

FCH47N60NF

N-Channel SupreMOS® FRFET® MOSFET

600 V, 45.8 A, 65 mΩ

Features

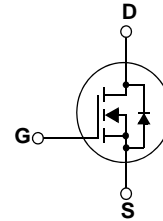
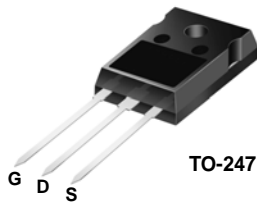
- 650 V @ T_J = 150 °C
- Typ. R_{DS(on)} = 62 mΩ
- Ultra Low Gate Charge (Typ. Q_g = 240 nC)
- Low Effective Output Capacitance (Typ. C_{oss,eff} = 420 pF)
- 100% Avalanche Tested
- RoHS Compliant

Applications

- Solar Inverter
- AC-DC Power Supply

Description

The SupreMOS® MOSFET is Fairchild Semiconductor®'s next-generation of high voltage super-junction (SJ) technology employing a deep trench filling process that differentiate it from the conventional MOSFETs. This advanced technology and precise process control provide lowest R_{sp} on-resistance, superior switching performance and ruggedness. SupreMOS MOSFET is suitable for high frequency switching power converter applications such as PFC, server/telecom power, FPD TV power, ATX power and industrial power applications. SupreMOS FRFET® MOSFET's optimized body diode reverse recovery performance can remove additional component and improve system reliability.



MOSFET Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Parameter	FCH47N60NF	Unit
V _{DSS}	Drain to Source Voltage	600	V
V _{GSS}	Gate to Source Voltage	±30	V
I _D	Drain Current	-Continuous (T _C = 25°C)	45.8
		-Continuous (T _C = 100°C)	28.9
I _{DM}	Drain Current	- Pulsed (Note 1)	137.4
E _{AS}	Single Pulsed Avalanche Energy (Note 2)	2926	mJ
I _{AR}	Avalanche Current	15.3	A
E _{AR}	Repetitive Avalanche Energy	3.7	mJ
dv/dt	MOSFET dv/dt Ruggedness	100	V/ns
	Peak Diode Recovery dv/dt (Note 3)	50	V/ns
P _D	Power Dissipation	(T _C = 25°C)	368
		- Derate above 25°C	2.94
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 Seconds	300	°C

*Drain current limited by maximum junction temperature

Thermal Characteristics

Symbol	Parameter	FCH47N60NF	Unit
R _{θJC}	Thermal Resistance, Junction to Case	0.34	°C/W
R _{θCS}	Thermal Resistance, Case to Heat Sink (Typical)	0.24	
R _{θJA}	Thermal Resistance, Junction to Ambient	40	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FCH47N60NF	FCH47N60NF	TO-247	-	-	30

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 1 \text{ mA}, V_{GS} = 0 \text{ V}, T_C = 25^\circ\text{C}$	600	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 1 \text{ mA}, \text{Referenced to } 25^\circ\text{C}$	-	0.78	-	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 480 \text{ V}, V_{GS} = 0 \text{ V}$	-	-	10	μA
		$V_{DS} = 480 \text{ V}, V_{GS} = 0 \text{ V}, T_C = 125^\circ\text{C}$	-	-	100	
I_{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 30 \text{ V}, V_{DS} = 0 \text{ V}$	-	-	± 100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$	3	-	5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 23.5 \text{ A}$	-	57.5	65.0	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS} = 40 \text{ V}, I_D = 23.5 \text{ A}$	-	52	100	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 100 \text{ V}, V_{GS} = 0 \text{ V}$ $f = 1 \text{ MHz}$	-	4600	6120	pF
C_{oss}	Output Capacitance		-	195	260	pF
C_{riss}	Reverse Transfer Capacitance		-	3.0	5.0	pF
C_{oss}	Output Capacitance	$V_{DS} = 380 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	-	108	-	pF
$C_{oss,eff.}$	Effective Output Capacitance	$V_{DS} = 0 \text{ V to } 380 \text{ V}, V_{GS} = 0 \text{ V}$	-	492	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 380 \text{ V}, I_D = 23.5 \text{ A},$ $V_{GS} = 10 \text{ V}$ (Note 4)	-	121	157	nC
Q_{gs}	Gate to Source Gate Charge		-	23	-	nC
Q_{gd}	Gate to Drain "Miller" Charge		-	47	-	nC
ESR	Equivalent Series Resistance(G-S)	Drain Open	-	0.9	-	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 380 \text{ V}, I_D = 23.5 \text{ A}$ $R_{GEN} = 4.7 \Omega$ (Note 4)	-	34	78	ns
t_r	Turn-On Rise Time		-	22	54	ns
$t_{d(off)}$	Turn-Off Delay Time		-	117	244	ns
t_f	Turn-Off Fall Time		-	4	18	ns

Drain-Source Diode Characteristics

I_S	Maximum Continuous Drain to Source Diode Forward Current	-	-	47	A	
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current	-	-	141	A	
V_{SD}	Drain to Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_{SD} = 23.5 \text{ A}$	-	-	1.2	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0 \text{ V}, I_{SD} = 23.5 \text{ A}$	-	169	-	ns
Q_{rr}	Reverse Recovery Charge	$di_F/dt = 100 \text{ A}/\mu\text{s}$	-	1.3	-	μC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $I_{AS} = 15.3 \text{ A}, R_G = 25 \Omega, \text{Starting } T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 45.8 \text{ A}, di/dt \leq 1200 \text{ A}/\mu\text{s}, V_{DD} \leq 380 \text{ V}, \text{Starting } T_J = 25^\circ\text{C}$
4. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

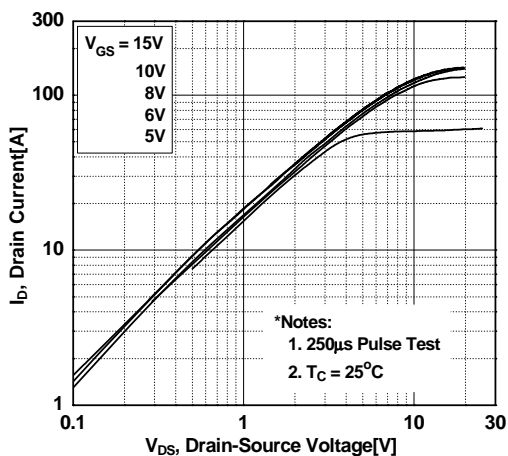


Figure 2. Transfer Characteristics

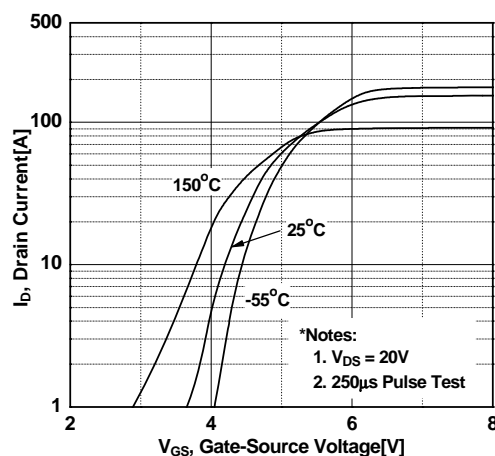


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

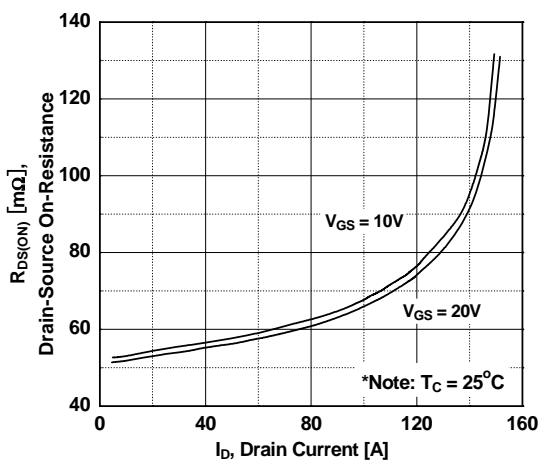


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

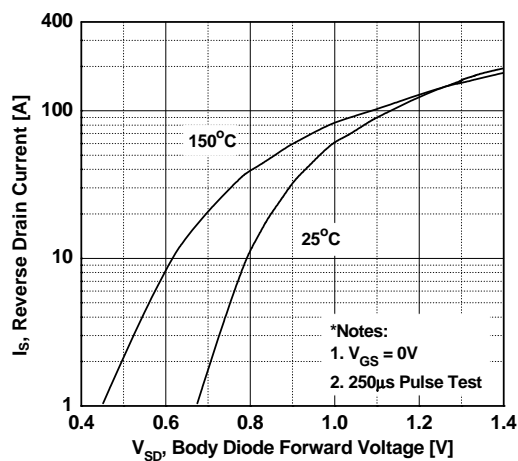


Figure 5. Capacitance Characteristics

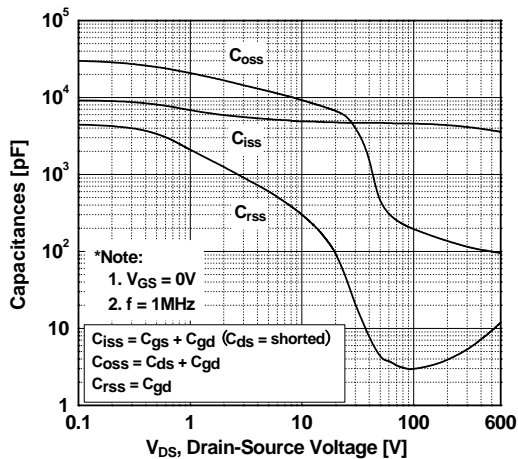
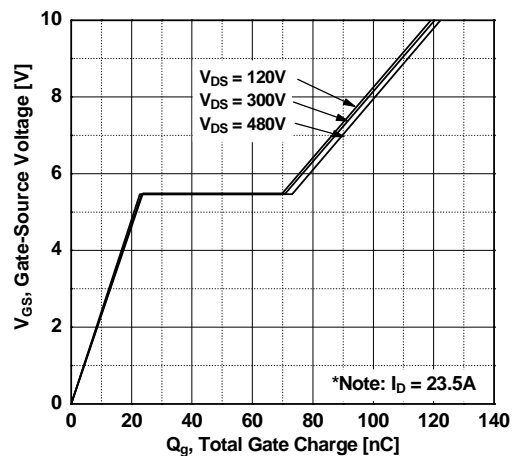


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

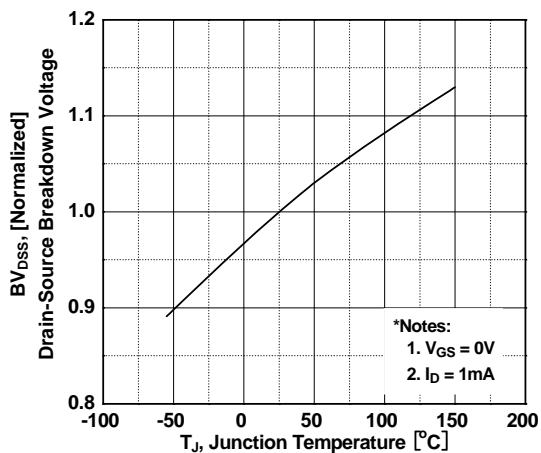


Figure 8. On-Resistance Variation vs. Temperature

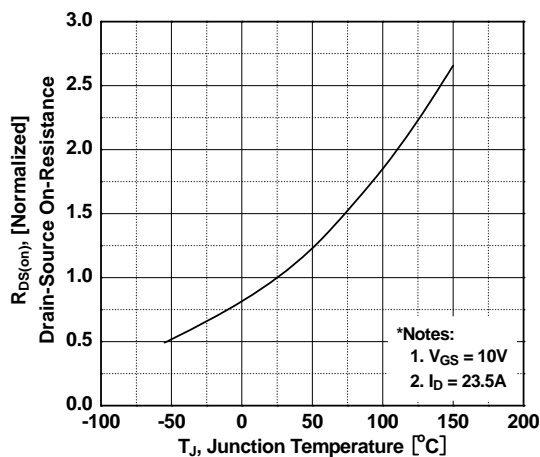


Figure 9. Maximum Safe Operating Area

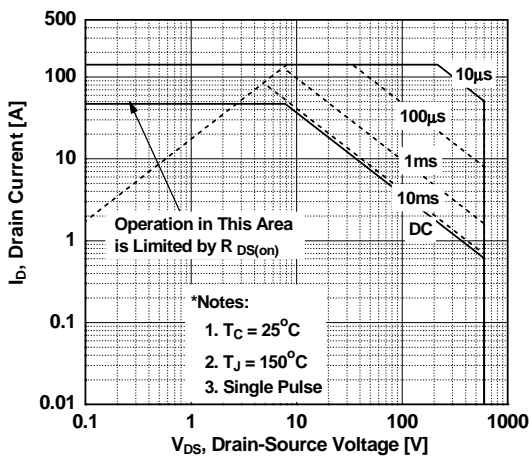


Figure 10. Maximum Drain Current vs. Case Temperature

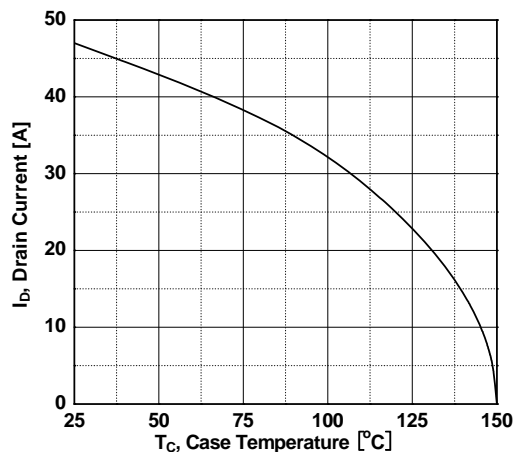
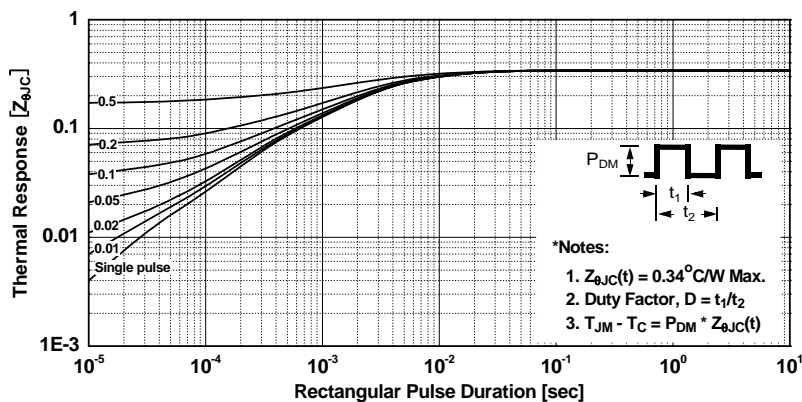
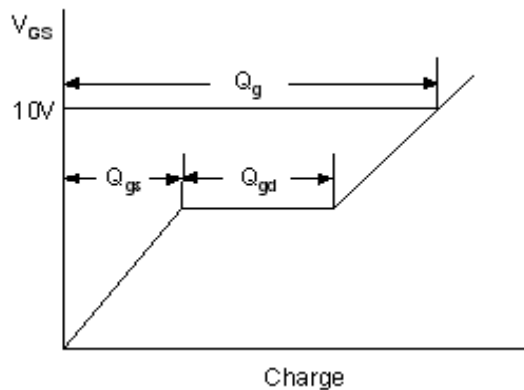
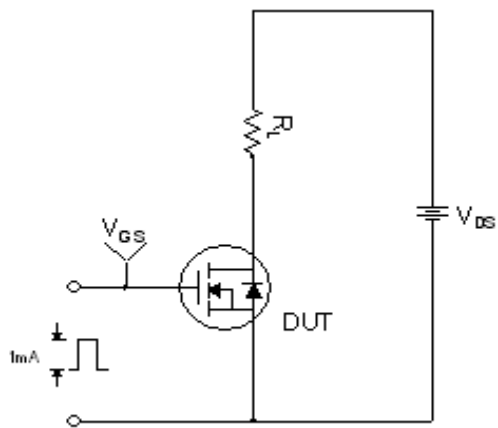


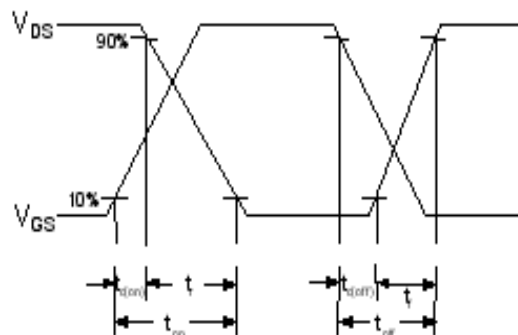
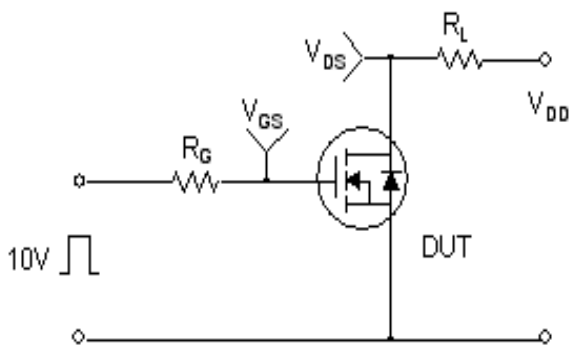
Figure 11. Transient Thermal Response Curve



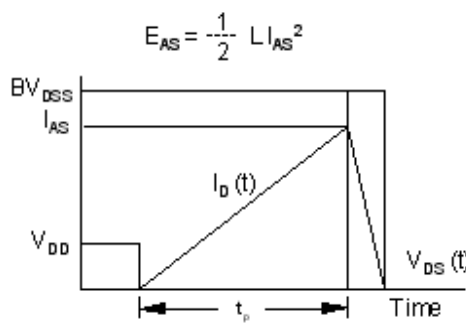
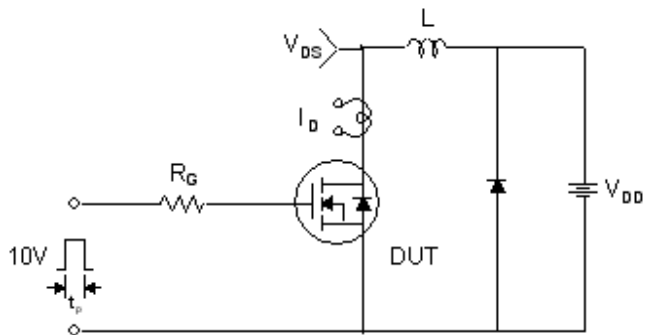
Gate Charge Test Circuit & Waveform



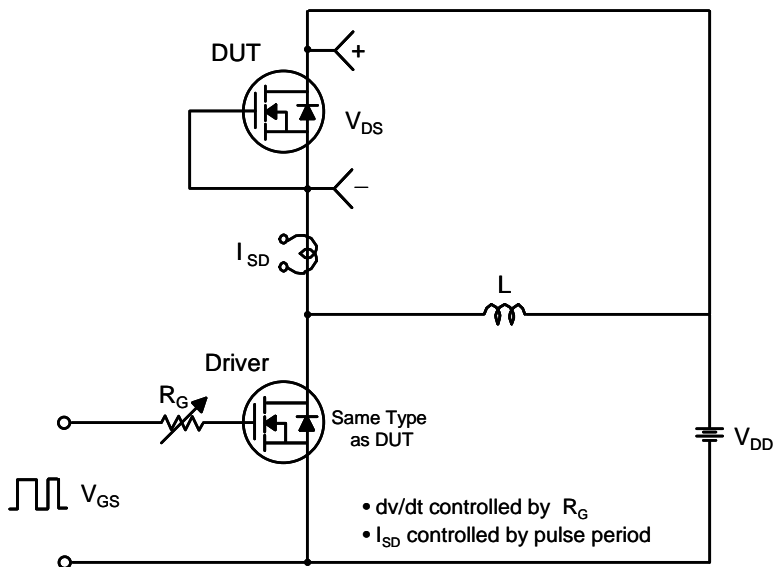
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

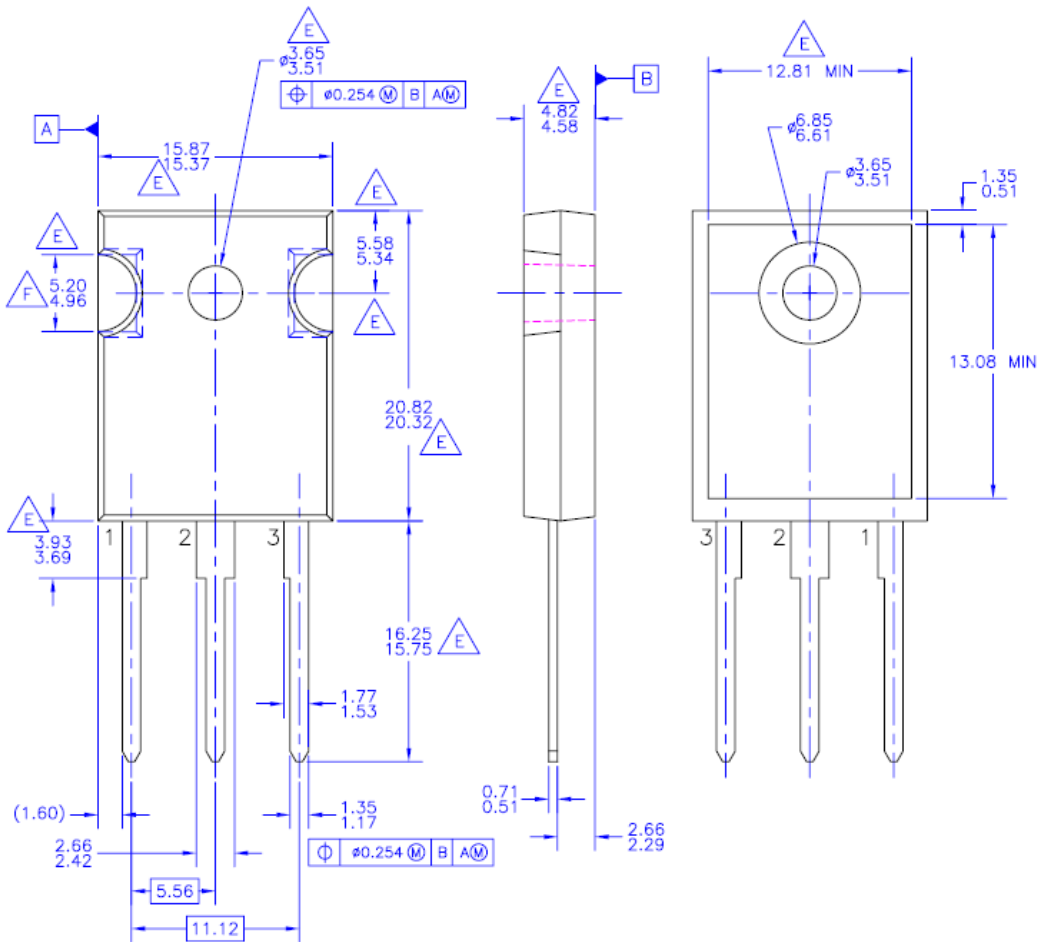


Peak Diode Recovery dv/dt Test Circuit & Waveforms



Mechanical Dimensions

TO-247-3L





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 - C. ALL DIMENSIONS ARE IN MILLIMETERS.
 - D. DRAWING CONFORMS TO ASME Y14.5 - 1994
- E** DOES NOT COMPLY JEDEC STANDARD VALUE
- F** NOTCH MAY BE SQUARE
- G. DRAWING FILENAME: MKT-TO247A03_REV02

Dimensions in Millimeters



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