



7N65-ML

Power MOSFET

7A, 650V N-CHANNEL POWER MOSFET

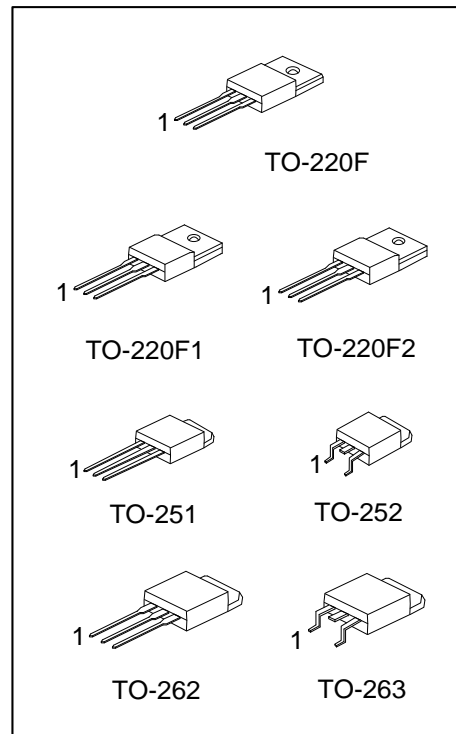
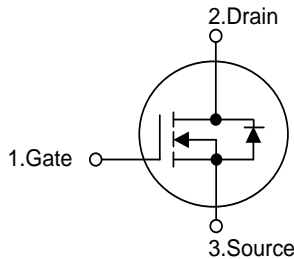
DESCRIPTION

The UTC 7N65-ML is a high voltage power MOSFET combines advanced trench MOSFET designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and high rugged avalanche characteristics. This power MOSFET is usually used in high speed switching applications of switching power supplies and adaptors.

FEATURES

- * $R_{DS(ON)} \leq 1.3 \Omega @ V_{GS}=10V, I_D=3.5A$
- * Fast switching capability
- * Avalanche energy tested
- * Improved dv/dt capability, high ruggedness

SYMBOL



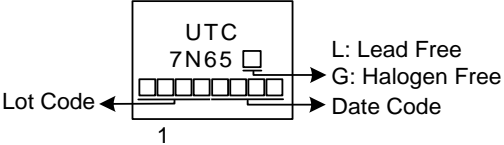
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
7N65L-TF1-T	7N65G-TF1-T	TO-220F1	G	D	S	Tube
7N65L-TF2-T	7N65G-TF2-T	TO-220F2	G	D	S	Tube
7N65L-TF3-T	7N65G-TF3-T	TO-220F	G	D	S	Tube
7N65L-TM3-T	7N65G-TM3-T	TO-251	G	D	S	Tube
7N65L-TN3-R	7N65G-TN3-R	TO-252	G	D	S	Tape Reel
7N65L-T2Q-T	7N65G-T2Q-T	TO-262	G	D	S	Tube
7N65L-TQ2-T	7N65G-TQ2-T	TO-263	G	D	S	Tube
7N65L-TQ2-R	7N65G-TQ2-R	TO-263	G	D	S	Tape Reel

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

<p>7N65G-TF1-T</p> <p>(1)Packing Type (2)Package Type (3)Green Package</p>	<p>(1) T: Tube, R: Tape Reel (2) TF1: TO-220F1, TF2: TO-220F2, TF3: TO-220F TM3: TO-251, TN3: TO-252, T2Q: TO-262 TQ2: TO-263 (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}	650	V
Gate-Source Voltage		V _{GSS}	±30	V
Continuous Drain Current		I _D	7	A
Pulsed Drain Current (Note 2)		I _{DM}	14	A
Avalanche Energy	Single Pulsed (Note 3)	E _{AS}	281.3	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.3	V/ns
Power Dissipation	TO-220F/TO-220F1 TO-220F2	P _D	35	W
	TO-251/TO-252		48	W
	TO-262/TO-263		125	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 = 10mH, I_{AS} = 7.5A, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25°C

