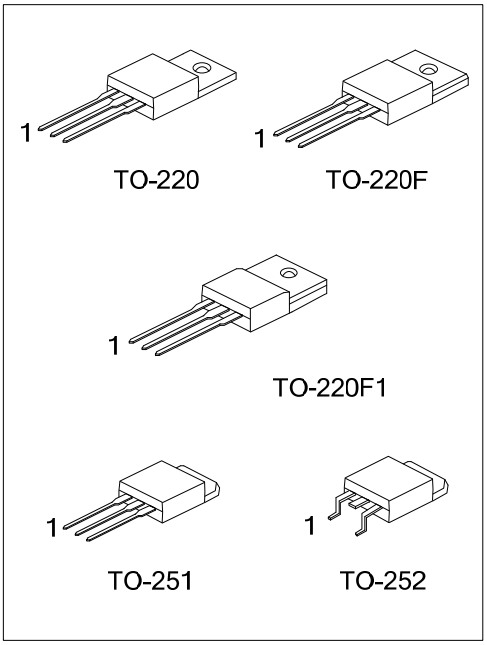
10NM60-U2

Power MOSFET

10A, 600V N-CHANNEL SUPER-JUNCTION MOSFET



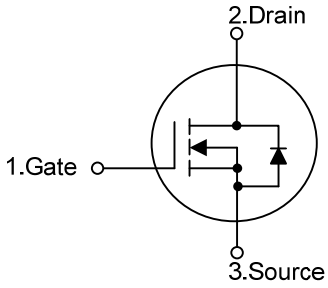
■ DESCRIPTION

The **UTC 10NM60-U2** is a Super Junction MOSFET Structure and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and a high rugged avalanche characteristics. This power MOSFET is usually used at DC-DC, AC-DC converters for power applications.

■ FEATURES

* $R_{DS(ON)}$ < 0.55Ω @ V_{GS}=10V, I_D=5.0A
* By using Super Junction Structure
* Fast Switching
* With 100% Avalanche Tested

■ SYMBOL



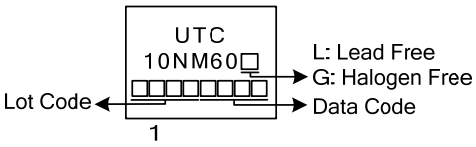
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
10NM60L-TA3-T	10NM60G-TA3-T	TO-220	G	D	S	Tube
10NM60L-TF3-T	10NM60G-TF3-T	TO-220F	G	D	S	Tube
10NM60L-TF1-T	10NM60G-TF1-T	TO-220F1	G	D	S	Tube
10NM60L-TM3-T	10NM60G-TM3-T	TO-251	G	D	S	Tube
10NM60L-TN3-R	10NM60G-TN3-R	TO-252	G	D	S	Tape Reel

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

10NM60G-TA3-T (1)Packing Type (2)Package Type (3)Green Package	(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TM3: TO-251, TN3: TO-252 (3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



■ ABSOLUTE MAXIMUM RATINGS (T_C =25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DSS}	600	V
Gate-Source Voltage		V_{GSS}	±30	V
Drain Current	Continuous	I_D	10	A
	Pulsed (Note 2)	I_{DM}	40	A
Avalanche Current (Note 2)		I_{AR}	1.9	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	238	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	5.6	V/ns
Power Dissipation	TO-220	P_D	156	W
	TO-220F/TO-220F1		25	W
	TO-251/TO-252		60	W
Junction Temperature		T_J	+150	°C
Storage Temperature Range		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=132mH, I_{AS}=1.9A, V_{DD}= 50V, R_G=25Ω, Starting T_J=25°C
4. I_{SD} ≤10A, di/dt ≤200A/μs, V_{DD} ≤BV_{DSS}, Starting T_J=25°C

■ THERMAL DATA

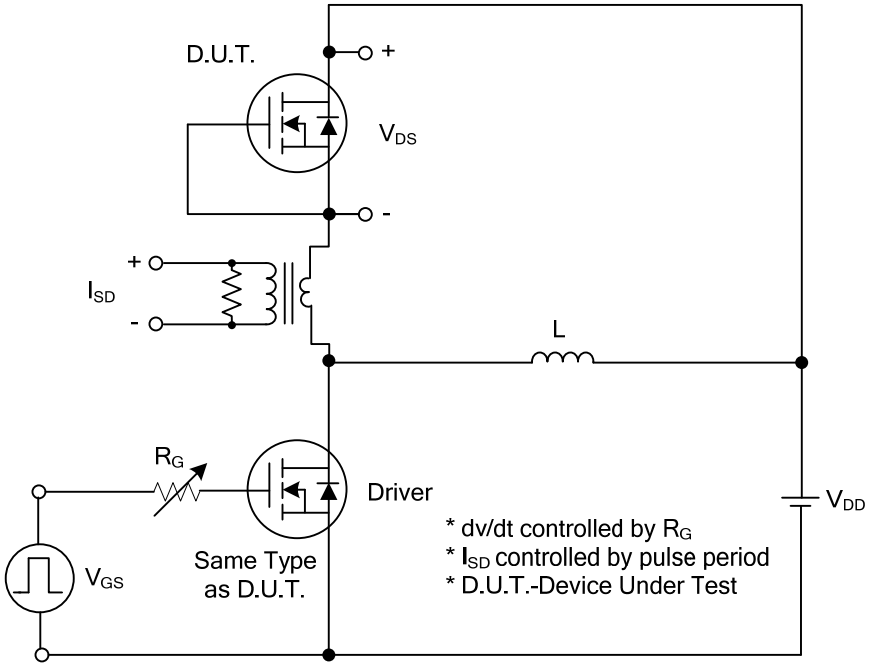
PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1	θ_{JA}	62.5	°C/W
	TO-251/TO-252		110	
Junction to Case	TO-220	θ_{JC}	0.8	°C/W
	TO-220F/TO-220F1		5.0	
	TO-251/TO-252		2.08	

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

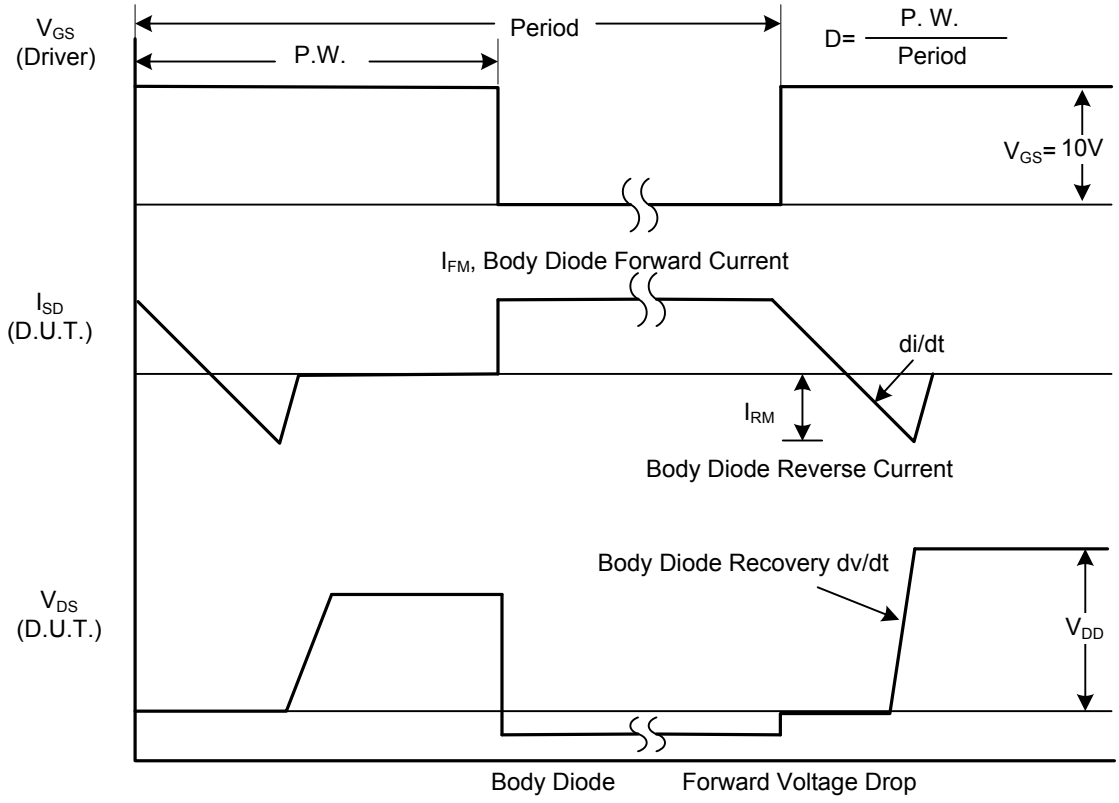
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V, I_D=250μA	600			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=600V, V_{GS}=0V			10	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{DS}=0V ,V_{GS}=30V			100	nA
	Reverse		V_{DS}=0V ,V_{GS}=-30V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}= V_{GS}, I_D=250μA	2.5		4.5	V
Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=10V, I_D=5.0A			0.55	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C_{ISS}	V_{GS}=0V, V_{DS}=25V, f=1.0MHz		650		pF
Output Capacitance		C_{OSS}			820		pF
Reverse Transfer Capacitance		C_{RSS}			100		pF
SWITCHING PARAMETERS							
Total Gate Charge (Note 1)		Q_G	V_{DS}=150V, V_{GS}=10V, I_D=6.0A (Note 1, 2)		29		nC
Gate to Source Charge		Q_{GS}			11		nC
Gate to Drain Charge		Q_{GD}			10		nC
Turn-ON Delay Time (Note 1)		$t_{D(ON)}$	V_{DD}=300V, V_{GS}=10V, I_D=8.0A, R_G=25Ω (Note 1, 2)		20		ns
Rise Time		t_R			23		ns
Turn-OFF Delay Time		$t_{D(OFF)}$			78		ns
Fall-Time		t_F			32		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I_S				10	A
Maximum Body-Diode Pulsed Current		I_{SM}				40	A
Drain-Source Diode Forward Voltage (Note 1)		V_{SD}	I_S =10A, V_{GS}=0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)		t_{rr}	I_S =10A, V_{GS}=0V, dI_F/dt=100A/μs		320		ns
Body Diode Reverse Recovery Charge		Q_{rr}			4.1		μC

Notes: 1. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%.
2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

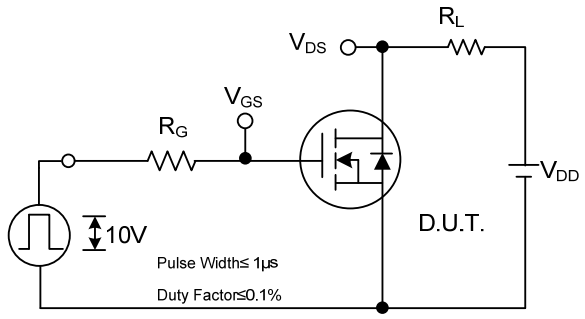


Peak Diode Recovery dv/dt Test Circuit

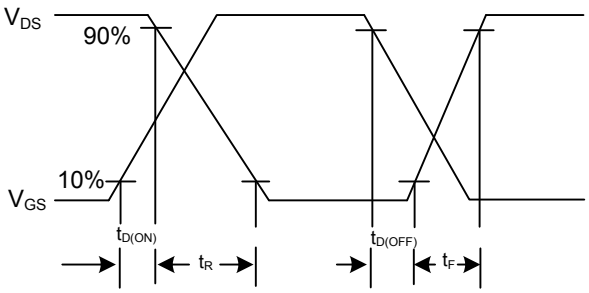


Peak Diode Recovery dv/dt Waveforms

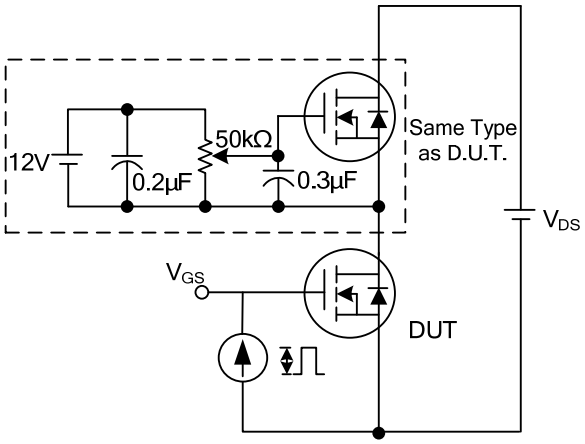
■ TEST CIRCUITS AND WAVEFORMS (Cont.)



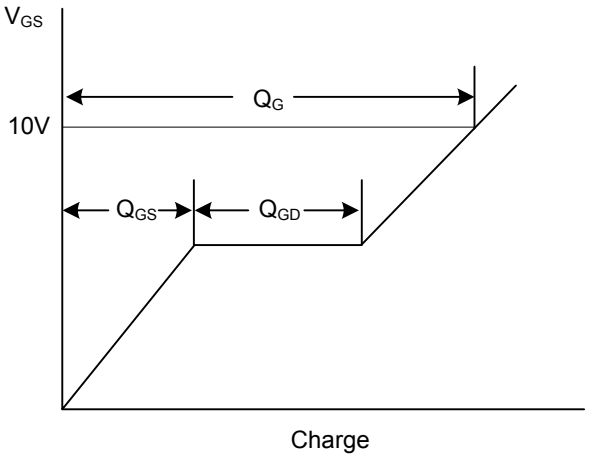
Switching Test Circuit



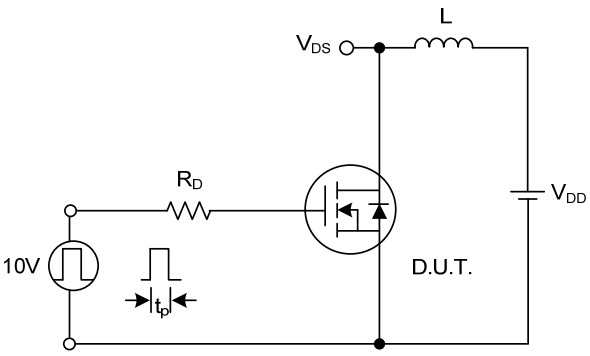
Switching Waveforms



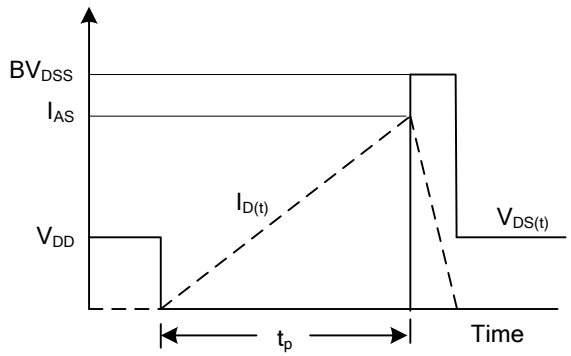
Gate Charge Test Circuit



Gate Charge Waveform



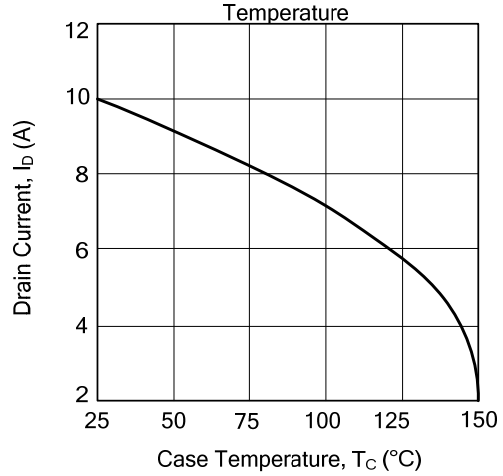
Unclamped Inductive Switching Test Circuit



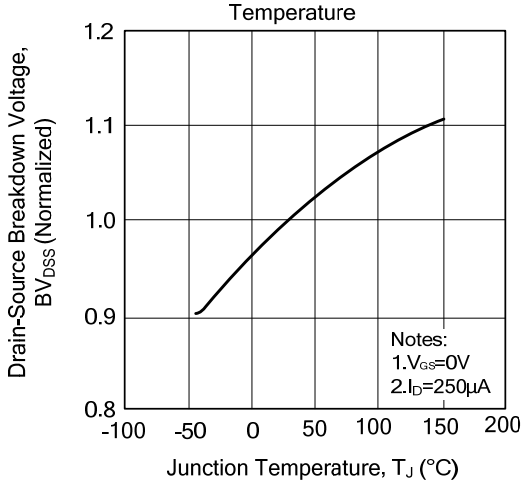
Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

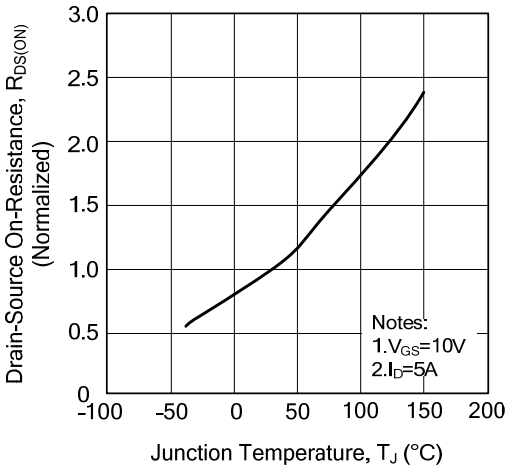
Maximum Drain Current vs. Case Temperature



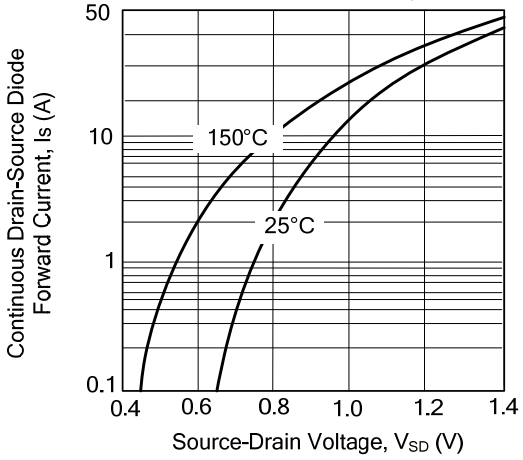
Breakdown Voltage Variation vs. Temperature



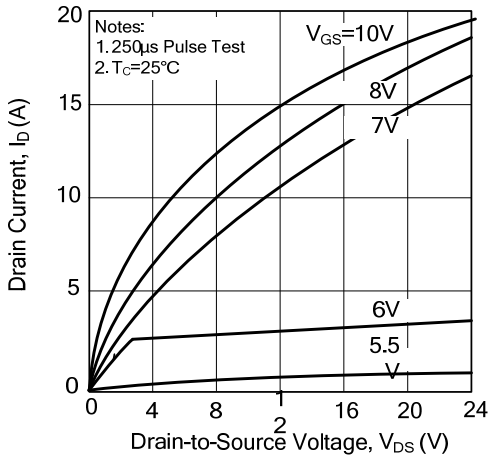
On-Resistance Variation vs. Temperature



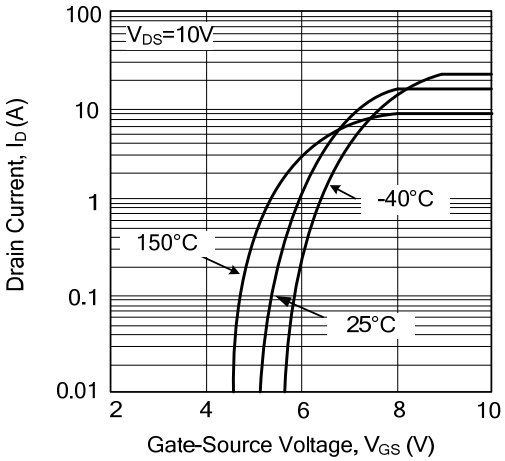
Body Diode Forward Voltage Variation with Source Current and Temperature



On-Region Characteristics

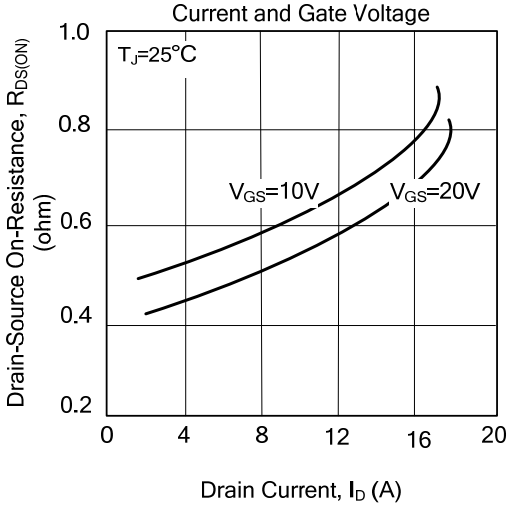


Transfer Characteristics

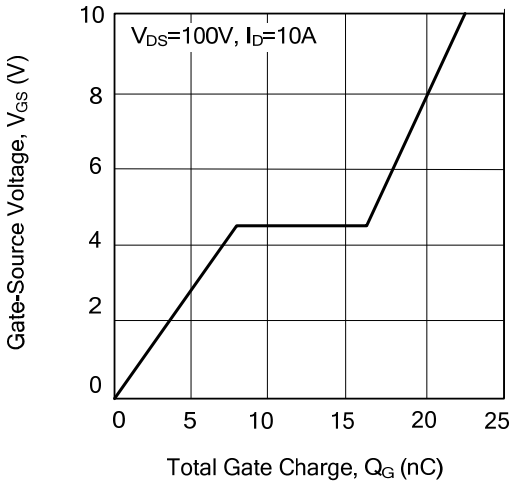


■ TYPICAL CHARACTERISTICS

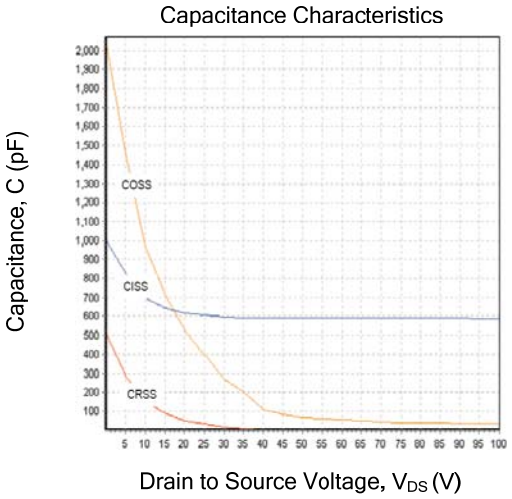
On-Resistance Variation vs. Drain Current and Gate Voltage



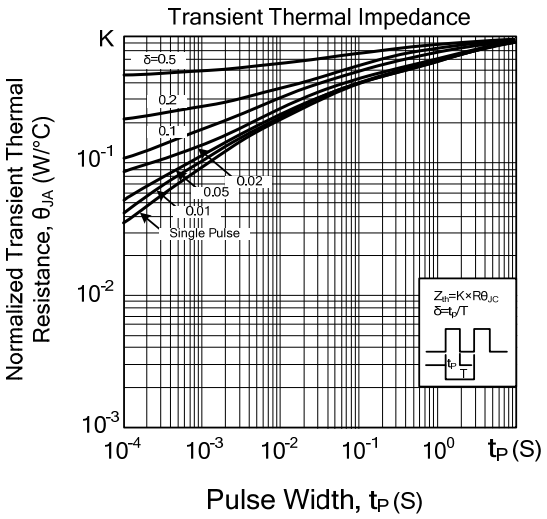
Gate Charge Characteristics



Capacitance Characteristics



Transient Thermal Impedance



Maximum Safe Operating Area