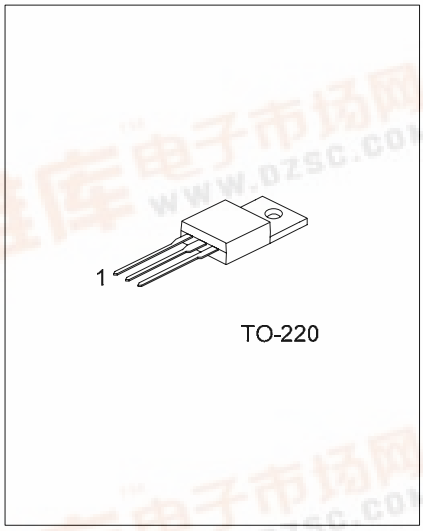
60 Amps, 60 Volts
N-CHANNEL POWER MOSFET



TO-220

*Pb-free plating product number: 60N06L

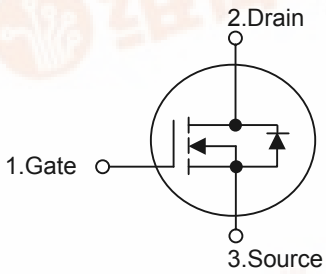
■ DESCRIPTION

The UTC **60N06** is n-channel enhancement mode power field effect transistors with stable off-state characteristics, 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 39 nC)
* Fast switching capability
* Low reverse transfer Capacitance (C_{RSS}= typical 115 pF)
* Avalanche energy Specified
* Improved dv/dt capability, high ruggedness

■ SYMBOL



■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Normal	Lead Free Plating		1	2	3	
60N06-TA3-T	60N06L-TA3-T	TO-220	G	D	S	Tube

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

60N06L-TA3-T (1)Packing Type (2)Package Type (3)Lead Plating	(1) T: Tube, R: Tape Reel (2) TA3: TO-220 (3) L: Lead Free Plating, Blank: Pb/Sn

■ 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℃	I_D	60	A
	T_C = 100℃		39	A
Drain Current Pulsed (Note 1)		I_{DM}	120	A
Avalanche Energy	Single Pulsed (Note 2)	E_{AS}	1000	mJ
	Repetitive (Note 1)	E_{AR}	180	mJ
Total Power Dissipation		P_D	120	W
Junction Temperature		T_J	+175	℃
Storage Temperature		T_{STG}	-55 ~ +175	℃

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
Thermal Resistance Junction-Ambient	θ_{JA}			62.5	℃/W
Thermal Resistance Junction-Case	θ_{JC}			1.25	℃/W

■ ELECTRICAL CHARACTERISTICS (T_C = 25℃, 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 = 250 μA	60			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 = 250 μA	2.0		4.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS} = 10 V, I_D = 30 A		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 4, 5)		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 4, 5)		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} = 0 V,		60		ns
Reverse Recovery Charge	Q_{RR}	dI_F / dt = 100 A/μs		3.4		μC

Note 1. Repeativity rating: pulse width limited by junction temperature
2. L=0.61mH, I_{AS}=60A, R_G=20Ω, Starting T_J=25℃
3. I_{SD}≤60A, di/dt≤300A/μs, V_{DD}≤BV_{DSS}, Starting T_J=25℃
4. Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%
5. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

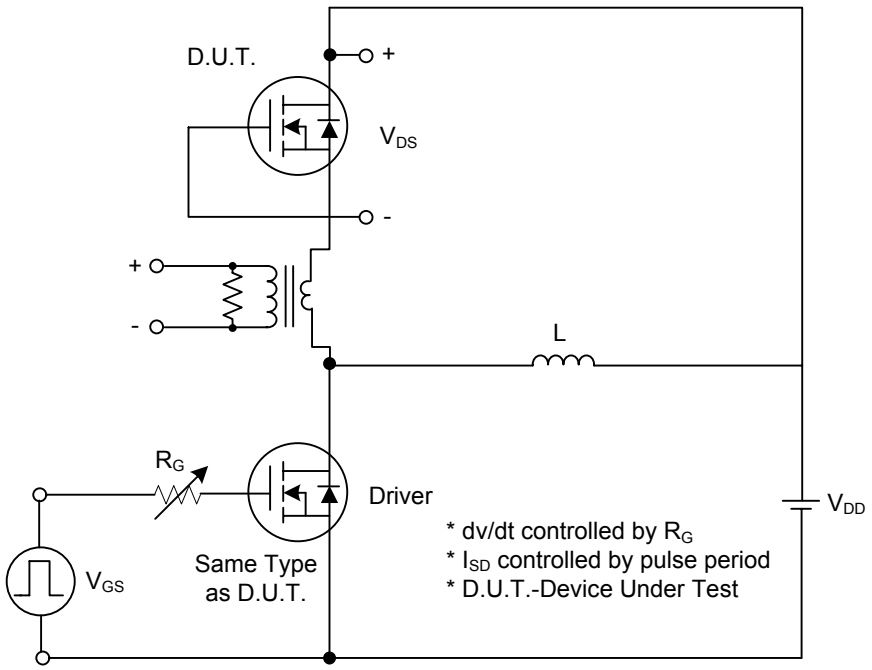


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

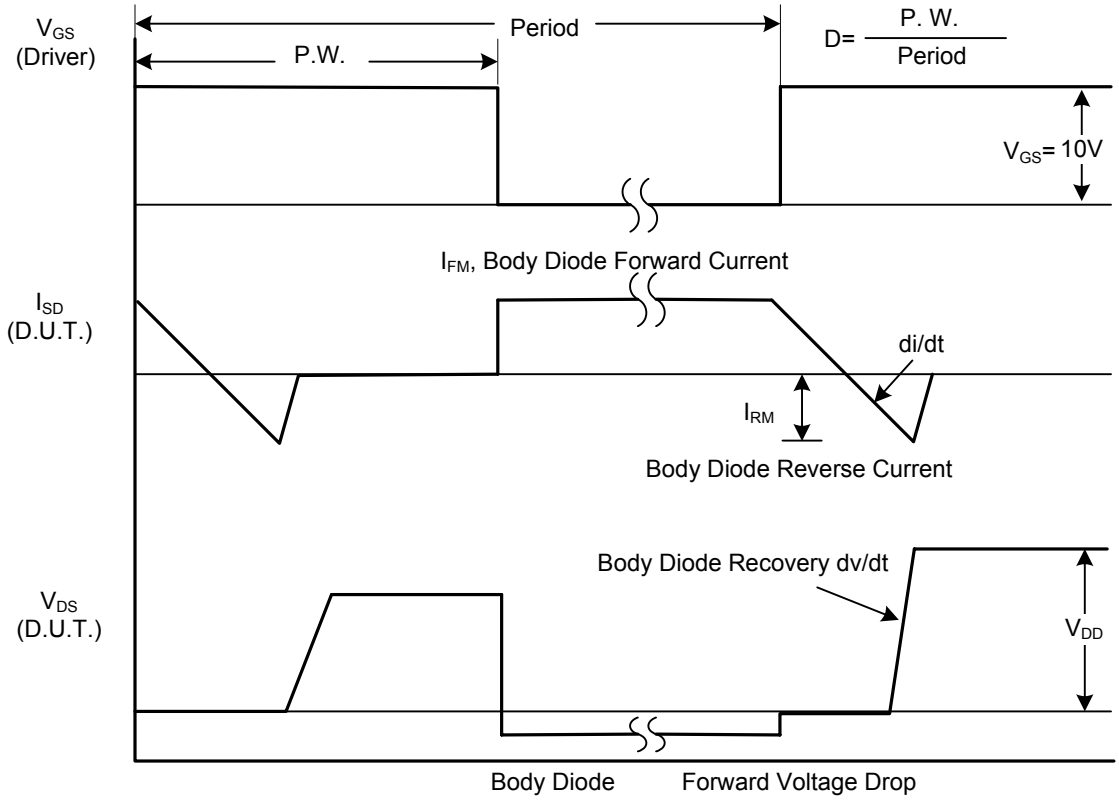


Fig. 1B Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)

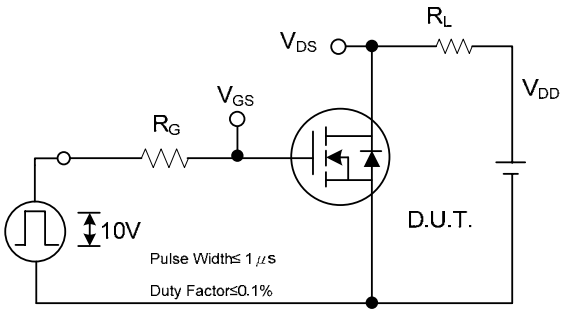


Fig. 2A Switching Test Circuit

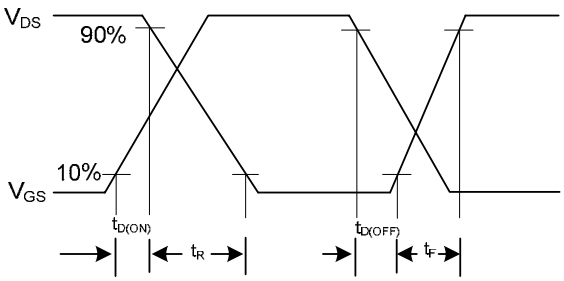


Fig. 2B Switching Waveforms

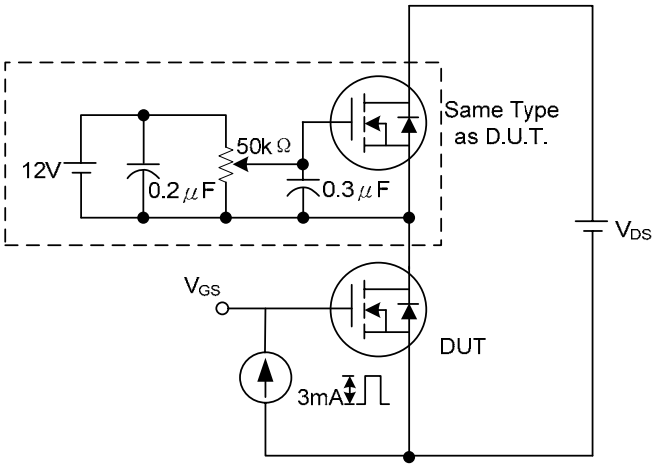


Fig. 3A Gate Charge Test Circuit

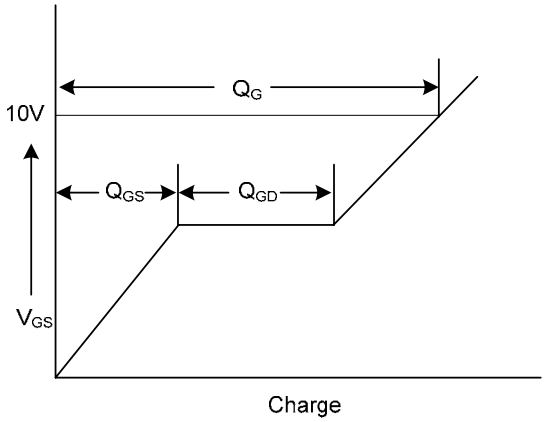


Fig. 3B Gate Charge Waveform

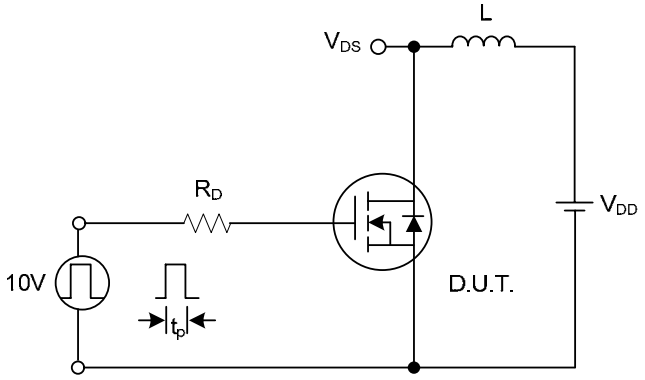


Fig. 4A Unclamped Inductive Switching Test Circuit

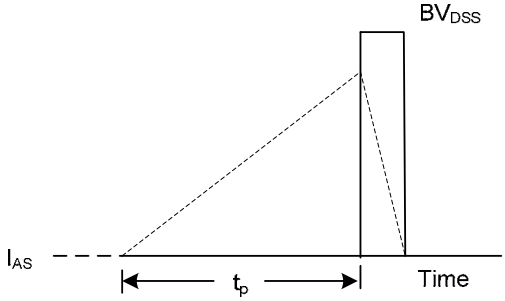
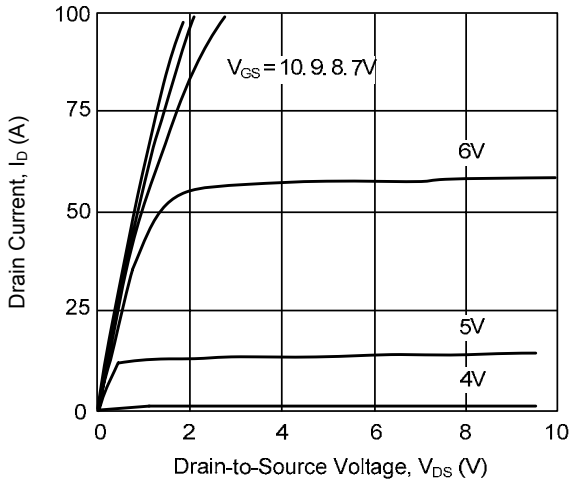


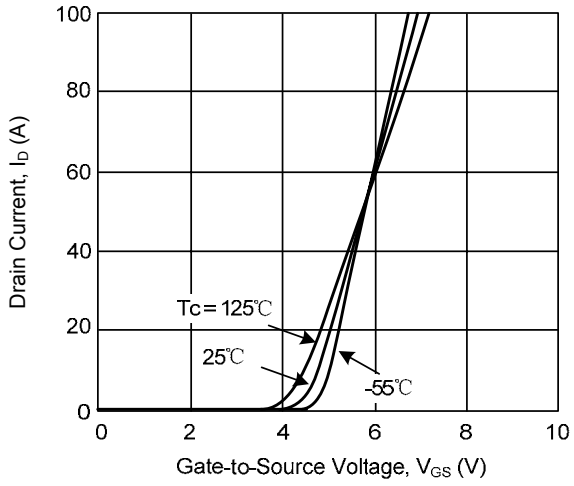
Fig. 4B Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

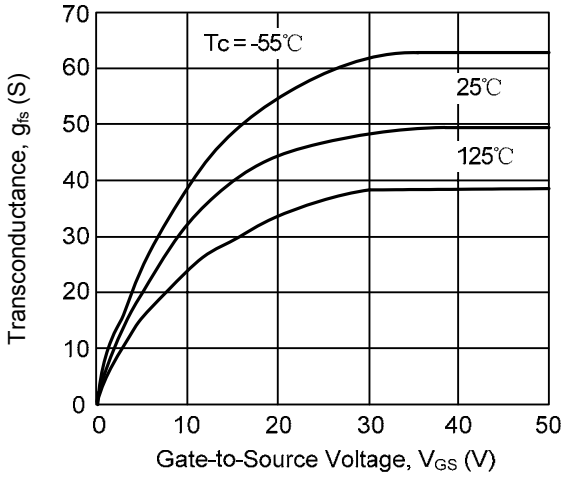
Output Characteristics



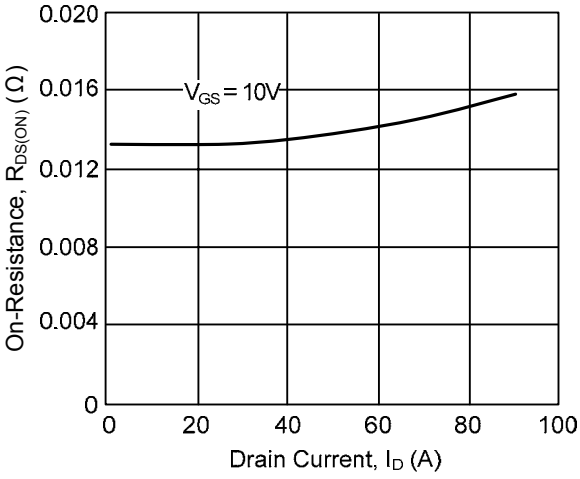
Transfer Characteristics



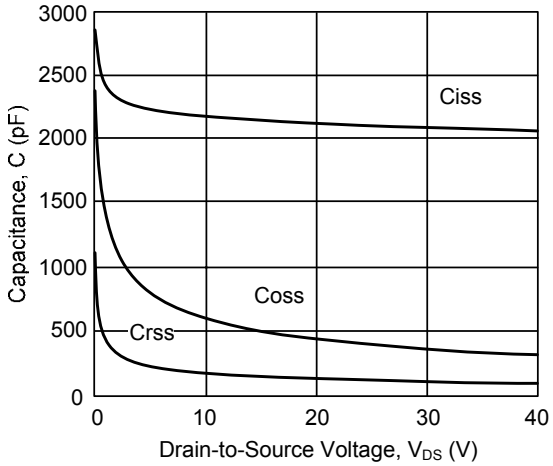
Transconductance



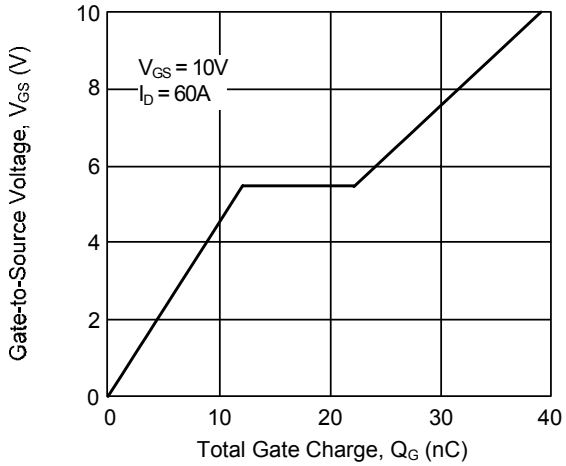
On-Resistance vs. Drain Current



Capacitance

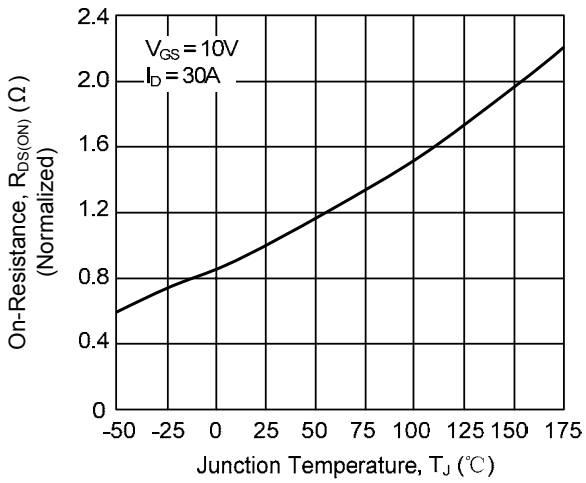


Gate Charge

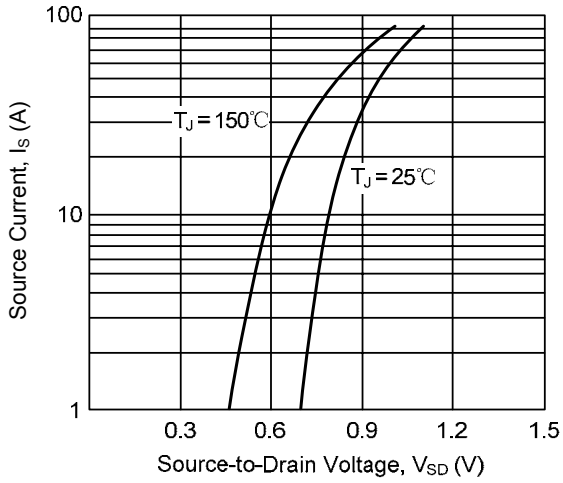


■ TYPICAL CHARACTERISTICS(Cont.)

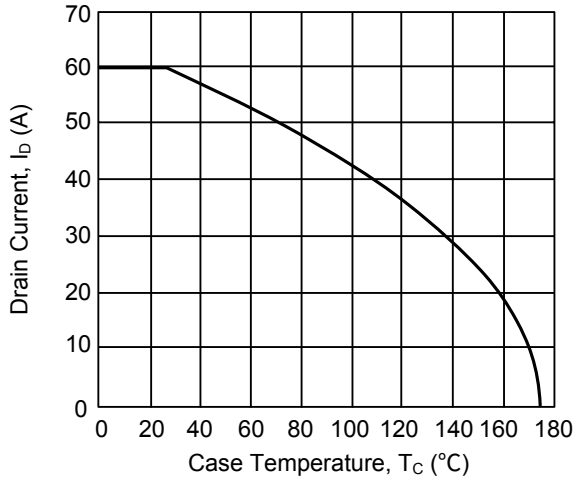
On-Resistance vs. Junction Temperature



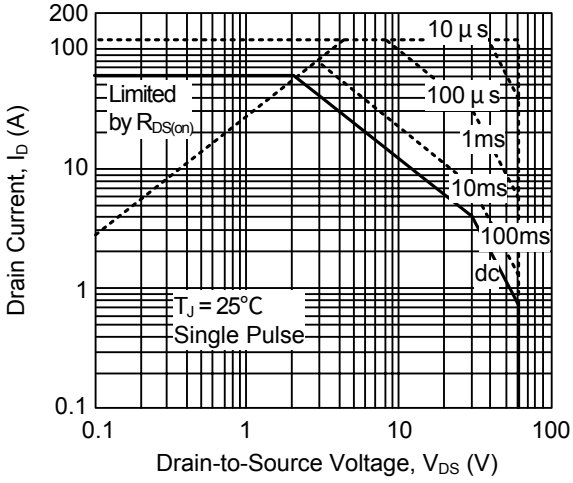
Source-Drain Diode Forward Voltage



Maximum Avalanche and Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance