

# FCH76N60N

## N-Channel MOSFET

### 600V, 76A, 36mΩ

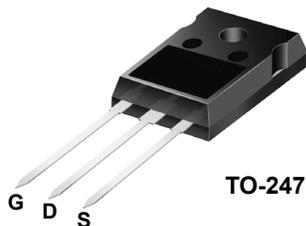
#### Features

- 650V @T<sub>J</sub> = 150°C
- R<sub>DS(on)</sub> = 28mΩ (Typ.)@ V<sub>GS</sub> = 10V, I<sub>D</sub> = 38A
- Ultra Low Gate Charge (Typ. Q<sub>g</sub> = 218nC)
- Low Effective Output Capacitance
- 100% Avalanche Tested
- RoHS Compliant

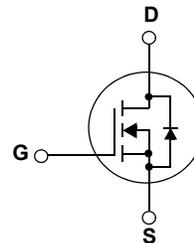
#### Description

The SupreMOS MOSFET, Fairchild's next generation of high voltage super-junction MOSFETs, employs a deep trench filling process that differentiates it from preceding multi-epi based technologies. By utilizing this advanced technology and precise process control, SupreMOS provides world class R<sub>sp</sub>, superior switching performance and ruggedness.

This SupreMOS MOSFET fits the industry's AC-DC SMPS requirements for PFC, server/telecom power, FPD TV power, ATX power, and industrial power applications.



TO-247



#### MOSFET Maximum Ratings T<sub>C</sub> = 25°C unless otherwise noted

Symbol	Parameter	Conditions	Ratings	Units
V <sub>DSS</sub>	Drain to Source Voltage		600	V
V <sub>GSS</sub>	Gate to Source Voltage		±30	V
I <sub>D</sub>	Drain Current	-Continuous (T <sub>C</sub> = 25°C)	76	A
		-Continuous (T <sub>C</sub> = 100°C)	48.1	
I <sub>DM</sub>	Drain Current	- Pulsed (Note 1)	228	A
E <sub>AS</sub>	Single Pulsed Avalanche Energy	(Note 2)	8022	mJ
I <sub>AR</sub>	Avalanche Current		25.3	A
E <sub>AR</sub>	Repetitive Avalanche Energy		5.43	mJ
dv/dt	MOSFET dv/dt Ruggedness		100	V/ns
	Peak Diode Recovery dv/dt	(Note 3)	20	
P <sub>D</sub>	Power Dissipation	(T <sub>C</sub> = 25°C)	543	W
		- Derate above 25°C	4.34	W/°C
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature Range		-55 to +150	°C
T <sub>L</sub>	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	Ratings	Units
R <sub>θJC</sub>	Thermal Resistance, Junction to Case	0.23	°C/W
R <sub>θCS</sub>	Thermal Resistance, Case to Heat Sink (Typical)	0.24	
R <sub>θJA</sub>	Thermal Resistance, Junction to Ambient	40	

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FCH76N60N	FCH76N60N	TO-247	-	-	30

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
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### Off Characteristics

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$ , $T_C = 25^\circ\text{C}$	600	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , 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	$V_{GS} = V_{DS}$ , $I_D = 250\mu\text{A}$	2.0	-	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}$ , $I_D = 38\text{A}$	-	28	36	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 20\text{V}$ , $I_D = 38\text{A}$	-	90	-	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 100\text{V}$ , $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$	-	9310	12385	pF
$C_{oss}$	Output Capacitance		-	370	495	pF
$C_{riss}$	Reverse Transfer Capacitance		-	3.1	5	pF
$C_{oss}$	Output Capacitance	$V_{DS} = 380\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1\text{MHz}$	-	195	-	pF
$C_{oss,eff.}$	Effective Output Capacitance	$V_{DS} = 0\text{V}$ to $380\text{V}$ , $V_{GS} = 0\text{V}$	-	914	-	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)	-	218	285	nC
$Q_{gs}$	Gate to Source Gate Charge		-	39	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		-	66	-	nC
ESR	Equivalent Series Resistance(G-S)	Drain Open	-	1	-	$\Omega$

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 380\text{V}$ , $I_D = 38\text{A}$ $R_{GEN} = 25\Omega$ (Note 4)	-	34	78	ns
$t_r$	Turn-On Rise Time		-	24	58	ns
$t_{d(off)}$	Turn-Off Delay Time		-	235	480	ns
$t_f$	Turn-Off Fall Time		-	32	74	ns

### Drain-Source Diode Characteristics

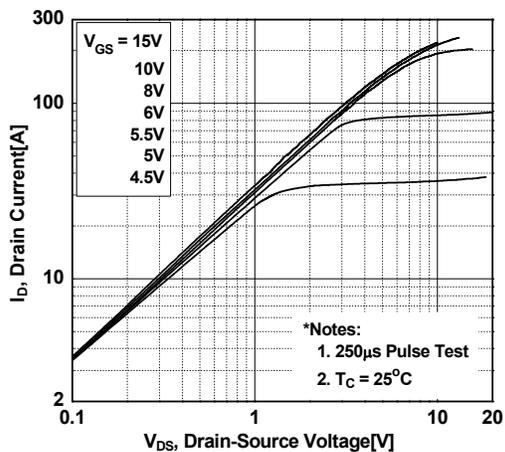
$I_S$	Maximum Continuous Drain to Source Diode Forward Current	-	-	76	A	
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current	-	-	228	A	
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0\text{V}$ , $I_{SD} = 38\text{A}$	-	-	1.2	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{V}$ , $I_{SD} = 38\text{A}$	-	612	-	ns
$Q_{rr}$	Reverse Recovery Charge	$di_F/dt = 100\text{A}/\mu\text{s}$	-	16	-	$\mu\text{C}$

#### Notes:

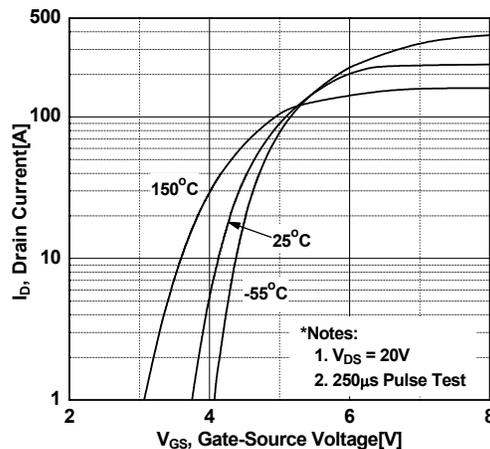
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $I_{AS} = 25.3\text{A}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 76\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq 380\text{V}$ , Starting  $T_J = 25^\circ\text{C}$
4. Essentially Independent of Operating Temperature Typical Characteristics

## Typical Performance Characteristics

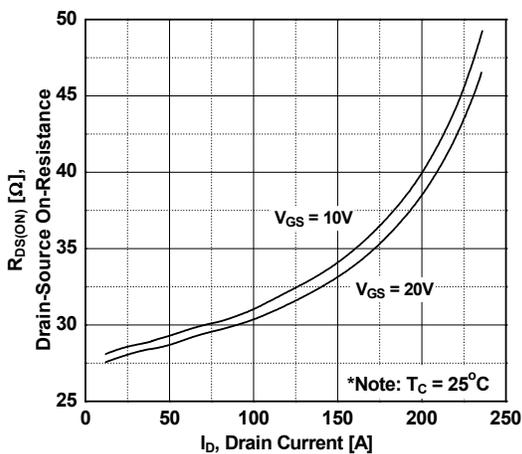
**Figure 1. On-Region Characteristics**



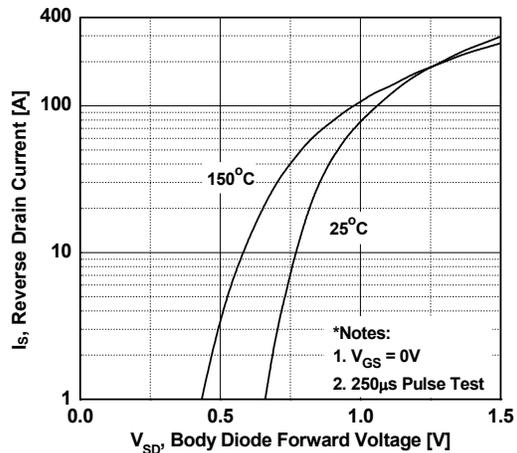
**Figure 2. Transfer Characteristics**



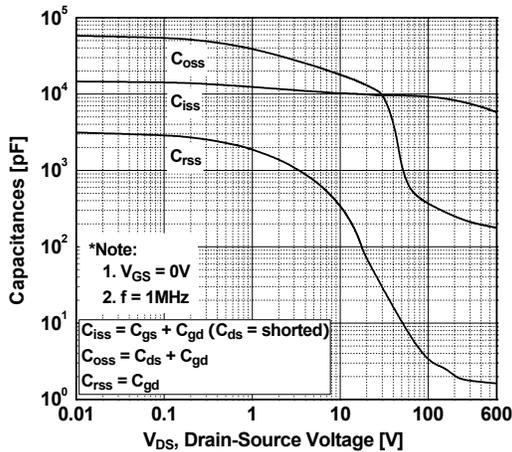
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



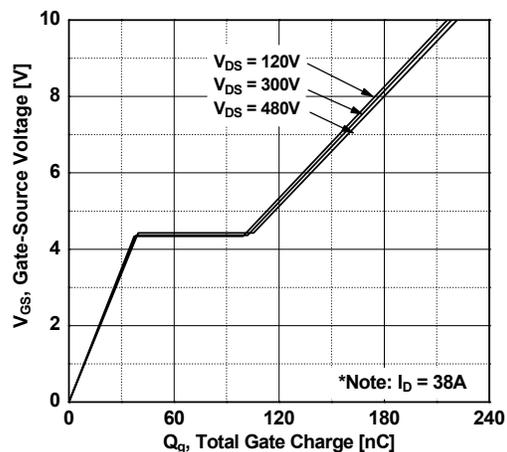
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**



**Figure 6. Gate Charge Characteristics**



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

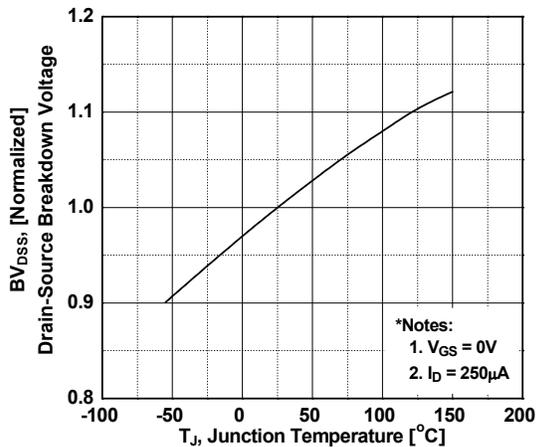


Figure 8. On-Resistance Variation vs. Temperature

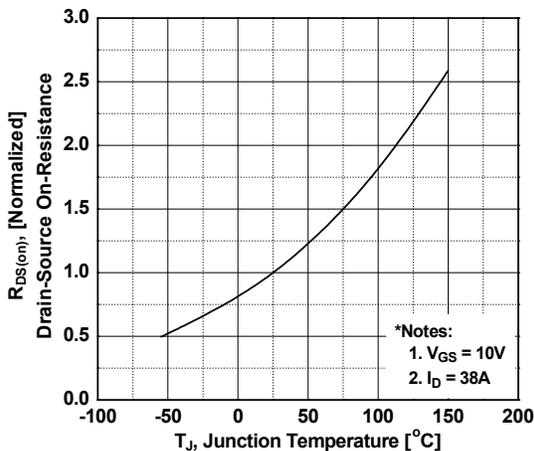


Figure 9. Maximum Safe Operating Area

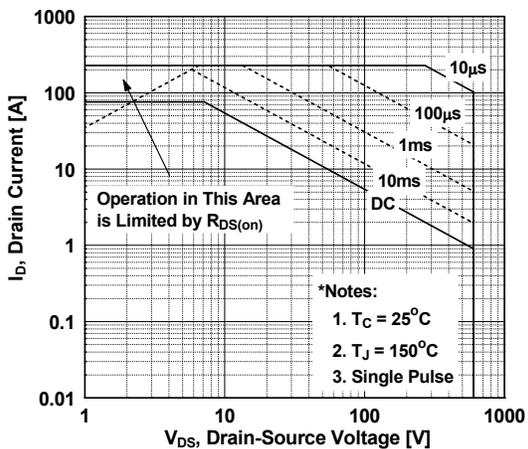


Figure 10. Maximum Drain Current vs. Case Temperature

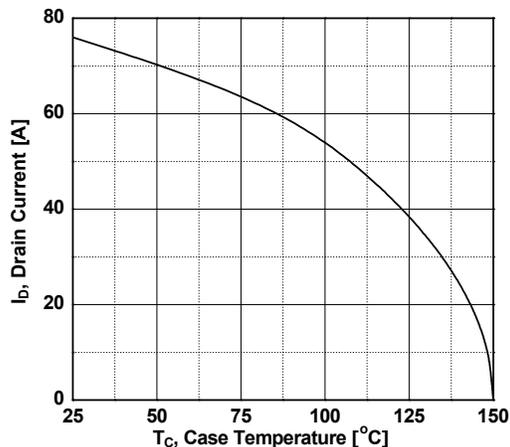
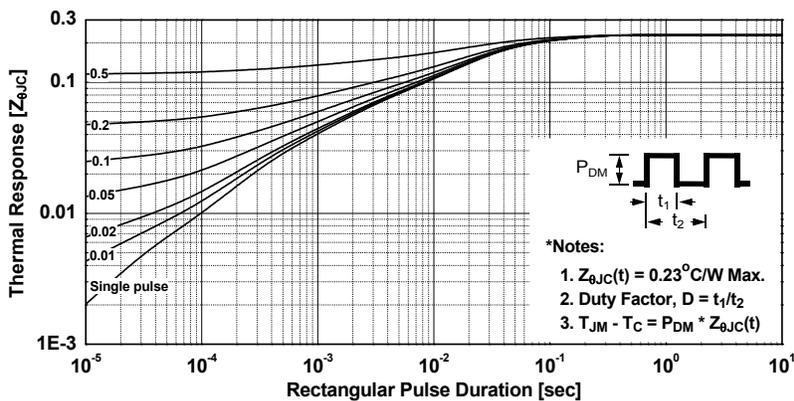
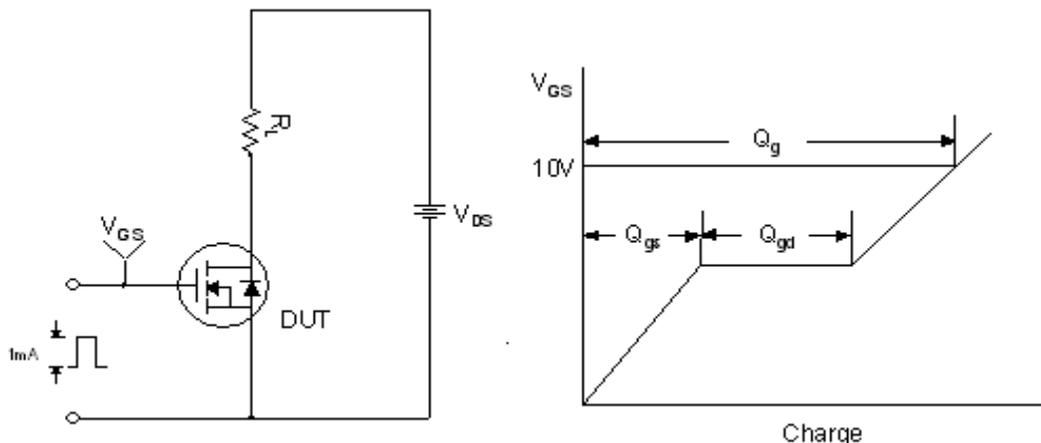


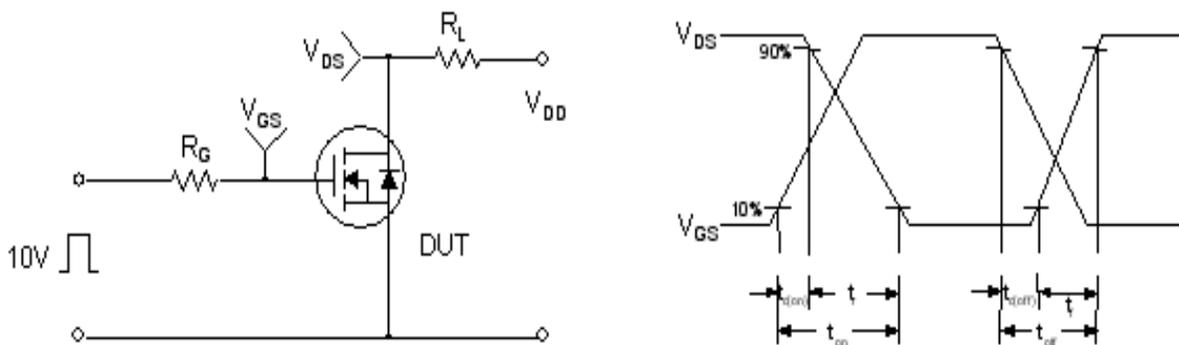
Figure 11. Transient Thermal Response Curve



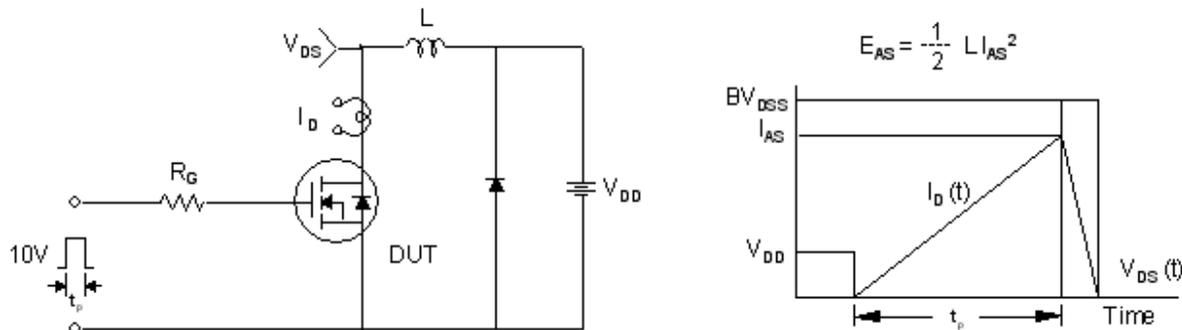
**Gate Charge Test Circuit & Waveform**



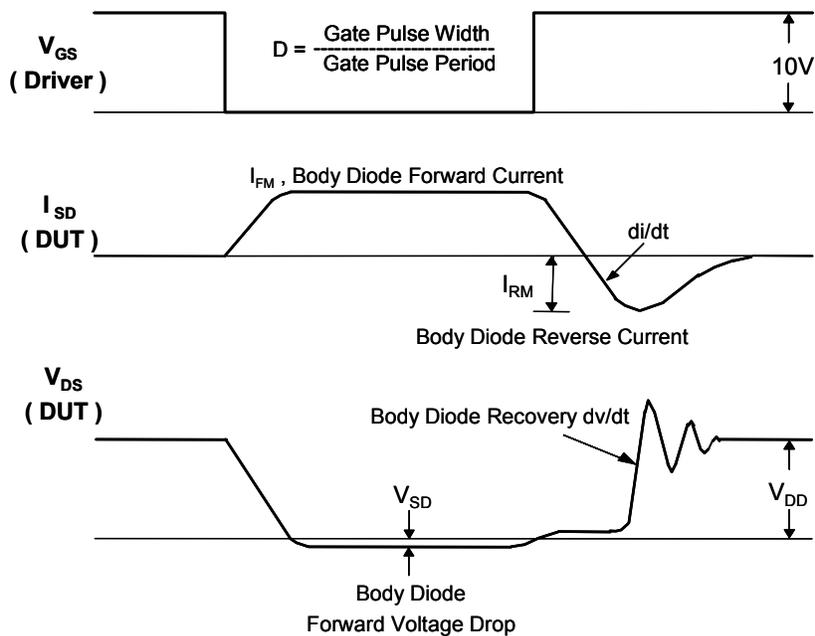
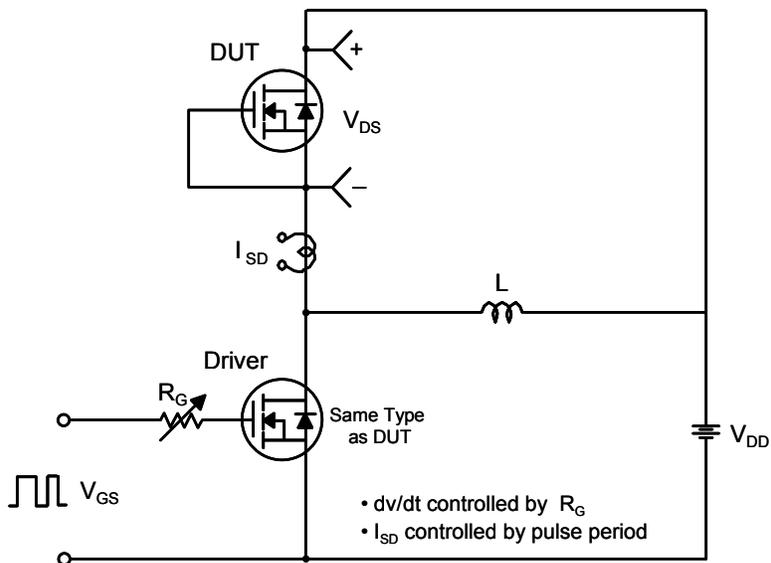
**Resistive Switching Test Circuit & Waveforms**



**Unclamped Inductive Switching Test Circuit & Waveforms**

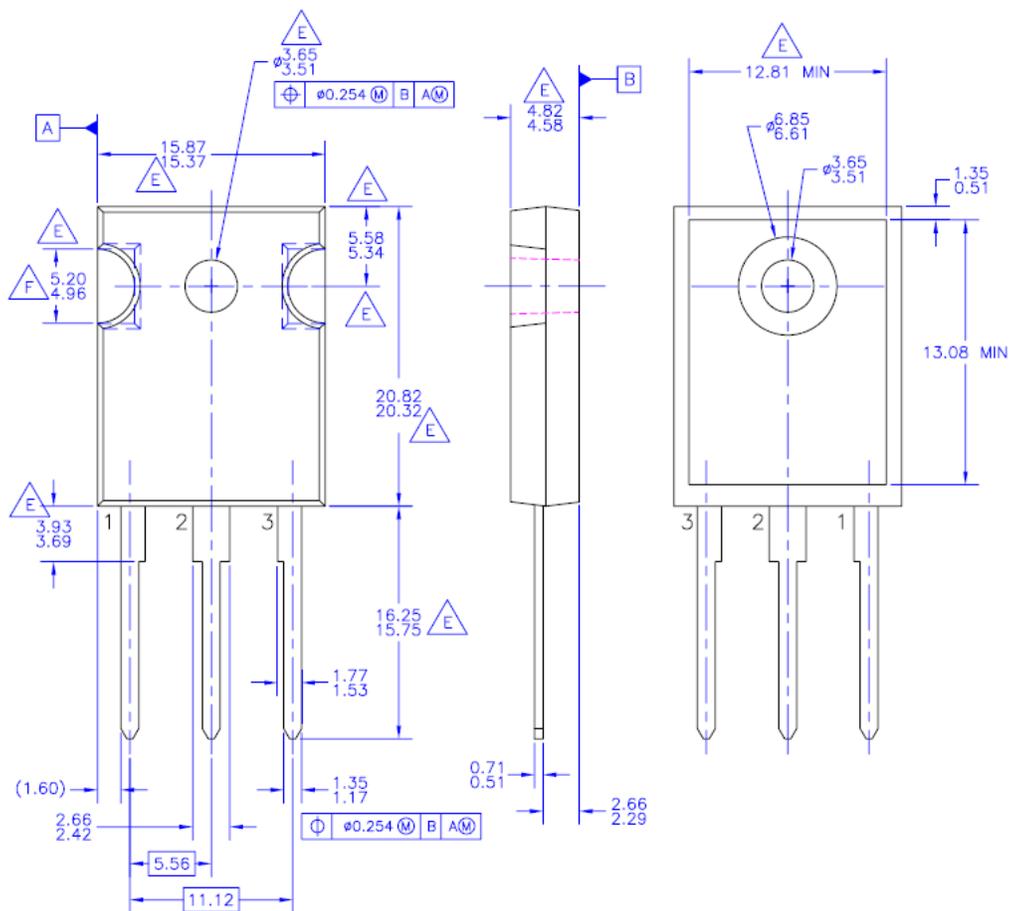


Peak Diode Recovery dv/dt Test Circuit & Waveforms



## Mechanical Dimensions

### TO-247



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