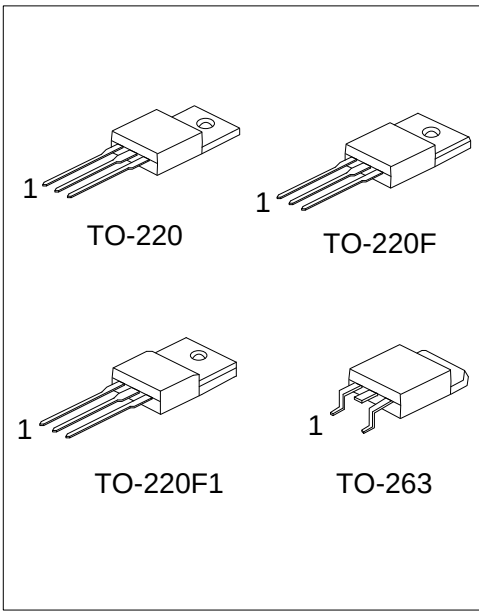
60N06

Power MOSFET

60A, 60V N-CHANNEL POWER MOSFET



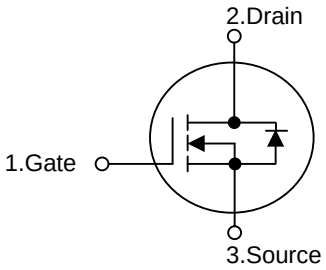
■ DESCRIPTION

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}=10V, I_D=30A
* 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	60N06G-TA3-T	TO-220	G	D	S	Tube
60N06L-TF3-T	60N06G-TF3-T	TO-220F	G	D	S	Tube
60N06L-TF1-T	60N06G-TF1-T	TO-220F1	G	D	S	Tube
60N06L-TQ2-R	60N06G-TQ2-R	TO-263	G	D	S	Tape Reel
60N06L-TQ2-T	60N06G-TQ2-T	TO-263	G	D	S	Tube

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

60N06G-TA3-T
(1)Packing Type
(2)Package Type
(3)Green Package

(1) T: Tube, R: Tape Reel
(2) TA3: TO-220, TF1: TO-220F1, TF3: TO-220F, TQ2: TO-263
(3) G: Halogen Free and Lead 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}	1000	mJ
	Repetitive (Note 2)	E_{AR}	180	mJ
Power Dissipation (T_C=25°C)	TO-220/TO-263	P_D	100	W
	TO-220F/TO-220F1		34	W
Junction Temperature		T_J	+150	°C
Storage Temperature		T_{STG}	-55 ~ +150	°C

Notes: 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. Repetitive Rating : Pulse width limited by maximum junction temperature.
3. L=0.6mH, I_{AS}=60A, V_{DD}=50V, R_G=20Ω, Starting T_J = 25°C

■ THERMAL DATA

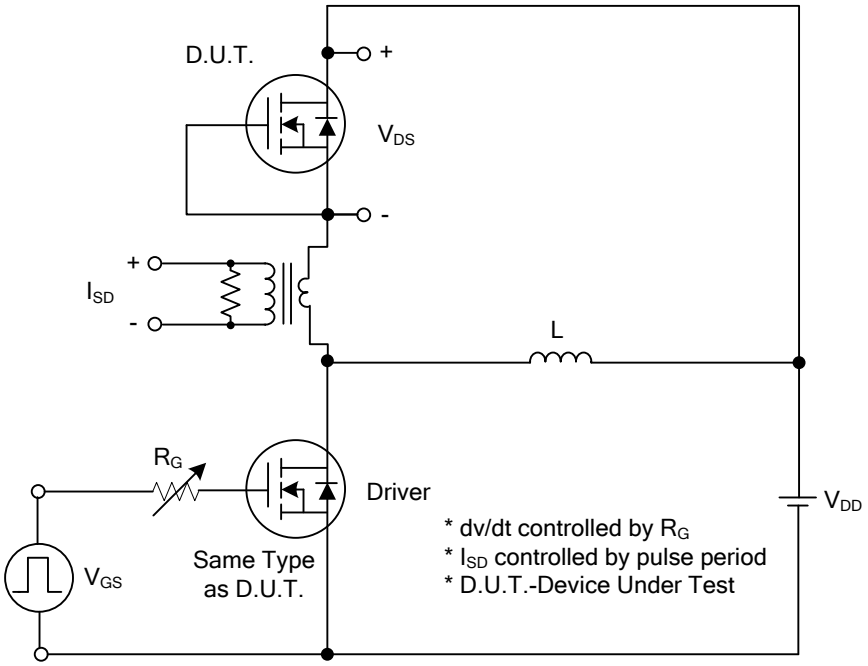
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient		θ_{JA}	62.5	°C/W
Junction to Case	TO-220/TO-263	θ_{JC}	1.25	°C/W
	TO-220F		3.68	°C/W

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

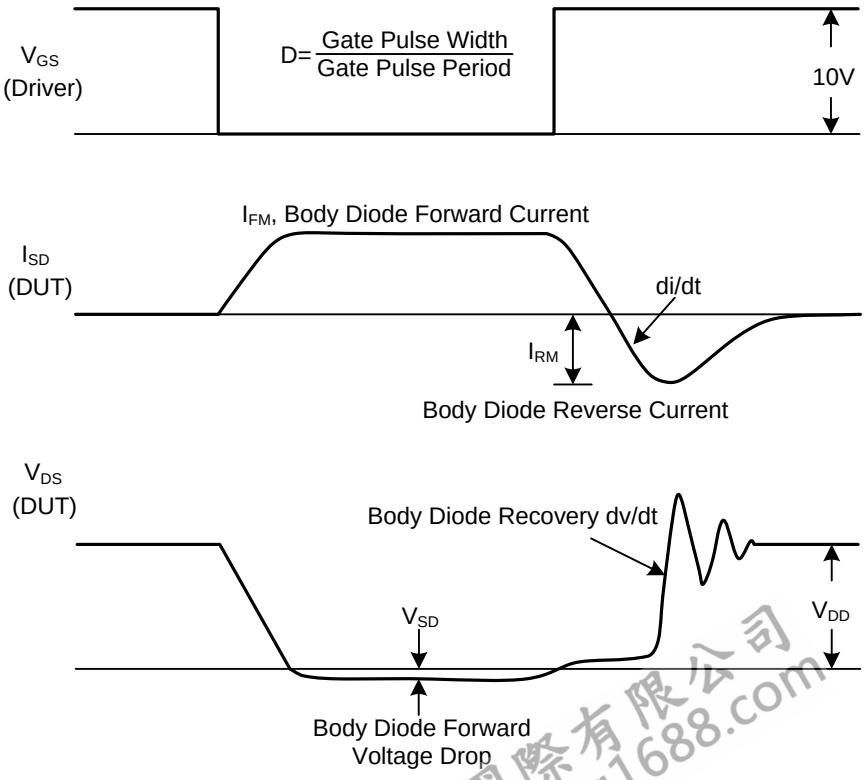
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V, I_D=250μA	60			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=60V, V_{GS}=0V			1	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS}=20V, V_{DS}=0V			100	nA
	Reverse		V_{GS}=-20V, V_{DS}=0V			-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}=10V, 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							
Total Gate Charge		Q_G	V_{DS}=30V, V_{GS}=10V, I_D=60A I_G=10mA (Note 1, 2)		39	60	nC
Gate-Source Charge		Q_{GS}			12		nC
Gate-Drain Charge (Miller Charge)		Q_{GD}			10		nC
Turn-On Delay Time		$t_{D(ON)}$	V_{DD}=30V, V_{GS}=10V, I_D=60A, R_G =25Ω (Note 1, 2)		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
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS							
Continuous Source Current		I_S				60	A
Pulsed Source Current		I_{SM}				120	A
Diode Forward Voltage		V_{SD}	V_{GS}=0V, I_S=60A			1.6	V
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

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

■ TEST CIRCUITS AND WAVEFORMS

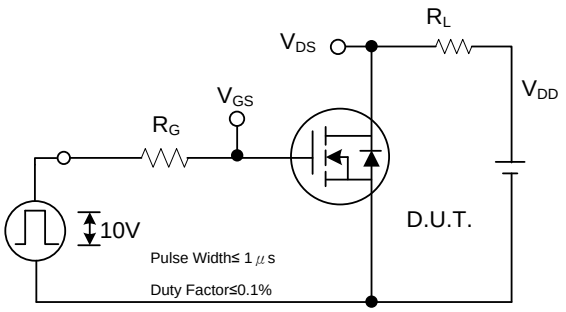


Peak Diode Recovery dv/dt Test Circuit

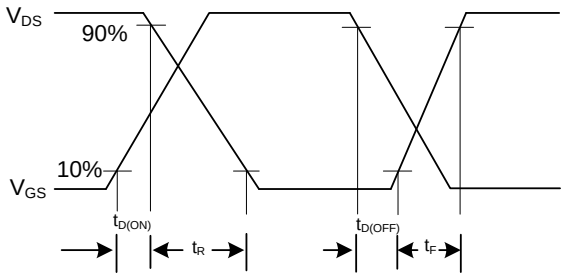


Peak Diode Recovery dv/dt Waveforms

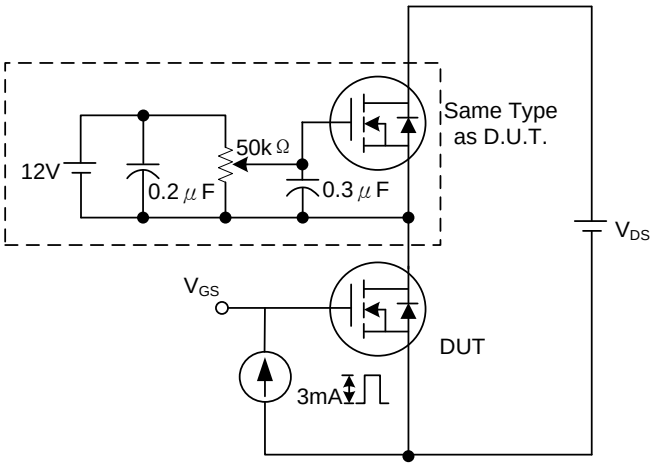
■ TEST CIRCUITS AND WAVEFORMS



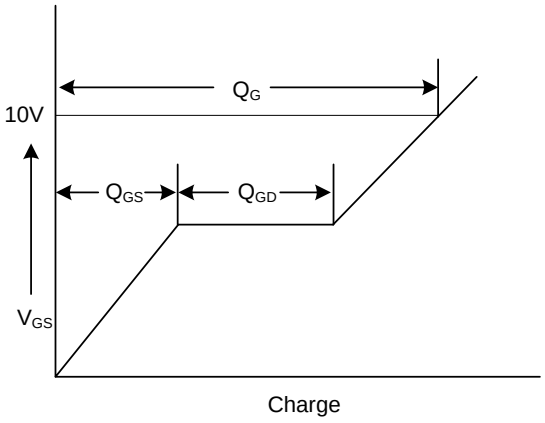
Switching Test Circuit



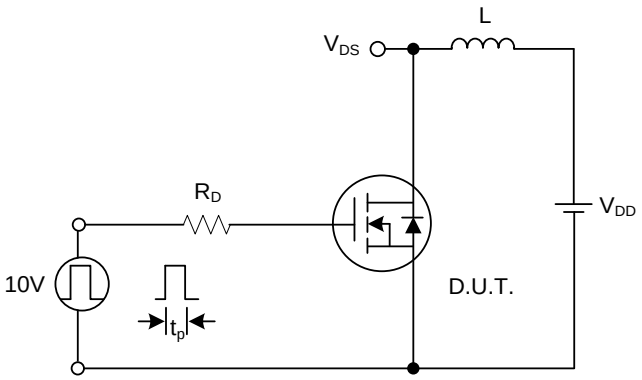
Switching Waveforms



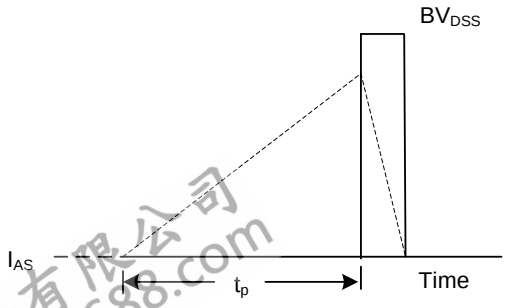
Gate Charge Test Circuit



Gate Charge Waveform



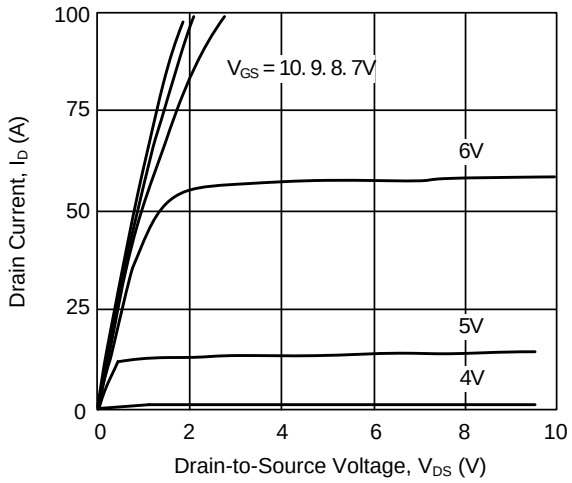
Unclamped Inductive Switching Test Circuit



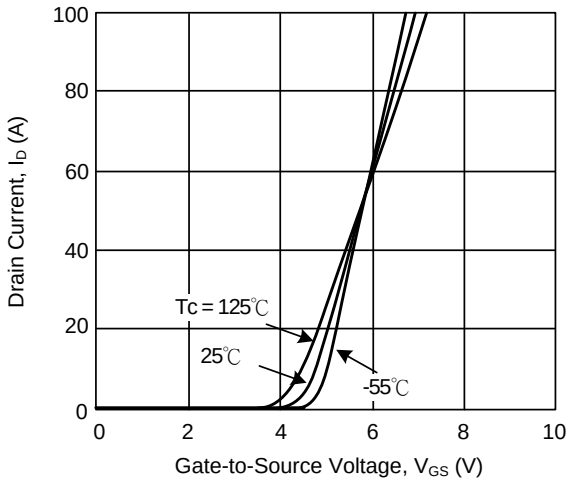
Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

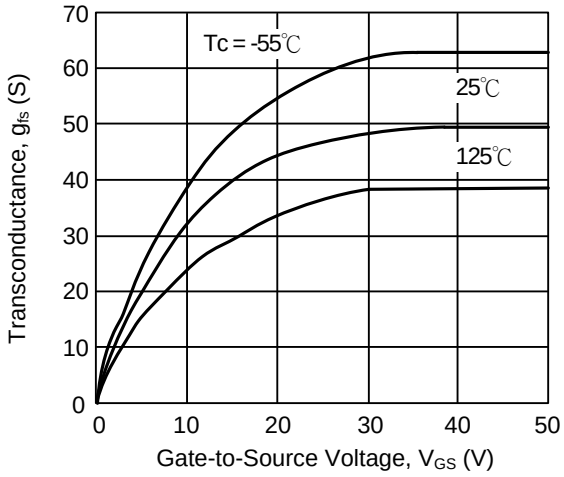
Output Characteristics



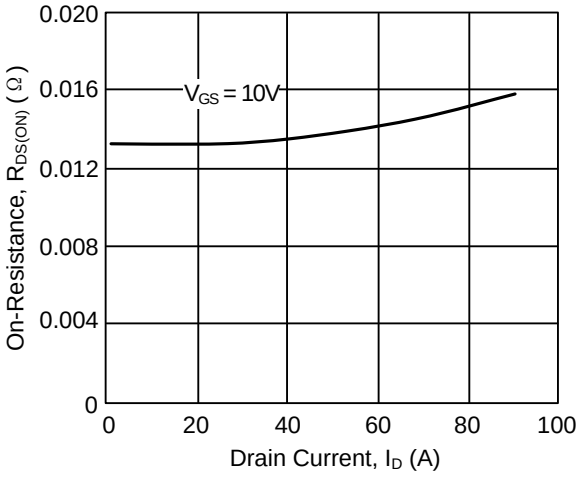
Transfer Characteristics



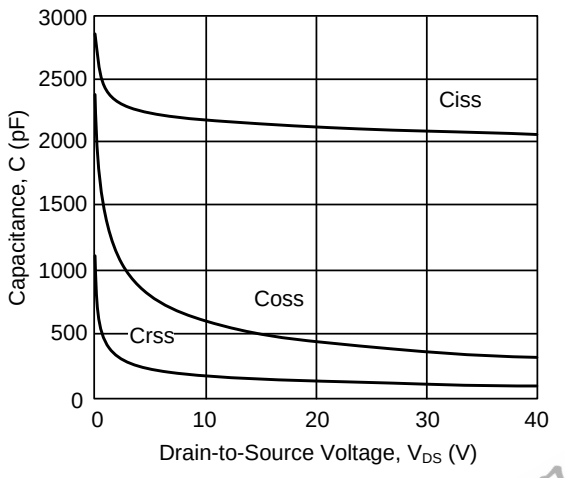
Transconductance



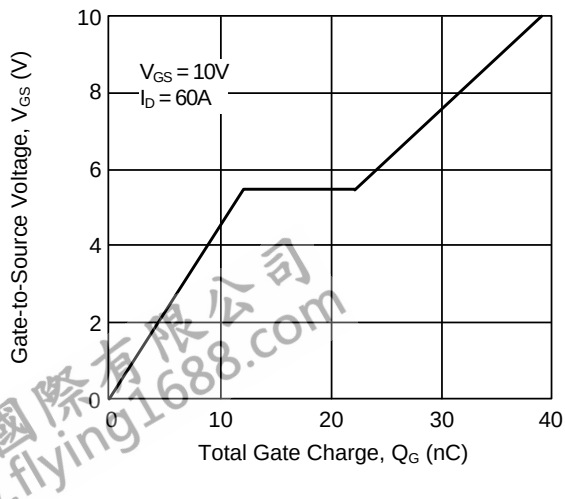
On-Resistance vs. Drain Current



Capacitance

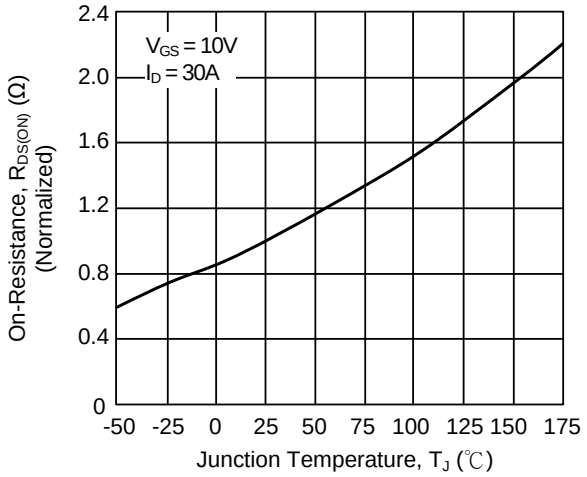


Gate Charge

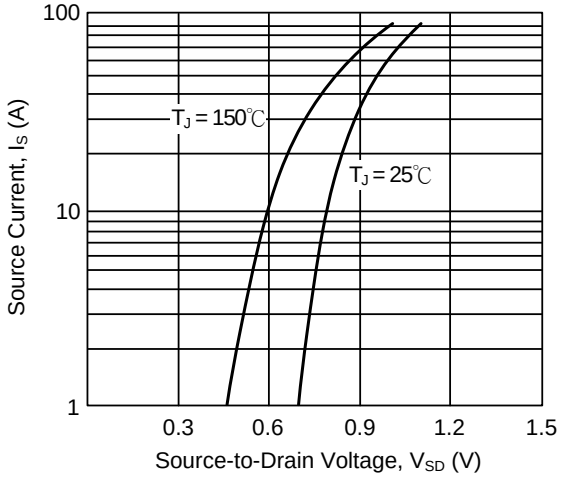


■ TYPICAL CHARACTERISTICS (Cont.)

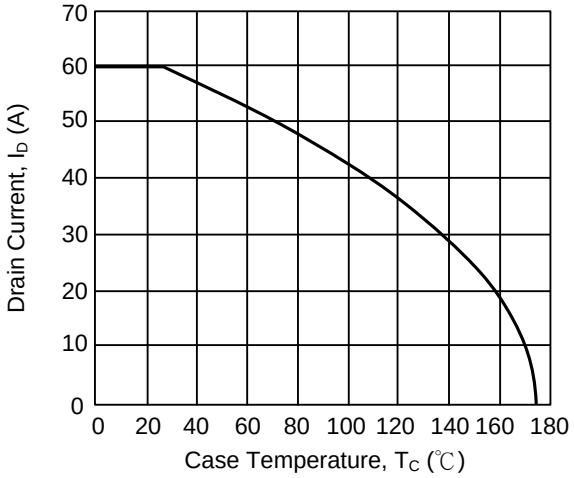
On-Resistance vs. Junction Temperature



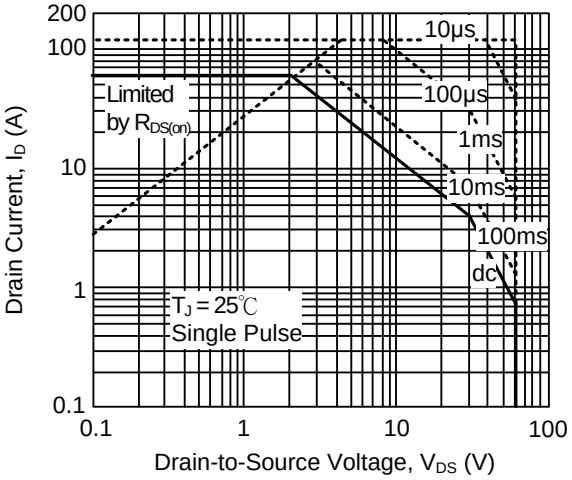
Source-Drain Diode Forward Voltage



Maximum Avalanche and Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance