

## 10 Amps, 600 Volts

### N-CHANNEL MOSFET

#### DESCRIPTION

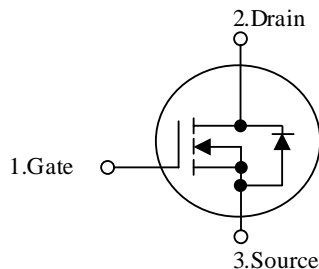
These N-Channel enhancement mode power field effect Transistors are produced using planar stripe, DMOS technology.

This advanced technology has been especially tailored to minimize on - state resistance , provide superior switching performance, and Withstand high energy pulse in the avalanche and commutation mode .These devices are well suited for high efficiency switch mode power supply, electronic lamp ballasts based on half bridge topology.

#### FEATURES

- \*  $R_{DS(ON)} = 0.60\Omega @ V_{GS} = 10V$
- \* Low gate and reverse transfer Capacitance ( C: 18 pF typical )
- \* Fast switching capability
- \* Avalanche energy tested
- \* Improved dv/dt capability, high ruggedness

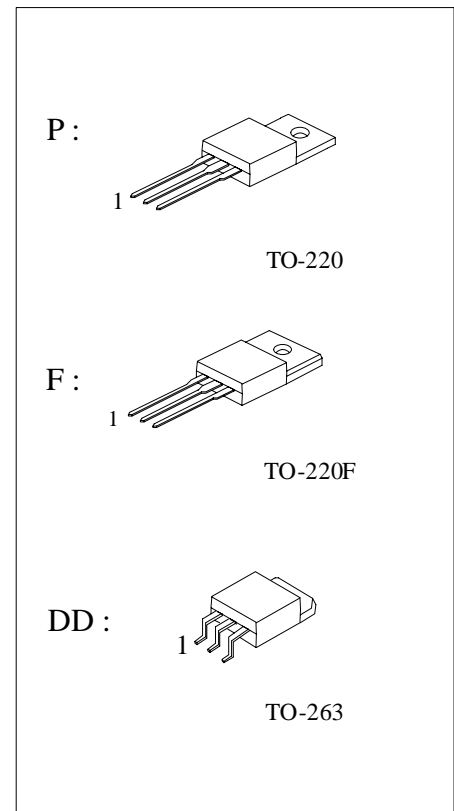
#### SYMBOL



#### ORDERING INFORMATION

Order Number	Package	Pin Assignment			Packing
		1	2	3	
FTK10N60P	TO-220	G	D	S	Tube
FTK10N60F	TO-220F	G	D	S	Tube
FTK10N60DD	TO-263	G	D	S	Reel & Taping

Note: Pin Assignment: G: Gate D: Drain S: Source





# FTK10N60P/F/DD

## ■ ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub> = 25°C, unless otherwise specified)

PARAMET		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V <sub>DSS</sub>	600	V
Gate-Source Voltage		V <sub>GSS</sub>	±30	V
Avalanche Current (Note 1)		I <sub>AR</sub>	9.5	A
Continuous Drain Current	T <sub>C</sub> = 25°C	I <sub>D</sub>	9.5	A
	T <sub>C</sub> = 100°C		5.5	
Pulsed Drain Current (Note 1)		I <sub>DM</sub>	28	A
Avalanche Energy	Single Pulse(Note 2)	E <sub>AS</sub>	700	mJ
	Repetitive Limited by T <sub>J(MAX)</sub>	E <sub>AR</sub>	18	mJ
Peak Diode Recovery dv/dt (Note 3)		dv/dt	4.5	V/ns
Power Dissipation (TO-220,TO-263/ TO-220F)	T <sub>C</sub> = 25°C	P <sub>D</sub>	156 / 48	W
	Derate above 25°C		1.25 / 0.38	
Junction Temperature		T <sub>J</sub>	+150	°C
Operating and Storage Temperature		T <sub>STG</sub>	-55 ~ +150	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.  
Absolute maximum ratings are stress ratings only and functional device operation is not implied.

## ■ THERMAL DATA

PARAMETER		SYMBOL	MIN	TYP	MAX	UNIT
Junction-to-Ambient		θ <sub>JA</sub>			62.5	°C / W
Junction-to-Case	TO-220, TO-263	θ <sub>Jc</sub>			1.18	
	TO-220F	θ <sub>Jc</sub>			2.6	

## ■ ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C, unless Otherwise specified.)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
<b>OFF CHARACTERISTICS</b>								
Drain-Source Breakdown Voltage		BV <sub>DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA	600			V	
Drain-Source Leakage Current		I <sub>DSS</sub>	V <sub>DS</sub> = 600V, V <sub>GS</sub> = 0V			10	μA	
Gate-Body Leakage Current	Forward	I <sub>GSSF</sub>	V <sub>GS</sub> = 30V, V <sub>DS</sub> = 0V			100	nA	
	Reverse	I <sub>GSSR</sub>	V <sub>GS</sub> = -30V, V <sub>DS</sub> = 0V			-100	nA	
Breakdown Voltage Temperature Coefficient		ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	I <sub>D</sub> = 250μA, Referenced to 25°C		0.7		V / °C	
<b>ON CHARACTERISTICS</b>								
Gate Threshold Voltage		V <sub>GS(TH)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	2.0		4.0	V	
Static Drain-Source On-Resistance		R <sub>DS(ON)</sub>	V <sub>GS</sub> = 10V, I <sub>D</sub> = 4.75A		0.6	0.73	Ω	
Forward Transconductance		g <sub>FS</sub>	V <sub>DS</sub> = 40V, I <sub>D</sub> = 3.5A (Note 4)		8.7		S	
<b>DYNAMIC CHARACTERISTICS</b>								
Input Capacitance		C <sub>ISS</sub>	V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f = 1.0MHz		1570		pF	
Output Capacitance		C <sub>OSS</sub>				166		pF
Reverse Transfer Capacitance		C <sub>RSS</sub>				18		pF
<b>SWITCHING CHARACTERISTICS</b>								
Turn-On Delay Time		t <sub>D(ON)</sub>	V <sub>DD</sub> = 300V, I <sub>D</sub> = 9.5 A , R <sub>G</sub> = 25Ω (Note 4,5)		23		ns	
Turn-On Rise Time		t <sub>r</sub>				69		ns
Turn-Off Delay Time		t <sub>D(OFF)</sub>				144		ns
Turn-Off Fall Time		t <sub>f</sub>				77		ns
Total Gate Charge		Q <sub>G</sub>	V <sub>DS</sub> = 480V, I <sub>D</sub> = 9.5 A V <sub>GS</sub> = 10V (Note 4,5)		44		nC	
Gate-Source Charge		Q <sub>GS</sub>				6.7		nC
Gate-Drain Charge		Q <sub>GD</sub>				18.5		nC



## ■ ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ , unless Otherwise specified.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS</b>						
Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = 10.0\text{ A}$			1.5	V
Maximum Continuous Drain-Source Diode Forward Current	$I_S$				10	A
Maximum Pulsed Drain-Source Diode Forward Current	$I_{SM}$				40	A
Reverse Recovery Time	$t_{RR}$	$V_{GS} = 0\text{ V}, I_S = 7.0\text{ A},$		400		ns
Reverse Recovery Charge	$Q_{RR}$	$dI_F/dt = 100\text{ A}/\mu\text{s}$ (Note 4)		4.0		$\mu\text{C}$

Note:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2.  $L = 19.5\text{ mH}, I_{AS} = 7.5\text{ A}, V_{DD} = 50\text{ V}, R_G = 25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 7.5\text{ A}, di/dt \leq 300\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$
4. Pulse Test: Pulse width  $\leq 300\ \mu\text{s}$ , Duty cycle  $\leq 2\%$
5. Essentially independent of operating temperature

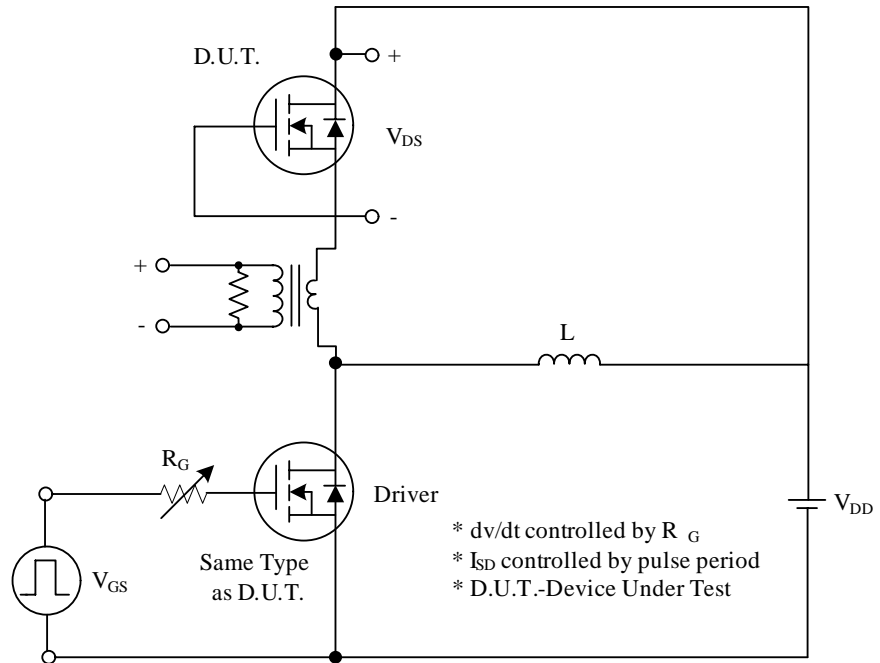


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

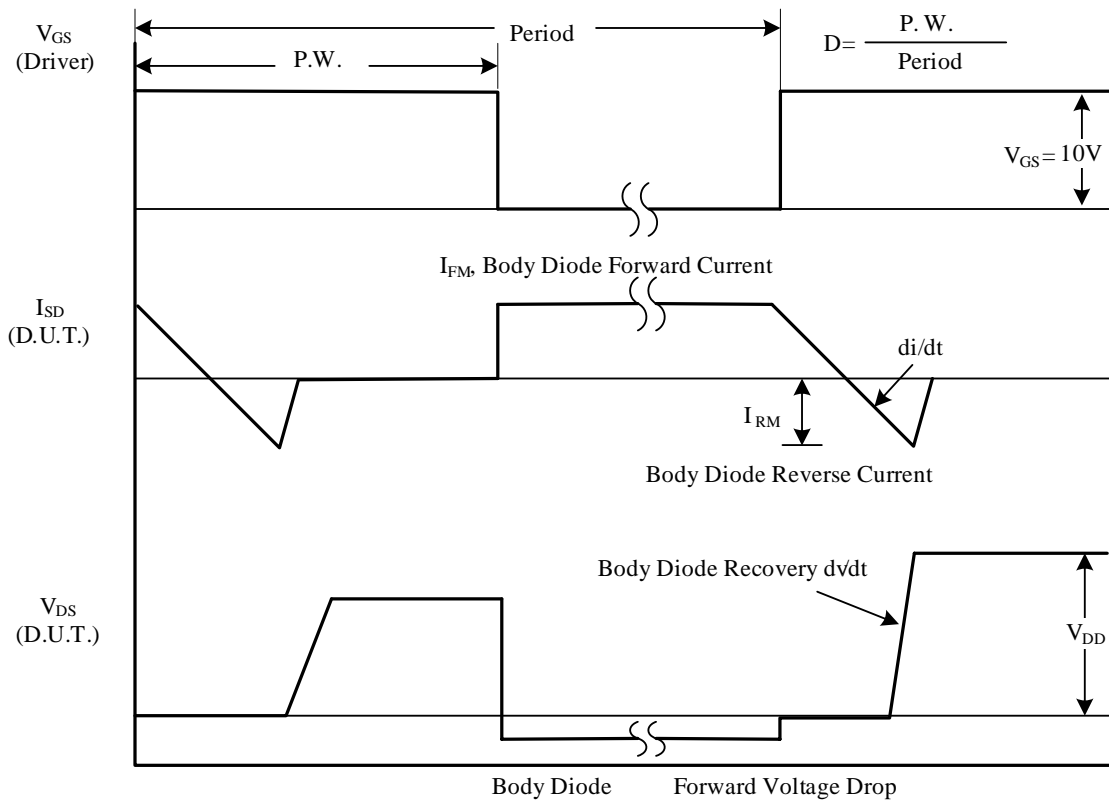


Fig. 1B Peak Diode Recovery dv/dt Waveforms

## TEST CIRCUITS AND WAVEFORMS (Cont.)

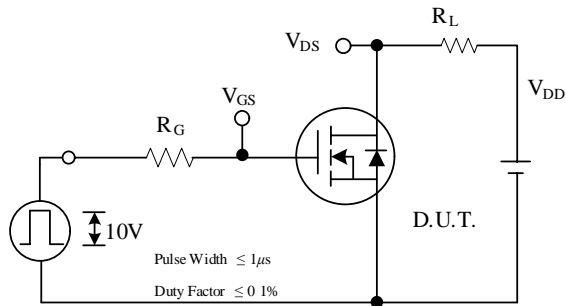


Fig. 2A Switching Test Circuit

