



F20N65-ML

Power MOSFET

20A, 650V N-CHANNEL POWER MOSFET

DESCRIPTION

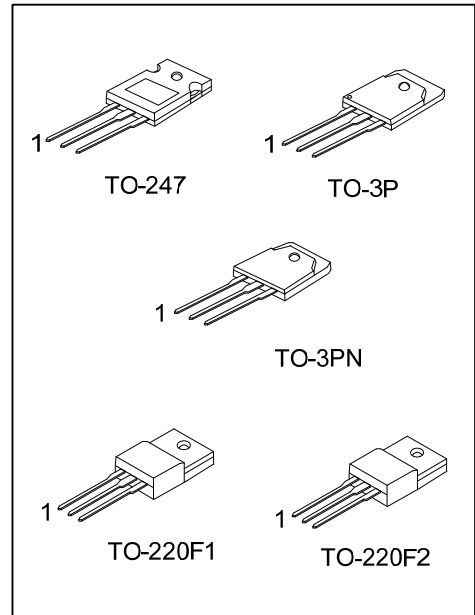
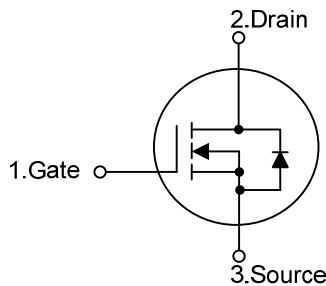
The UTC **F20N65-ML** is a N-channel mode power MOSFET using UTC's advanced technology to provide customers with a minimum on-state resistance, high switching speed, low gate charge and low input capacitance.

The UTC **F20N65-ML** is universally applied in high efficiency switch mode power supply.

FEATURES

- * $R_{DS(ON)} \leq 0.43 \Omega$ @ $V_{GS}=10V$, $I_D=10A$
- * High Switching Speed

SYMBOL



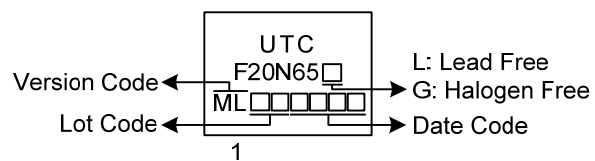
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
F20N65L-ML-TF1-T	F20N65G-ML-TF1-T	TO-220F1	G	D	S	Tube
F20N65L-ML-TF2-T	F20N65G-ML-TF2-T	TO-220F2	G	D	S	Tube
F20N65L-ML-T3P-T	F20N65G-ML-T3P-T	TO-3P	G	D	S	Tube
F20N65L-ML-T3N-T	F20N65G-ML-T3N-T	TO-3PN	G	D	S	Tube
F20N65L-ML-T47-T	F20N65G-ML-T47-T	TO-247	G	D	S	Tube

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

F20N65G-ML-TF1-T	(1) Packing Type	(1) T: Tube, R: Tape Reel
	(2) Package Type	(2) TF1: TO-220F1, TF2: TO-220F2, TF3: TO-220F, T2Q: TO-262, TQ2: TO-263, T3P: TO-3P, T3N: TO-3PN, T47: TO-247, T474: TO-247-4
	(3) Version Code	(3) Version ML
	(4) Green Package	(4) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



■ **ABSOLUTE MAXIMUM RATINGS** (unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DS}	650	V
Gate-Source Voltage		V_{GS}	± 30	V
Continuous Drain Current	Continuous	I_D	20	A
	Pulsed	I_{DM}	40	A
Single Pulsed Avalanche Energy		E_{AS}	653	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.5	V/ns
Power Dissipation	TO-220F1	P_D	42	W
	TO-220F2			
	TO-3P/TO-3PN		270	W
	TO-247		260	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. $L = 30\text{mH}$, $I_{AS} = 6.6\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, 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 CHARACTERISTICS**

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220F1	θ_{JA}	62.5	°C/W
	TO-220F2			
	TO-3P/TO-3PN		40	°C/W
	TO-247		40	°C/W
Junction to Case	TO-220F1	θ_{JC}	2.98	°C/W
	TO-220F2			
	TO-3P/TO-3PN		0.46	°C/W
	TO-247		0.48	°C/W

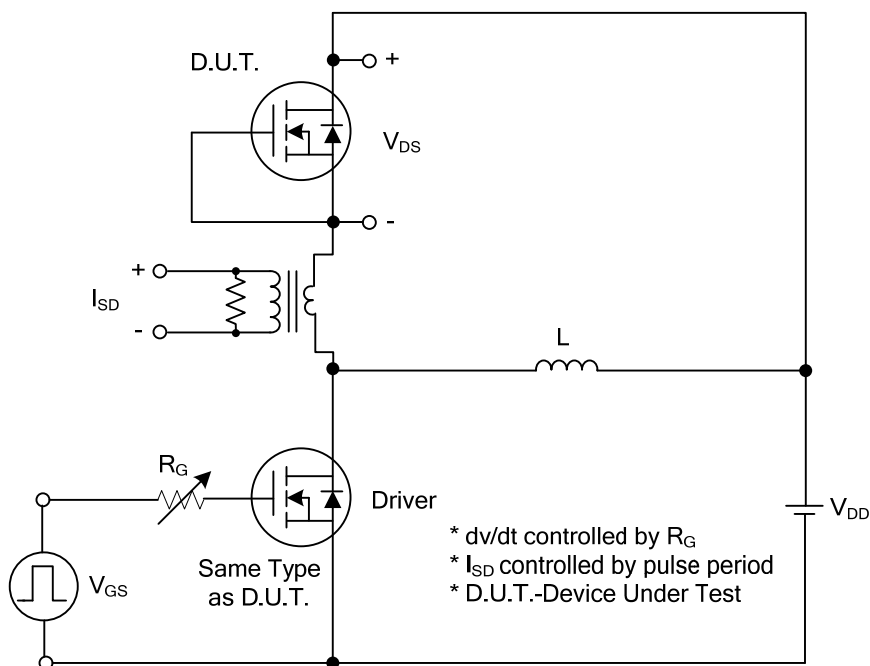
ELECTRICAL CHARACTERISTICS

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	I _D =250μA, V _{GS} =0V	650			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =650V, V _{GS} =0V			10	μA
Gate-Source Leakage Current	Forward	I _{GSS}	V _{GS} =+30V, V _{DS} =0V			+100	nA
	Reverse		V _{GS} =-30V, V _{DS} =0V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} , I _D =250μA	2.0		4.0	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V, I _D =10A			0.43	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =25V, f=1.0MHz		3315		pF
Output Capacitance		C _{OSS}			258		pF
Reverse Transfer Capacitance		C _{RSS}			10		pF
SWITCHING PARAMETERS							
Total Gate Charge		Q _G	V _{DS} =520V, V _{GS} =10V, I _D =20A (Note 1, 2)		80		nC
Gate to Source Charge		Q _{GS}			40		nC
Gate to Drain Charge		Q _{GD}			20		nC
Turn-ON Delay Time		t _{D(ON)}	V _{DD} =100V, V _{GS} =10V, I _D =20A, R _G =25Ω (Note 1, 2)		35		ns
Rise Time		t _R			20		ns
Turn-OFF Delay Time		t _{D(OFF)}			205		ns
Fall-Time		t _F			51		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		V _{SD}	I _S =20A, V _{GS} =0V			1.4	V
Body Diode Reverse Recovery Time		t _{rr}	I _S =20A, V _{GS} =0V, dI _F /dt=100A/μs (Note 1)		180		ns

