

# FCH76N60NF

## N-Channel SupreMOS® FRFET® MOSFET

600 V, 72.8 A, 38 mΩ

### Features

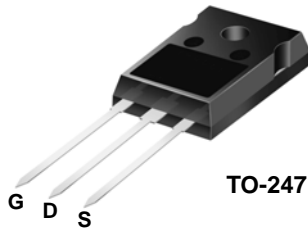
- $R_{DS(on)} = 28.7 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 38 \text{ A}$
- Ultra Low Gate Charge (Typ.  $Q_g = 230 \text{ nC}$ )
- Low Effective Output Capacitance (Typ.  $C_{oss,eff} = 896 \text{ pF}$ )
- 100% Avalanche Tested
- RoHS Compliant

### Applications

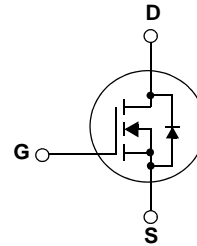
- Solar Inverter
- AC-DC Power Supply

### 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.



TO-247



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

Symbol	Parameter	FCH76N60NF	Unit
$V_{DSS}$	Drain to Source Voltage	600	V
$V_{GSS}$	Gate to Source Voltage	$\pm 30$	V
$I_D$	Drain Current	-Continuous ( $T_C = 25^\circ\text{C}$ )	72.8
		-Continuous ( $T_C = 100^\circ\text{C}$ )	46
$I_{DM}$	Drain Current	- Pulsed (Note 1)	218
$E_{AS}$	Single Pulsed Avalanche Energy	(Note 2)	7381
$I_{AR}$	Avalanche Current		24.3
$E_{AR}$	Repetitive Avalanche Energy		5.43
dv/dt	MOSFET dv/dt Ruggedness		100
	Peak Diode Recovery dv/dt (Note 3)		50
$P_D$	Power Dissipation	( $T_C = 25^\circ\text{C}$ )	543
		- Derate above $25^\circ\text{C}$	4.34
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$
$T_L$	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

\*Drain current limited by maximum junction temperature

### Thermal Characteristics

Symbol	Parameter	FCH76N60NF	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.23	$^\circ\text{C/W}$
$R_{\theta CS}$	Thermal Resistance, Case to Heat Sink (Typical)	0.24	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	40	

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FCH76N60NF	FCH76N60NF	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	$I_D = 1 \text{ mA}, \text{Referenced to } 25^\circ\text{C}$	-	0.73	-	$\text{V}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 480 \text{ V}, V_{GS} = 0 \text{ V}$	-	-	10	$\mu\text{A}$
		$V_{DS} = 480 \text{ V}, V_{GS} = 0 \text{ V}, T_C = 125^\circ\text{C}$	-	-	100	
$I_{GSS}$	Gate to Body Leakage Current	$V_{GS} = \pm 30 \text{ V}, V_{DS} = 0 \text{ V}$	-	-	$\pm 100$	nA

### On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$	3.0	-	5.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 38 \text{ A}$	-	28.7	38.0	m $\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 20 \text{ V}, I_D = 38 \text{ A}$	-	92	-	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 100 \text{ V}, V_{GS} = 0 \text{ V}$ $f = 1 \text{ MHz}$	-	8305	11045	pF
$C_{oss}$	Output Capacitance		-	361	480	pF
$C_{rss}$	Reverse Transfer Capacitance		-	3.3	5.0	pF
$C_{oss}$	Output Capacitance	$V_{DS} = 380 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	-	192	-	pF
$C_{oss,eff.}$	Effective Output Capacitance	$V_{DS} = 0 \text{ V to } 380 \text{ V}, V_{GS} = 0 \text{ V}$	-	896	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 380 \text{ V}, I_D = 38 \text{ A},$ $V_{GS} = 10 \text{ V}$ (Note 4)	-	230	300	nC
$Q_{gs}$	Gate to Source Gate Charge		-	44	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		-	95	-	nC
ESR	Equivalent Series Resistance(G-S)	Drain Open	-	1.2	-	$\Omega$

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 380 \text{ V}, I_D = 38 \text{ A}$ $R_G = 4.7 \Omega$ (Note 4)	-	51	112	ns
$t_r$	Turn-On Rise Time		-	44	98	ns
$t_{d(off)}$	Turn-Off Delay Time		-	213	436	ns
$t_f$	Turn-Off Fall Time		-	43	96	ns

### Drain-Source Diode Characteristics

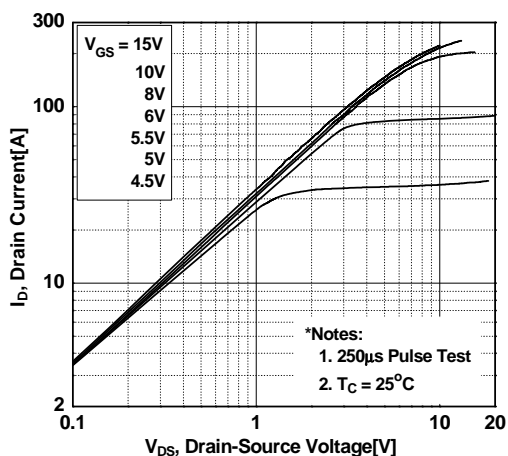
$I_S$	Maximum Continuous Drain to Source Diode Forward Current	-	-	76	A	
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current	-	-	228	A	
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_{SD} = 38 \text{ A}$	-	-	1.2	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0 \text{ V}, I_{SD} = 38 \text{ A}$	-	200	-	ns
$Q_{rr}$	Reverse Recovery Charge	$di_F/dt = 100 \text{ A}/\mu\text{s}$	-	1.8	-	$\mu\text{C}$

#### Notes:

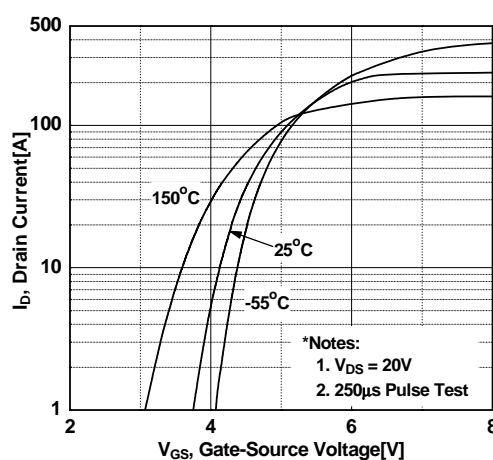
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $I_{AS} = 24.3 \text{ A}, R_G = 25 \Omega, \text{Starting } T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 72.8 \text{ A}, di/dt \leq 1200 \text{ A}/\mu\text{s}, V_{DD} \leq 380 \text{ V}, \text{Starting } T_J = 25^\circ\text{C}$
4. Essentially Independent of Operating Temperature Typical Characteristics

## Typical Performance Characteristics

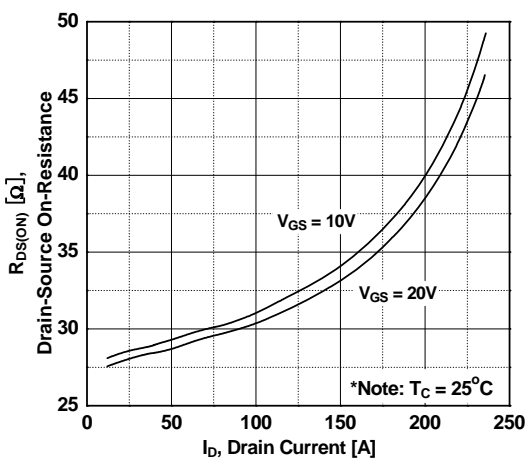
**Figure 1. On-Region Characteristics**



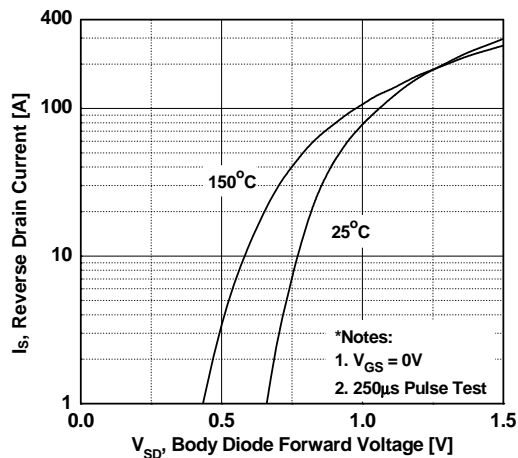
**Figure 2. Transfer Characteristics**



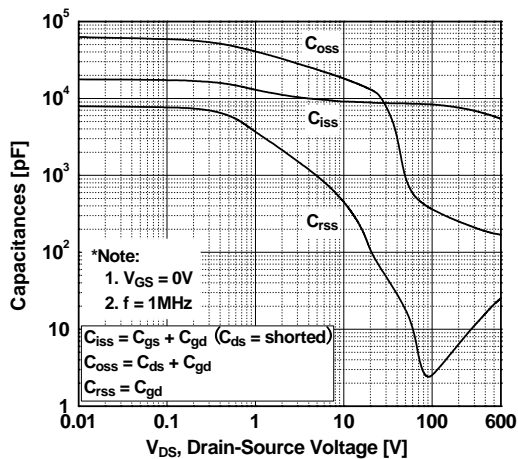
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



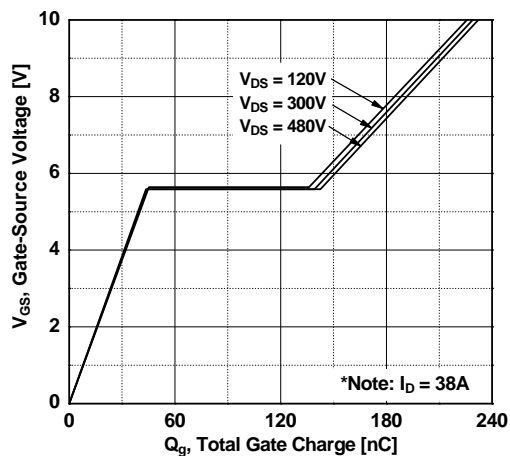
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**



**Figure 6. Gate Charge Characteristics**



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

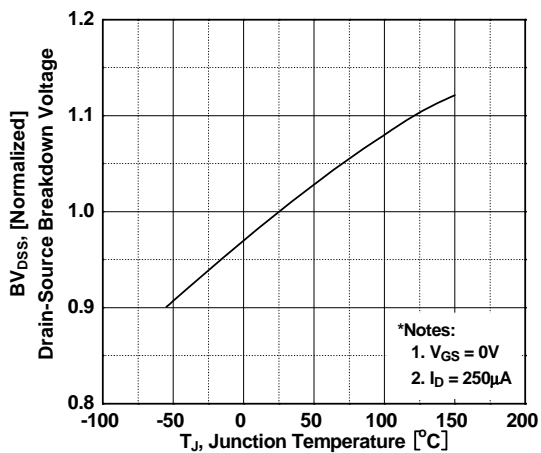


Figure 8. On-Resistance Variation vs. Temperature

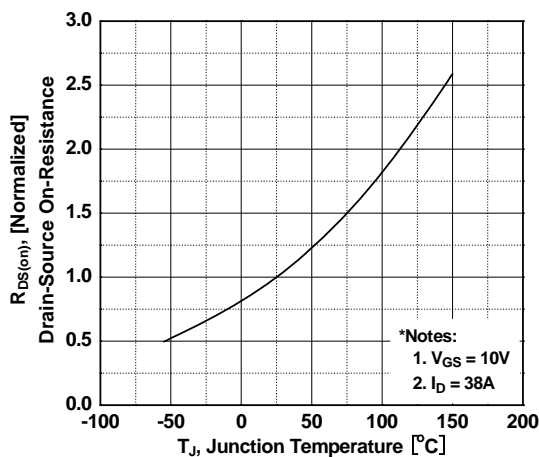


Figure 9. Maximum Safe Operating Area

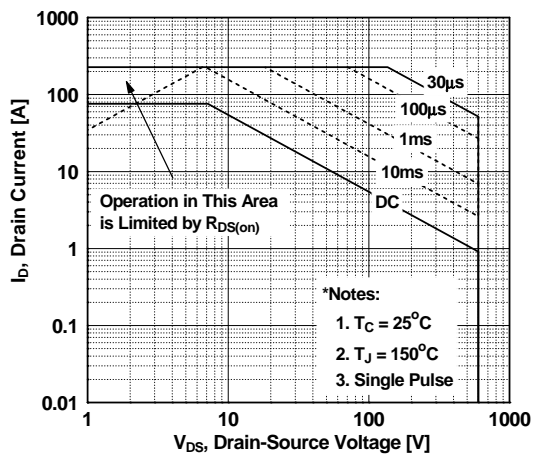


Figure 10. Maximum Drain Current vs. Case Temperature

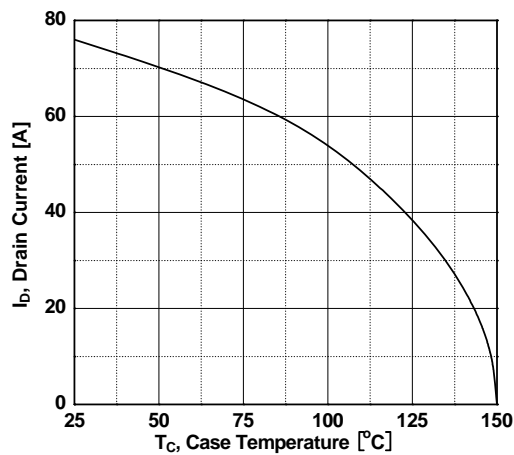
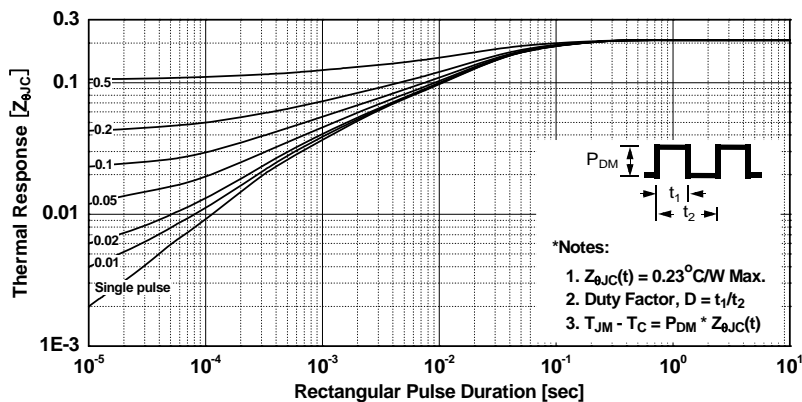
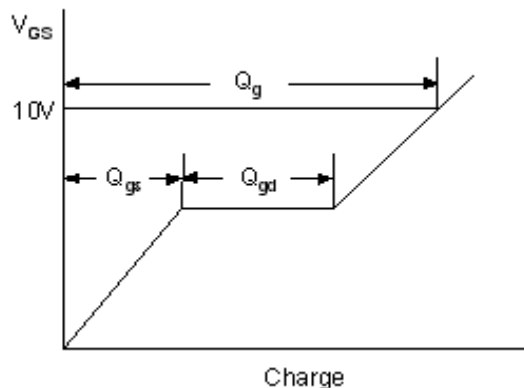
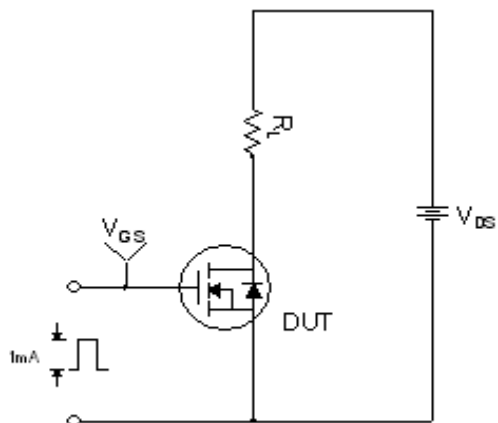


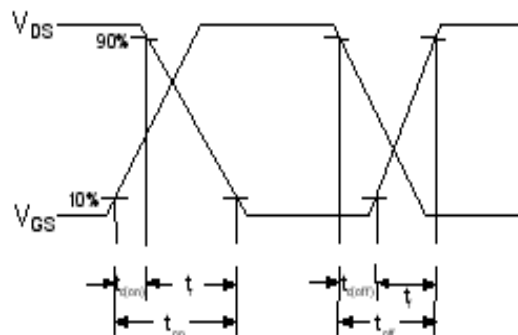
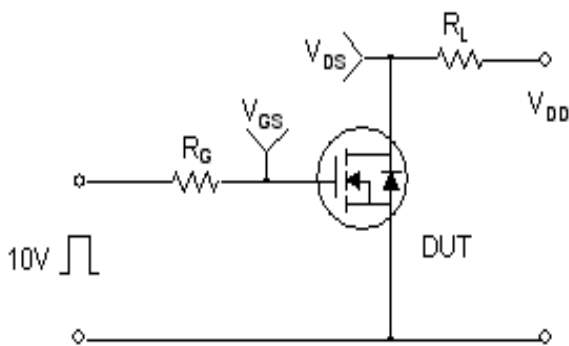
Figure 11. Transient Thermal Response Curve



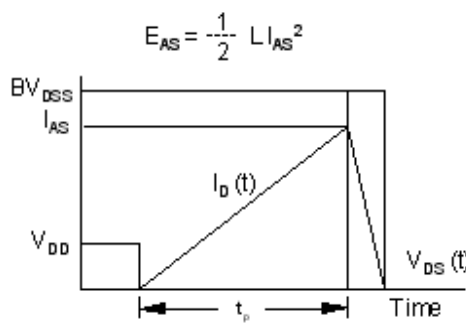
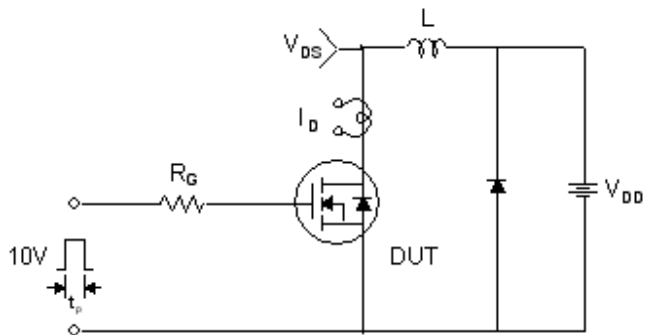
**Gate Charge Test Circuit & Waveform**



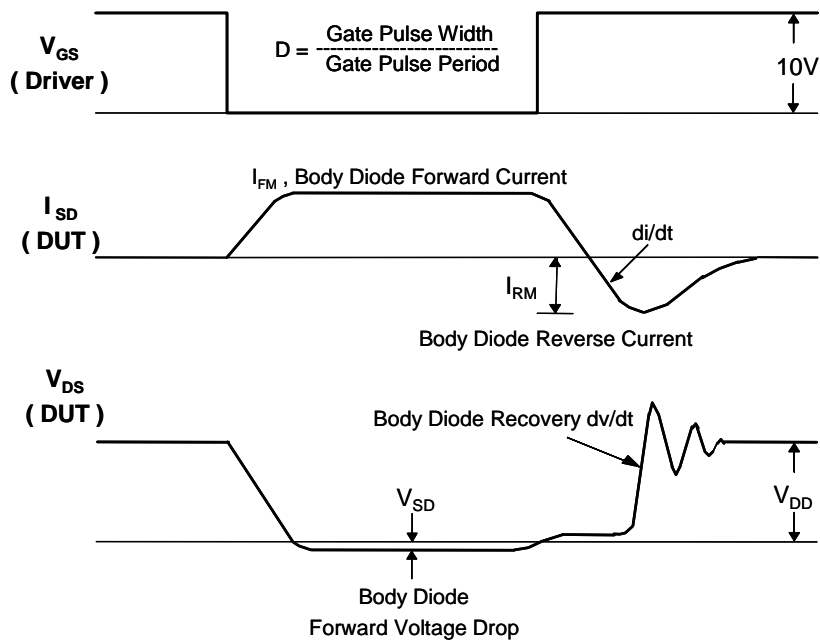
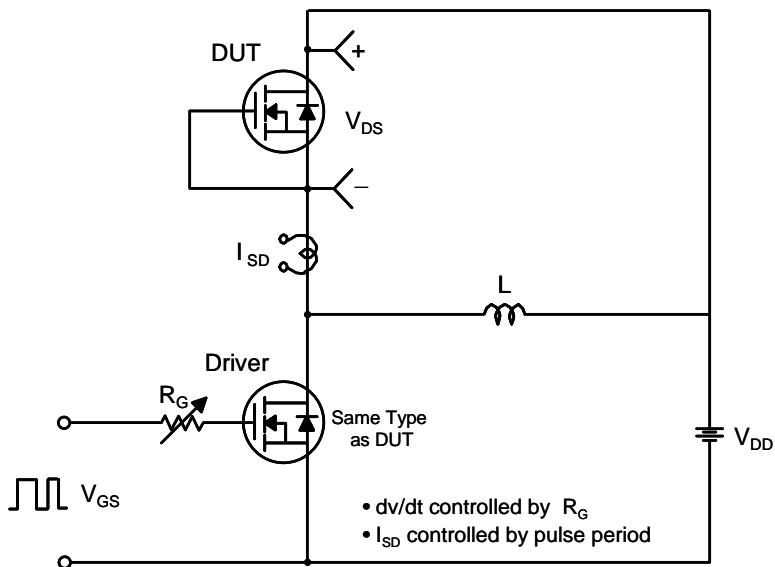
**Resistive Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching Test Circuit & Waveforms**

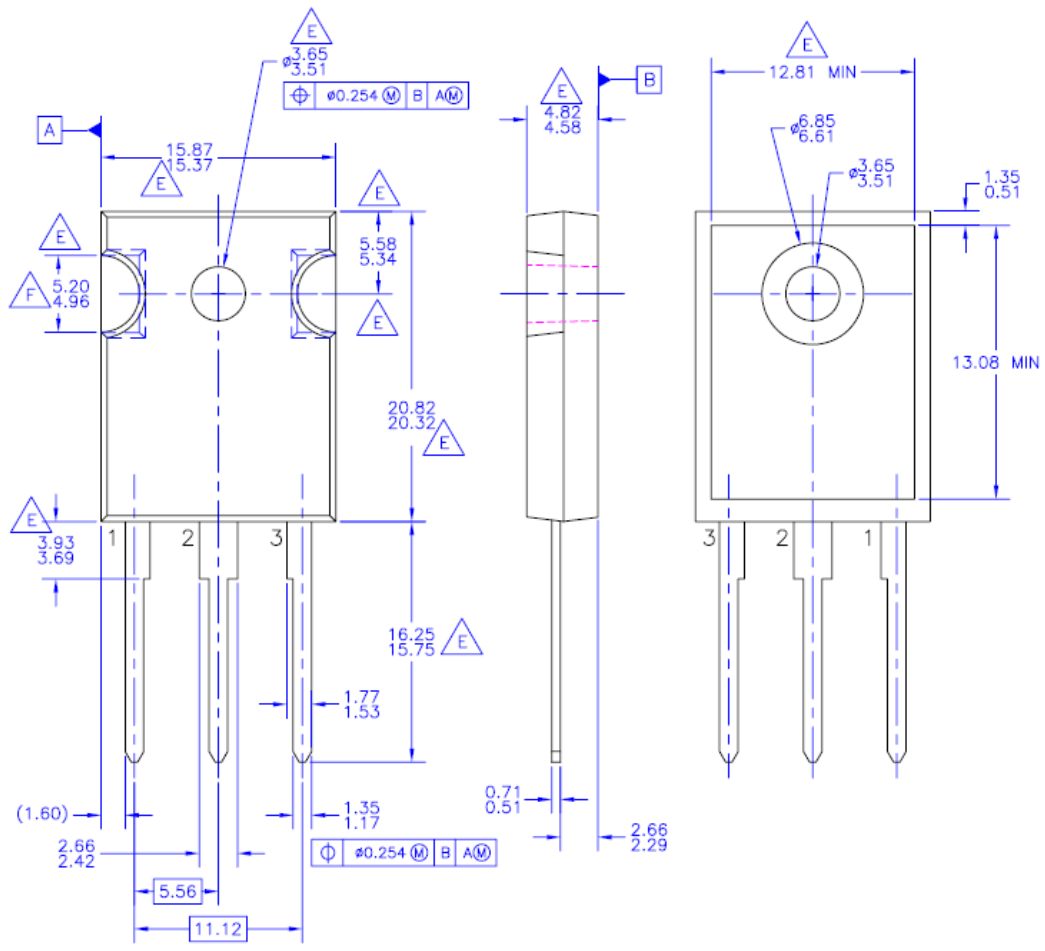


Peak Diode Recovery dv/dt Test Circuit & Waveforms



**Mechanical Dimensions**

**TO-247-3L**




- NOTES; UNLESS OTHERWISE SPECIFIED
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  - B. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
  - 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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| BitSiC™   | Global Power Resource <sup>SM</sup>             | QFET®                                 | TinyBuck™        |
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