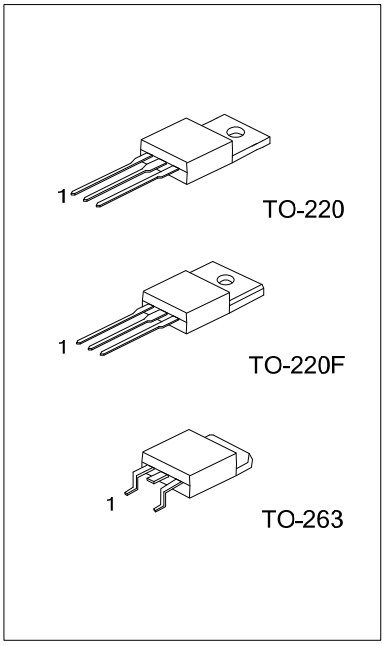
60N06

Power MOSFET

60A, 60V N-CHANNEL POWER MOSFET



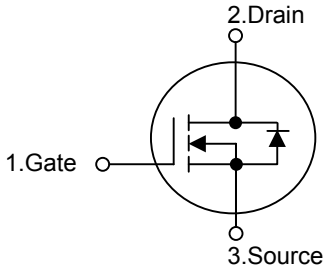
■ DESCRIPTION

The U TC **60N06** is N-c hannel en hancement mod e po wer field effect transistors with stable off-stat e charact eristics, fast switching speed, low thermal resistance, usually used at telecom and computer application.

■ FEATURES

* $R_{DS(ON)}$ = 18mΩ @V_{GS} = 10 V
* Ultra low gate charge (typical 39nC)
* Fast switching capability
* Low reverse transfer Capacitance (C_{RSS}= typical 115pF)
* Avalanche energy Specified
* Improved dv/dt capability, high ruggedness

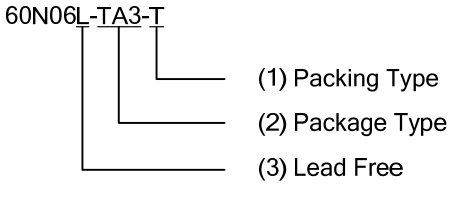
■ SYMBOL



■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
60N06L-TA3-T 60N0	6G-TA3-T	TO-220	G	D	S	Tube
60N06L-TF3-T 60N0	6G-TF3-T	TO-220F	G	D	S	Tube
60N06L-TQ2-R 60N0	6G-TQ2-R	TO-263	G	D	S	Tape Reel
60N06L-TQ2-T 60N0	6G-TQ2-T	TO-263	G	D	S	Tube

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



(1) T: Tube

(2) TA3: TO-220, TF3: TO-220F, TQ2: TO-263

(3) G: Halogen Free, L: Lead Free

■ ABSOLUTE MAXIMUM RATINGS

PARAMETER SYMBOL			RATINGS	UNIT
Drain to Source Voltage		V_{DSS} 60		V
Gate to Source Voltage		V_{GS}	±20 V	
Continuous Drain Current	T_C = 25°C	I_D	60	A
	T_C = 100°C		39	A
Drain Current Pulsed (Note 2)		I_{DM} 120		A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS} 1	000	mJ
	Repetitive (Note 2)	E_{AR} 180		mJ
Power Dissipation (T_C=25°C)	TO-220	P_D	100	W
	TO-220F 70.62			
	TO-263 54			
Junction Temperature		T_J +	150	°C
Storage Temperature		T_{STG}	-55 ~ +150	°C

Note: 1. 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.
2. Repeativity rating: pulse width limited by junction temperature
3. L=0.61mH, I_{AS}=60A, R_G=20Ω, Starting T_J=25℃

■ THERMAL DATA

PARAMETER SYMBOL			RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F	θ_{JA}	62.5	°C/W
	TO-263 110			
Junction to Case	TO-220	θ_{JC}	1.25	°C/W
	TO-220F		1.77	
	TO-263 2.31			

■ ELECTRICAL CHARACTERISTICS (T_C = 25°C, unless otherwise specified)

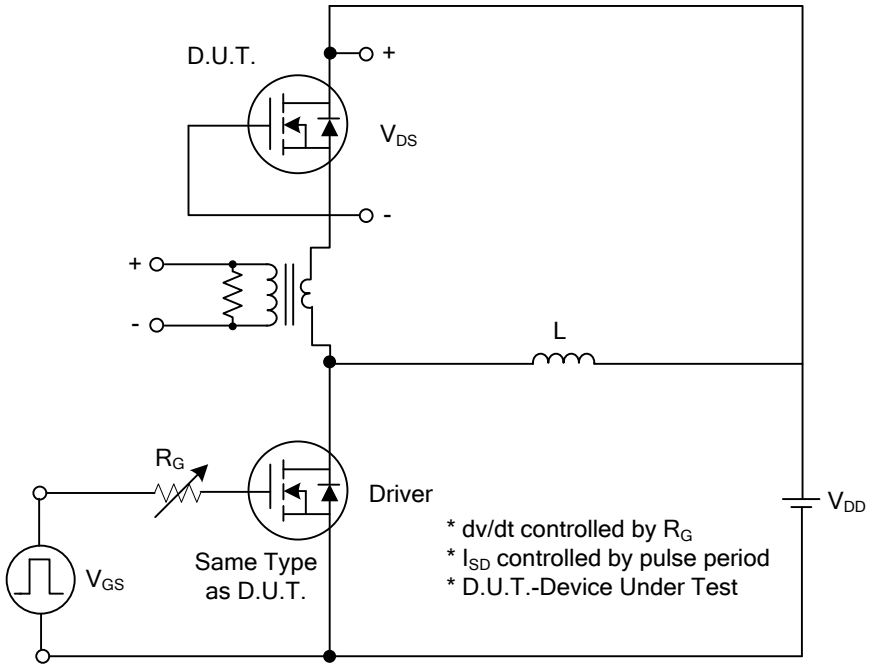
PARAMETER SYMBOL			TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS} = 0 V, I_D = 250μA 6	0			V
Drain-Source Leakage Current		I_{DSS} V	$_{DS}$ = 60 V, V_{GS} = 0 V			1	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS} = 20V, V_{DS} = 0 V			100	nA
	Reverse		V_{GS} = -20V, V_{DS} = 0 V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS} = V_{GS}, I_D = 250μA 2.0			4.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS} = 10 V, I_D = 30A		14	18	mΩ
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}	V_{GS} = 0V, V_{DS} =25V, f = 1MHz		2000		pF
Output Capacitance		C_{OSS}			400		pF
Reverse Transfer Capacitance		C_{RSS}			115		pF
SWITCHING CHARACTERISTICS							
Turn-On Delay Time		$t_{D(ON)}$	V_{DD}=30V, I_D=60A, R_L=0.5Ω, V_{GS}=10V (Note 2, 3)		12	30	ns
Rise Time		t_R			11	30	ns
Turn-Off Delay Time		$t_{D(OFF)}$			25	50	ns
Fall Time		t_F			15	30	ns
Total Gate Charge		Q_G	V_{DS} = 30V, V_{GS} = 10 V I_D = 60A (Note 2, 3)		39	60	nC
Gate-Source Charge		Q_{GS}			12		nC
Gate-Drain Charge (Miller Charge)		Q_{GD}			10		nC

■ ELECTRICAL CHARACTERISTICS(Cont.)

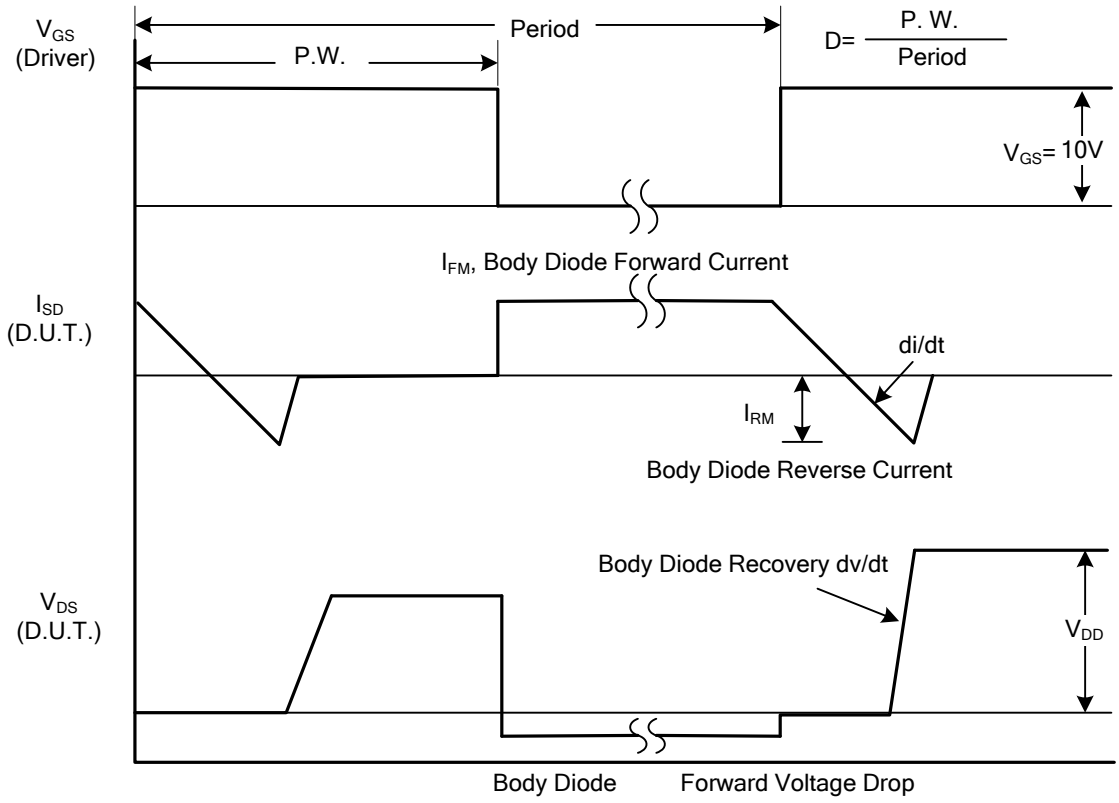
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS						
Diode Forward Voltage	V_{SD}	V_{GS} = 0 V, I_S = 60A			1.6	V
Continuous Source Current	I_S				60	A
Pulsed Source Current	I_{SM}				120	
Reverse Recovery Time	t_{rr}	I_S=60A, V_{GS}=0V, dI_F/dt=100A/μs	60			ns
Reverse Recovery Charge	Q_{RR}			3.4		μC

Note: 1. I_{SD}≤60A, di/dt≤300A/μs, V_{DD}≤BV_{DSS}, Starting T_J=25℃
2. Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%
3. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

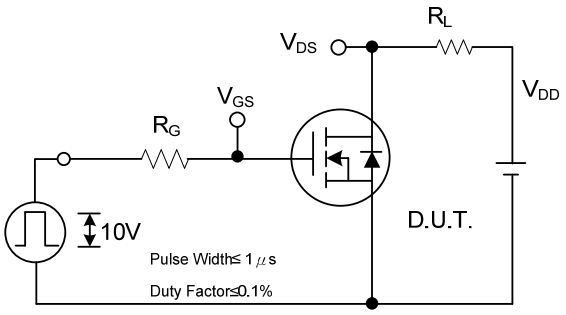


Peak Diode Recovery dv/dt Test Circuit

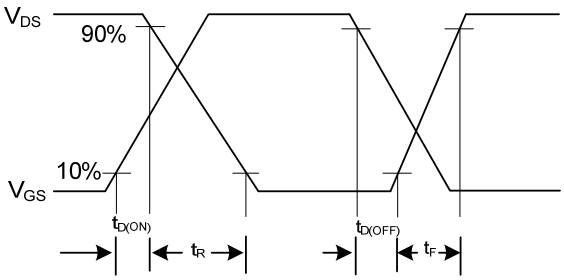


Peak Diode Recovery dv/dt Waveforms

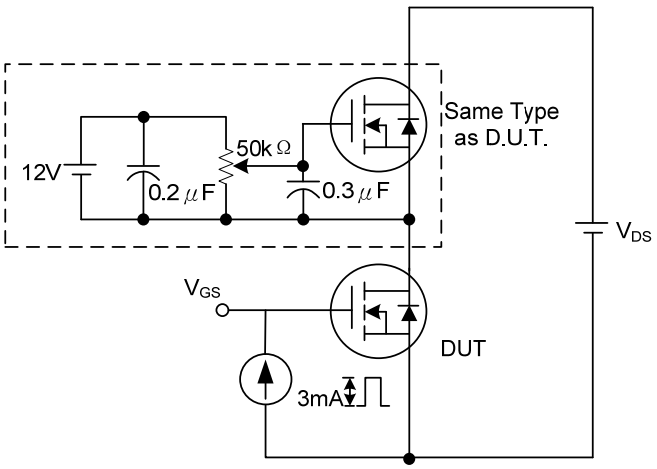
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



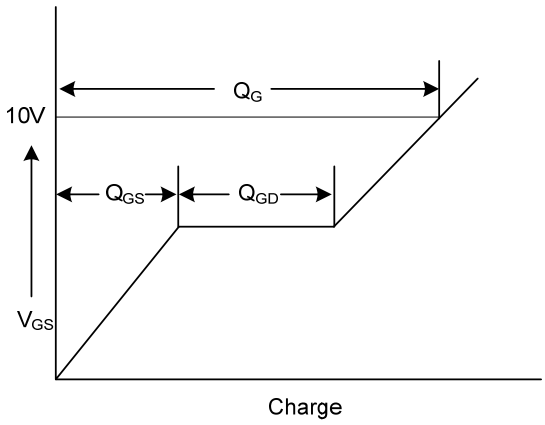
S witching Test Circuit



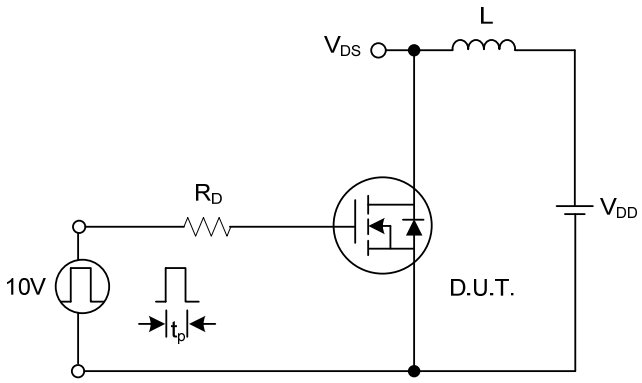
S witching Waveforms



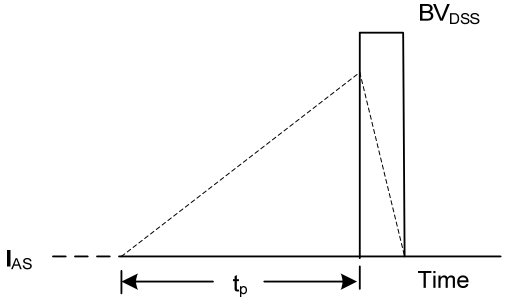
Gate Charge Test Circuit



G ate Charge Waveform



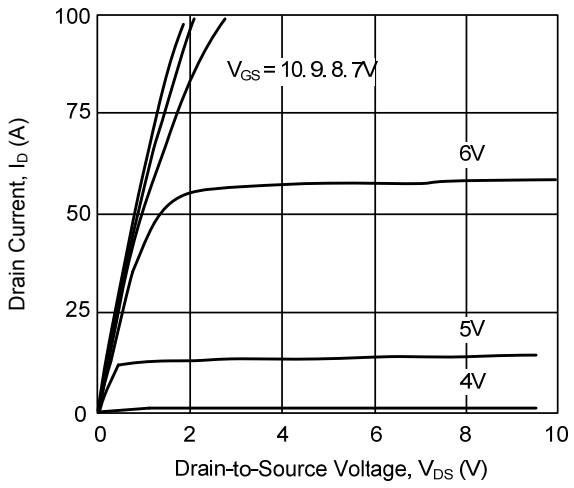
Unc lamped Inductive Switching Test Circuit



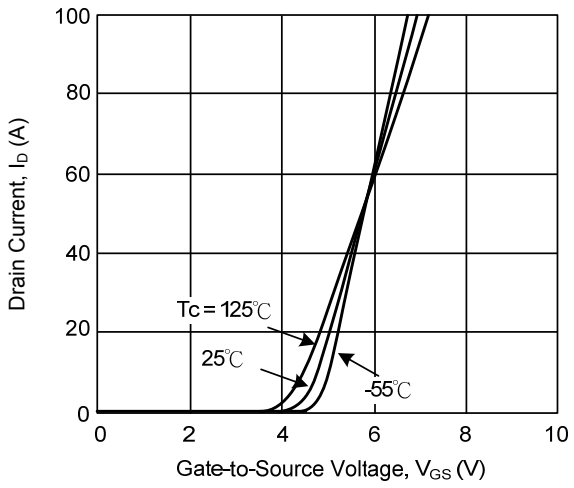
Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

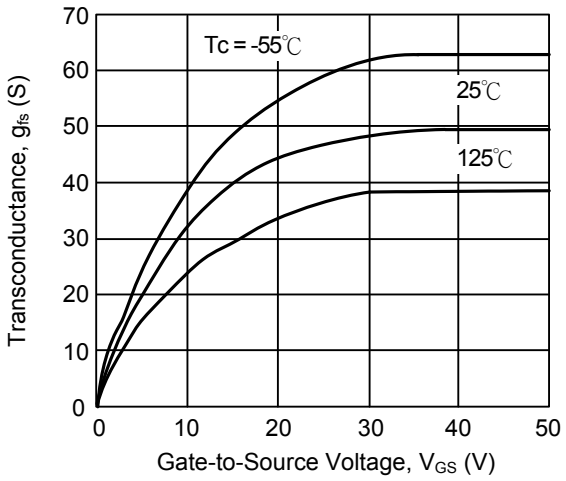
Output Characteristics



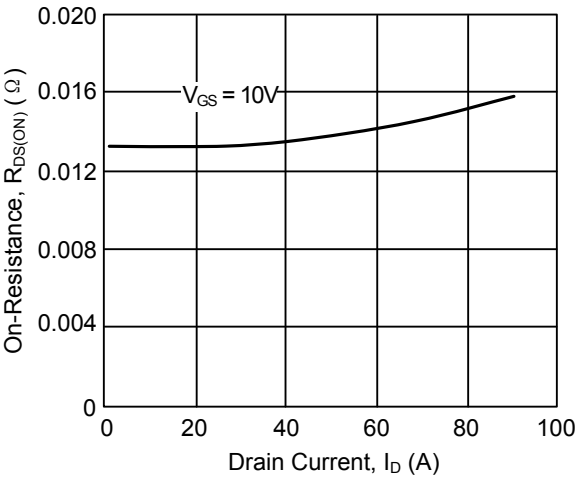
Transfer Characteristics



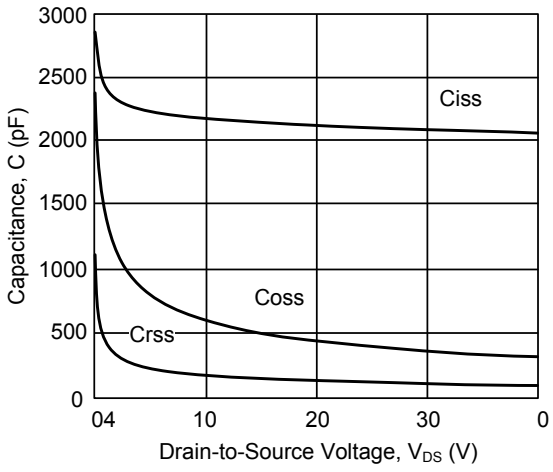
Transconductance



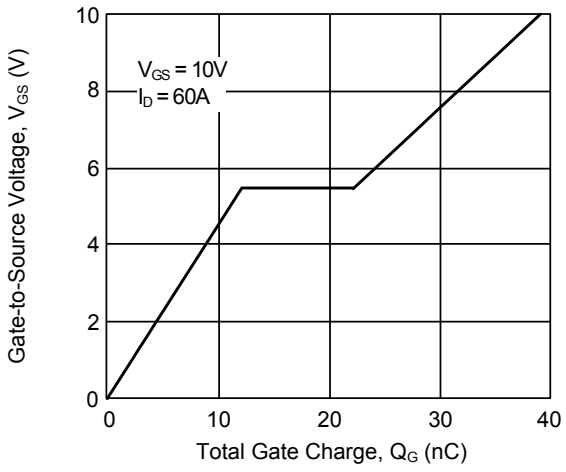
On-Resistance vs. Drain Current



Capacitance

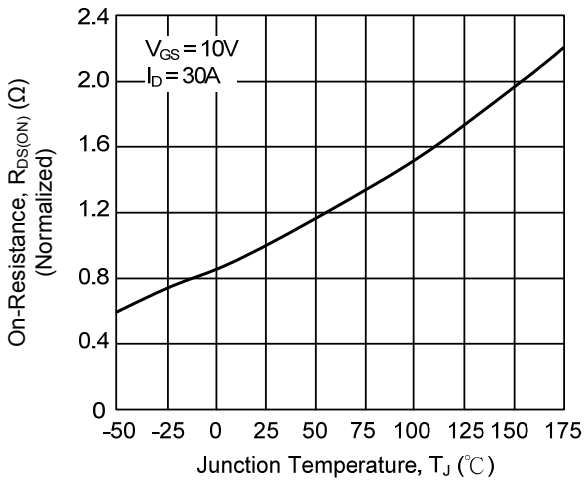


Gate Charge

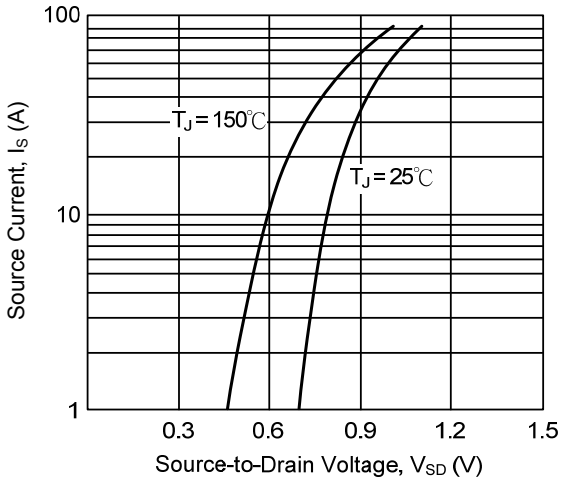


■ TYPICAL CHARACTERISTICS(Cont.)

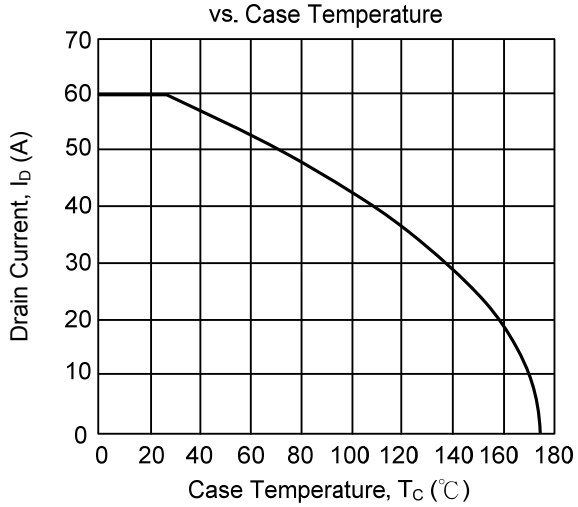
On-Resistance vs. Junction Temperature



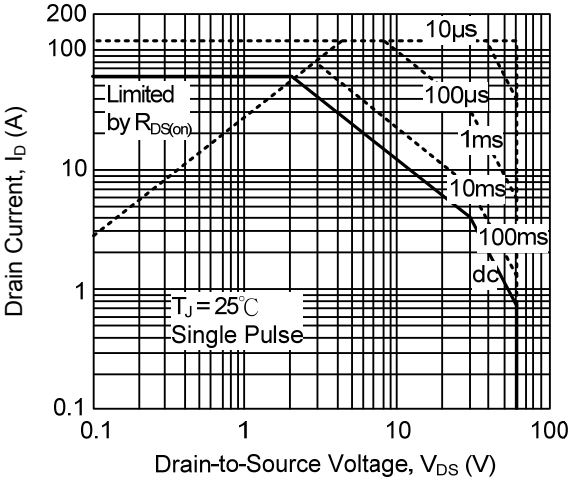
Source-Drain Diode Forward Voltage



Maximum Avalanche and Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance