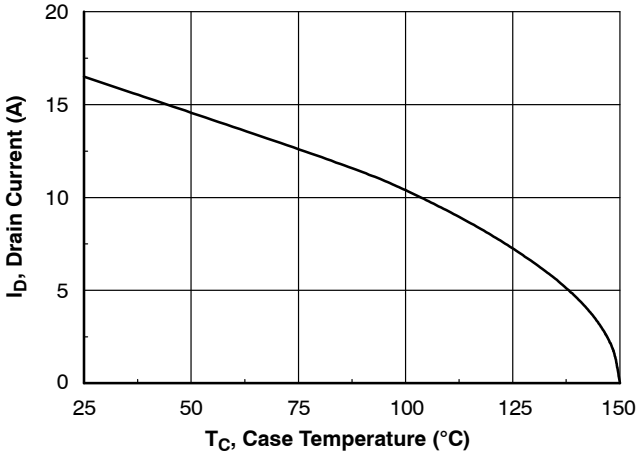


Figure 10. Maximum Drain Current vs. Case Temperature

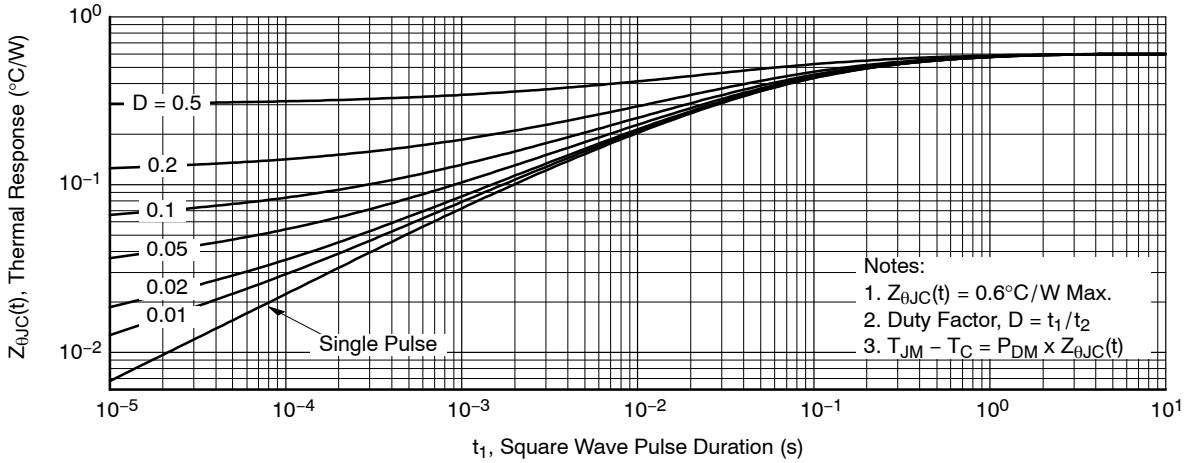


Figure 11. Transient Thermal Response Curve

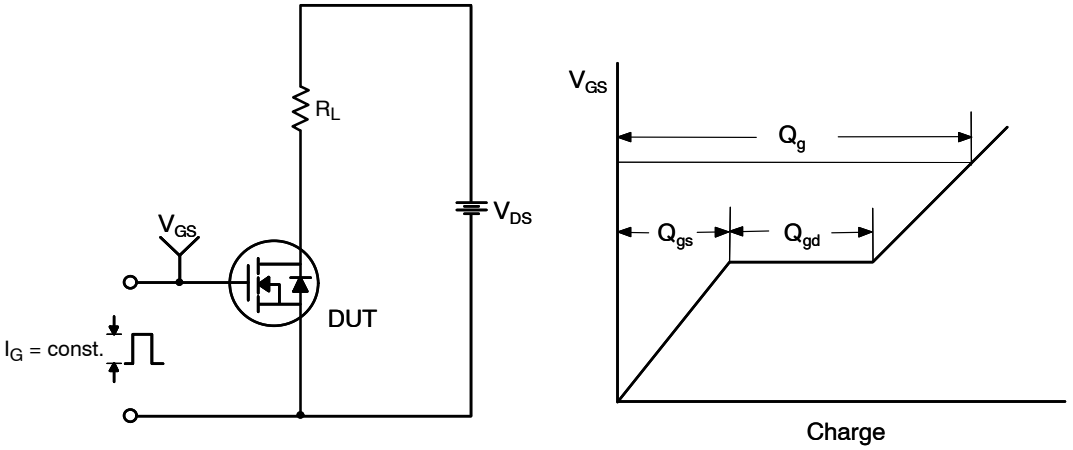


Figure 12. Gate Charge Test Circuit & Waveform

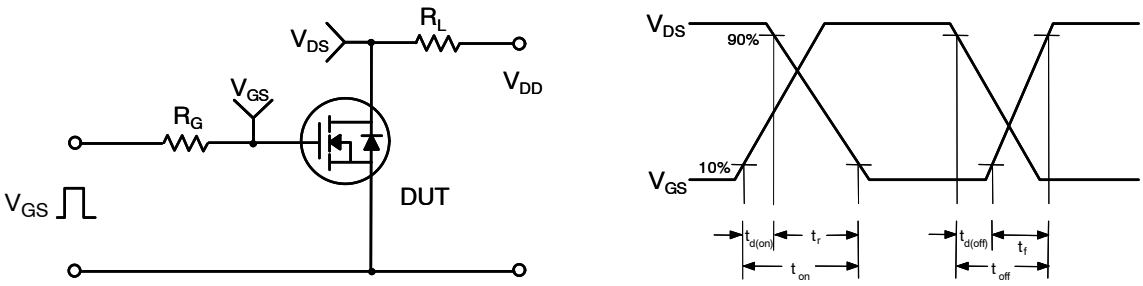


Figure 13. Resistive Switching Test Circuit & Waveforms

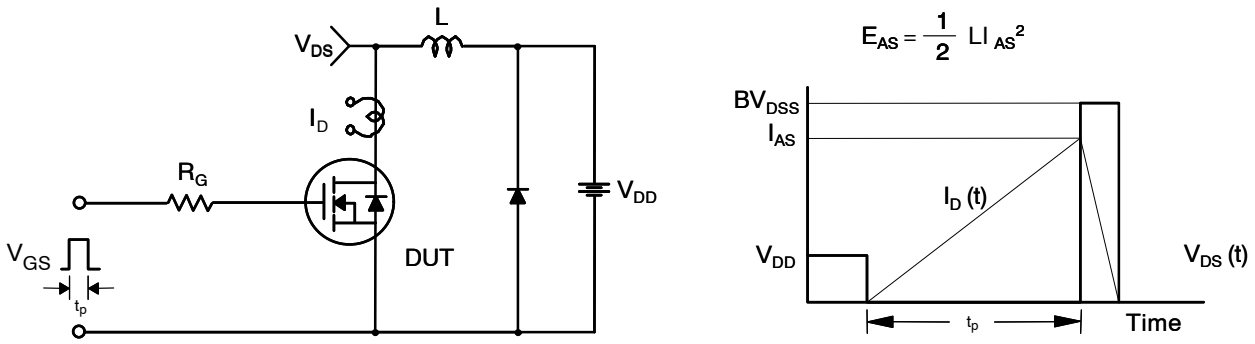


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

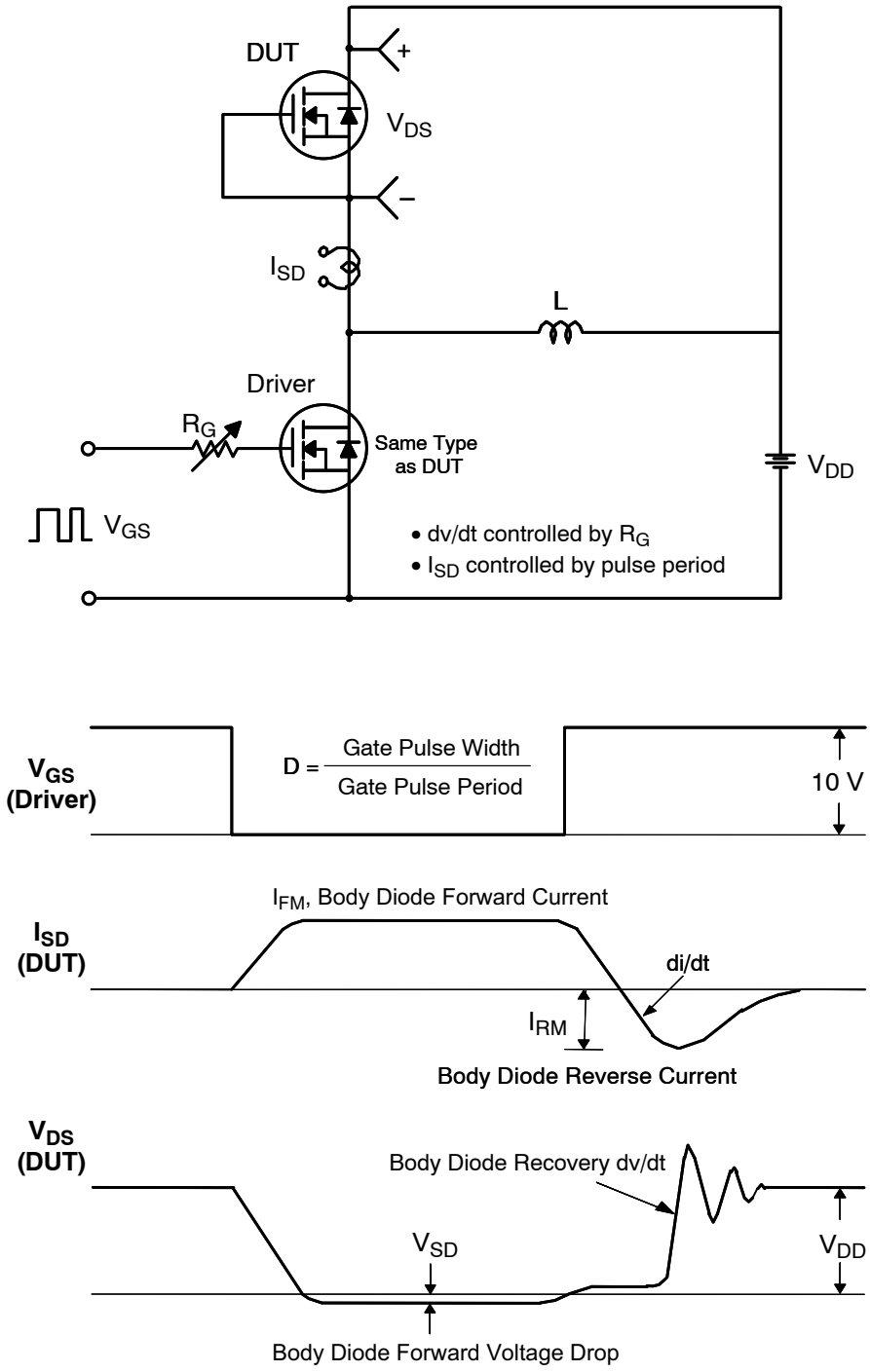


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

TO−3P−3LD / EIAJ SC−65, ISOLATED
CASE 340BZ
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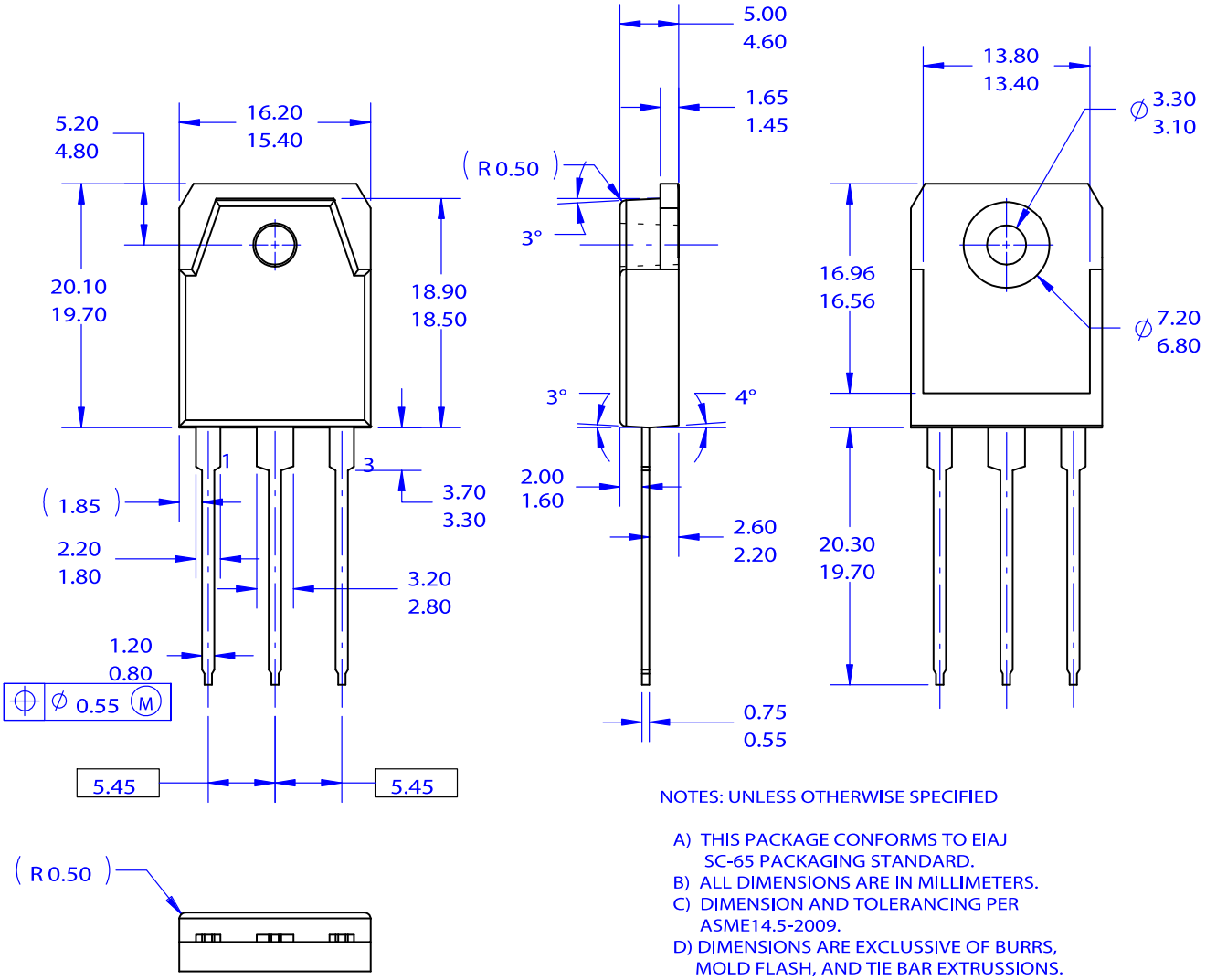
DATE 31 OCT 2016



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 EXCLUSSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSSIONS.

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