



10NM60-U2

Power MOSFET

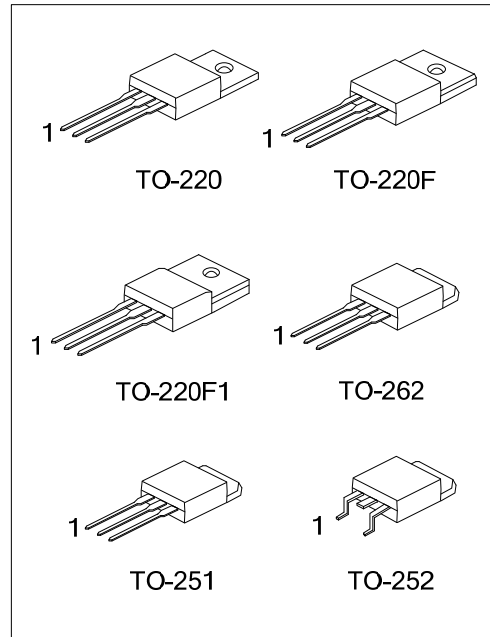
10A, 600V N-CHANNEL SUPER-JUNCTION MOSFET

DESCRIPTION

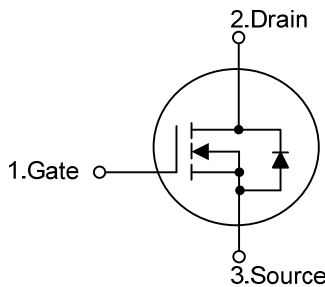
The **UTC 10NM60-U2** is a Super Junction MOSFET Structure and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and a high rugged avalanche characteristics. This power MOSFET is usually used at AC-DC converters for power applications.

FEATURES

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



SYMBOL



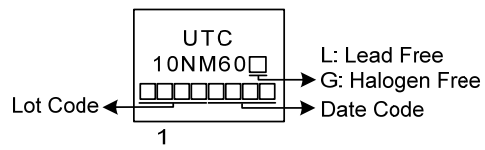
ORDERING INFORMATION

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
10NM60L-T2Q-T	10NM60G-T2Q-T	TO-262	G	D	S	Tube

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

<p>10NM60G-TA3-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) TA3: TO-220, TF3: TO-220F, TF1: TO-220F1, TM3: TO-251, TN3: TO-252, T2Q: TO-262</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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■ MARKING



■ ABSOLUTE MAXIMUM RATINGS ($T_C=25^{\circ}\text{C}$, 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	$T_C=25^{\circ}\text{C}$	10	A
			$T_C=100^{\circ}\text{C}$	6.5	A
	Pulsed (Note 2)		I_{DM}	30	A
Avalanche Energy	Single Pulsed (Note 3)		E_{AS}	306	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.0	V/ns	
Power Dissipation	TO-220/TO-263		P_D	82	W
	TO-220F/TO-220F1			28	W
	TO-251/TO-252			58	W
Junction Temperature		T_J	+150	$^{\circ}\text{C}$	
Storage Temperature Range		T_{STG}	-55 ~ +150	$^{\circ}\text{C}$	

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. $L=100\text{mH}$, $I_{AS}=2.47\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\Omega$, Starting $T_J=25^{\circ}\text{C}$

4. $I_{SD}\leq 10\text{A}$, $di/dt\leq 200\text{A}/\mu\text{s}$, $V_{DD}\leq BV_{DSS}$, Starting $T_J=25^{\circ}\text{C}$

■ THERMAL DATA

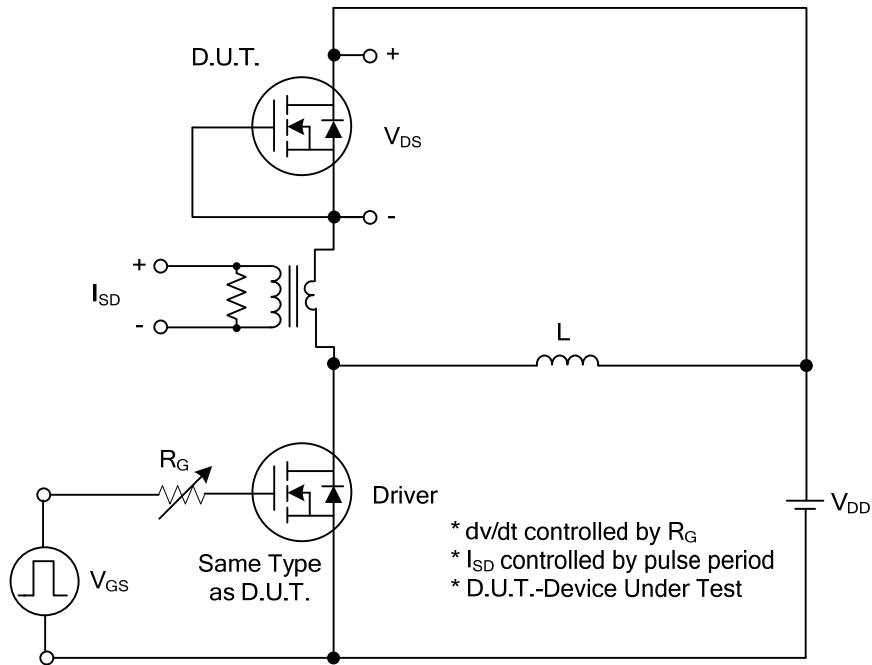
PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220/TO-220F	θ_{JA}	62.5	$^{\circ}\text{C}/\text{W}$
	TO-220F1/TO-263			
	TO-251/TO-252			
Junction to Case	TO-220/TO-263	θ_{JC}	1.52	$^{\circ}\text{C}/\text{W}$
	TO-220F/TO-220F1		4.46	
	TO-251/TO-252		2.16	

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

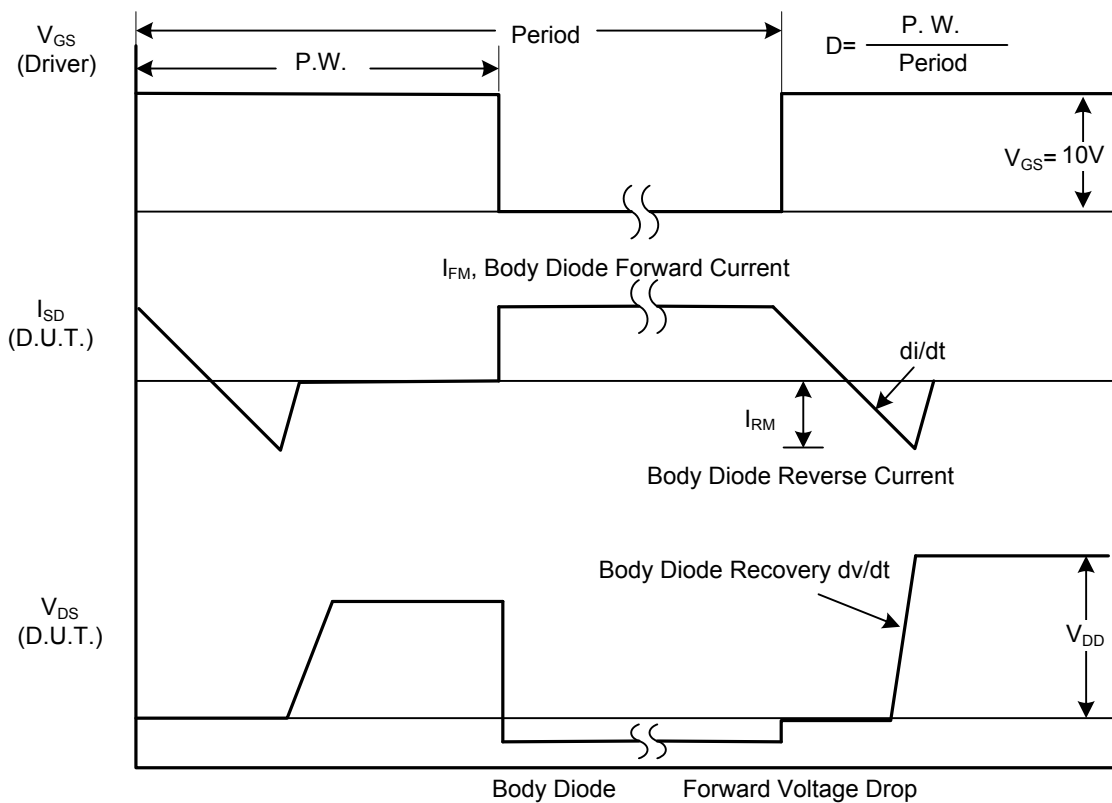
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =250μA	600			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =600V, V _{GS} =0V			10	μA
Gate-Source Leakage Current	Forward	V _{DS} =0V, V _{GS} =30V V _{DS} =0V, V _{GS} =-30V			100	nA
	Reverse				-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} =50V, f=1.0MHz		573		pF
Output Capacitance	C _{OSS}			71		pF
Reverse Transfer Capacitance	C _{RSS}			3.5		pF
SWITCHING PARAMETERS						
Total Gate Charge (Note 1)	Q _G	V _{DS} =480V, V _{GS} =10V, I _D =10A (Note 1, 2)		35		nC
Gate to Source Charge	Q _{GS}			12		nC
Gate to Drain Charge	Q _{GD}			11		nC
Turn-ON Delay Time (Note 1)	t _{D(ON)}	V _{DD} =100V, V _{GS} =10V, I _D =10A, R _G =25Ω (Note 1, 2)		8		ns
Rise Time	t _R			20		ns
Turn-OFF Delay Time	t _{D(OFF)}			68		ns
Fall-Time	t _F			34		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I _S				10	A
Maximum Body-Diode Pulsed Current	I _{SM}				30	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		595		ns
Body Diode Reverse Recovery Charge	Q _{rr}				0.4	

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

TEST CIRCUITS AND WAVEFORMS

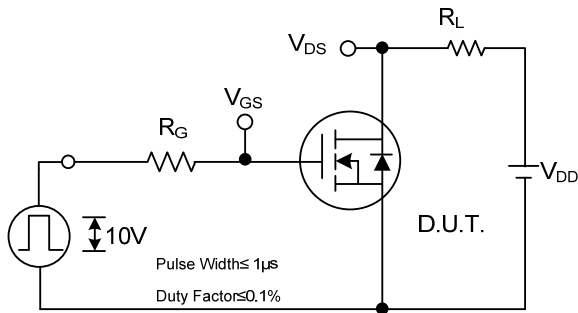


Peak Diode Recovery dv/dt Test Circuit



Peak Diode Recovery dv/dt Waveforms

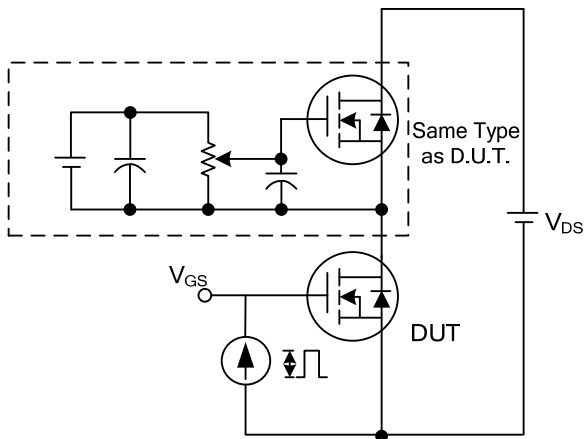
TEST CIRCUITS AND WAVEFORMS (Cont.)



Switching Test Circuit



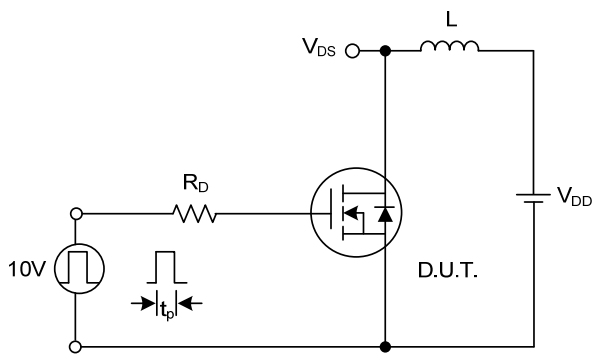
Switching Waveforms



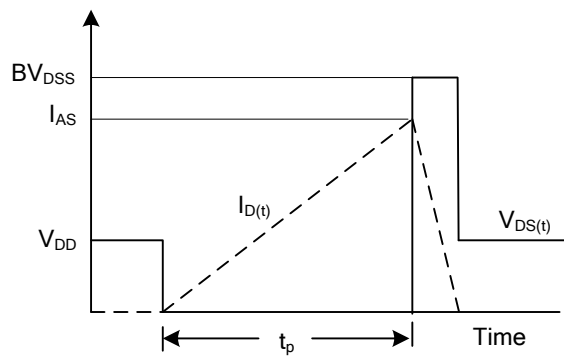
Gate Charge Test Circuit



Gate Charge Waveform

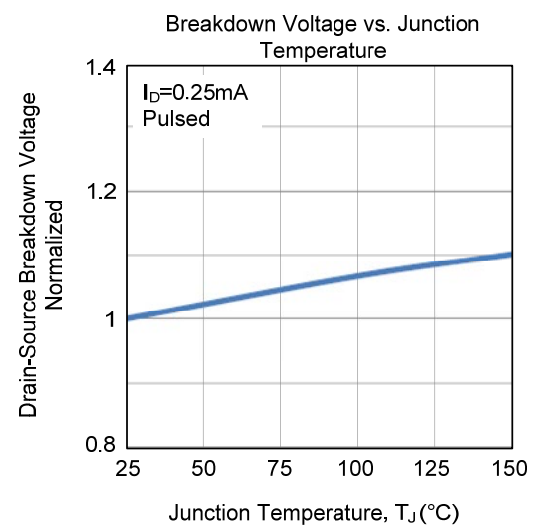
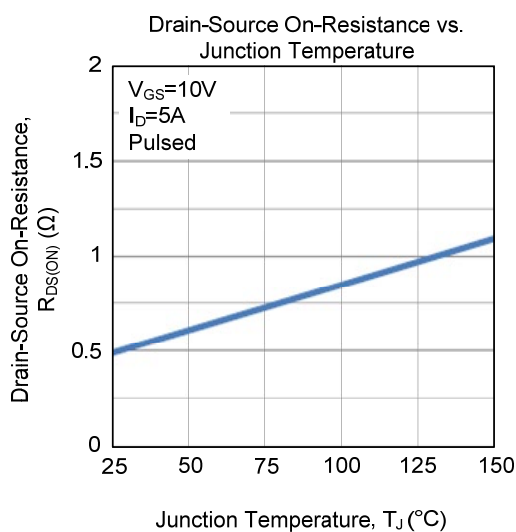
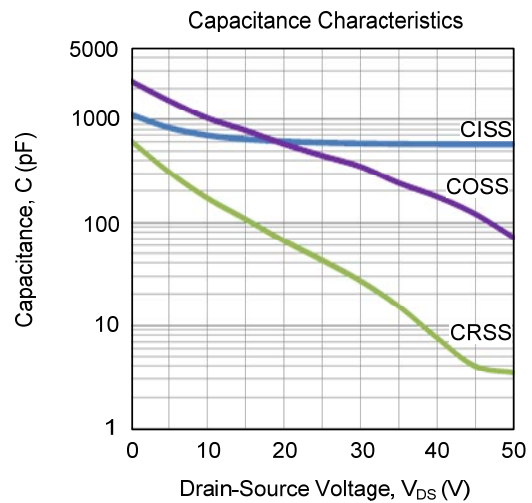
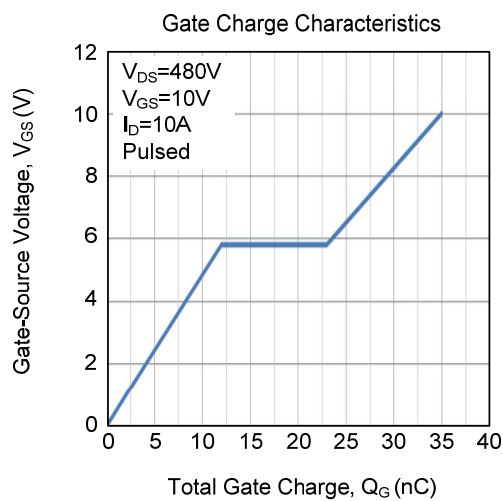
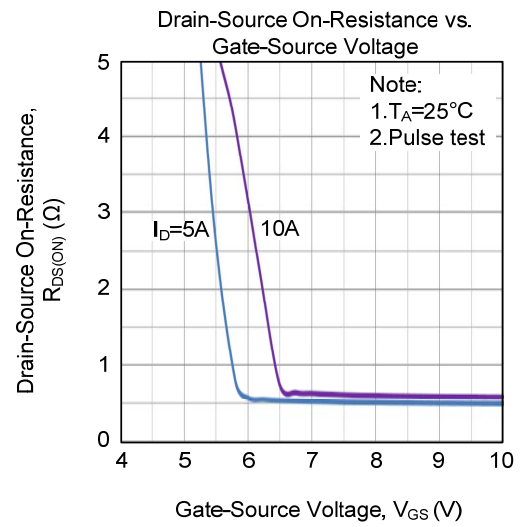
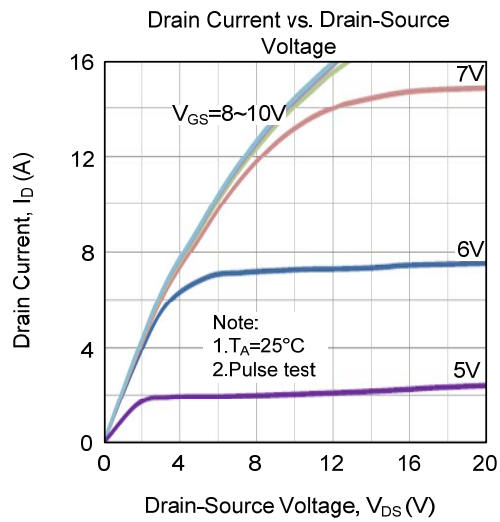


Unclamped Inductive Switching Test Circuit

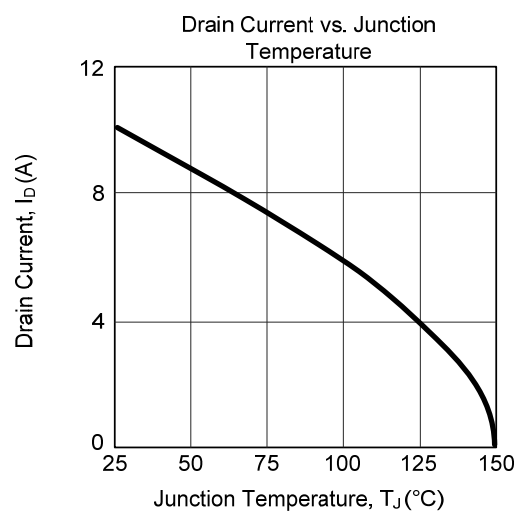
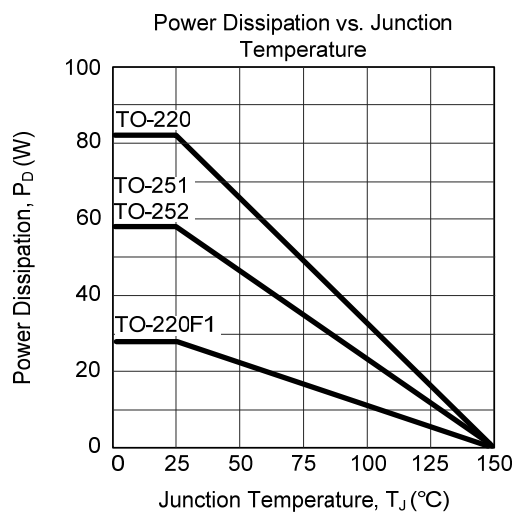
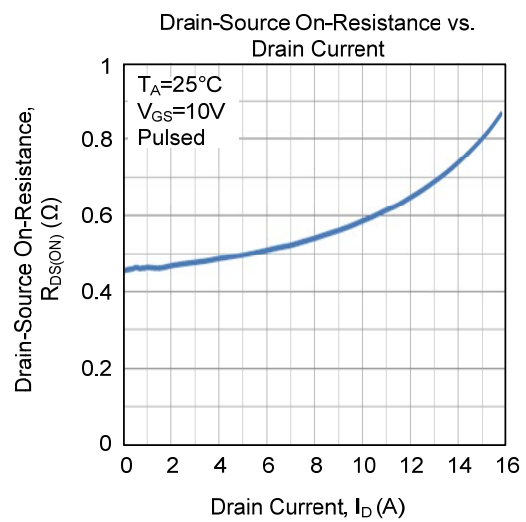
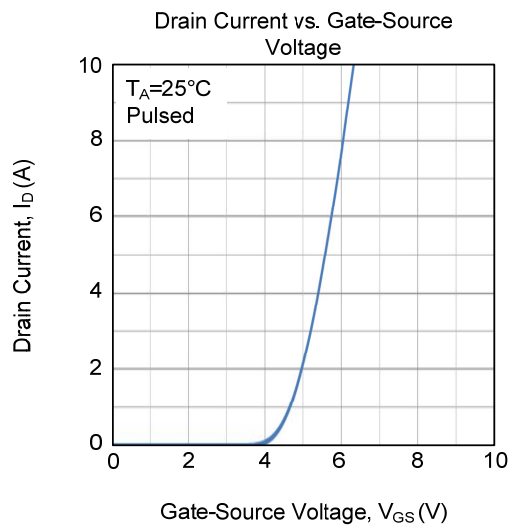
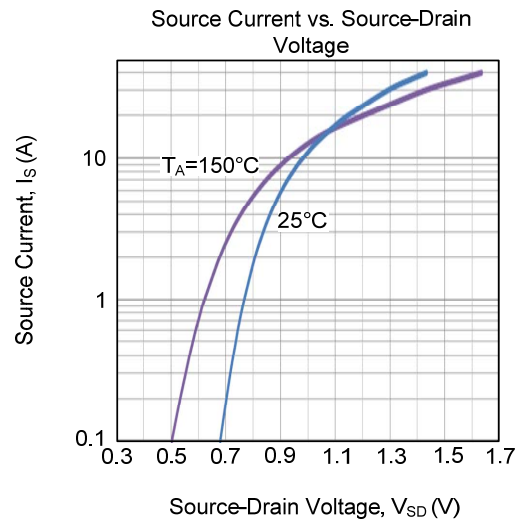
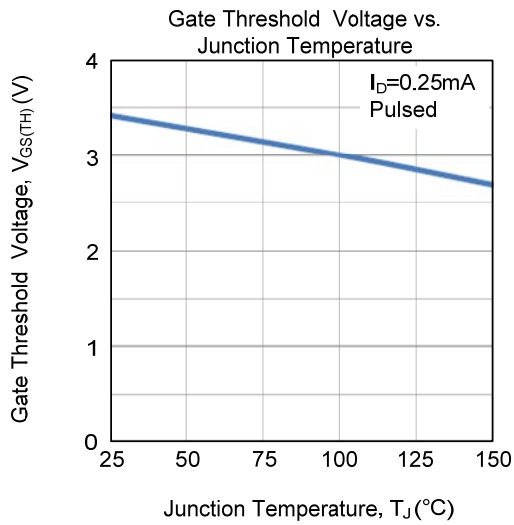


Unclamped Inductive Switching Waveforms

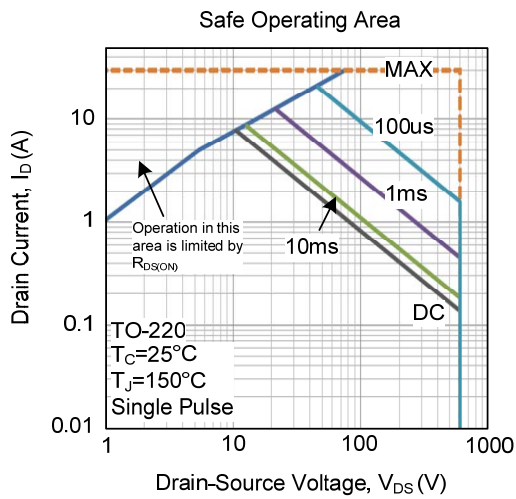
TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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