

**Features:**

- 1200V High Blocking Voltage
- Low On-Resistance
- High Speed Switching
- Easy to Parallel

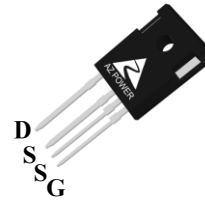
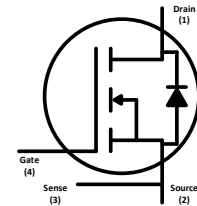
**Benefits:**

- Increased frequency
- Minimal switching loss
- Higher Efficiency
- Low cooling requirement

Symbol	Value	Unit
$V_{DS}$	1200	V
$I_{DS} (T_c=25^\circ\text{C})$	49	A
$R_{DSon}$	65	m $\Omega$

**Applications:**

- Switch Mode Power Supply
- High Voltage DC/DC Converters
- Solar Inverters
- Motor Drivers

**Outline**

**TO-247-4**
**Circuit**

**Maximum Ratings (T<sub>c</sub> = 25°C unless otherwise specified)**

Symbol	Parameter	Value	Unit	Test Conditions
$V_{DSmax}$	Drain-Source Voltage	1200	V	$V_{GS} = 0V, I_{DS} = 100\mu A$
$V_{GSmax}$	Gate-Source Voltage	-10/+25	V	Absolute Maximum values
$V_{GSop}$	Gate-Source Voltage	-5/+20	V	Recommended operational values
$I_{DS}$	Continuous Drain Current	49	A	$V_{GS} = 20V, T_C = 25^\circ\text{C}$
		31		$V_{GS} = 20V, T_C = 100^\circ\text{C}$
$I_{DS(pulse)}$	Pulsed Drain Current	80	A	Pulse width $t_p$ limited by $T_{Jmax}$
$P_D$	Power Dissipation	227	W	$T_C = 25^\circ\text{C}, T_J = 150^\circ\text{C}$
$T_{J,max}$	Operating Junction Temperature	150	°C	
$T_{stg}$	Storage Temperature Range	-55 to 150	°C	

**Thermal characteristics**

Symbol	Parameter	Min.	Typ.	Max.	Unit
$R_{thJC}$	Thermal resistance		0.55		°C/W

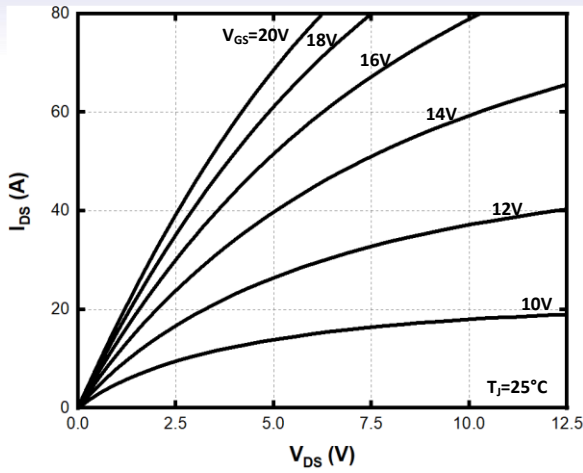
**Electrical Characteristics (T<sub>c</sub> = 25°C unless otherwise specified)**

Symbol	Parameter	Value			Unit	Test Conditions
		Min.	Typ.	Max.		
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	1200			V	V <sub>GS</sub> = 0V, I <sub>DS</sub> = 100μA
V <sub>GS(th)</sub>	Gate Threshold Voltage	1.2	2.0 1.5	3	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>DS</sub> = 5mA, T <sub>J</sub> = 25°C V <sub>DS</sub> = V <sub>GS</sub> , I <sub>DS</sub> = 5mA, T <sub>J</sub> = 150°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current		1	100	μA	V <sub>DS</sub> = 1200V, V <sub>GS</sub> = 0V
I <sub>GSS</sub>	Gate-Source Leakage Current			250	nA	V <sub>GS</sub> = 20V, V <sub>DS</sub> = 0V
R <sub>DS(on)</sub>	Drain-Source On-State Resistance		65 95	80	mΩ	V <sub>GS</sub> = 20V, I <sub>DS</sub> = 25A, T <sub>J</sub> = 25°C V <sub>GS</sub> = 20V, I <sub>DS</sub> = 25A, T <sub>J</sub> = 150°C
g <sub>fs</sub>	Transconductance		9.8		S	V <sub>DS</sub> = 20V, I <sub>DS</sub> = 25A
R <sub>G,int</sub>	Internal Gate Resistance		1.4		Ω	f = 1 MHz, V <sub>AC</sub> = 25mV
C <sub>ISS</sub>	Input Capacitance		2075		pF	V <sub>DS</sub> = 1000V, V <sub>GS</sub> = 0V f = 1 MHz, V <sub>AC</sub> = 25mV
C <sub>OSS</sub>	Output Capacitance		127			
C <sub>RSS</sub>	Reverse Transfer Capacitance		17			
E <sub>OSS</sub>	C <sub>OSS</sub> Stored Energy		144			
E <sub>on</sub>	Turn-On Switching Energy		315		μJ	V <sub>DD</sub> = 800V, V <sub>GS</sub> = -5/20V, I <sub>DS</sub> = 25A, R <sub>G(EXT)</sub> = 2Ω, L = 0.5mH
E <sub>off</sub>	Turn-off Switching Energy		66			
t <sub>d(on)</sub>	Turn-On Delay Time		12		ns	V <sub>DD</sub> = 800V, V <sub>GS</sub> = -5/20V, I <sub>DS</sub> = 25A, R <sub>G(EXT)</sub> = 2Ω, R <sub>L</sub> = 32Ω, Timing relative to V <sub>DS</sub>
t <sub>r</sub>	Rise Time		13			
t <sub>d(off)</sub>	Turn-off Delay Time		26			
t <sub>f</sub>	Fall Time		13			
Q <sub>GS</sub>	Gate to Source Charge		37		nC	V <sub>GS</sub> = -5/20V, V <sub>DS</sub> = 800V, I <sub>DS</sub> = 25A
Q <sub>GD</sub>	Gate to Drain Charge		63			
Q <sub>G</sub>	Total Gate Charge		146			

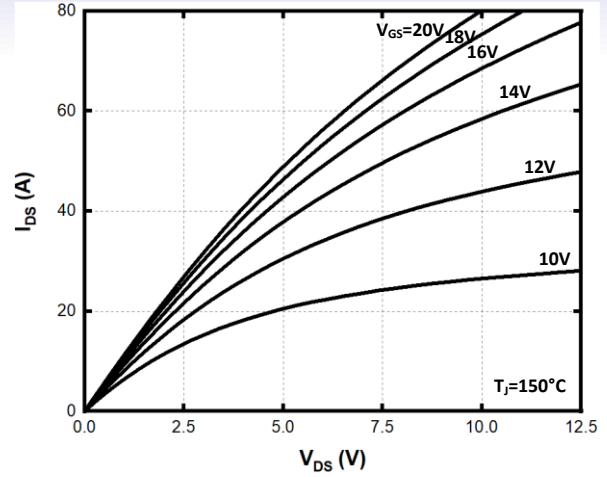
**Body Diode Characteristics**

Symbol	Parameter	Value			Unit	Test Conditions
		Min.	Typ.	Max.		
V <sub>SD</sub>	Diode Forward Voltage		4.6 4.1		V	V <sub>GS</sub> = -5V, I <sub>SD</sub> = 10A, T <sub>J</sub> = 25°C V <sub>GS</sub> = -5V, I <sub>SD</sub> = 10A, T <sub>J</sub> = 150°C
I <sub>SD</sub>	Continuous Diode Current		40		A	
t <sub>rr</sub>	Reverse Recovery Time		33		ns	V <sub>GS</sub> = -5V, I <sub>SD</sub> = 25A, V <sub>R</sub> = 800V, di/dt = 1400A/μs
Q <sub>rr</sub>	Reverse Recovery Charge		321		nC	
I <sub>rrm</sub>	Peak Reverse Recovery Current		14		A	

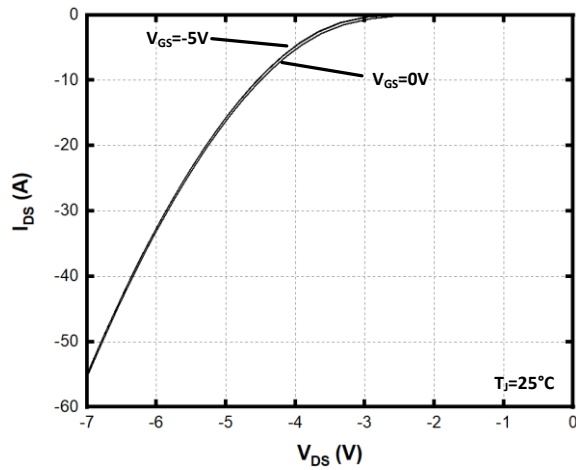
**Typical Performance**



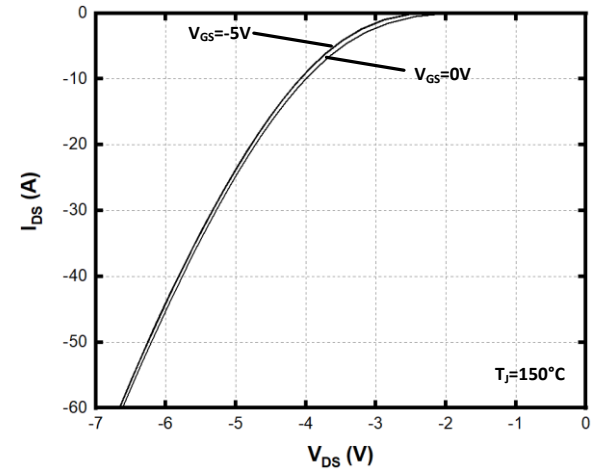
**Fig. 1 Output Characteristics,  $T_J = 25^\circ\text{C}$**



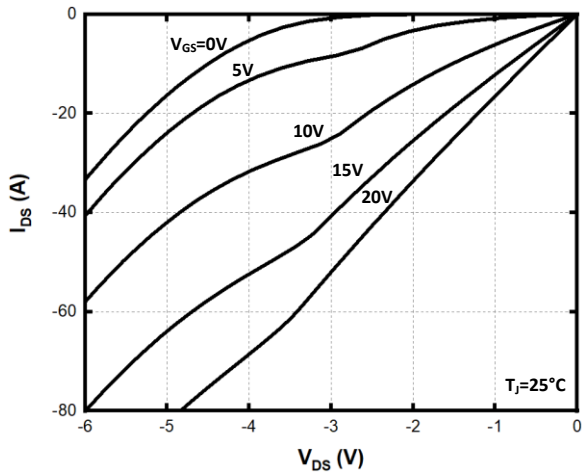
**Fig. 2 Output Characteristics,  $T_J = 150^\circ\text{C}$**



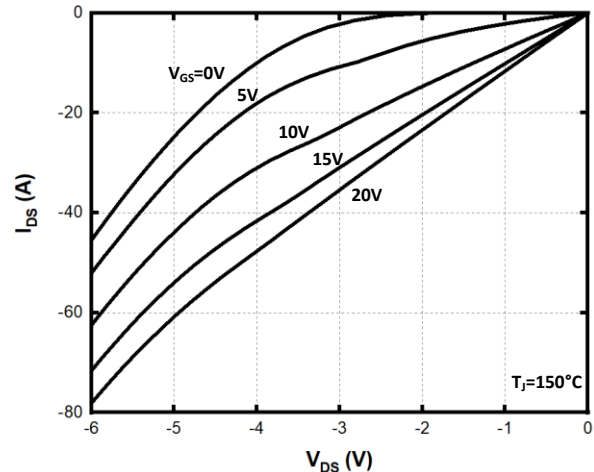
**Fig. 3 Body Diode Characteristics,  $T_J = 25^\circ\text{C}$**



**Fig. 4 Body Diode Characteristics,  $T_J = 150^\circ\text{C}$**

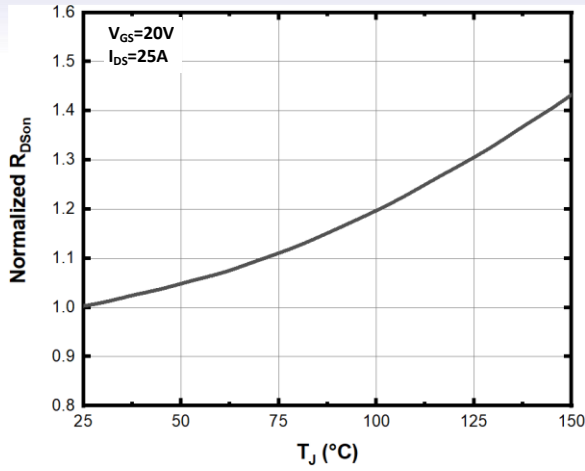


**Fig. 5 3rd Quadrant Characteristics,  $T_J = 25^\circ\text{C}$**

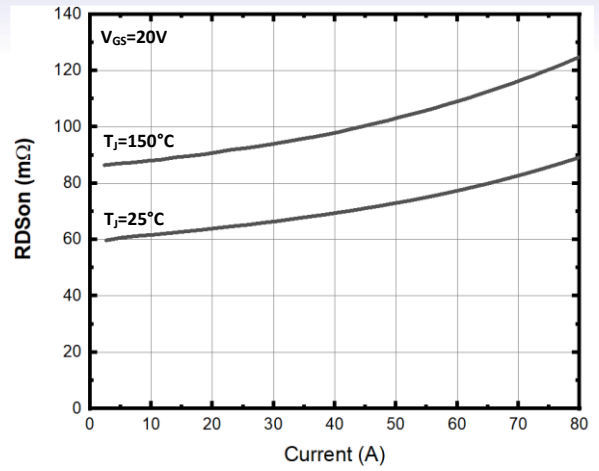


**Fig. 6 3rd Quadrant Characteristics,  $T_J = 150^\circ\text{C}$**

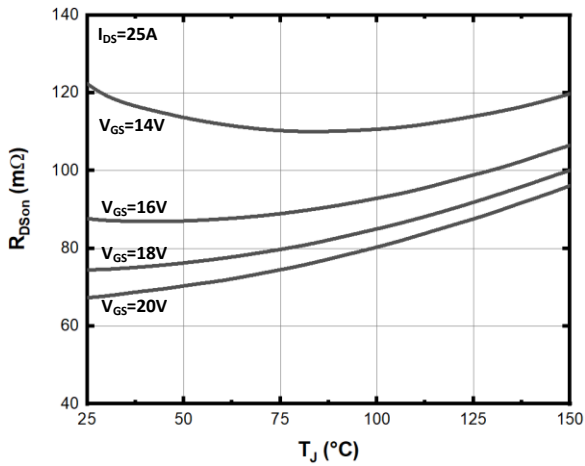
**Typical Performance**



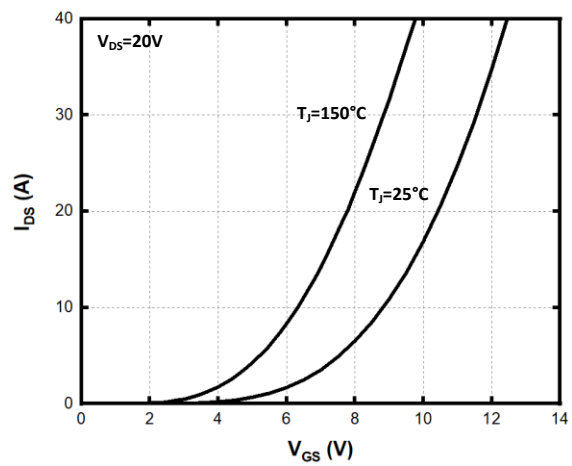
**Fig. 7 Normalized On-Resistance vs Temperature**



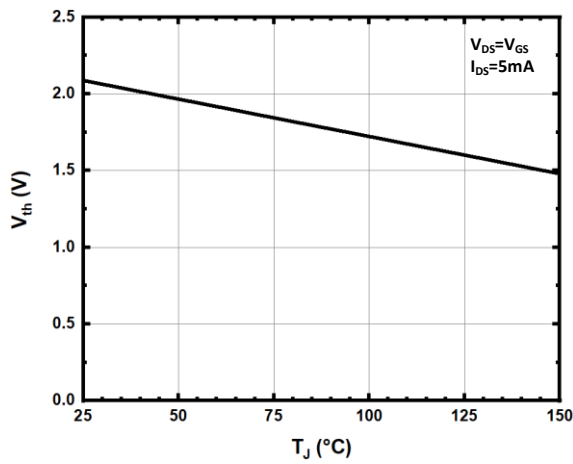
**Fig. 8 On-Resistance vs Drain Current**



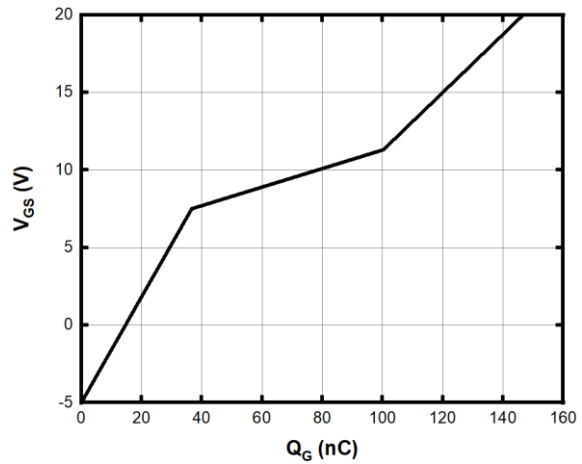
**Fig. 9 On-Resistance vs Temperature**



**Fig. 10 Transfer Characteristics**

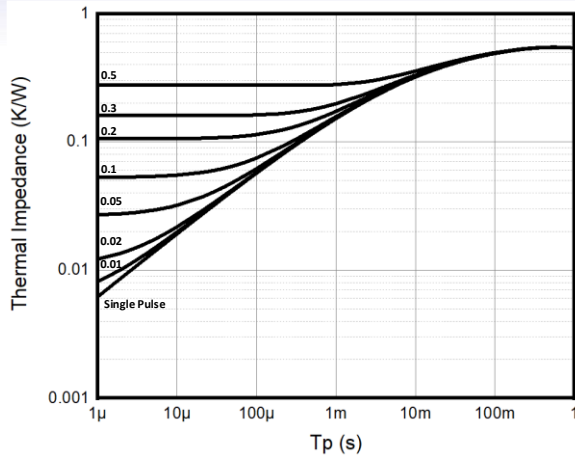


**Fig. 11 Threshold Voltage vs. Temperature**

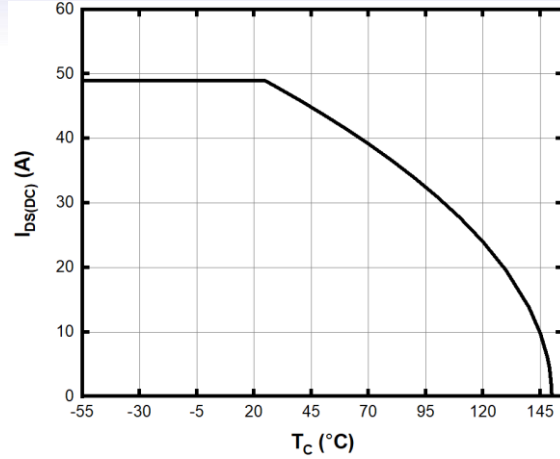


**Fig. 12 Gate Charge Characteristics**

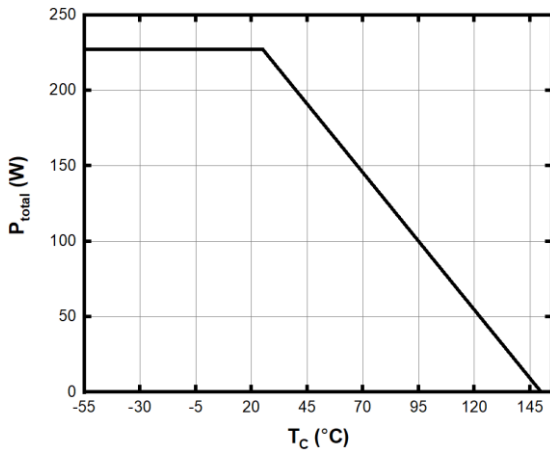
**Typical Performance**



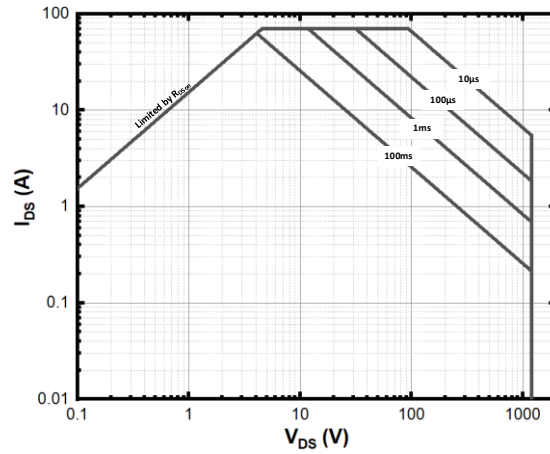
**Fig. 13 Transient Thermal Impedance**



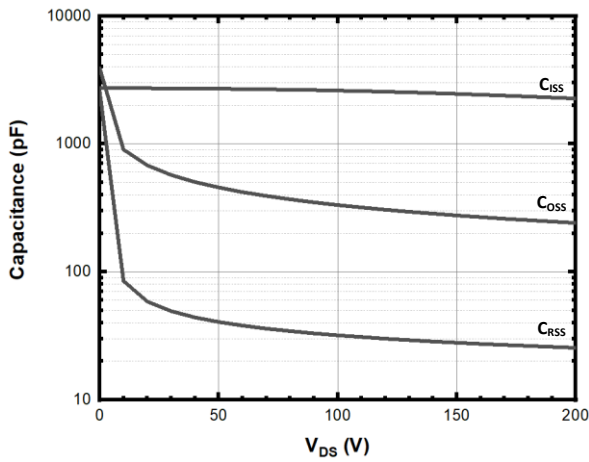
**Fig. 14 Continuous Drain Current Derating**



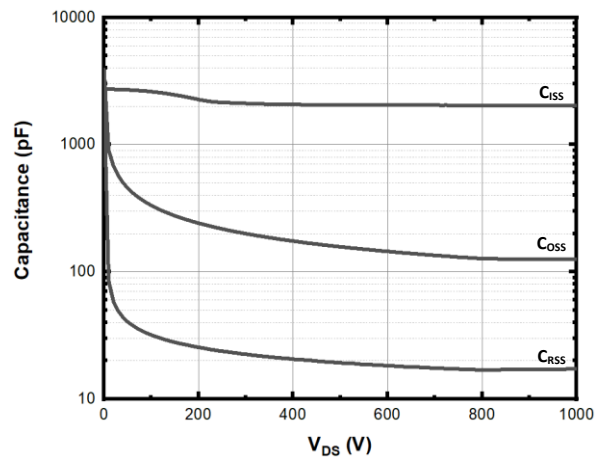
**Fig. 15 Power Derating**



**Fig. 16 Safe Operating Area**

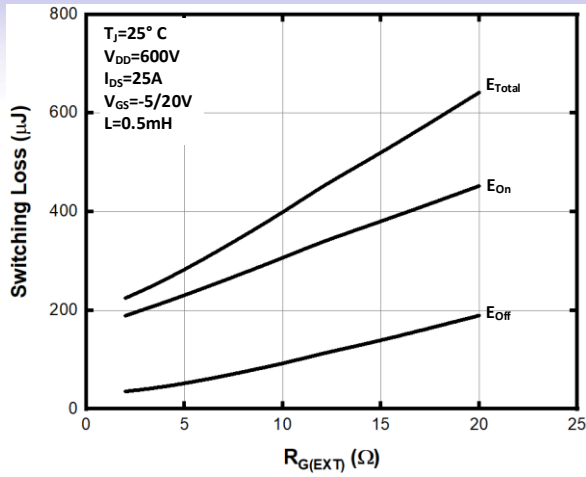


**Fig. 17 Capacitances vs  $V_{DS}$  (200V)**

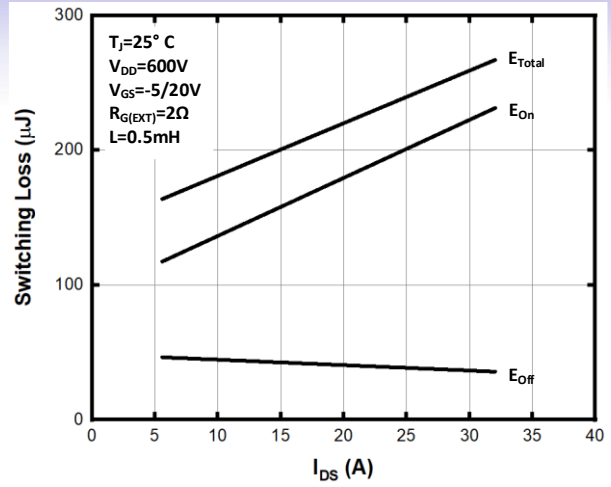


**Fig. 18 Capacitances vs  $V_{DS}$  (800V)**

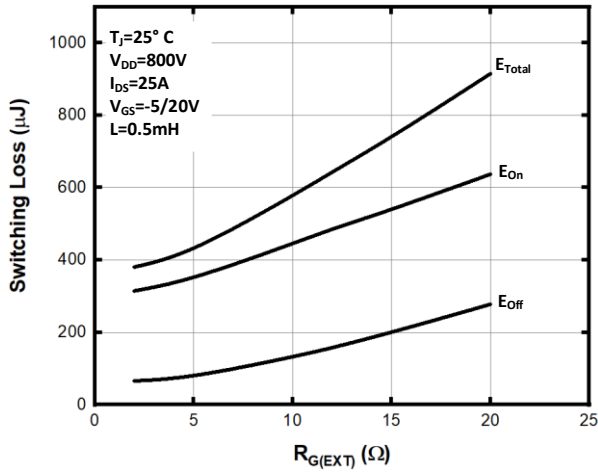
**Typical Performance**



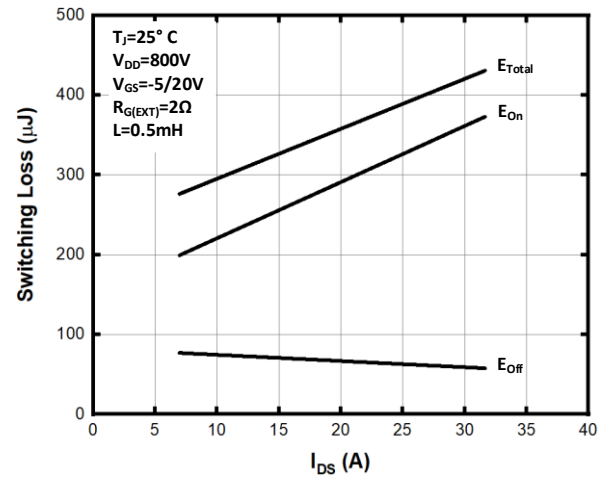
**Fig. 19 Switching Loss vs  $R_{G(EXT)}$  (600V)**



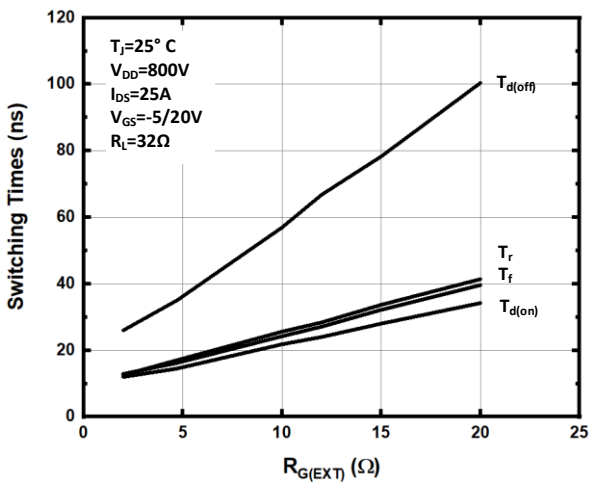
**Fig. 20 Switching Loss vs Drain Current (600V)**



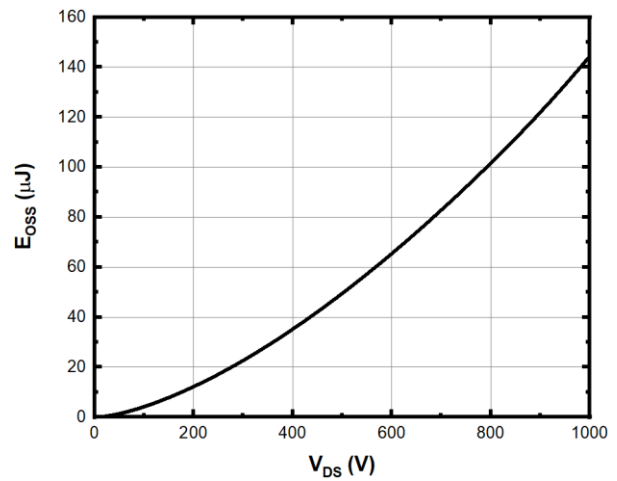
**Fig. 21 Switching Loss vs  $R_{G(EXT)}$  (800V)**



**Fig. 22 Switching Loss vs Drain Current (800V)**

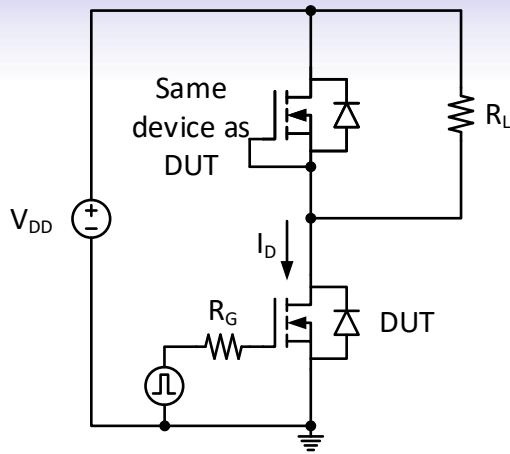


**Fig. 23 Switching Time vs  $R_{G(EXT)}$**

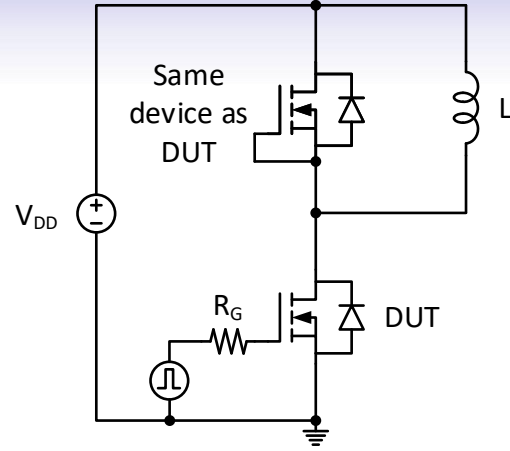


**Fig. 24 Output Capacitor Stored Energy**

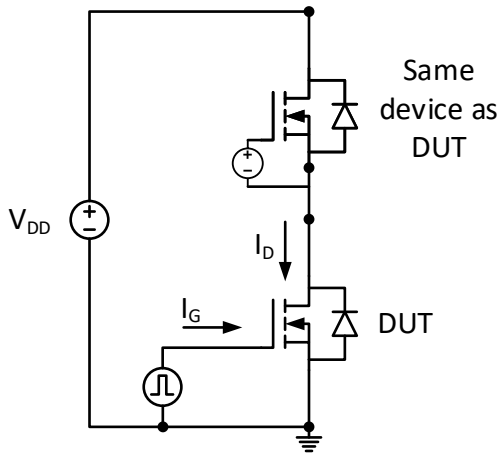
**Methodologies**



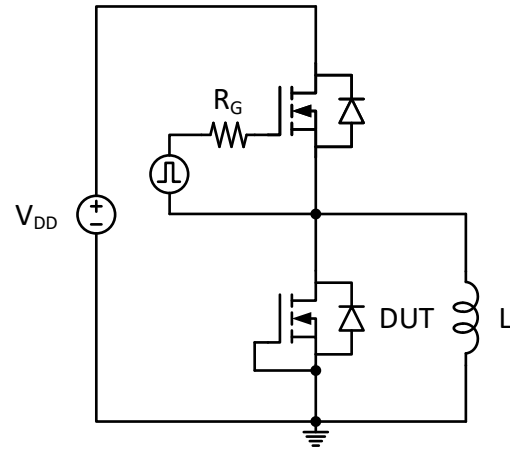
**Fig. 25 Resistive Load Switching**



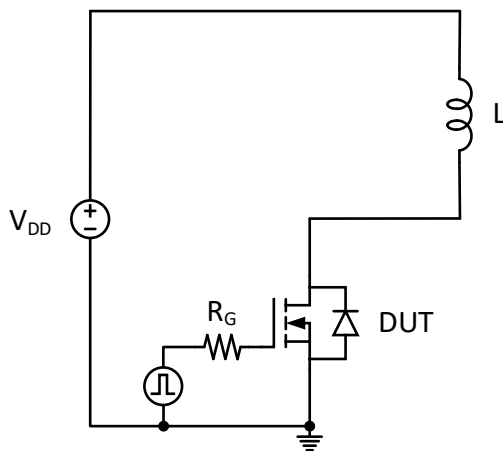
**Fig. 26 Clamped Inductive Switching**



**Fig. 27 Gate Charge**

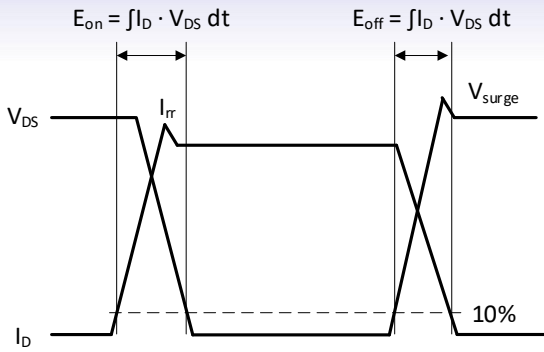


**Fig. 28 Body Diode Reverse Recovery**

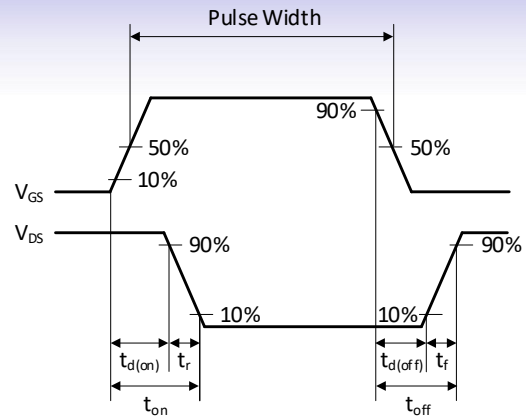


**Fig. 29 Unclamped Inductive Switching**

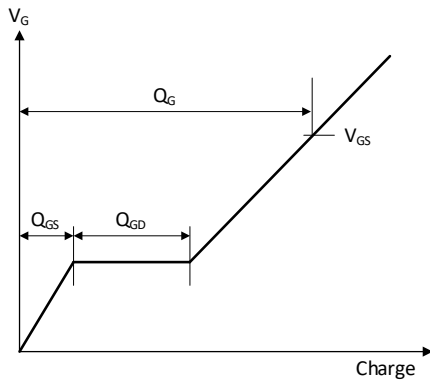
**Definitions**



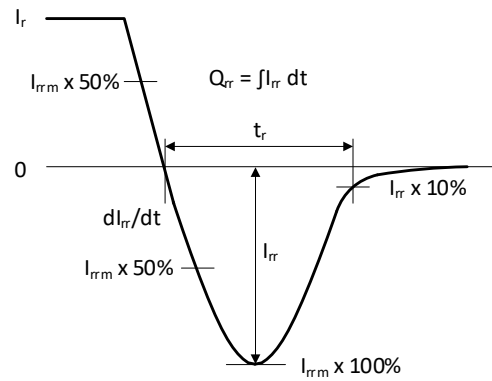
**Fig. 30 Switching Losses**



**Fig. 31 Switching Times**



**Fig. 32 Gate Charges**



**Fig. 33 Body Diode Reverse Recovery**

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