



20NM80-Q

Power MOSFET

20A, 800V N-CHANNEL SUPER-JUNCTION MOSFET

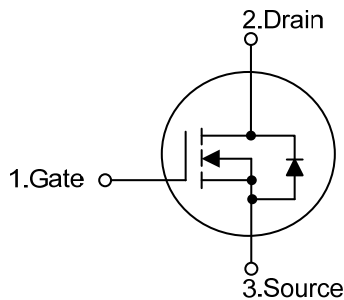
DESCRIPTION

The **UTC 20NM80-Q** 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

- * $R_{DS(ON)} \leq 0.35 \Omega$ @ $V_{GS}=10V$, $I_D=10A$
- * Fast switching capability
- * Avalanche energy tested
- * Improved dv/dt capability, high ruggedness

SYMBOL

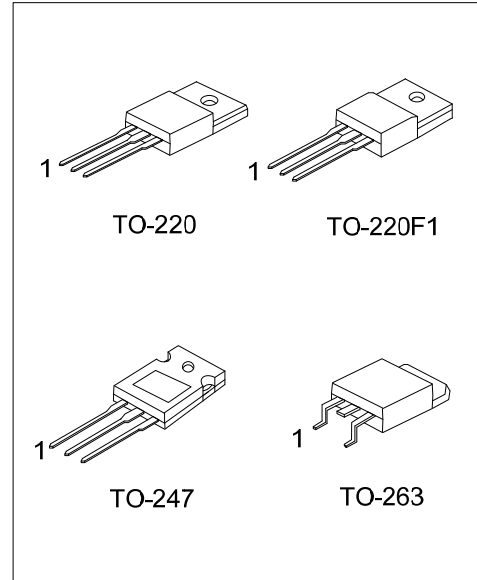


ORDERING INFORMATION

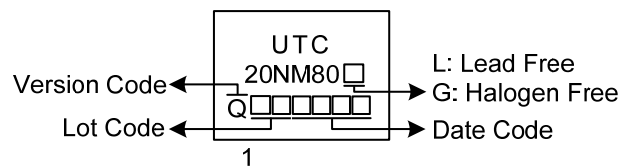
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
20NM80L-TA3-T	20NM80G-TA3-T	TO-220	G	D	S	Tube
20NM80L-TF1-T	20NM80G-TF1-T	TO-220F1	G	D	S	Tube
20NM80L-TQ2-T	20NM80G-TQ2-T	TO-263	G	D	S	Tube
20NM80L-TQ2-R	20NM80G-TQ2-R	TO-263	G	D	S	Tape Reel
20NM80L-T47-T	20NM80G-T47-T	TO-247	G	D	S	Tube

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

20NM80G-TA3-T	(1)Packing Type	(1) T: Tube, R: Tape Reel
	(2)Package Type	(2) TA3: TO-220, TF1: TO-220F1, TQ2: TO-263, T47: TO-247
	(3)Green Package	(3) G: Halogen Free and Lead Free, L: Lead Free



■ MARKING



■ **ABSOLUTE MAXIMUM RATINGS** ($T_C=25^{\circ}\text{C}$, unless otherwise specified)

PARAMETER			SYMBOL	RATINGS	UNIT
Drain-Source Voltage			V _{DSS}	800	V
Gate-Source Voltage			V _{GSS}	±30	V
Drain Current	Continuous	T _C =25°C	I _D	20	A
		T _C =100°C		13	A
	Pulsed (Note 2)		I _{DM}	60	A
Avalanche Energy	Single Pulsed (Note 3)		E _{AS}	338	mJ
Peak Diode Recovery dv/dt (Note 4)			dv/dt	1.2	V/ns
Power Dissipation	TO-220		P _D	110	W
	TO-220F1			31	W
	TO-247			130	W
	TO-263			110	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. $L = 100\text{mH}$, $I_{AS} = 2.6\text{A}$, $V_{DD} = 90\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$

4. $I_{SD} \leq 20\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^{\circ}\text{C}$

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F1	θ_{JA}	62.5	$^{\circ}\text{C}/\text{W}$
	TO-263			
	TO-247		40	$^{\circ}\text{C}/\text{W}$
Junction to Case	TO-220	θ_{JC}	1.13	$^{\circ}\text{C}/\text{W}$
	TO-220F1		4.03	$^{\circ}\text{C}/\text{W}$
	TO-247		0.96	$^{\circ}\text{C}/\text{W}$
	TO-263		1.13 (Note)	$^{\circ}\text{C}/\text{W}$

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

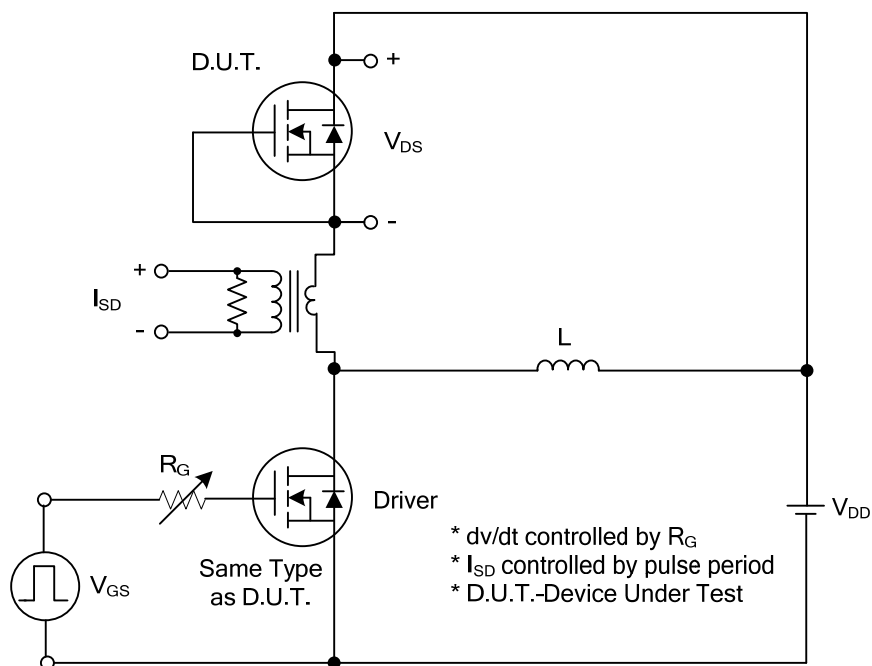
■ **ELECTRICAL CHARACTERISTICS** ($T_J=25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =250μA	800			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =800V, V _{GS} =0V			10	μA
Gate-Source Leakage Current	I _{GSS}	V _{GS} =±30V, V _{DS} =0V			±100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} =V _{GS} , I _D =250μA	2.5		4.5	V
Static Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =10A			0.35	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C _{ISS}	V _{GS} =0V, V _{DS} =50V, f=1MHz		1310		pF
Output Capacitance	C _{OSS}			161		pF
Reverse Transfer Capacitance	C _{RSS}			4.8		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge	Q _G	V _{DS} =640V, V _{GS} =10V, I _D =20A (Note 1, 2)		62		nC
Gate-Source Charge	Q _{GS}			15		nC
Gate-Drain Charge	Q _{DD}			24		nC
Turn-On Delay Time	t _{D(ON)}	V _{DD} =100V, V _{GS} =10V, I _D =20A, R _G =25Ω (Note 1, 2)		19		ns
Turn-On Rise Time	t _R			30		ns
Turn-Off Delay Time	t _{D(OFF)}			140		ns
Turn-Off Fall Time	t _F			63		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Continuous Drain-Source Diode Forward Current	I _S				20	A
Maximum Pulsed Drain-Source Diode Forward Current	I _{SM}				60	A
Drain-Source Diode Forward Voltage	V _{SD}	I _S =20A, V _{GS} =0V			1.4	V
Body Diode Reverse Recovery Time	t _{rr}	I _S =20A, V _{GS} =0V,		530		nS
Body Diode Reverse Recovery Charge	Q _{rr}	dl _F /dt=100A/μs		11		μC

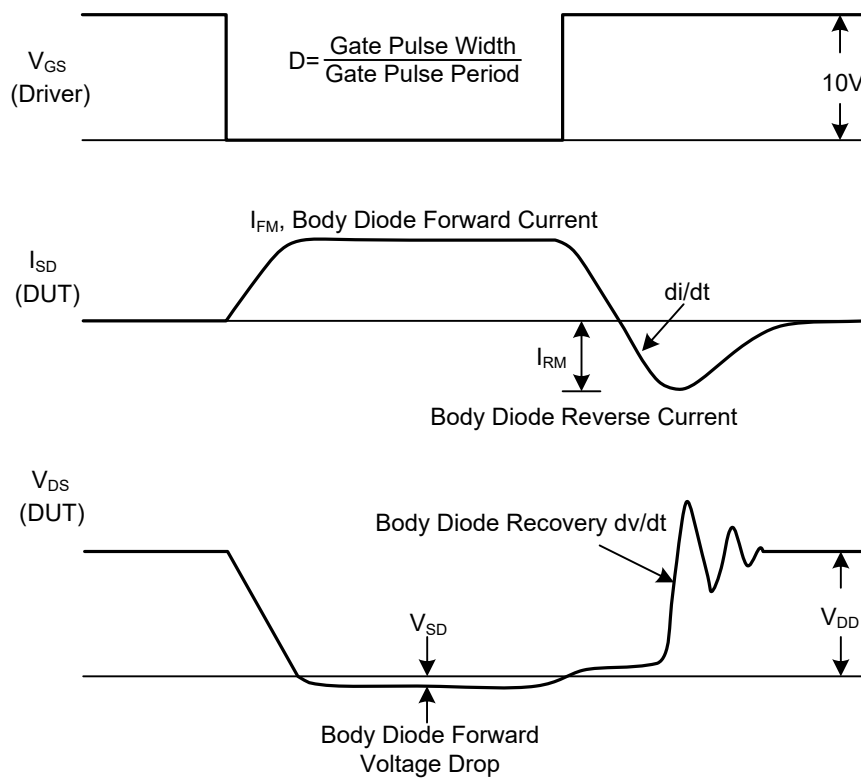
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

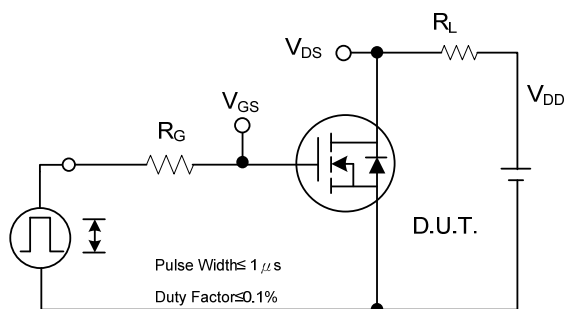


Peak Diode Recovery dv/dt Test Circuit

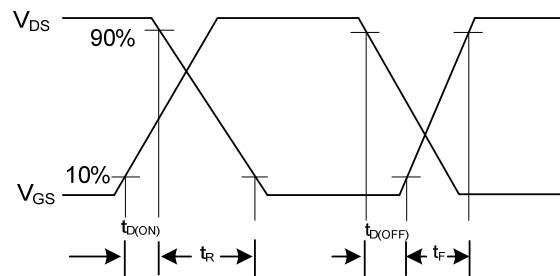


Peak Diode Recovery dv/dt Waveforms

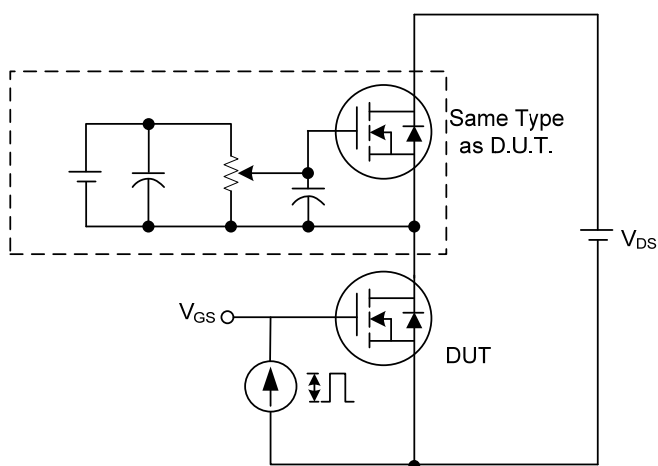
■ TEST CIRCUITS AND WAVEFORMS



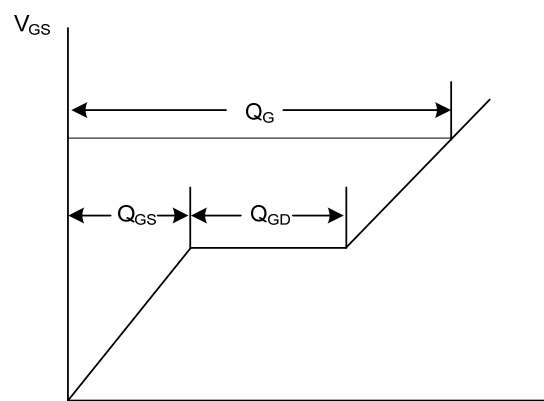
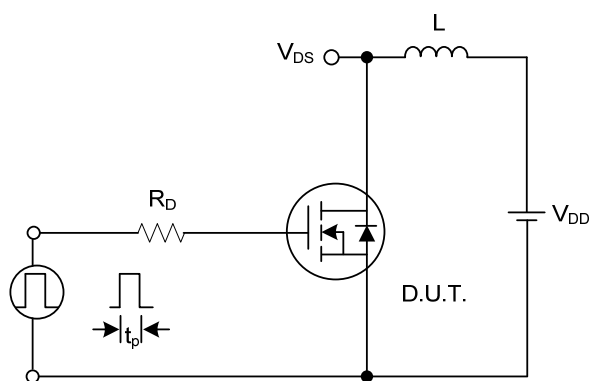
Switching Test Circuit



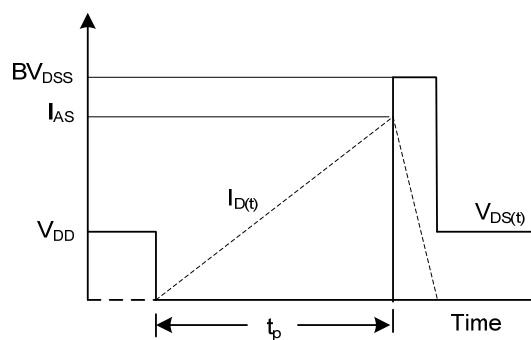
Switching Waveforms



Gate Charge Test Circuit

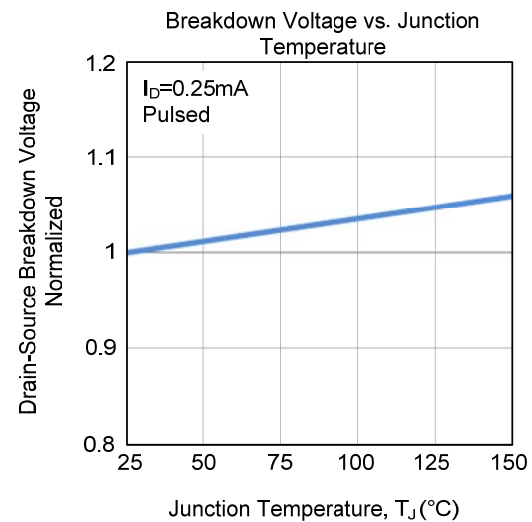
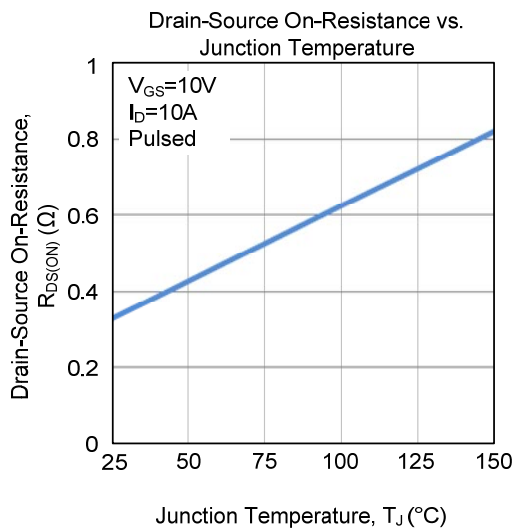
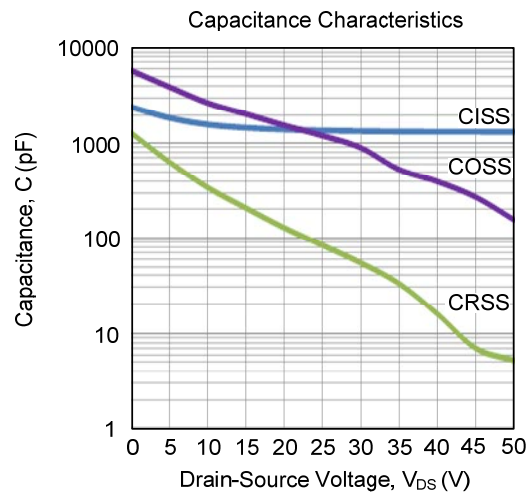
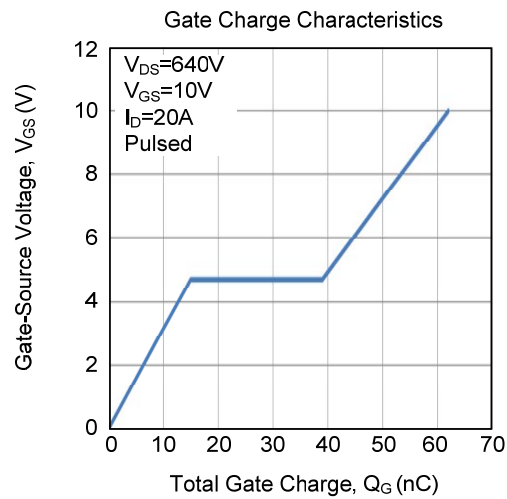
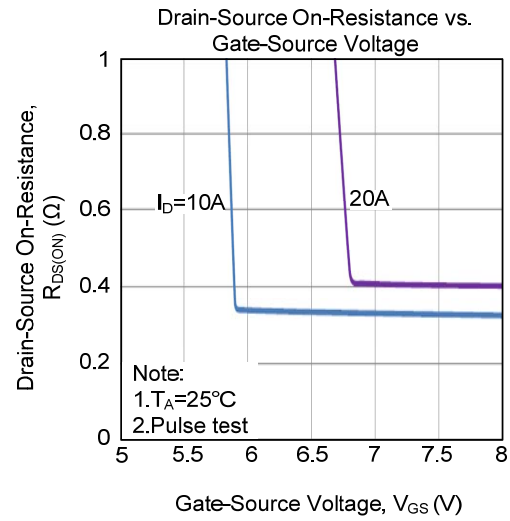
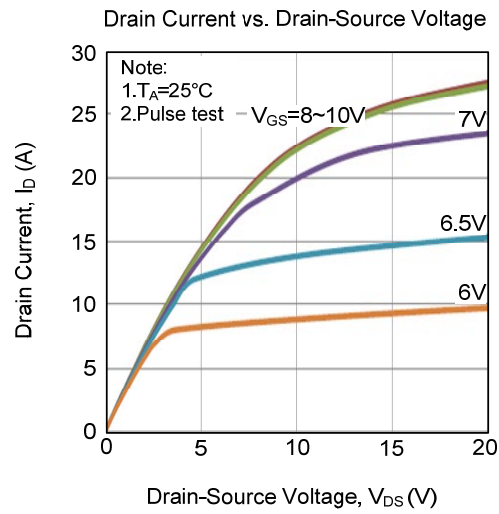
Charge
Gate Charge Waveform

Unclamped Inductive Switching Test Circuit

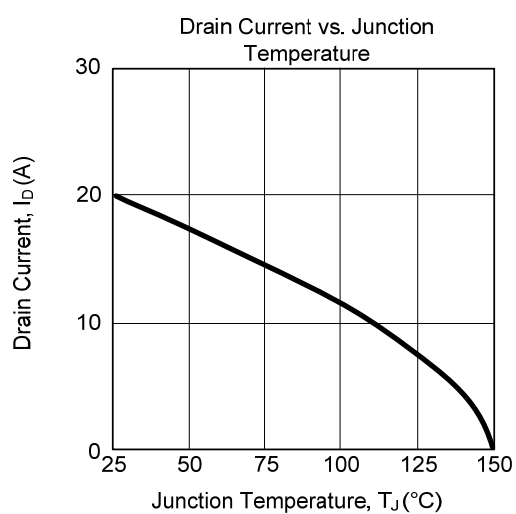
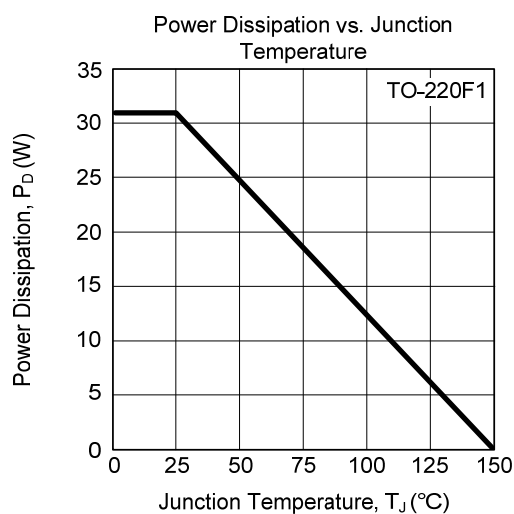
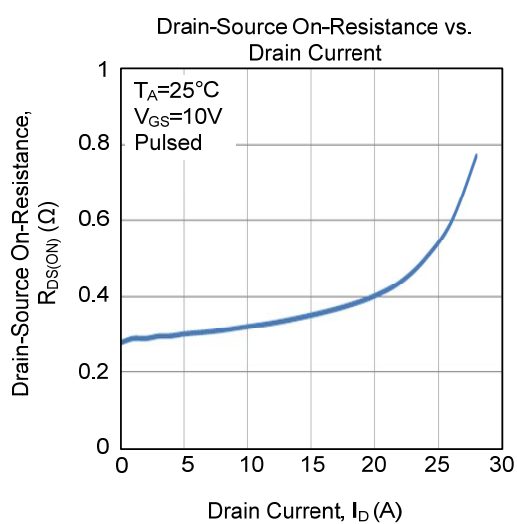
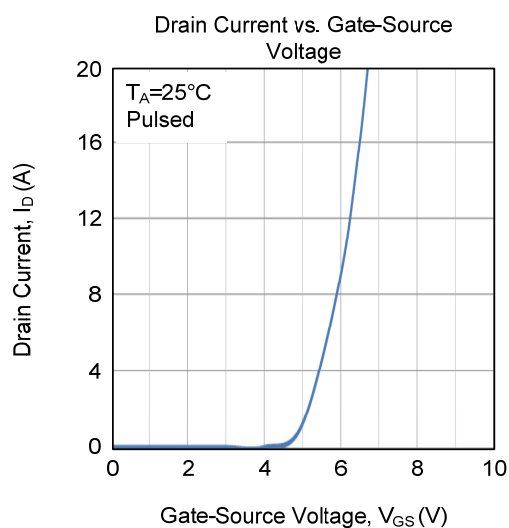
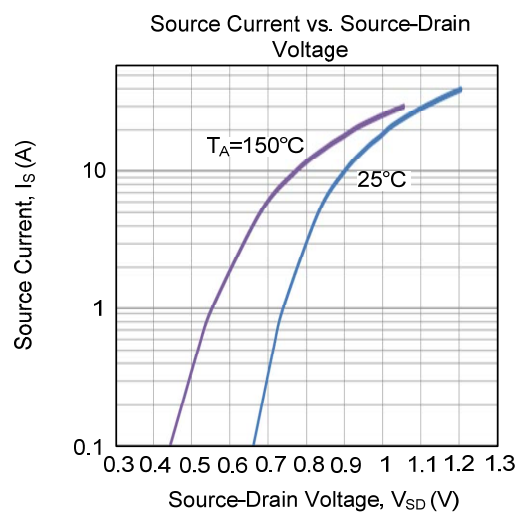
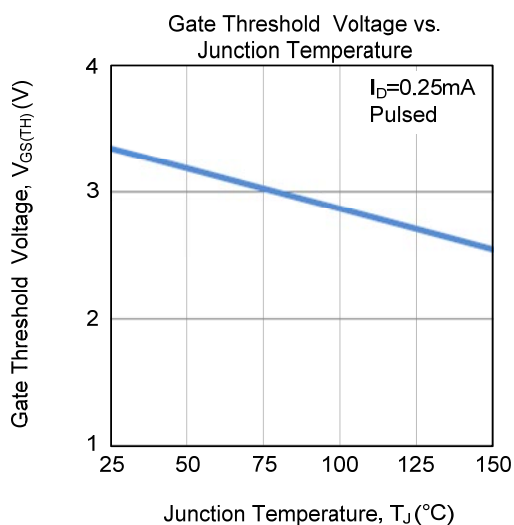


Unclamped Inductive Switching Waveforms

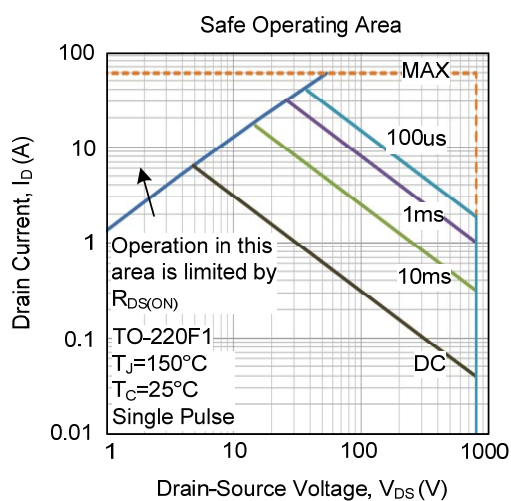
TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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