



USJ60R380Z

Power MOSFET

13A, 600V N-CHANNEL SUPER-JUNCTION MOSFET

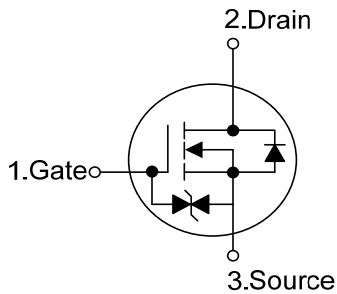
■ DESCRIPTION

The **UTC USJ60R380Z** 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

- * $R_{DS(ON)} \leq 0.38 \Omega @ V_{GS}=10V, I_D=2.7A$
- * Fast switching capability
- * Avalanche energy tested
- * Improved dv/dt capability, high ruggedness
- * With ESD protection

■ SYMBOL

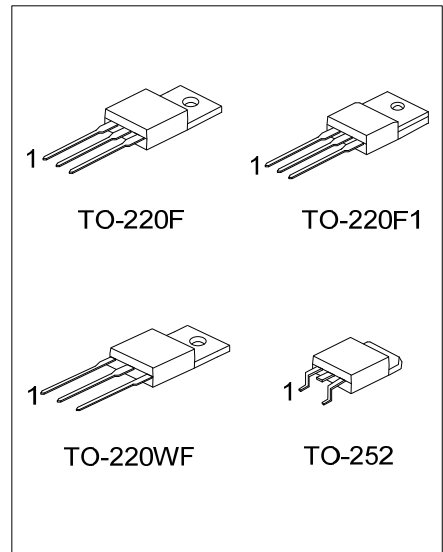


■ ORDERING INFORMATION

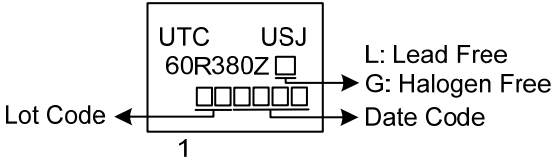
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
USJ60R380ZL-TF1-T	USJ60R380ZG-TF1-T	TO-220F1	G	D	S	Tube
USJ60R380ZL-TF3-T	USJ60R380ZG-TF3-T	TO-220F	G	D	S	Tube
USJ60R380ZL-TW1-T	USJ60R380ZG-TW1-T	TO-220WF	G	D	S	Tube
USJ60R380ZL-TN3-R	USJ60R380ZG-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>USJ60R380ZG-TF1-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) TF1: TO-220F1, TF3: TO-220F, TW1: TO-220WF TN3: TO-252</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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■ 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	13	A
	Pulsed (Note 2)	I _{DM}	39	A
Avalanche Energy	Single Pulsed (Note 3)	E _{AS}	153	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	1.06	V/ns
Power Dissipation	TO-220F/TO-220F1	P _D	29	W
	TO-220WF			
	TO-252		59	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 = 100mH, I_{AS} = 1.8A, V_{DD} = 50V, R_G = 25 Ω Starting T_J = 25°C

4. I_{SD} ≤ 13A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220F/TO-220F1	θ _{JA}	62.5	°C/W
	TO-220WF			
	TO-252		110	°C/W
Junction to Case	TO-220F/TO-220F1	θ _{JC}	4.3	°C/W
	TO-220WF			
	TO-252		2.1 (Note)	°C/W

Note: Device mounted on FR-4 substrate P_C board, 2oz copper, with 1inch square copper plate.

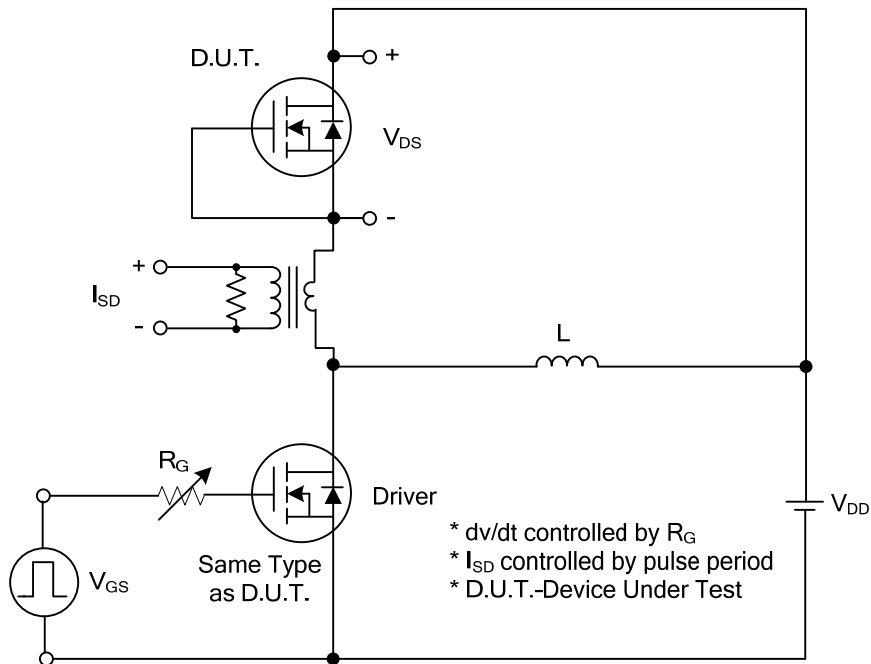
■ ELECTRICAL CHARACTERISTICS (T_J=25°C, unless otherwise specified)

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} =25V			10	μA	
	Reverse		V _{DS} =0V, V _{GS} =-20V			-10	μA	
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 =2.7A			0.38	Ω	
DYNAMIC PARAMETERS								
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =50V, f=1.0MHz		677		pF	
Output Capacitance		C _{OSS}				216		pF
Reverse Transfer Capacitance		C _{RSS}				10		pF
SWITCHING PARAMETERS								
Total Gate Charge (Note 1)		Q _G	V _{DS} =480V, V _{GS} =10V, I _D =13A (Note 1, 2)		31		nC	
Gate to Source Charge		Q _{GS}				8		nC
Gate to Drain Charge		Q _{GD}				12		nC
Internal Gate Input Resistance		R _G	V _{GS} =0V, f=1MHz		3.4		Ω	
Turn-ON Delay Time (Note 1)		t _{D(ON)}	V _{DD} =100V, V _{GS} =10V, I _D =13A, R _G =25Ω (Note 1, 2)		13		ns	
Rise Time		t _R				24		ns
Turn-OFF Delay Time		t _{D(OFF)}				73		ns
Fall-Time		t _F				32		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS								
Maximum Continuous Drain-Source Diode Forward Current		I _S				13	A	
Drain-Source Diode Forward Voltage (Note 1)		V _{SD}	I _S =13A, V _{GS} =0V			1.4	V	
Body Diode Reverse Recovery Time (Note 1)		t _{rr}	I _S =13A, V _{GS} =0V, dI _F /dt=100A/μs		310		ns	
Body Diode Reverse Recovery Charge		Q _{rr}				3.77		μC

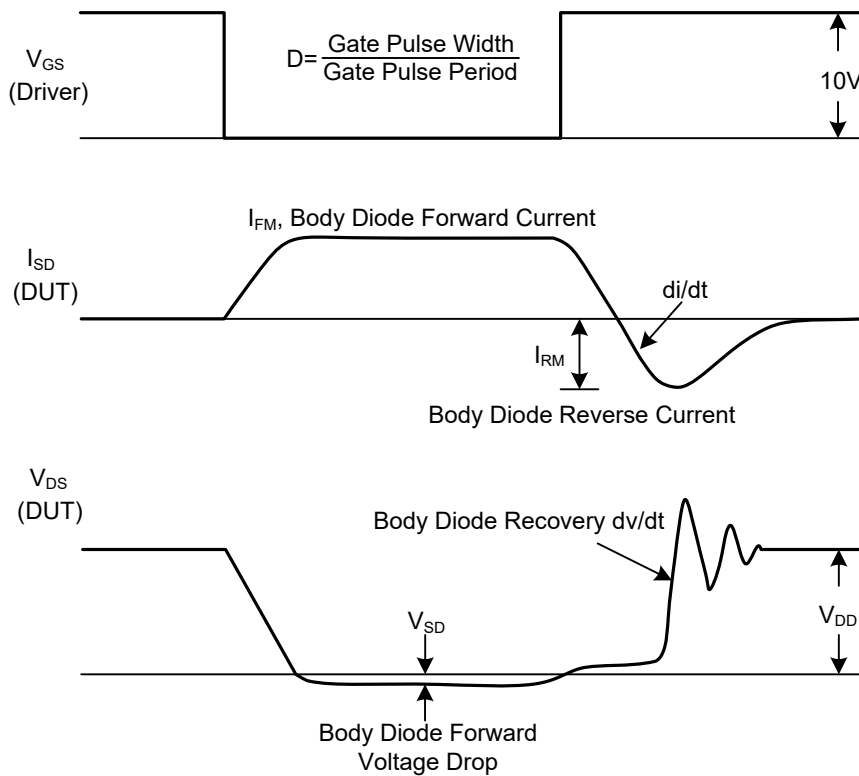
Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

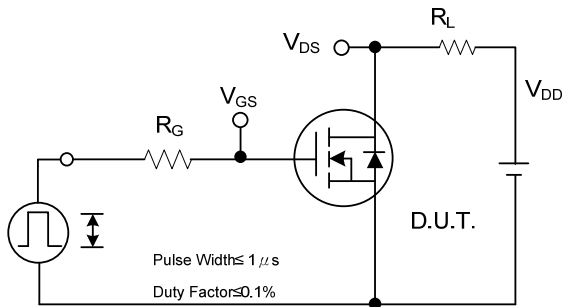


Peak Diode Recovery dv/dt Test Circuit

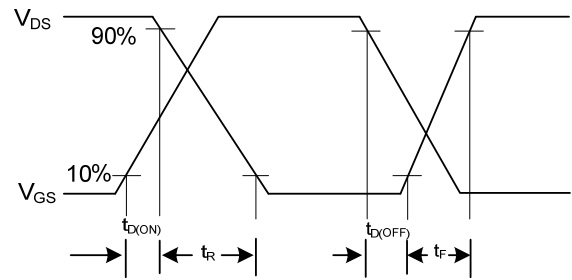


Peak Diode Recovery dv/dt Waveforms

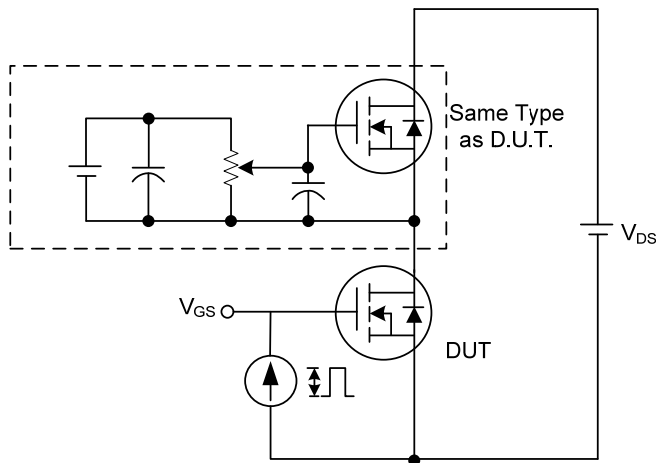
TEST CIRCUITS AND WAVEFORMS



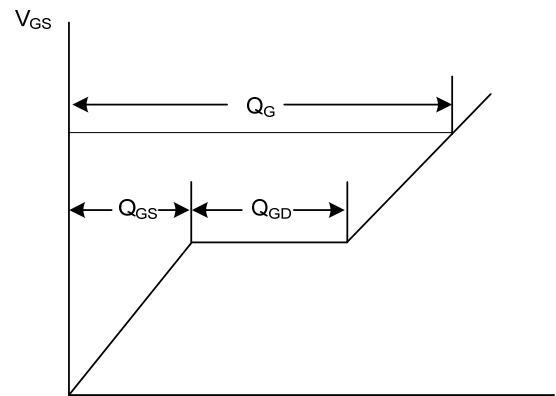
Switching Test Circuit



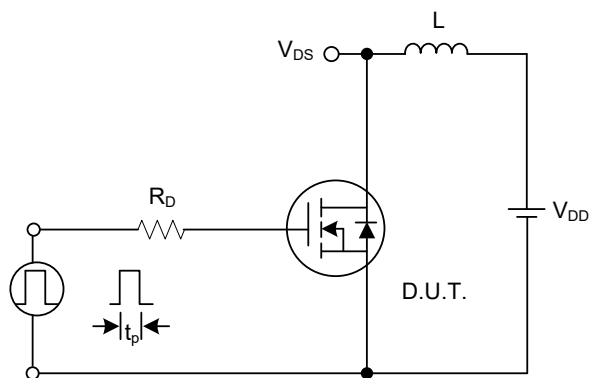
Switching Waveforms



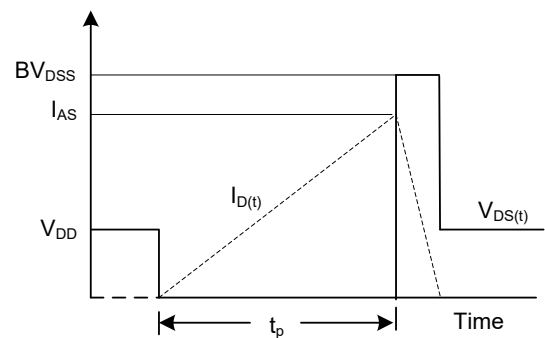
Gate Charge Test Circuit



Charge
Gate Charge Waveform

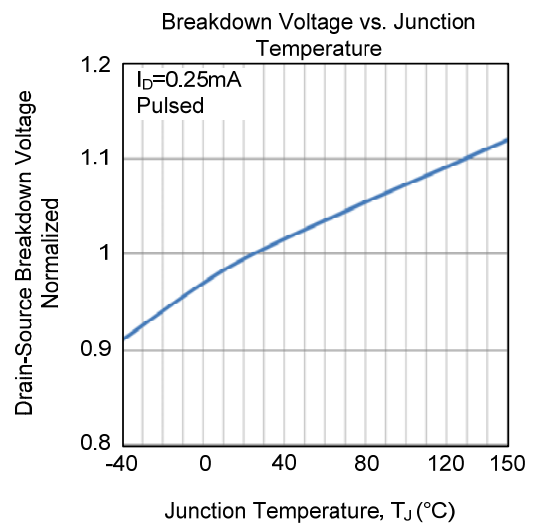
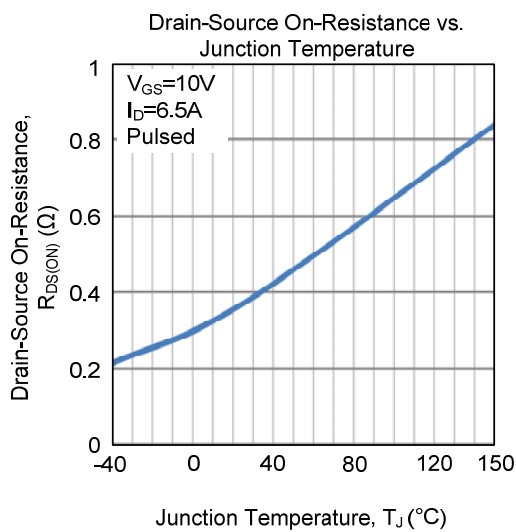
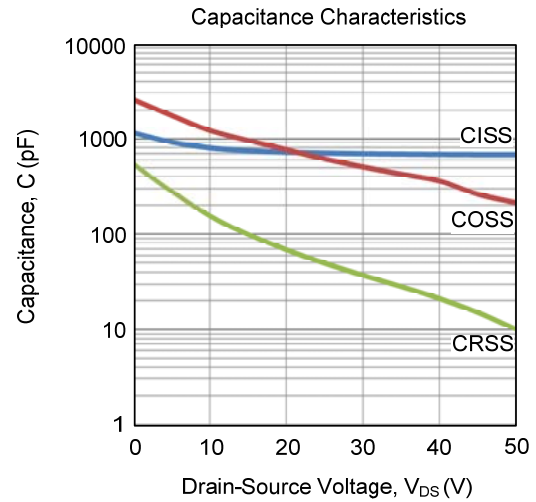
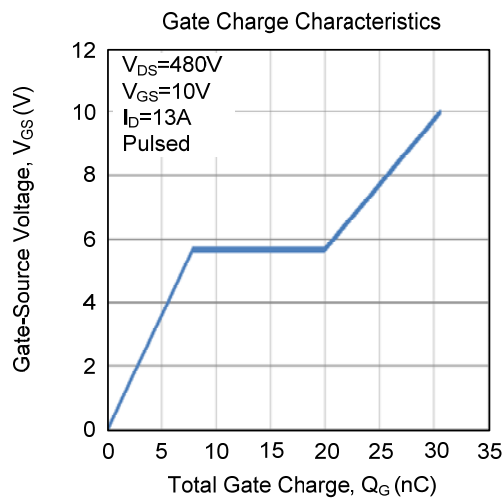
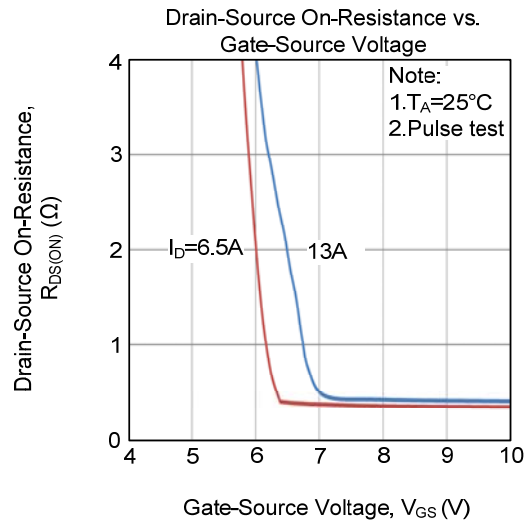
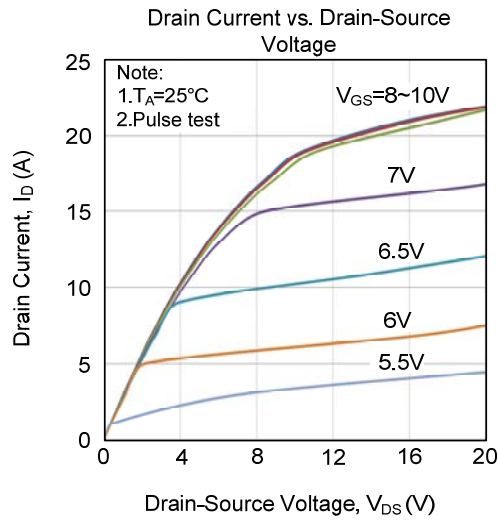


Unclamped Inductive Switching Test Circuit

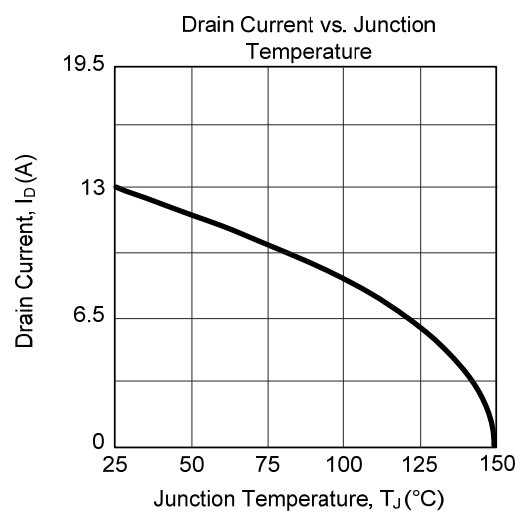
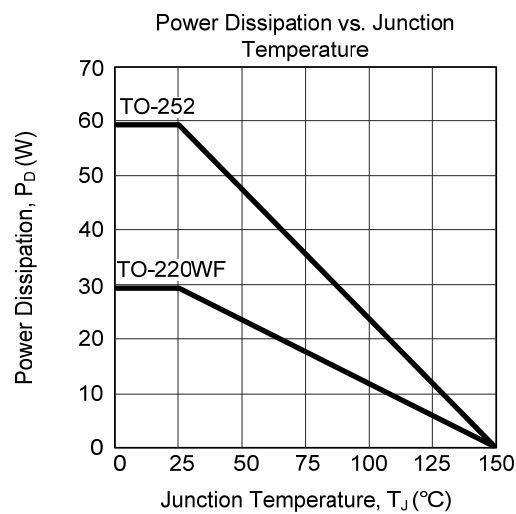
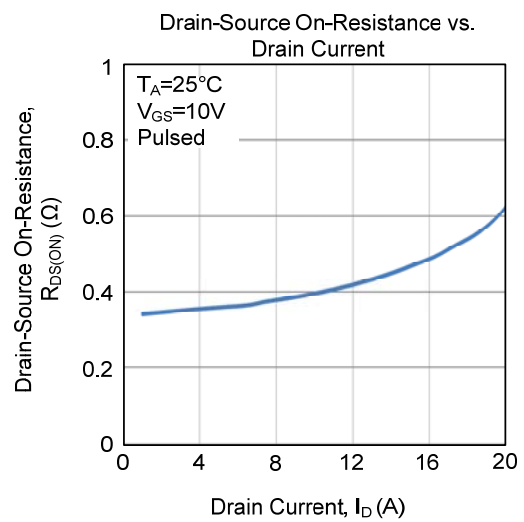
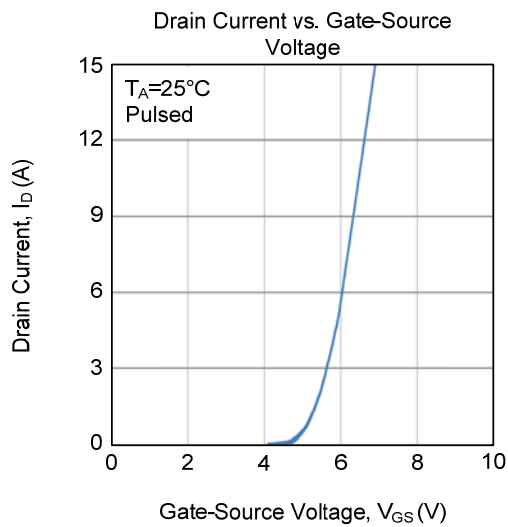
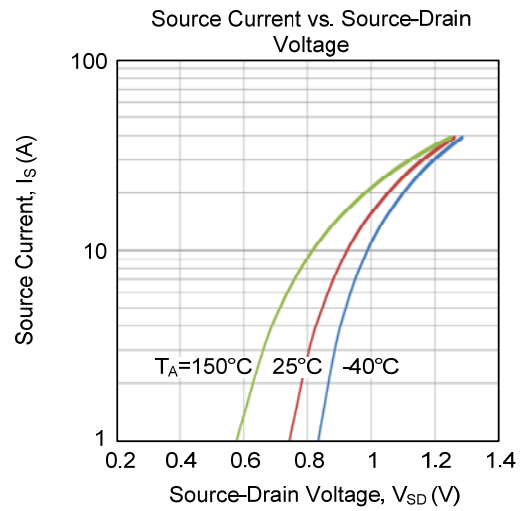
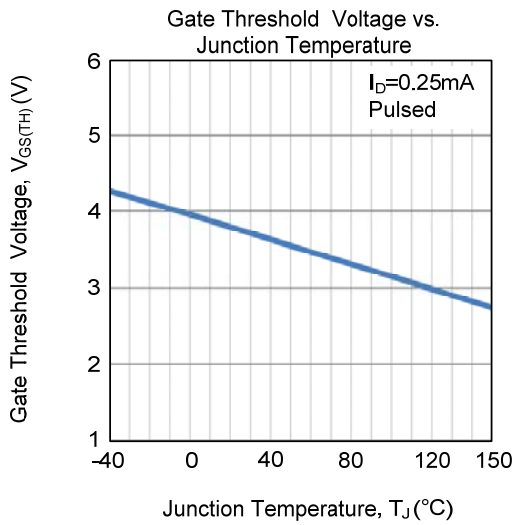


Unclamped Inductive Switching Waveforms

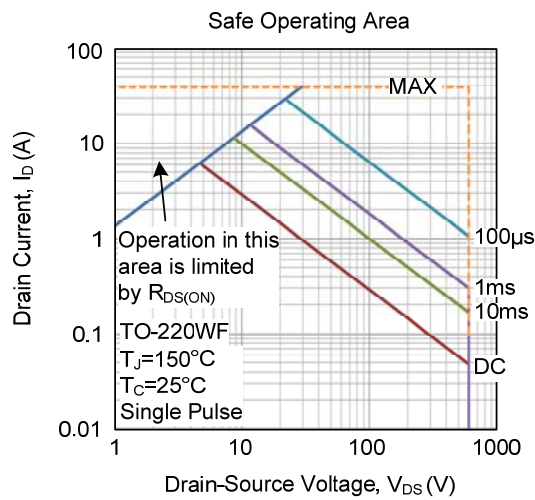
TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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