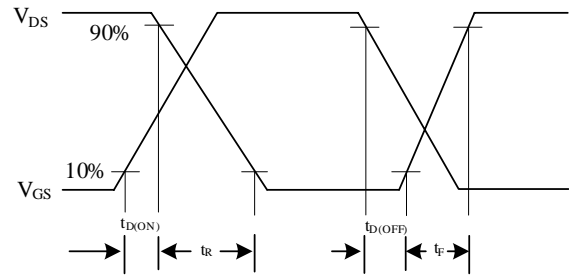


Fig. 2B Switching Waveforms

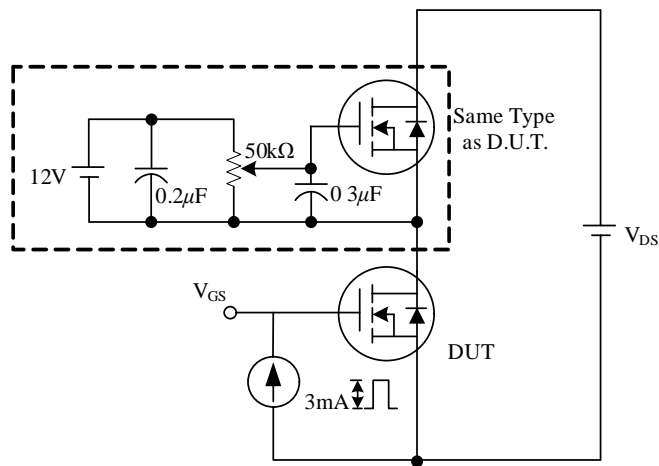


Fig. 3A Gate Charge Test Circuit

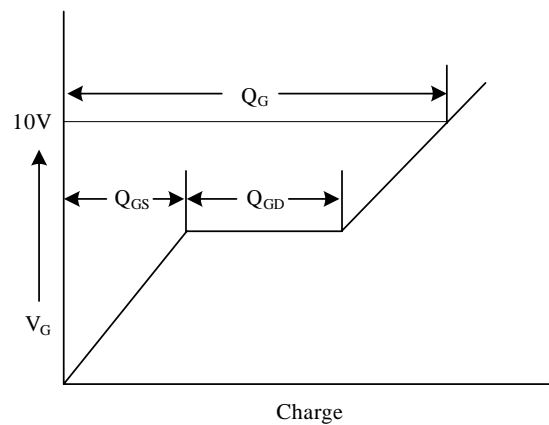


Fig. 3B Gate Charge Waveform

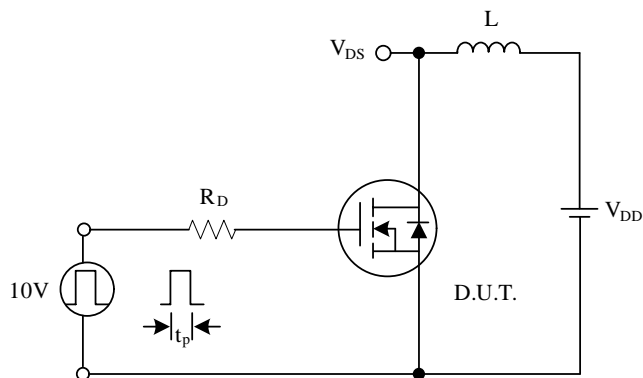


Fig. 4A Unclamped Inductive Switching Test Circuit

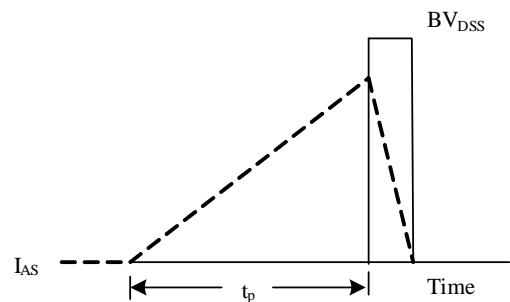


Fig. 4B Unclamped Inductive Switching Waveforms

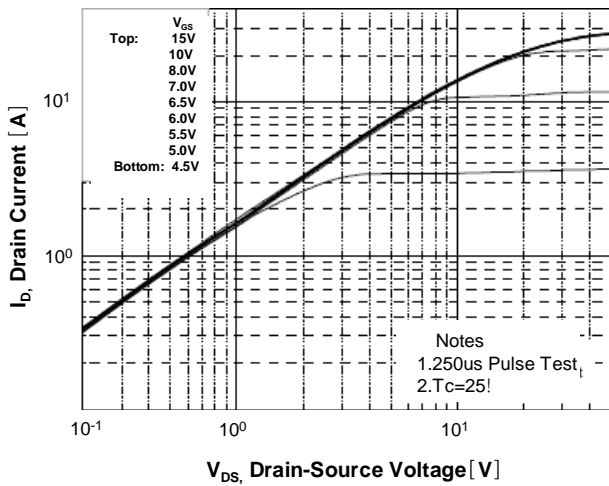


Figure 1. On-Region Characteristics

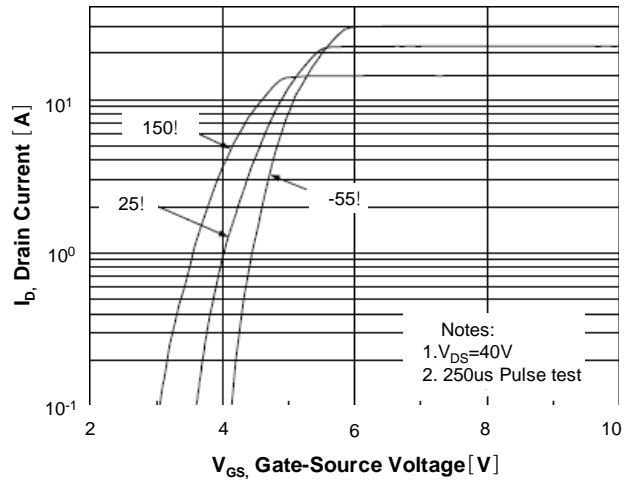


Figure 2. Transfet Characteristics

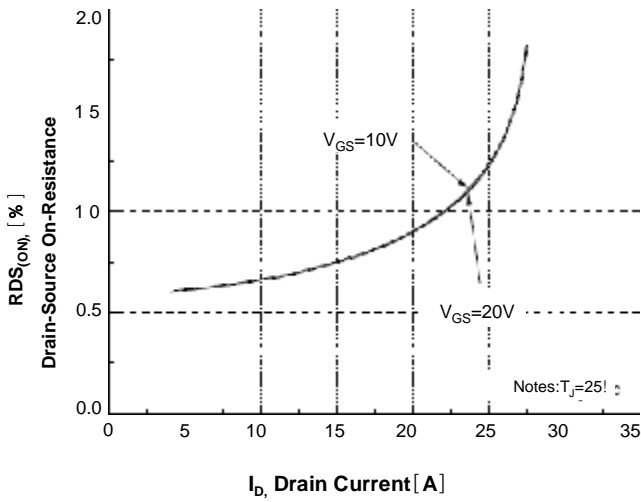


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

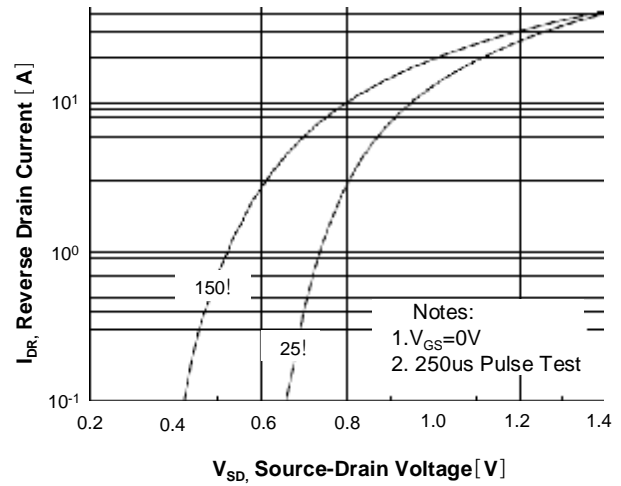


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

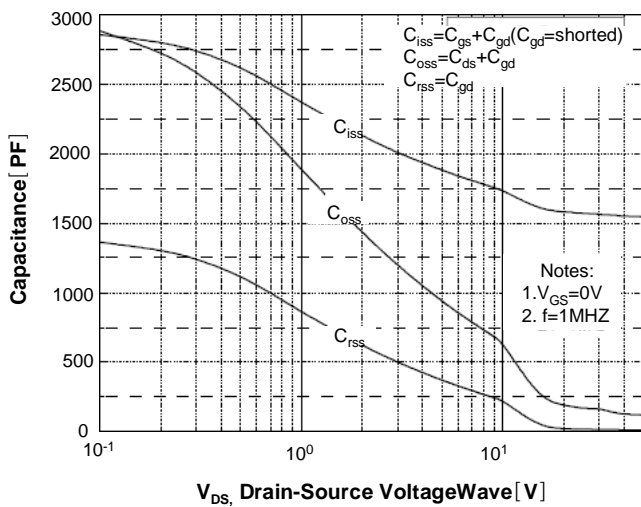


Figure 5. Capacitance Characteristics

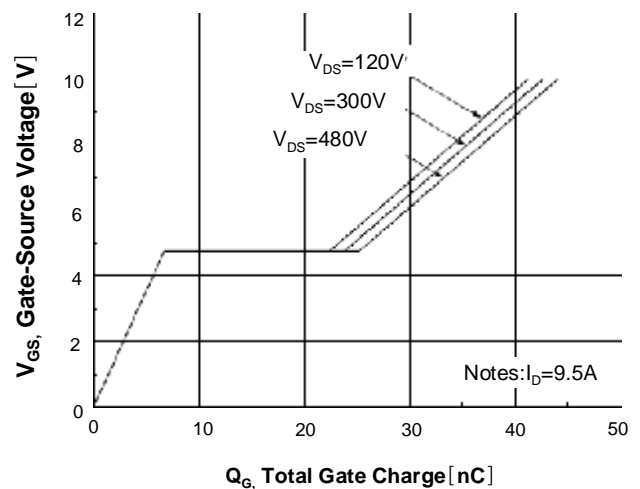
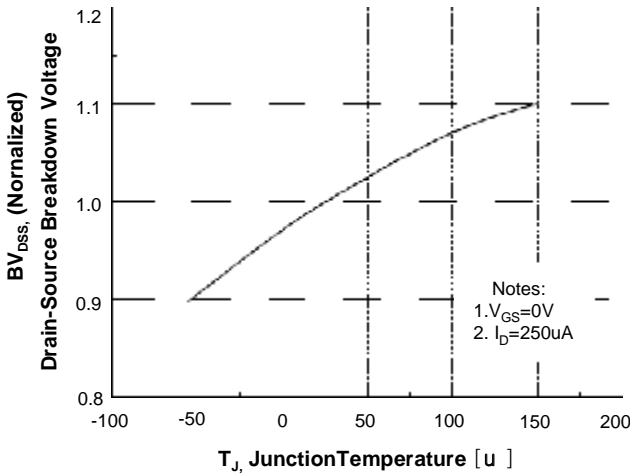
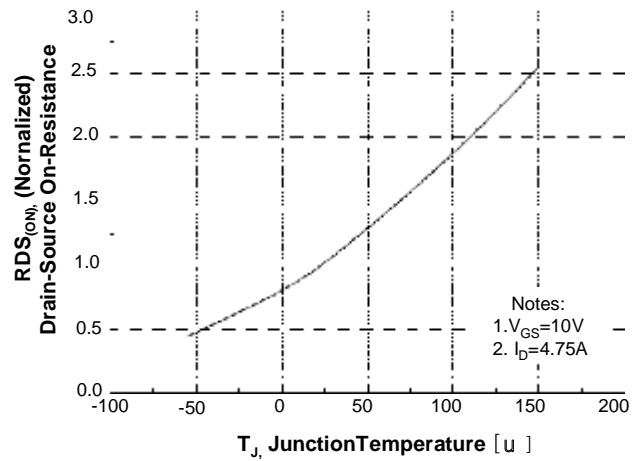


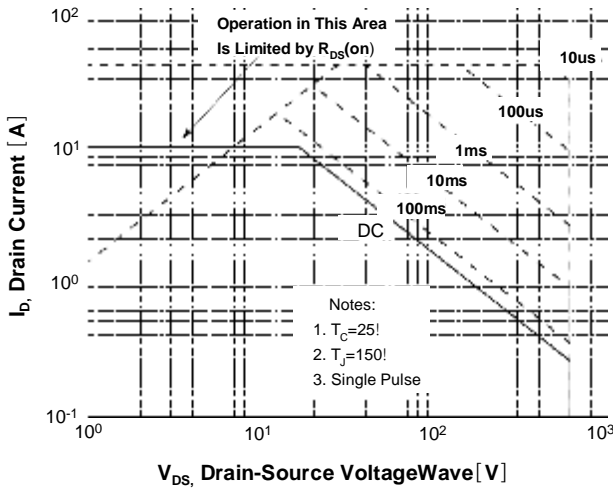
Figure 6. Gate Charge Characteristics



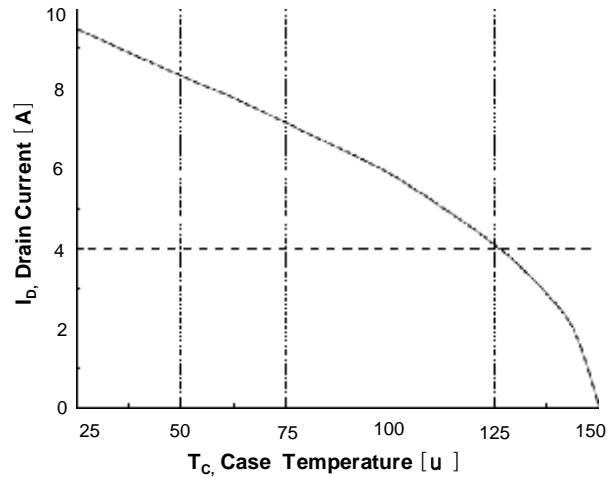
**Figure 7. Breakdown Voltage Variation vs. Temperature**



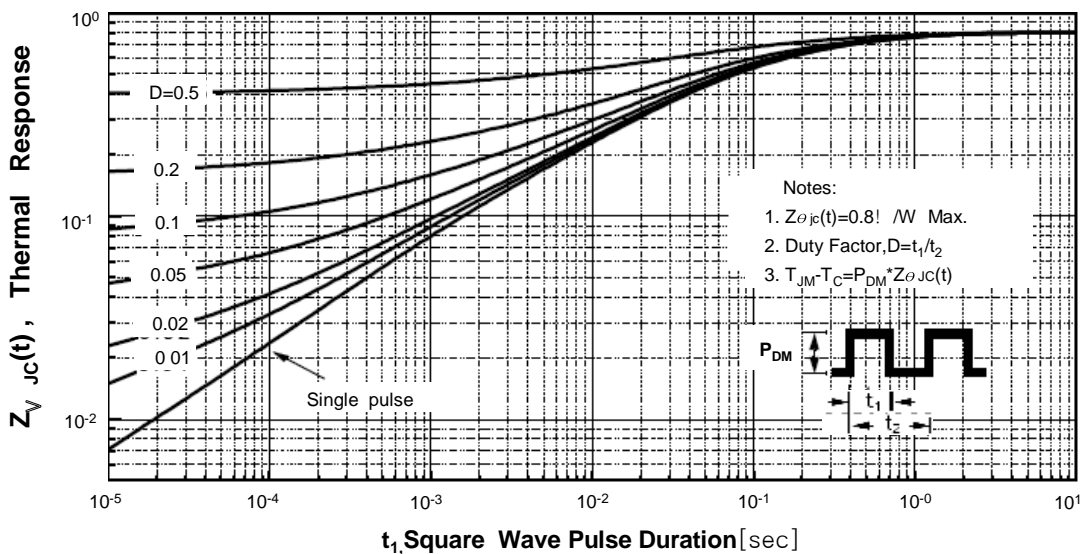
**Figure 8. On-Resistance Variation vs. Temperature**



**Figure 9. Maximum Safe Operating Area**



**Figure 10. Maximum Drain Current vs. Case Temperature**



**Figure 11. Transient Thermal Response Curve**