4. I_{SD} ≤ 7.0A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C

■ THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220F/TO-220F1 TO-220F2/TO-262 TO-263	θ _{JA}	62.5	°C/W
	TO-251/TO-252		110	°C/W
	TO-220F/TO-220F1 TO-220F2		3.57	°C/W
Junction to Case	TO-251/TO-252	θ _{JC}	2.6 (Note)	°C/W
	TO-262/TO-263		1	°C/W

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

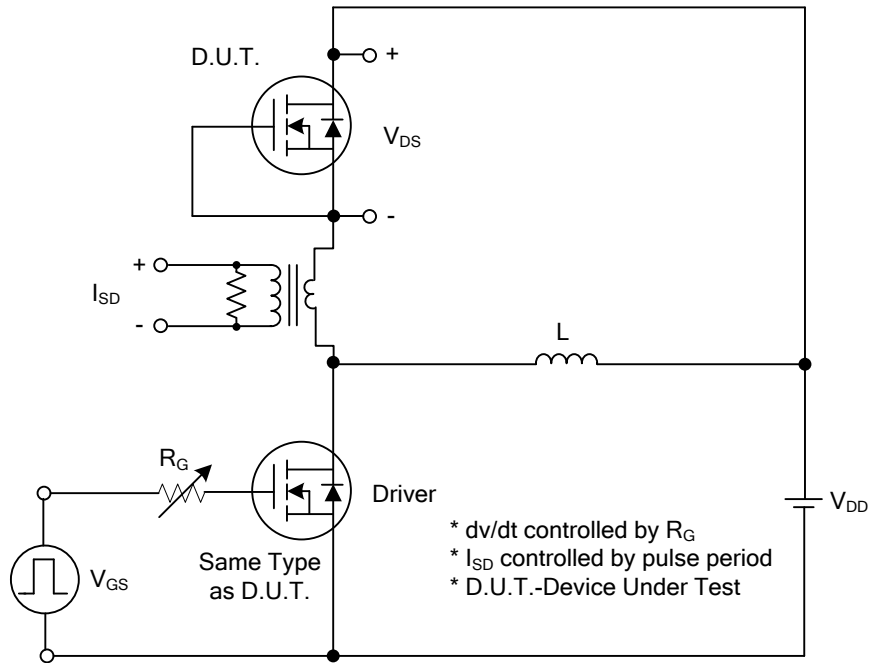
■ **ELECTRICAL CHARACTERISTICS** ($T_J=25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	650			V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=650V, V_{GS}=0V$			10	μA
Gate- Source Leakage Current	Forward	$V_{GS}=30V, V_{DS}=0V$			100	nA
	Reverse		$V_{GS}=-30V, V_{DS}=0V$			-100
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0		4.0	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=3.5A$			1.3	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ISS}	$V_{DS}=25V, V_{GS}=0V, f=1.0\text{MHz}$		870		pF
Output Capacitance	C_{OSS}			97		pF
Reverse Transfer Capacitance	C_{RSS}			9.6		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge (Note 1)	Q_G	$V_{DS}=520V, V_{GS}=10V, I_D=7A$ $I_G=1\text{mA}$ (Note 1, 2)		22		nC
Gate-Source Charge	Q_{GS}			5		nC
Gate-Drain Charge	Q_{GD}			5.5		nC
Turn-On Delay Time (Note 1)	$t_{D(ON)}$	$V_{DS}=100V, V_{GS}=10V, I_D=7A,$ $R_G=25\Omega$ (Note 1, 2)		12		ns
Turn-On Rise Time	t_R			20		ns
Turn-Off Delay Time	$t_{D(OFF)}$			74		ns
Turn-Off Fall Time	t_F			33		ns
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Maximum Body-Diode Continuous Current	I_S				7	A
Maximum Body-Diode Pulsed Current	I_{SM}				14	A
Drain-Source Diode Forward Voltage (Note 1)	V_{SD}	$I_S=7A, V_{GS}=0V$			1.4	V
Reverse Recovery Time (Note 1)	t_{rr}	$I_S=7A, V_{GS}=0V$ $di/dt=100A/\mu s$		506		ns
Reverse Recovery Charge	Q_{rr}				2.7	

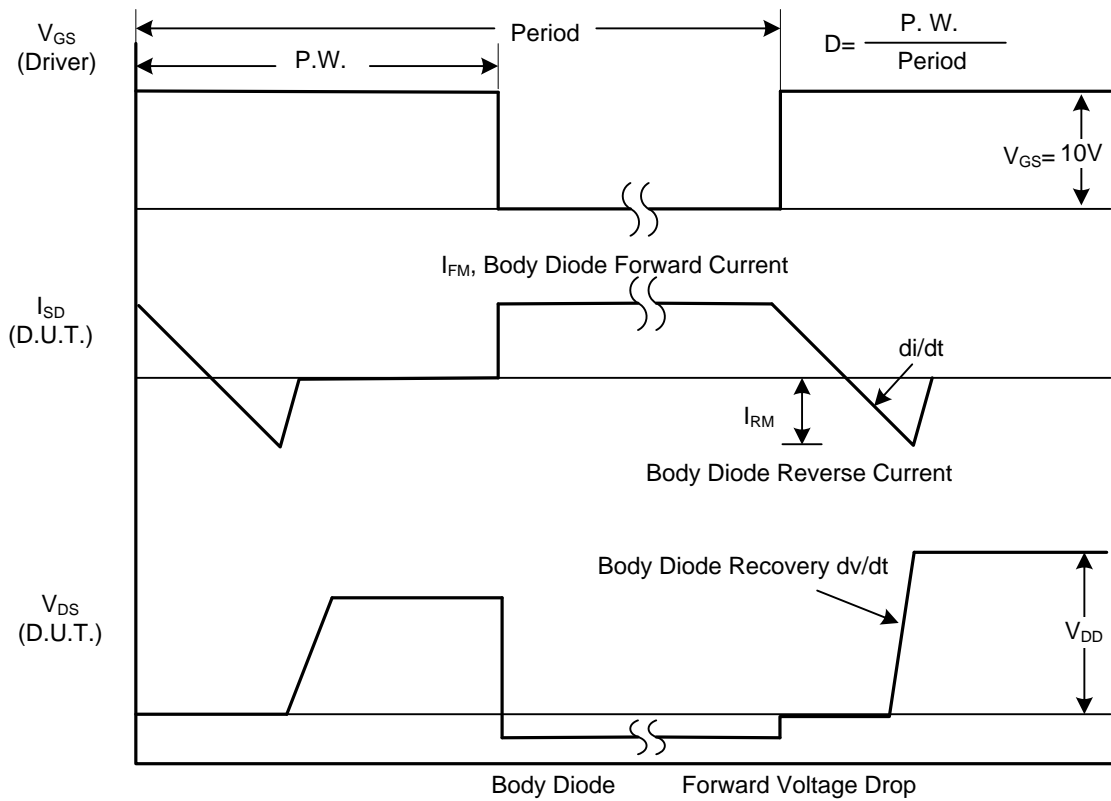
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

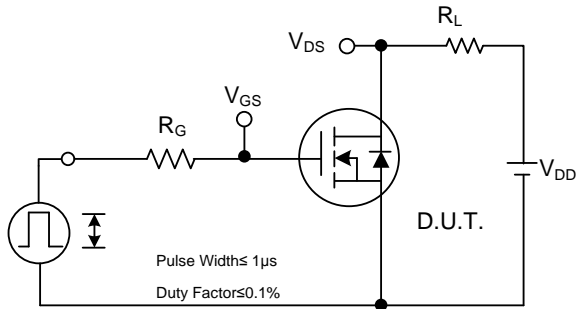


Peak Diode Recovery dv/dt Test Circuit

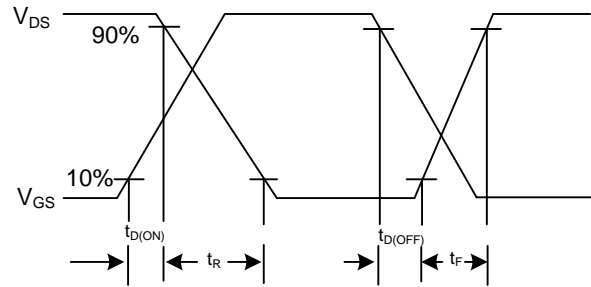


Peak Diode Recovery dv/dt Waveforms

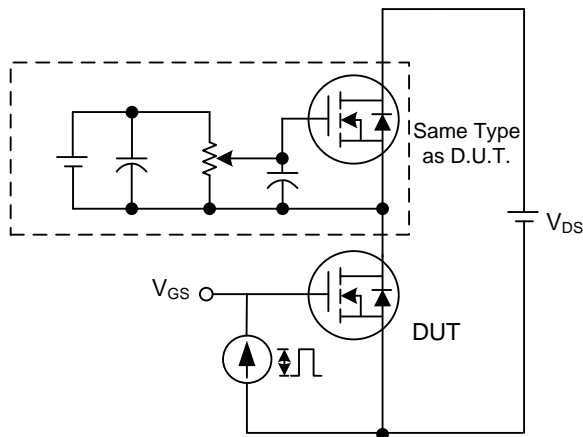
TEST CIRCUITS AND WAVEFORMS



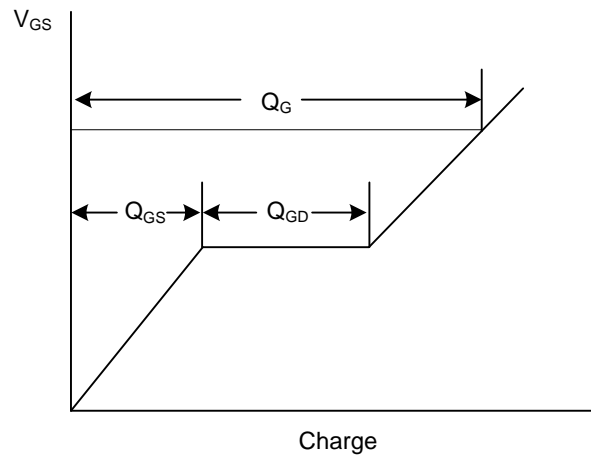
Switching Test Circuit



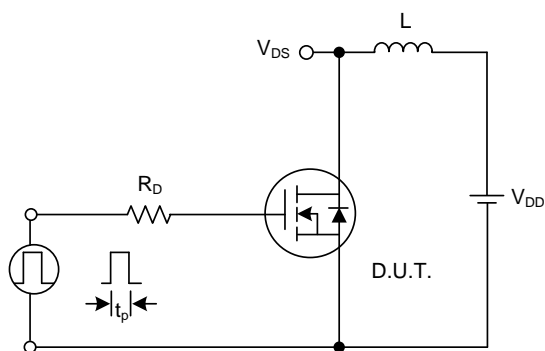
Switching Waveforms



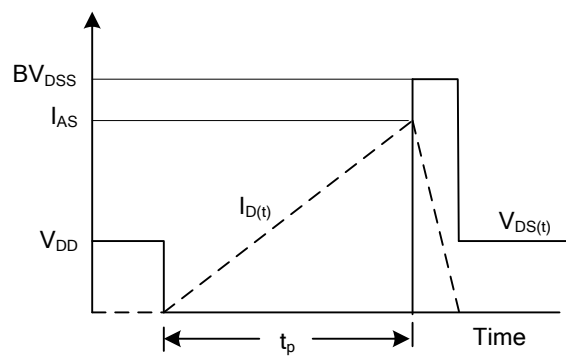
Gate Charge Test Circuit



Gate Charge Waveform

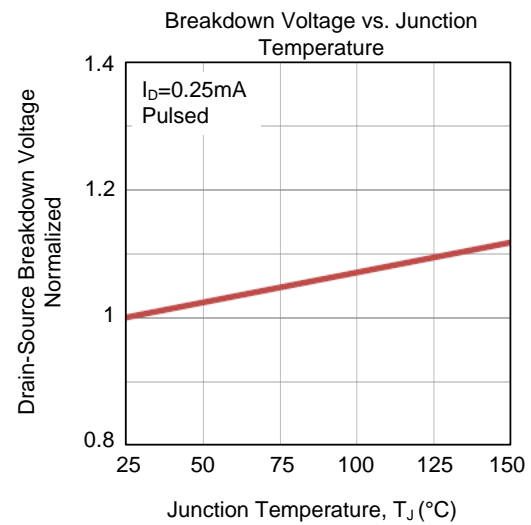
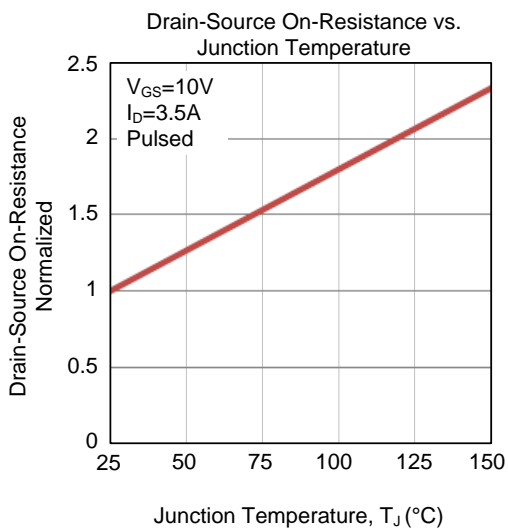
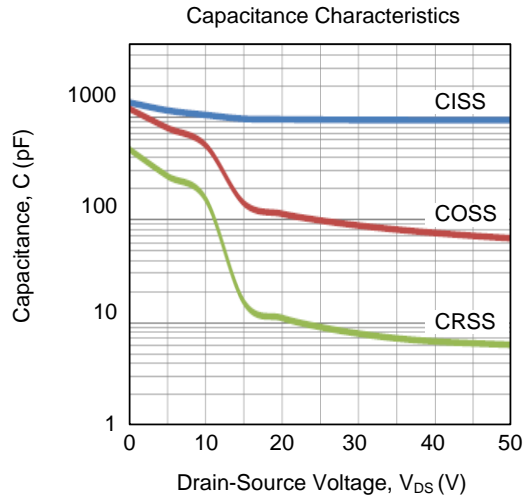
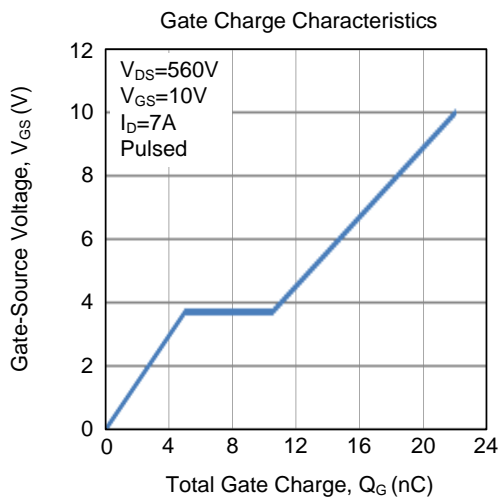
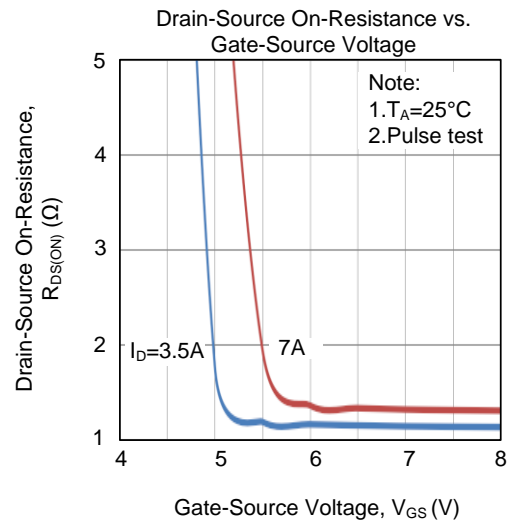
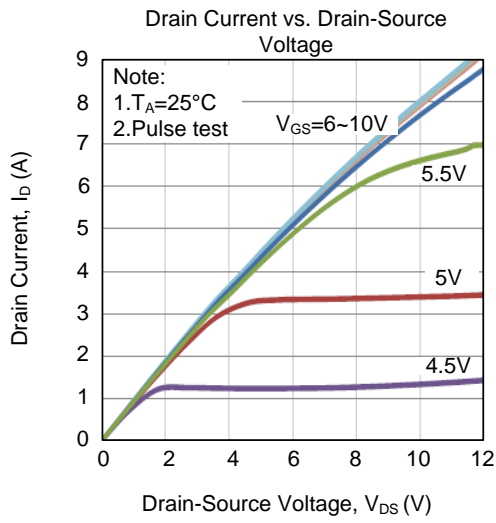


Unclamped Inductive Switching Test Circuit

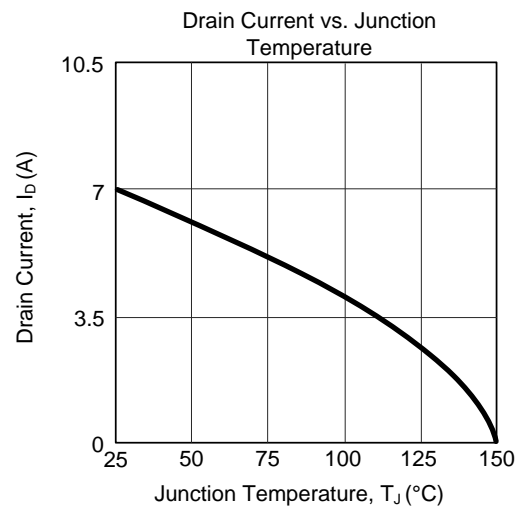
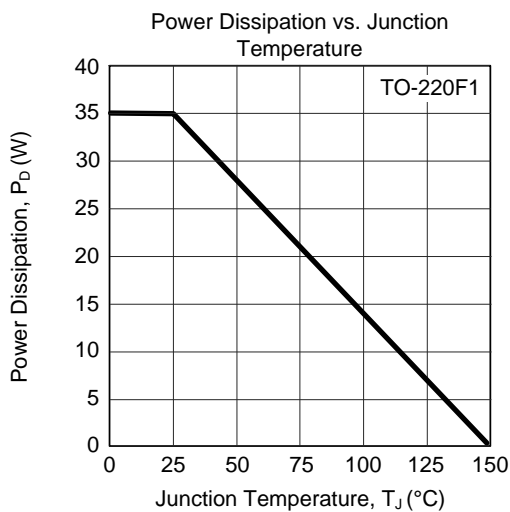
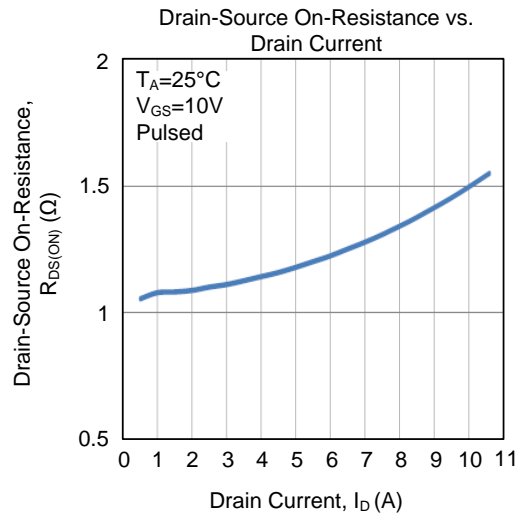
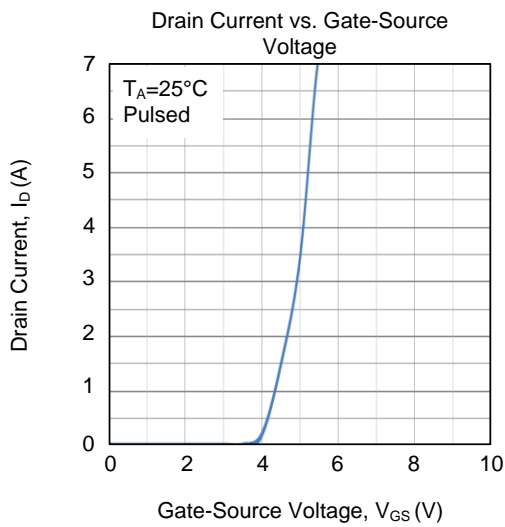
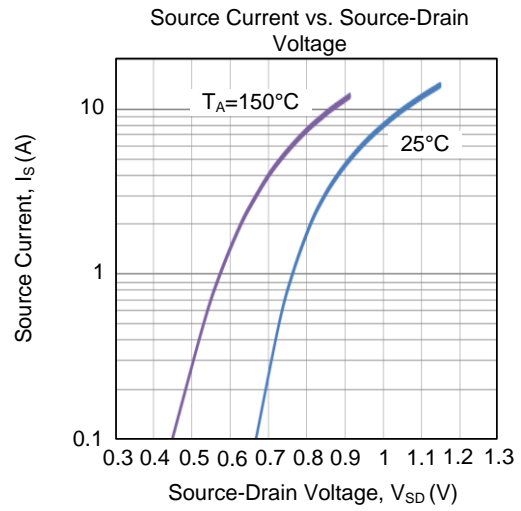
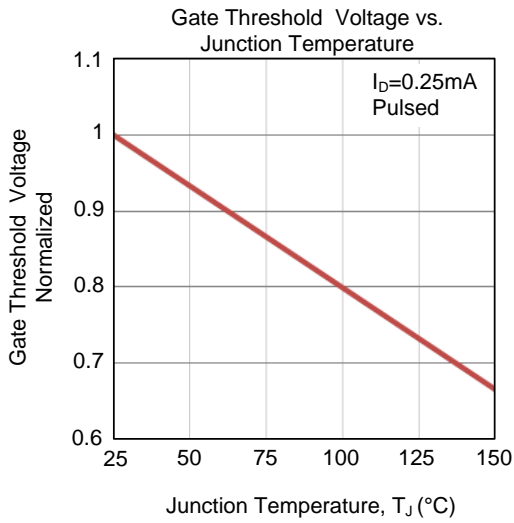


Unclamped Inductive Switching Waveforms

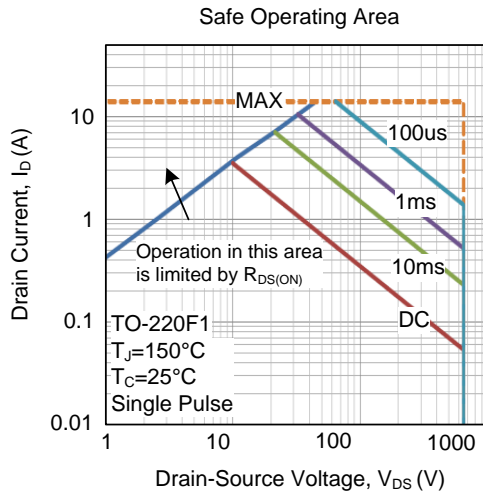
TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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