



20NM60

Power MOSFET

20A, 600V N-CHANNEL SUPER-JUNCTION MOSFET

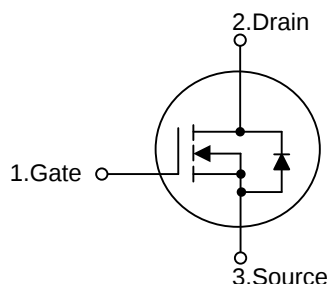
DESCRIPTION

The UTC 20NM60 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

- * $R_{DS(ON)} \leq 0.3 \Omega$ @ $V_{GS}=10V$, $I_D=10A$
- * By using Super Junction Structure
- * Fast Switching
- * With 100% Avalanche Tested

SYMBOL



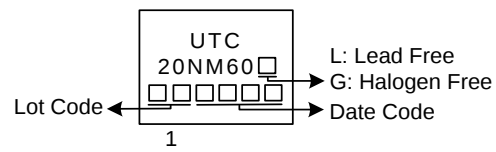
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
20NM60L-TA3-T	20NM60G-TA3-T	TO-220	G	D	S	Tube
20NM60L-TF1-T	20NM60G-TF1-T	TO-220F1	G	D	S	Tube
20NM60L-TF2-T	20NM60G-TF2-T	TO-220F2	G	D	S	Tube
20NM60L-TM3-T	20NM60G-TM3-T	TO-251	G	D	S	Tube
20NM60L-TN3-R	20NM60G-TN3-R	TO-252	G	D	S	Tape Reel
20NM60L-T47-T	20NM60G-T47-T	TO-247	G	D	S	Tube

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

20NM60G-TA3-T (1) Packing Type (2) Package Type (3) Green Package	(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF1: TO-220F1, TF2: TO-220F1, TM3: TO-251, TN3: TO-252, T47: TO-247 (3) G: Halogen Free and Lead Free, L: Lead Free
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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
Continuous Drain Current	Continuous	I_D	20	A
Pulsed Drain Current	Pulsed (Note 2)	I_{DM}	80	A
Avalanche Current (Note 3)		I_{AR}	3.4	A
Avalanche energy	Single Pulsed (Note 3)	E_{AS}	198.4	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	6.4	V/nS
Power Dissipation	TO-220	P_D	103	W
	TO-220F1/TO-220F2		33	W
	TO-247		180	W
	TO-251/TO-252		83	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. $L=10\text{mH}$, $I_{AS}=4.4\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\Omega$, Starting $T_J = 25^\circ\text{C}$.

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

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F1 TO-220F2	θ_{JA}	62.5	$^\circ\text{C/W}$
	TO-247		60	$^\circ\text{C/W}$
	TO-251/TO-252		110	$^\circ\text{C/W}$
Junction to Case	TO-220	θ_{JC}	1.21	$^\circ\text{C/W}$
	TO-220F1/TO-220F2		3.78	$^\circ\text{C/W}$
	TO-247		0.69	$^\circ\text{C/W}$
	TO-251/TO-252		1.5 (Note)	$^\circ\text{C/W}$

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

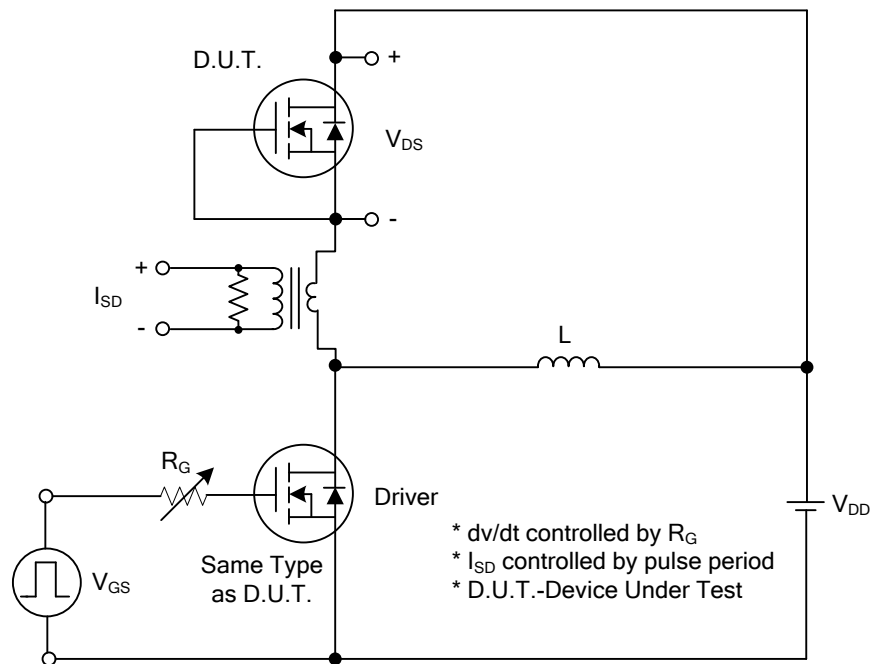
■ **ELECTRICAL CHARACTERISTICS** ($T_J = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V, I _D =250μA	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 =10A			0.3	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =25V, f=1.0MHz		1120		pF
Output Capacitance		C _{OSS}			890		pF
Reverse Transfer Capacitance		C _{RSS}			84		pF
SWITCHING PARAMETERS							
Total Gate Charge (Note 1)		Q _G	V _{DS} =480V, V _{GS} =10V, I _D =20A , I _G =1mA (Note 1, 2)		42		nC
Gate to Source Charge		Q _{GS}			7		nC
Gate to Drain Charge		Q _{GD}			16		nC
Turn-on Delay Time (Note 1)		t _{D(ON)}	V _{DD} =100V, V _{GS} =10V, I _D =20A, R _G =25Ω (Note 1, 2)		16		ns
Rise Time		t _R			28		ns
Turn-off Delay Time		t _{D(OFF)}			130		ns
Fall-Time		t _F			58		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Pulsed Current		I _S				20	A
Drain-Source Diode Forward Voltage (Note 1)		I _{SM}				80	A
Maximum Body-Diode Continuous Current		V _{SD}	I _S =20A, V _{GS} =0V			1.4	V
Reverse Recovery Time (Note 1)		t _{rr}	I _S =20A, V _{GS} =0V,		438		ns
Reverse Recovery Charge		Q _{rr}	dl _F /dt=100A/μs		7.7		μC

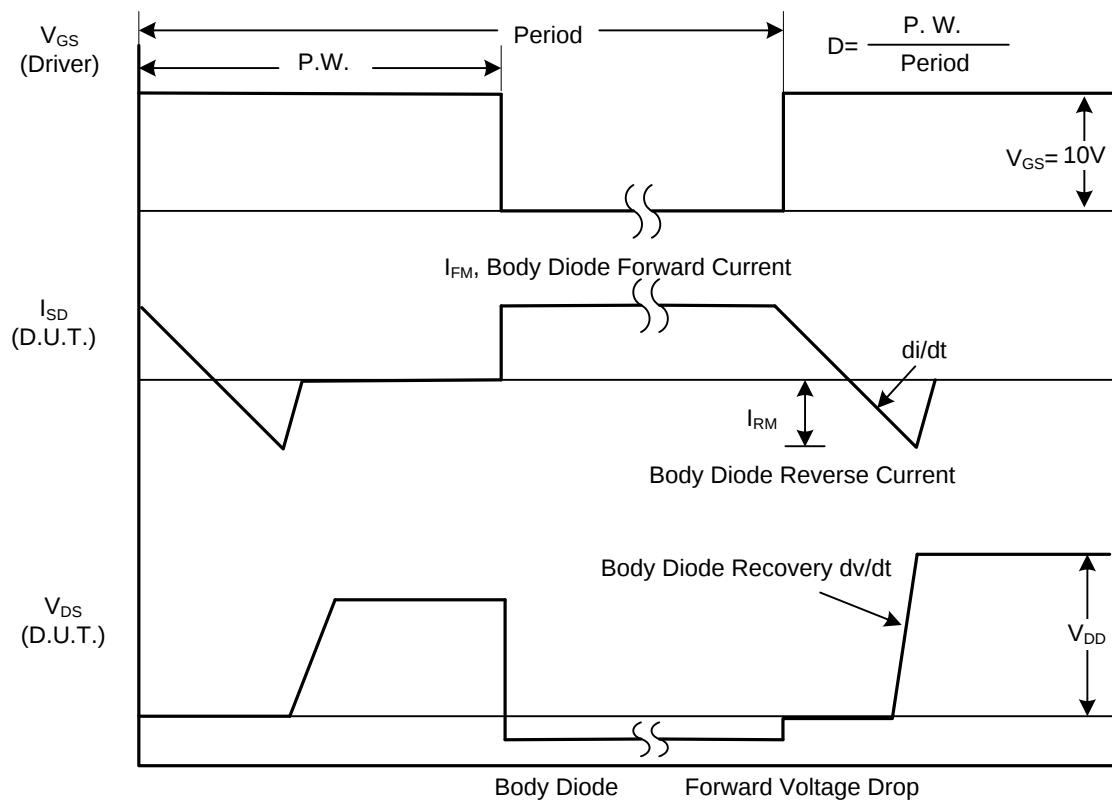
Note: 1. Pulse Test : Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

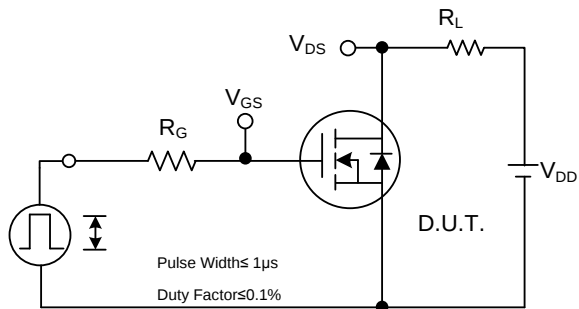


Peak Diode Recovery dv/dt Test Circuit

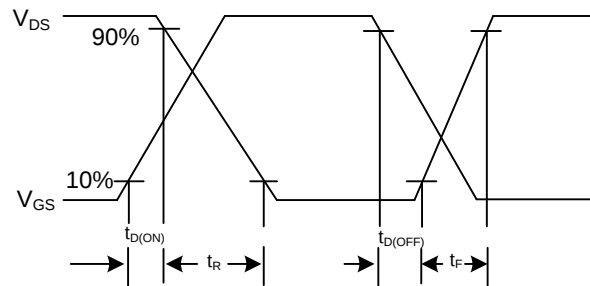


Peak Diode Recovery dv/dt Waveforms

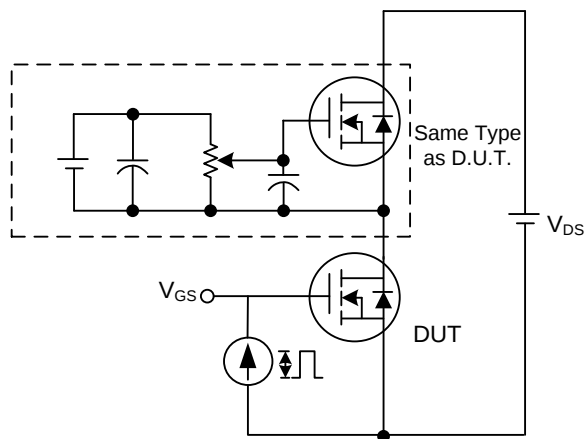
■ TEST CIRCUITS AND WAVEFORMS



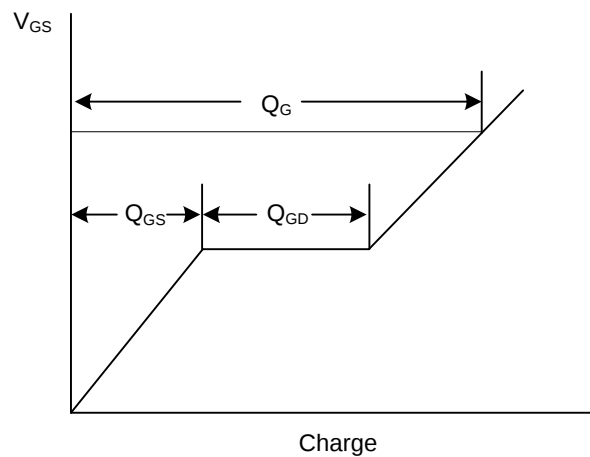
Switching Test Circuit



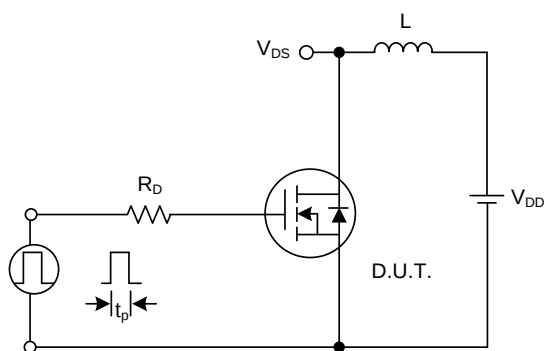
Switching Waveforms



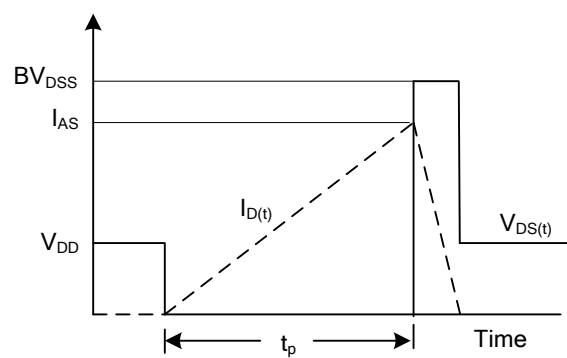
Gate Charge Test Circuit



Gate Charge Waveform

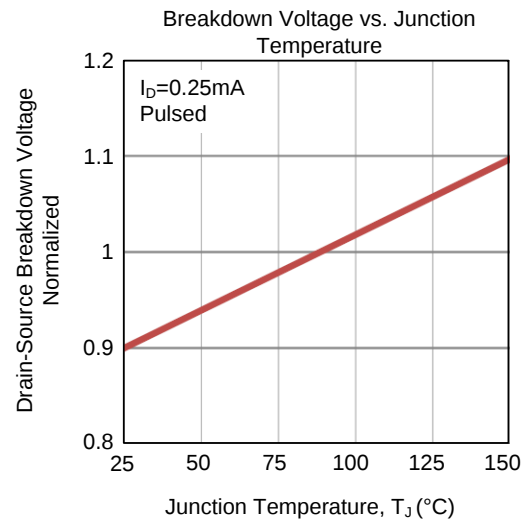
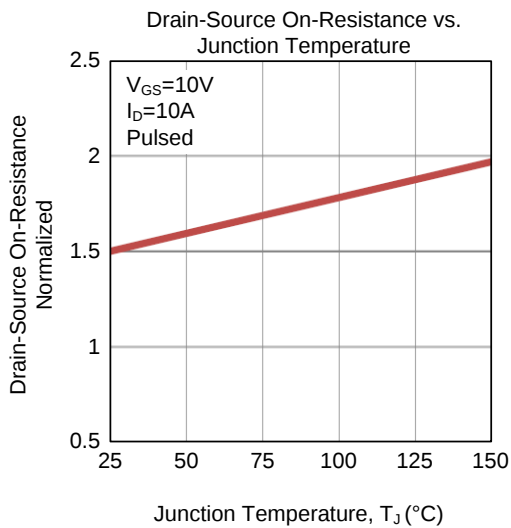
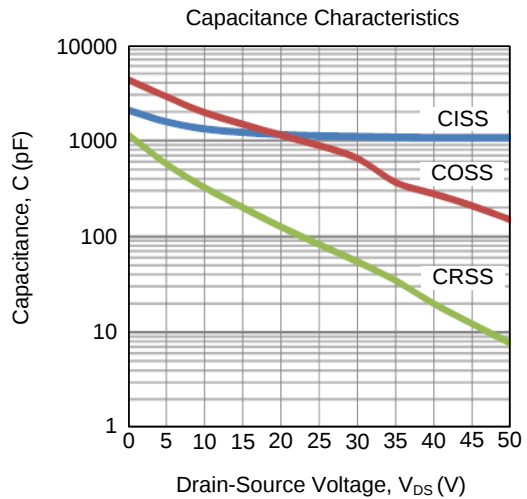
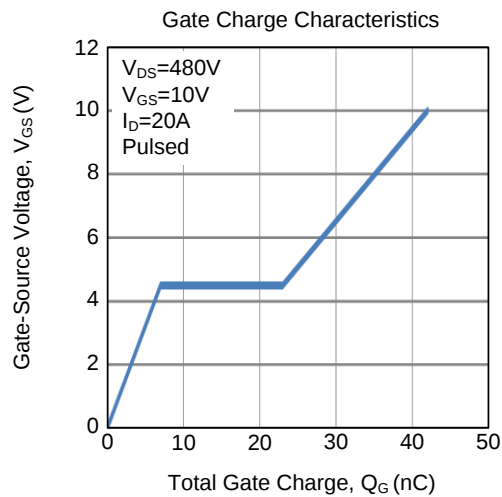
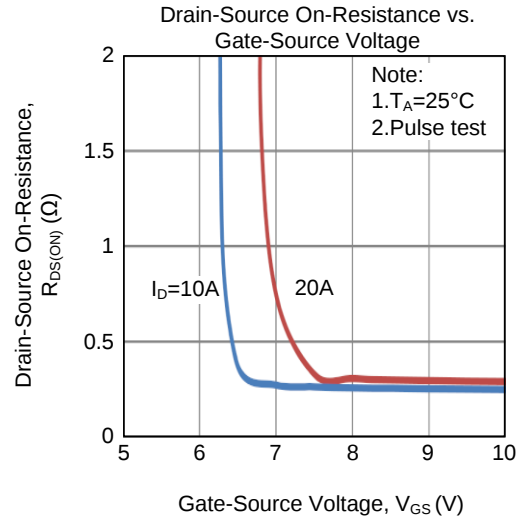
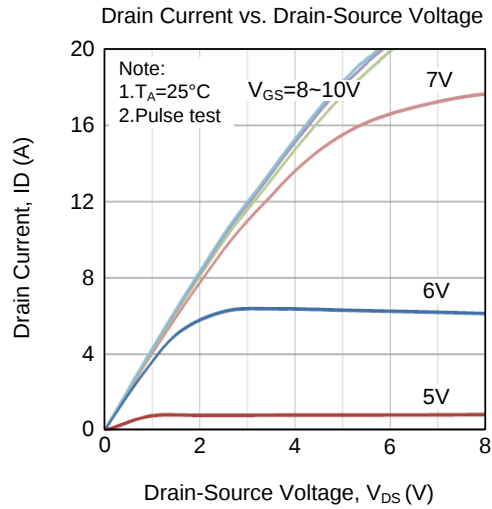


Unclamped Inductive Switching Test Circuit

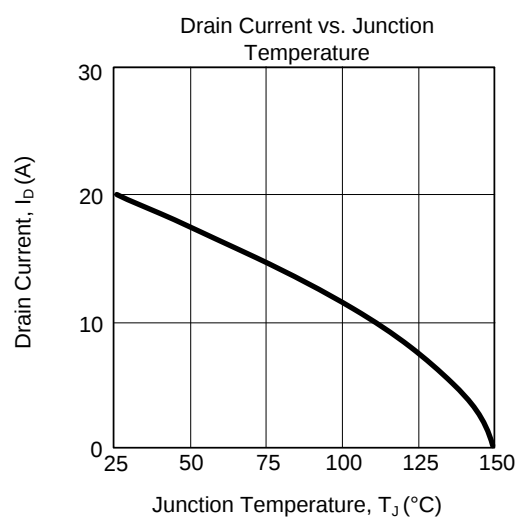
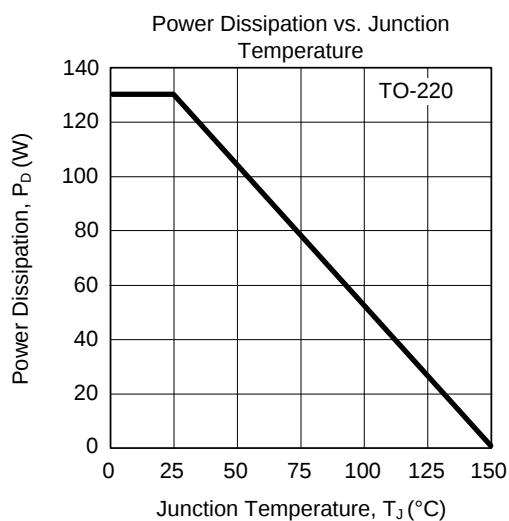
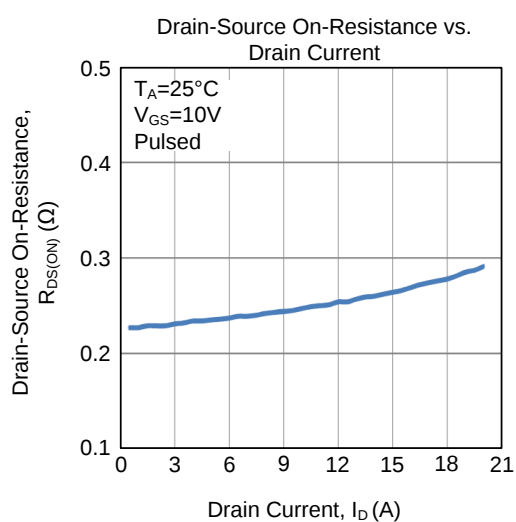
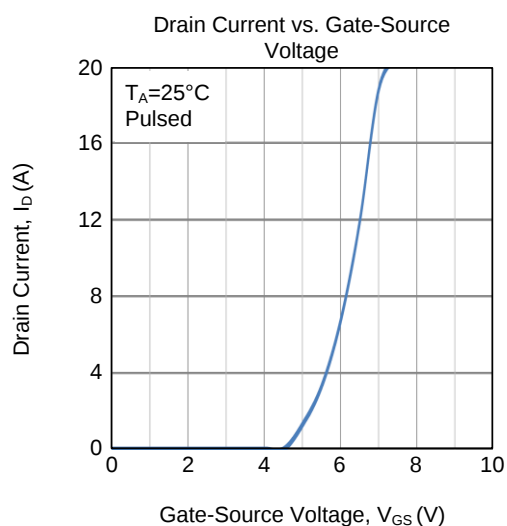
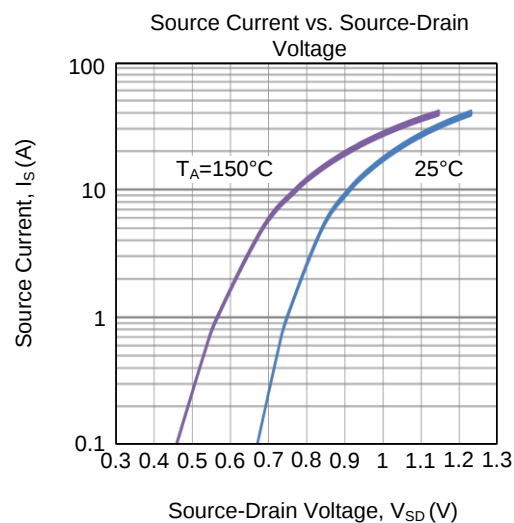
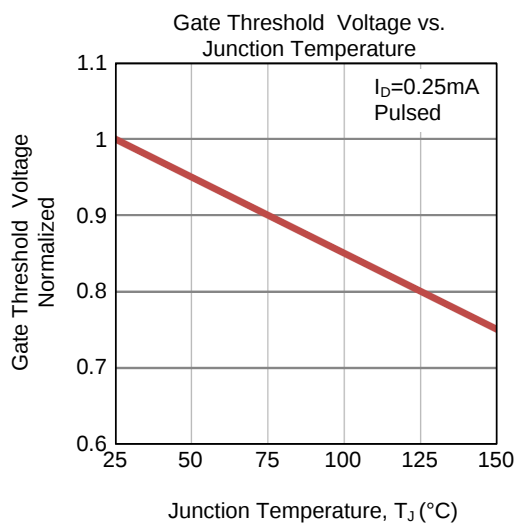


Unclamped Inductive Switching Waveforms

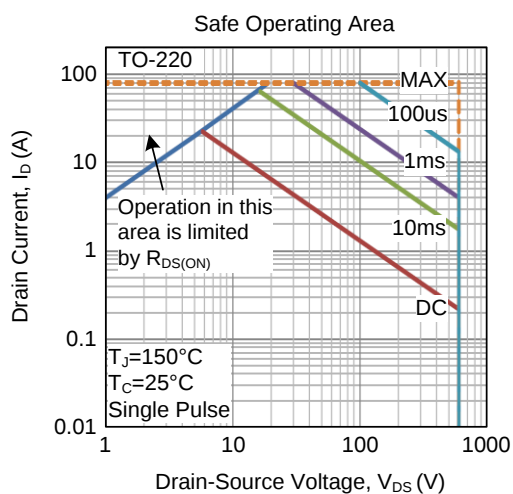
■ TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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