



20NM50

Power MOSFET

20A, 500V N-CHANNEL SUPER-JUNCTION MOSFET

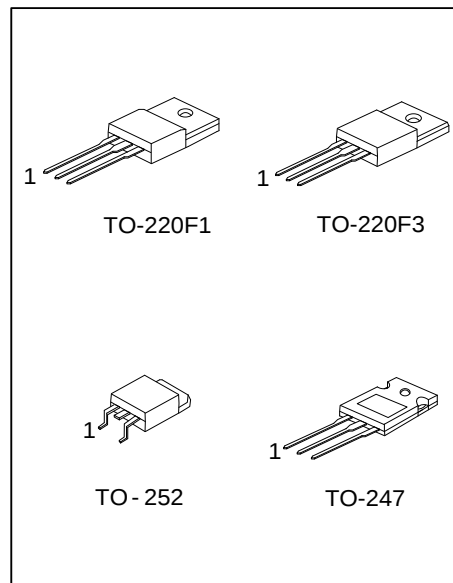
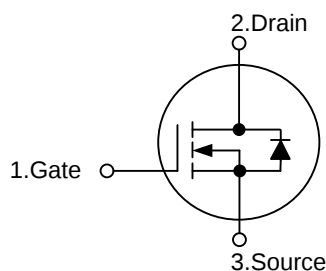
DESCRIPTION

The **UTC 20NM50** 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

- * $R_{DS(ON)} \leq 0.24\Omega$ @ $V_{GS}=10V$, $I_D=10A$
- * Fast Switching Capability
- * Avalanche Energy Specified
- * Improved dv/dt Capability, High Ruggedness

SYMBOL



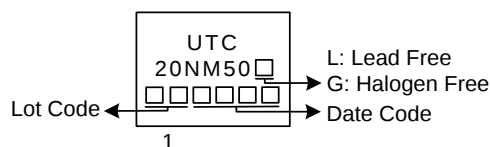
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
20NM50L-TF1-T	20NM50G-TF1-T	TO-220F1	G	D	S	Tube
20NM50L-TF3T-T	20NM50G-TF3T-T	TO-220F3	G	D	S	Tube
20NM50L-T47-T	20NM50G-T47-T	TO-247	G	D	S	Tube
20NM50L-TN3-R	20NM50G-TN3-R	TO-252	G	D	S	Tape Reel

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

20NM50G-TF1-T (1) Packing Type (2) Package Type (3) Green Package	(1) T: Tube, R: Tape Reel (2) TF1: TO-220F1, TF3T: TO-220F3, T47: TO-247 TN3: TO-252 (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}	500	V
Gate-Source Voltage		V_{GSS}	± 30	V
Drain Current	Continuous	I_D	20	A
	Pulsed (Note 2)	I_{DM}	40	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	545	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	9.5	V/ns
Power Dissipation	TO-220F1/TO-220F3	P_D	32	W
	TO-247		180	W
	TO-252		62	W
Junction Temperature		T_J	+150	$^{\circ}\text{C}$
Storage Temperature		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. $L = 100\text{mH}$, $I_{AS} = 3.3\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$

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

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220F1/TO-220F3	θ_{JA}	62.5	$^{\circ}\text{C/W}$
	TO-247		40	$^{\circ}\text{C/W}$
	TO-252		110	$^{\circ}\text{C/W}$
Junction to Case	TO-220F1/TO-220F3	θ_{JC}	3.91	$^{\circ}\text{C/W}$
	TO-247		0.69	$^{\circ}\text{C/W}$
	TO-252		2.01	$^{\circ}\text{C/W}$

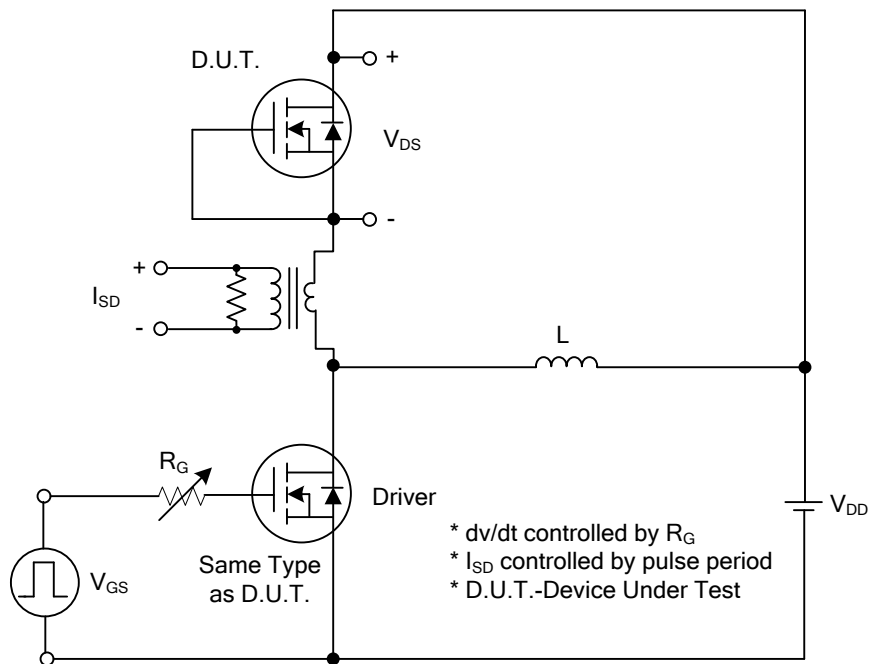
■ **ELECTRICAL CHARACTERISTICS** ($T_J = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =250μA	500			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =500V, V _{GS} =0V			25	μA
Gate-Body Leakage Current	I _{GSS}	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
Static Drain-Source On-Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =10A			0.24	Ω
DYNAMIC PARAMETERS						
Input Capacitance	C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1MHz		1090		pF
Output Capacitance	C _{OSS}			880		pF
Reverse Transfer Capacitance	C _{RSS}			120		pF
SWITCHING PARAMETERS						
Total Gate Charge (Note 1)	Q _G	V _{DS} =400V, V _{GS} =10V, I _D =20A (Note 1, 2)		43		nC
Gate to Source Charge	Q _{GS}			6		nC
Gate to Drain Charge	Q _{GD}			18		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			30		ns
Turn-OFF Delay Time	t _{D(OFF)}			134		ns
Fall-Time	t _F			50		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I _S				20	A
Maximum Body-Diode Pulsed Current	I _{SM}				40	A
Drain-Source Diode Forward Voltage (Note 1)	V _{SD}	I _S =20A, V _{GS} =0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t _{rr}	I _S =20A, V _{GS} =0V,		430		ns
Body Diode Reverse Recovery Charge	Q _{rr}	dI _F /dt=100A/μs		6.95		μC

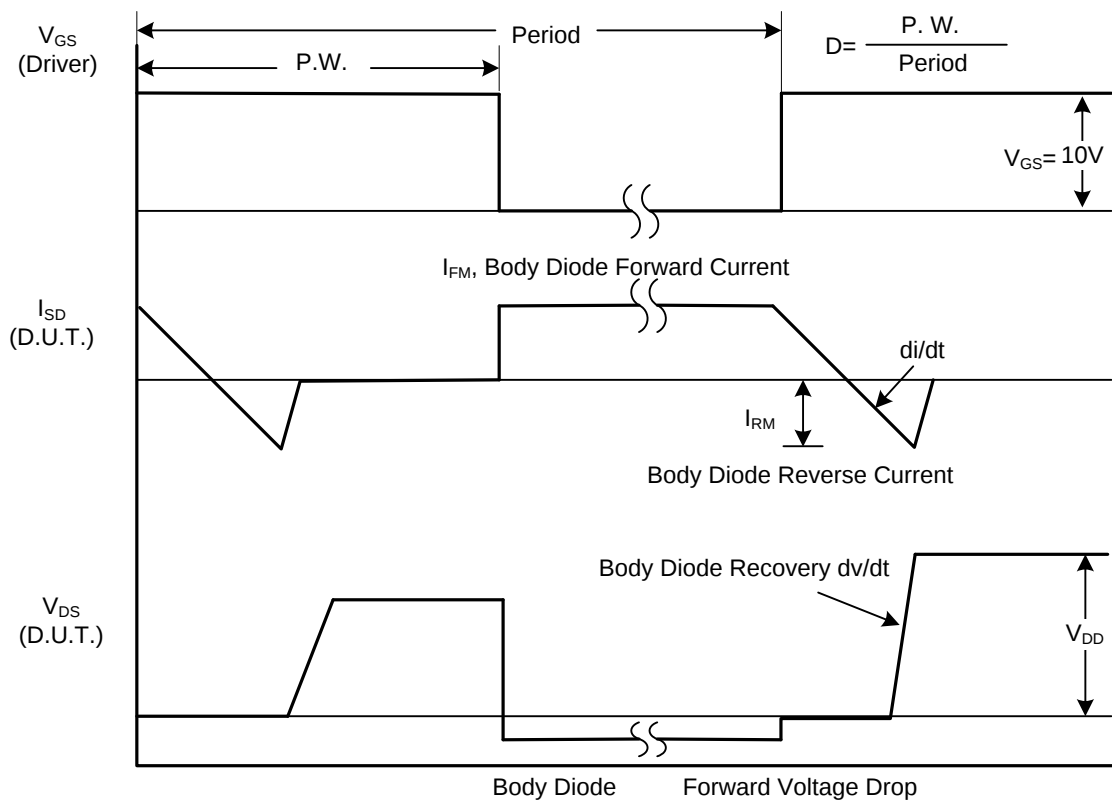
Notes: 1. Pulse Test : Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating ambient temperature.

■ TEST CIRCUITS AND WAVEFORMS

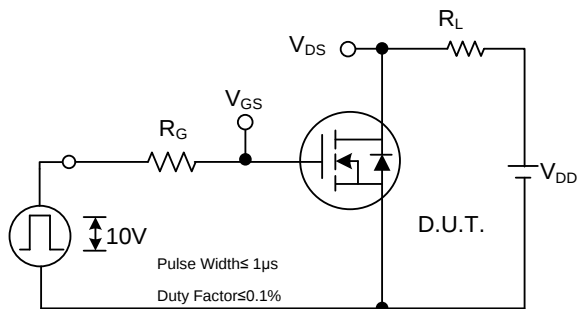


Peak Diode Recovery dv/dt Test Circuit

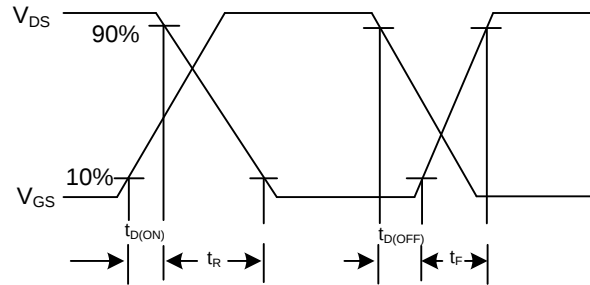


Peak Diode Recovery dv/dt Waveforms

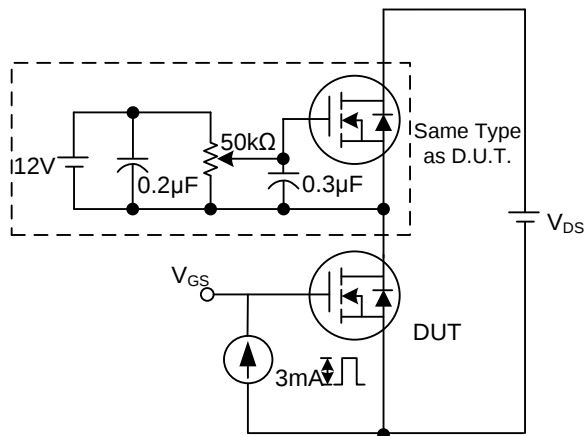
■ TEST CIRCUITS AND WAVEFORMS



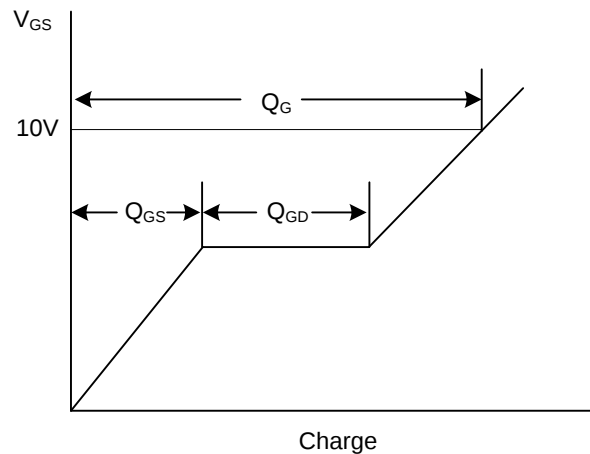
Switching Test Circuit



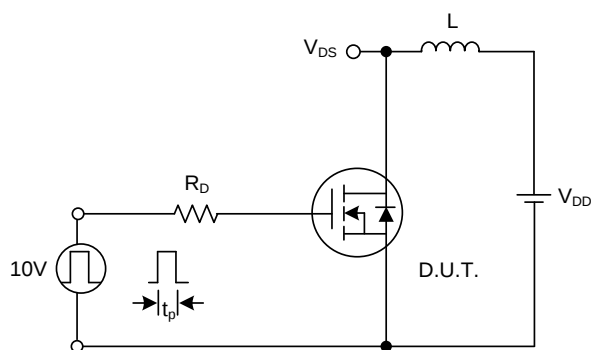