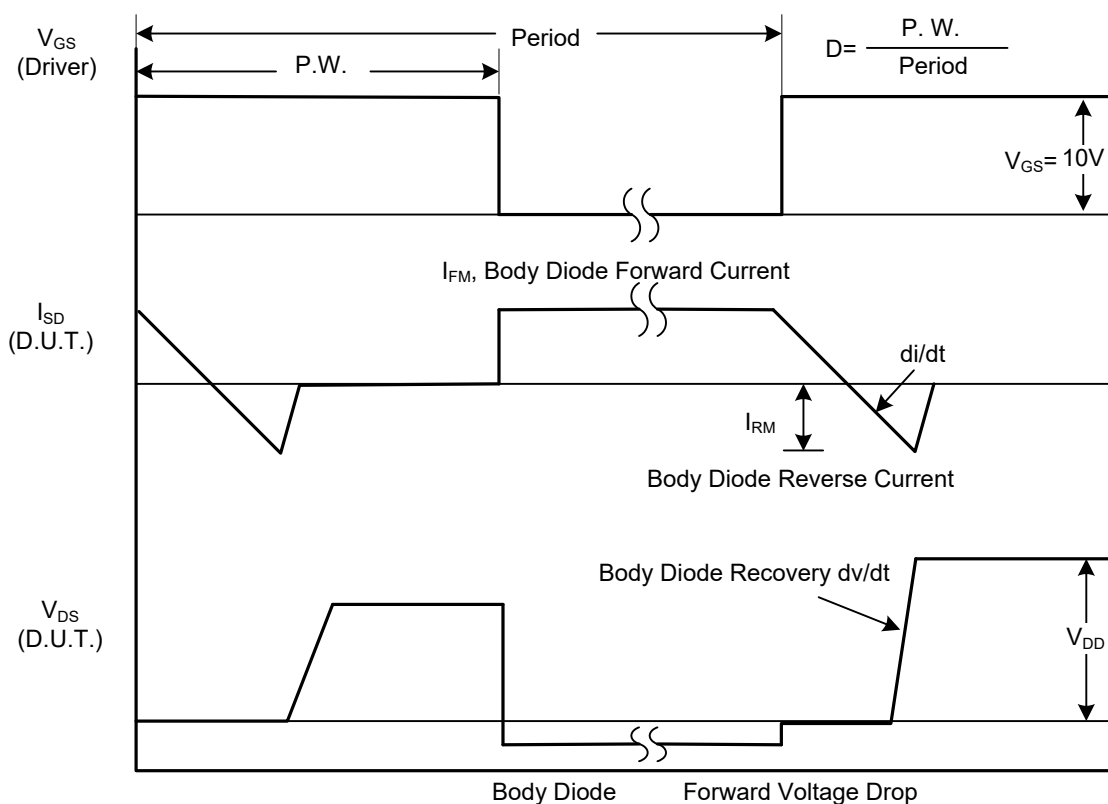
Notes: 1. Pulse Test: Pulse width $\leq 650\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

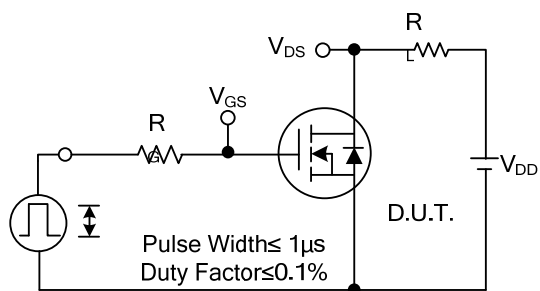


Peak Diode Recovery dv/dt Test Circuit

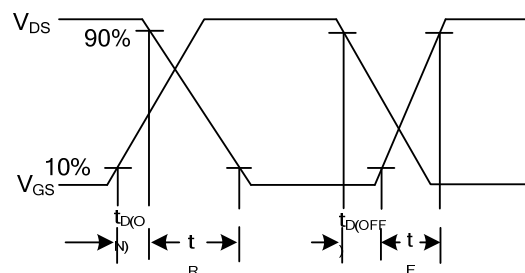


Peak Diode Recovery dv/dt Waveforms

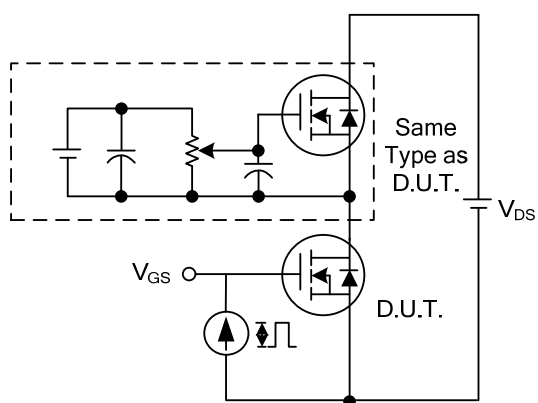
■ TEST CIRCUITS AND WAVEFORMS



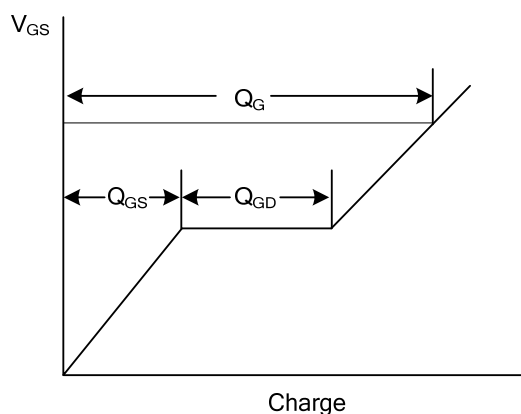
Switching Test Circuit



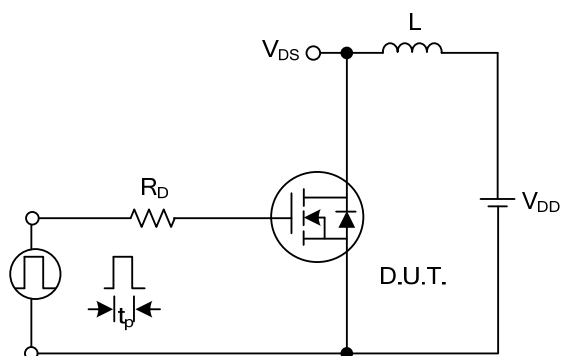
Switching Waveforms



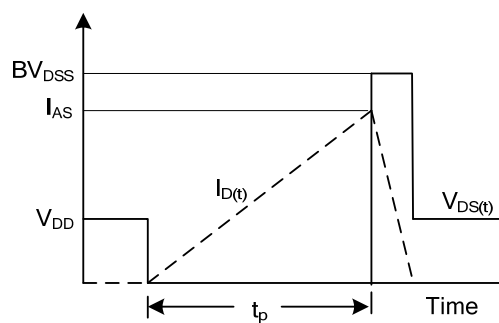
Gate Charge Test Circuit



Gate Charge Waveform

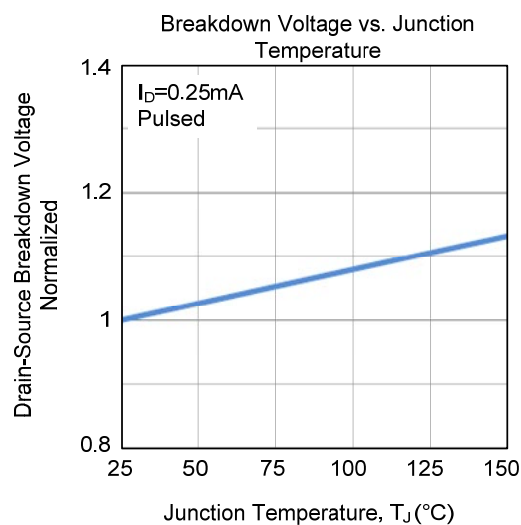
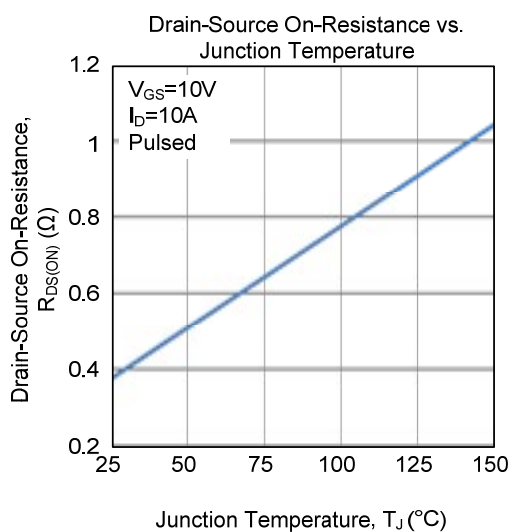
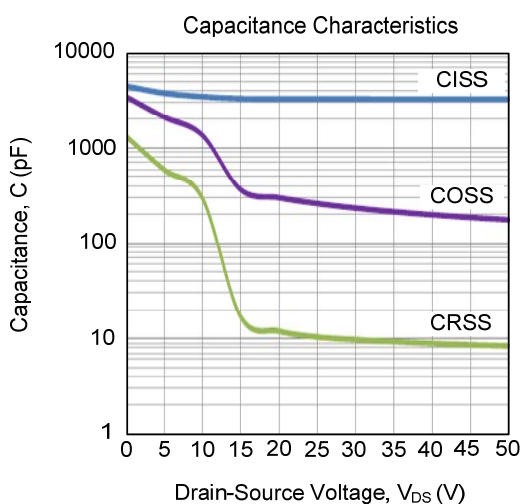
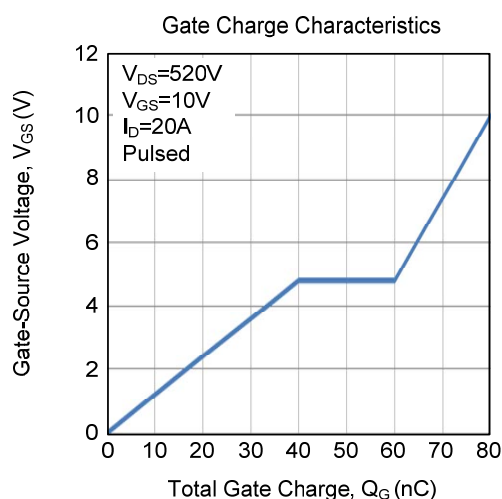
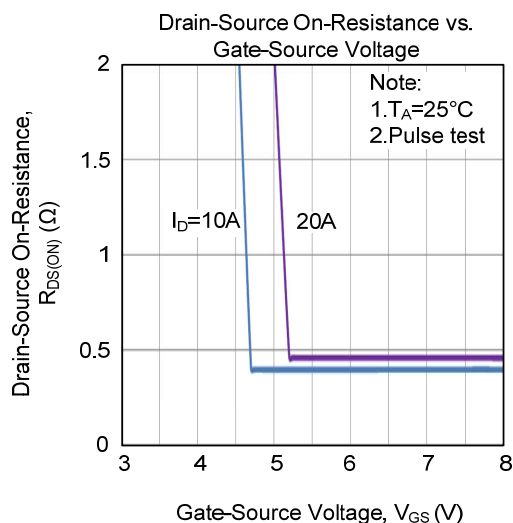
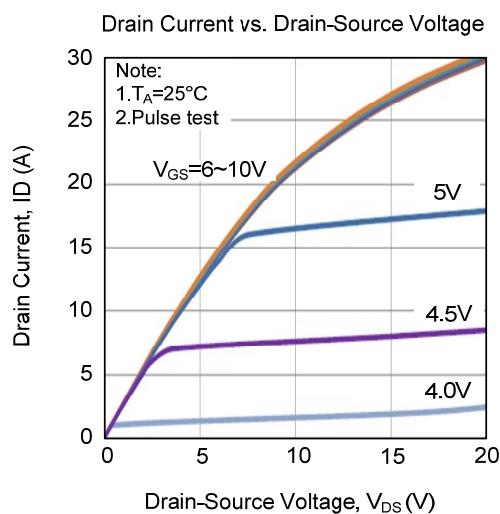


Unclamped Inductive Switching Test Circuit

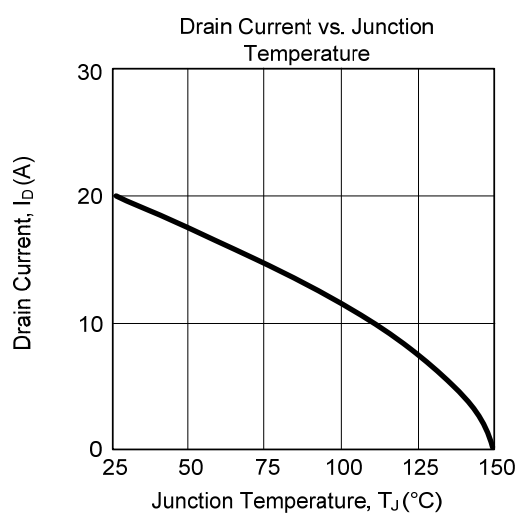
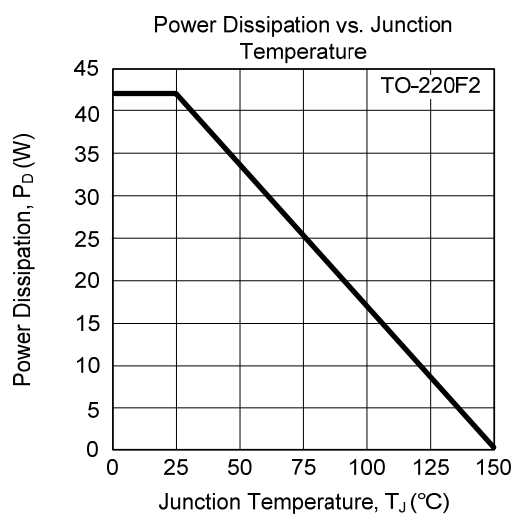
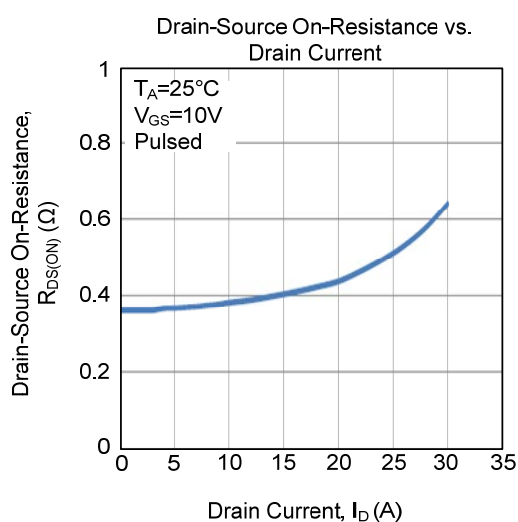
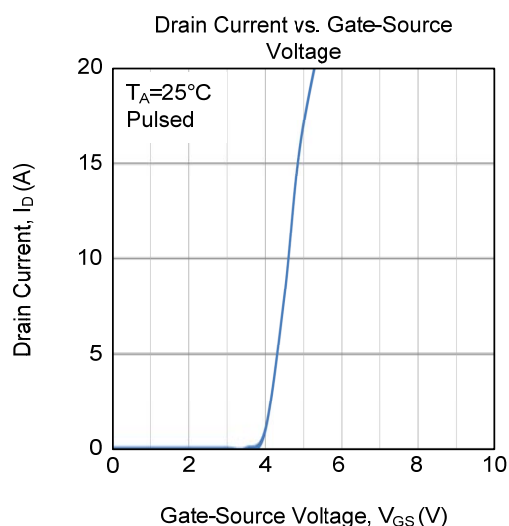
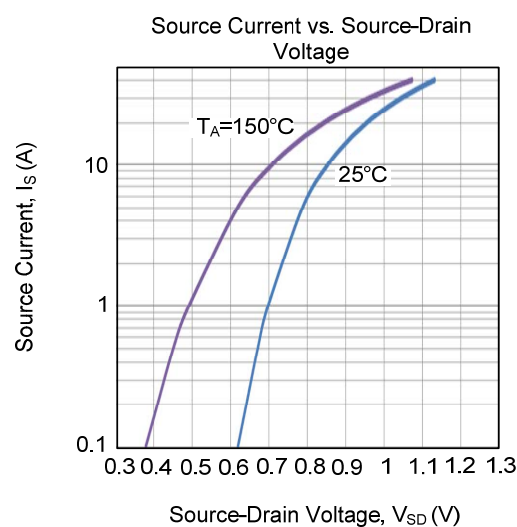
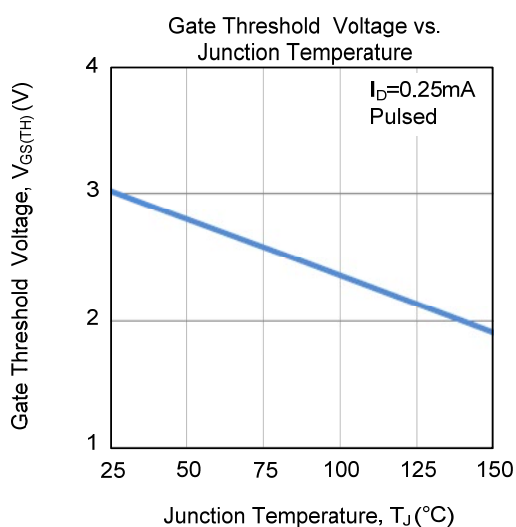


Unclamped Inductive Switching Waveforms

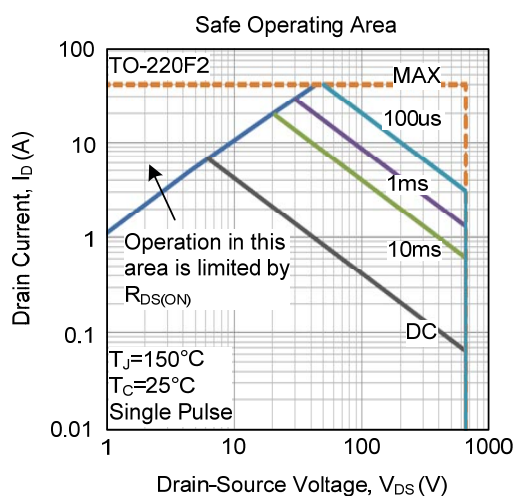
TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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