Switching Waveforms



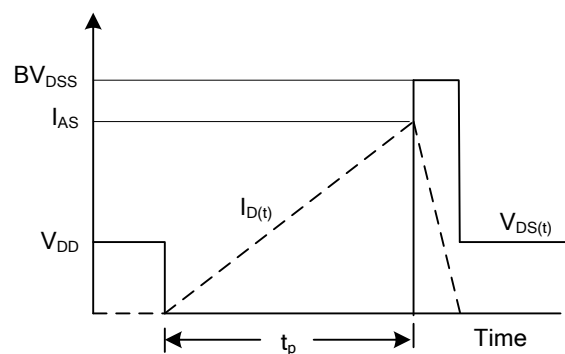
Gate Charge Test Circuit



Gate Charge Waveform

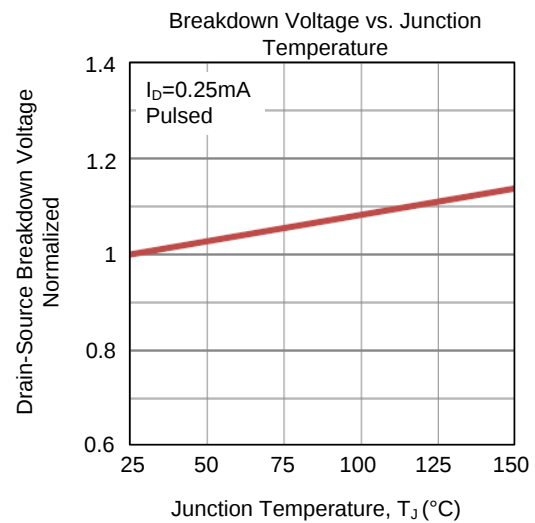
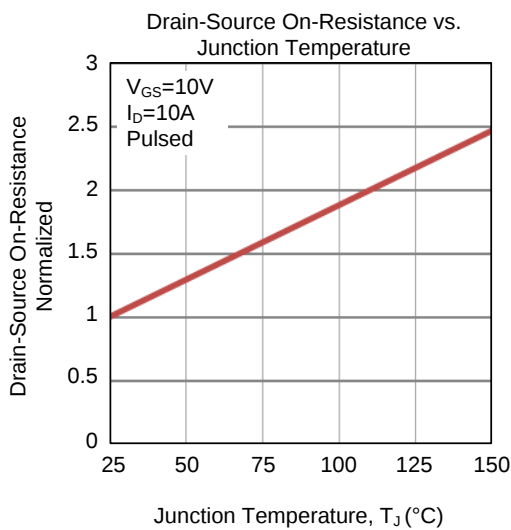
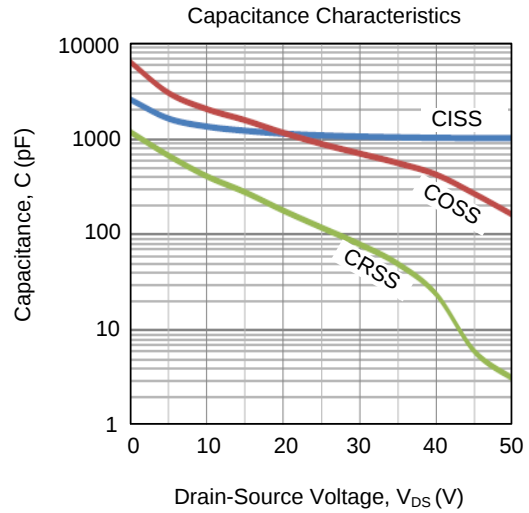
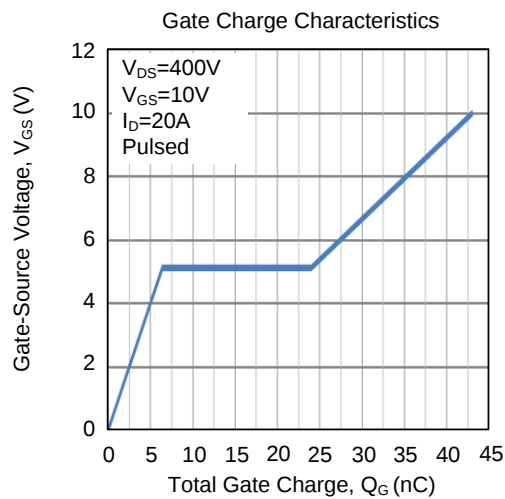
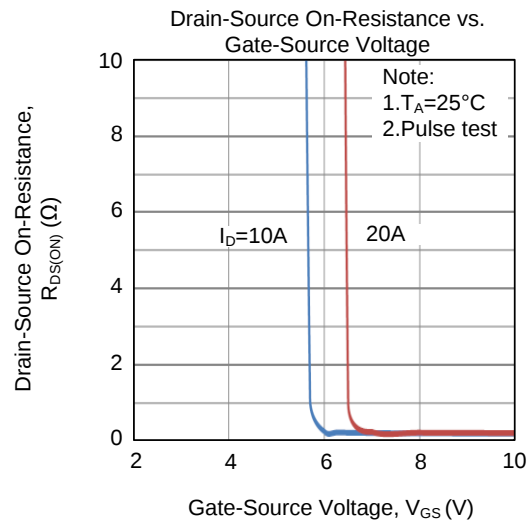
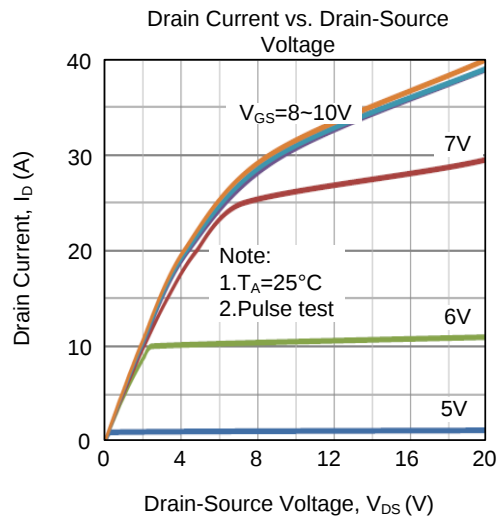


Unclamped Inductive Switching Test Circuit

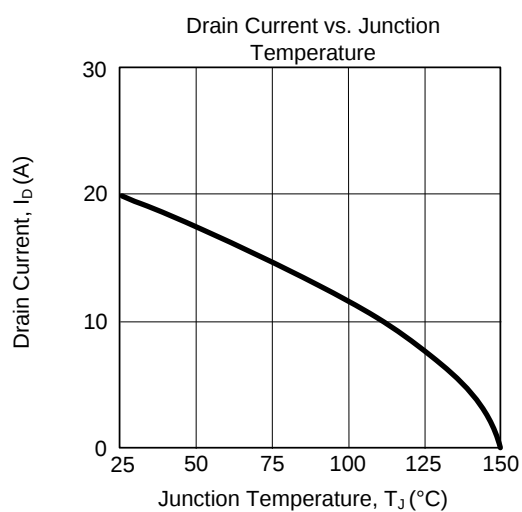
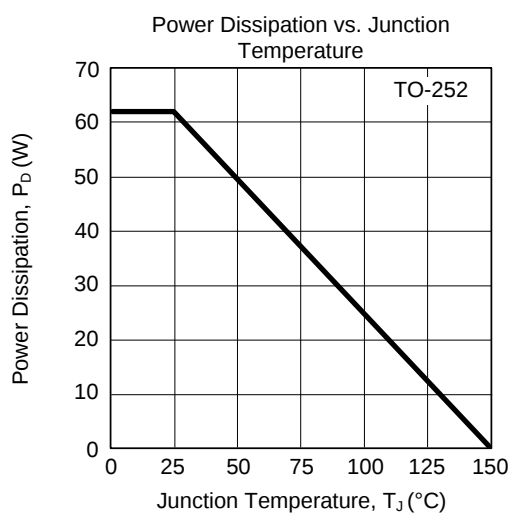
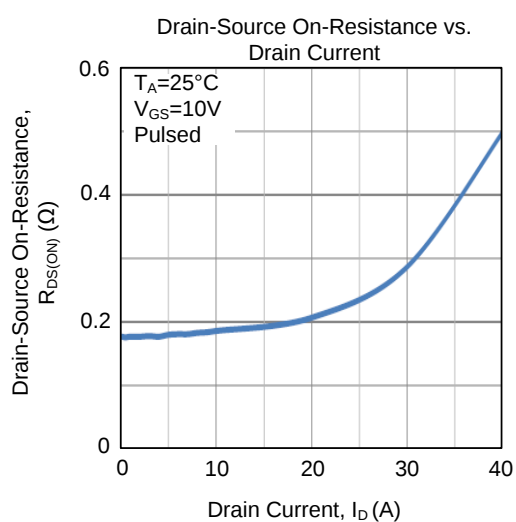
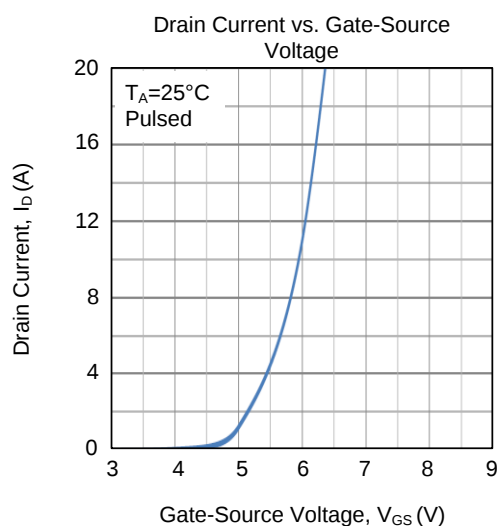
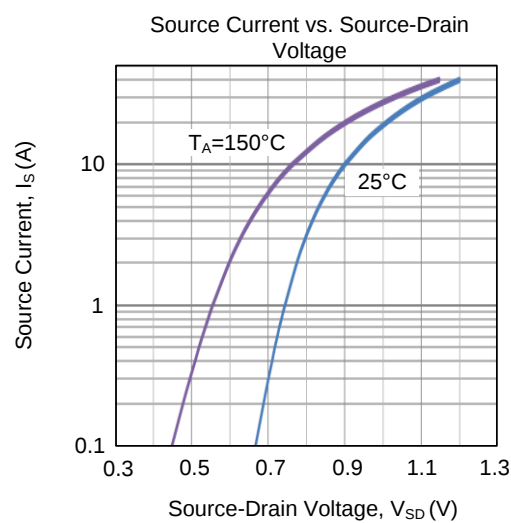
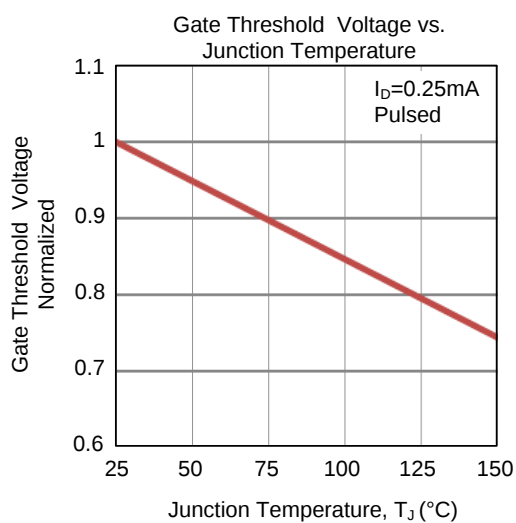


Unclamped Inductive Switching Waveforms

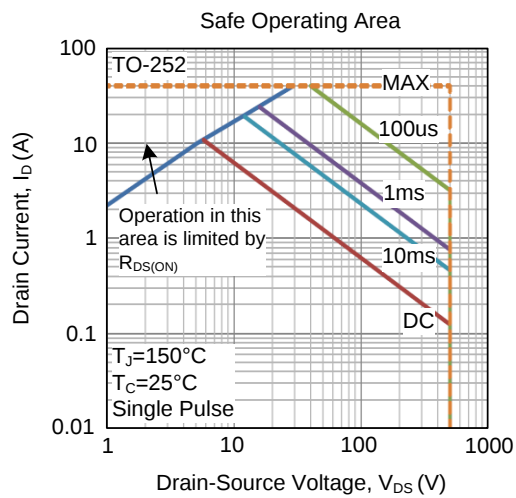
■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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