



7N90

Power MOSFET

7A, 900V N-CHANNEL POWER MOSFET

■ DESCRIPTION

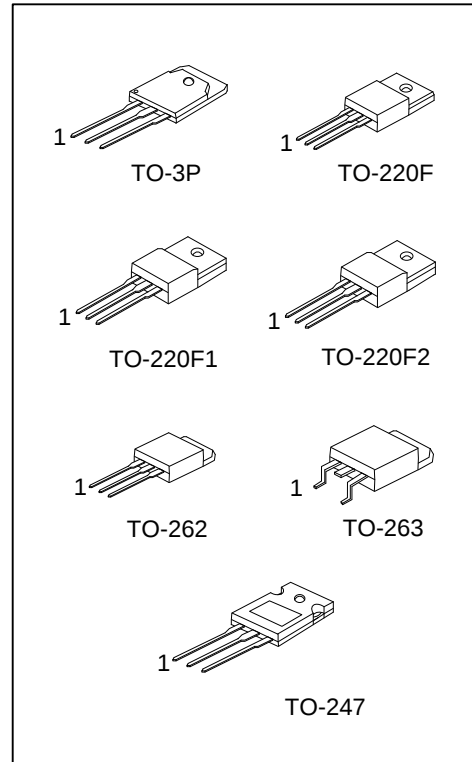
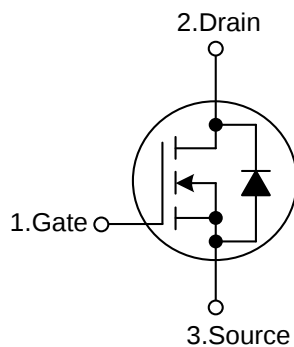
The UTC **7N90** is an N-channel mode power MOSFET using UTC's advanced technology to provide costumers with planar stripe and DMOS technology. This technology specializes in allowing a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **7N90** is universally applied in active power factor correction, electronic lamp ballast based on half bridge topology and high efficient switched mode power supply.

■ FEATURES

- * High switching speed
- * $R_{DS(ON)} \leq 1.8 \Omega$ @ $V_{GS}=10V$, $I_D=3.5A$
- * 100% avalanche tested
- * Improved dv/dt capability

■ SYMBOL



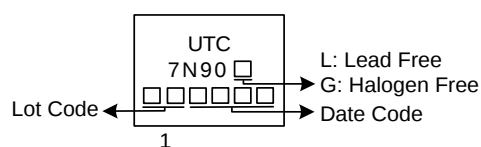
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
7N90L-TF1-T	7N90G-TF1-T	TO-220F1	G	D	S	Tube
7N90L-TF2-T	7N90G-TF2-T	TO-220F2	G	D	S	Tube
7N90L-TF3-T	7N90G-TF3-T	TO-220F	G	D	S	Tube
7N90L-T3P-T	7N90G-T3P-T	TO-3P	G	D	S	Tube
7N90L-T47-T	7N90G-T47-T	TO-247	G	D	S	Tube
7N90L-T2Q-T	7N90G-T2Q-T	TO-262	G	D	S	Tube
7N90L-TQ2-T	7N90G-TQ2-T	TO-263	G	D	S	Tube
7N90L-TQ2-R	7N90G-TQ2-R	TO-263	G	D	S	Tape Reel

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

7N90G-TF1-T (1) Packing Type (2) Package Type (3) Green Package	(1) T: Tube, R: Tape Reel (2) T3P: TO-3P, TF1: TO-220F1, TF2: TO-220F2 TF3: TO-220F, T2Q: TO-262 (3) G: Halogen Free and Lead Free, L: Lead Free
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■ MARKING



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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain to Source Voltage		V_{DSS}	900	V
Gate to Source Voltage		V_{GSS}	± 30	V
Continuous Drain Current	$T_C=25^{\circ}\text{C}$	I_D	7.0	A
	$T_C=100^{\circ}\text{C}$		4.4	A
Pulsed Drain Current (Note 2)		I_{DM}	14	A
Avalanche Current (Note 2)		I_{AR}	6.4	A
Single Pulsed Avalanche Energy (Note 3)		E_{AS}	540	mJ
Repetitive Avalanche Energy (Note 2)		E_{AR}	21	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.35	V/ns
Power Dissipation	TO-3P	P_D	240	W
	TO-220F/TO-220F1		39	W
	TO-220F2			
	TO-247		230	W
	TO-262/TO-263		155	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. $L=20\text{mH}$, $I_{AS}=7.35\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\Omega$, Starting $T_J=25^{\circ}\text{C}$

4. $I_{SD} \leq 7.0\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J=25^{\circ}\text{C}$

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-3P	θ_{JA}	40	$^{\circ}\text{C}/\text{W}$
	TO-220F/TO-220F1		62.5	$^{\circ}\text{C}/\text{W}$
	TO-220F2/TO-262			
	TO-263		50	$^{\circ}\text{C}/\text{W}$
	TO-247			
Junction to Case	TO-3P	θ_{JC}	0.52	$^{\circ}\text{C}/\text{W}$
	TO-220F/TO-220F1		3.2	$^{\circ}\text{C}/\text{W}$
	TO-220F2			
	TO-247		0.54	$^{\circ}\text{C}/\text{W}$
	TO-262/TO-263		0.8	$^{\circ}\text{C}/\text{W}$

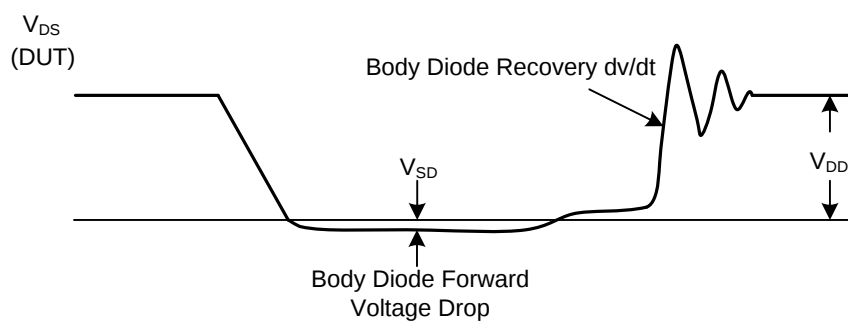
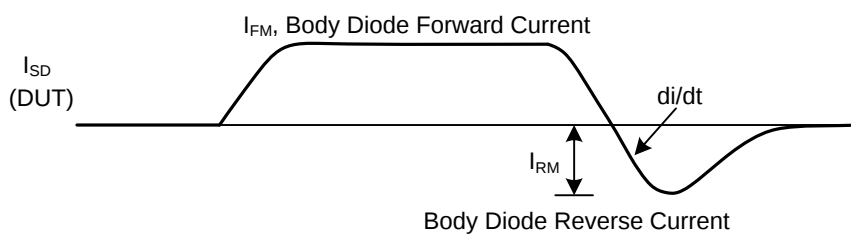
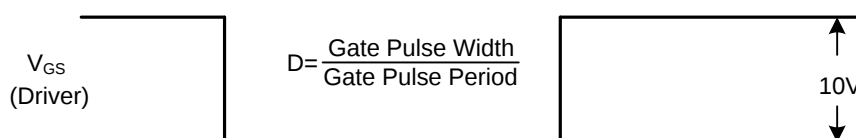
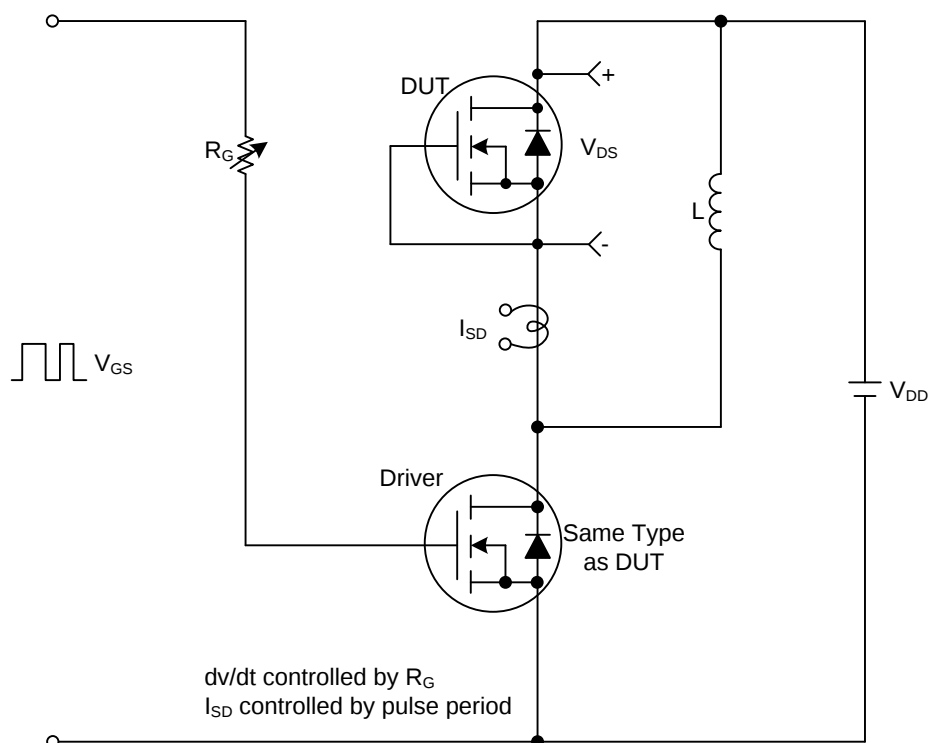
■ **ELECTRICAL CHARACTERISTICS** ($T_C=25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V, I _D =250μA	900			V
Breakdown Voltage Temperature Coefficient		ΔBV _{DSS} /ΔT _J	I _D =250μA, Referenced to 25°C		0.96		V/°C
Drain-Source Leakage Current		I _{DSS}	V _{DS} =900V, V _{GS} =0V			10	μA
			V _{DS} =720V, T _C =125°C			100	μA
Gate-Source Leakage Current	Forward	I _{GSS}	V _{DS} =0V, V _{GS} =30V			100	nA
	Reverse	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	3.0		5.0	V
Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V, I _D =3.5A		1.5	1.8	Ω
Forward Transconductance		g _{FS}	V _{DS} =50V, I _D =3.5A (Note 4)		5.7		S
DYNAMIC PARAMETERS							
Input Capacitance		C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1.0MHz			1880	pF
Output Capacitance		C _{OSS}				185	pF
Reverse Transfer Capacitance		C _{RSS}				23	pF
SWITCHING PARAMETERS							
Total Gate Charge		Q _G	V _{DS} =720V, V _{GS} =10V, I _D =7A I _G =1mA (Note 1, 2)		47		nC
Gate-Source Charge		Q _{GS}			11		nC
Gate-Drain Charge		Q _{GD}			13.6		nC
Turn-ON Delay Time		t _{D(ON)}	V _{DD} =100V, V _{GS} =10V, I _D =7A, R _G =25Ω (Note 1, 2)		28		ns
Turn-ON Rise Time		t _R			22		ns
Turn-OFF Delay Time		t _{D(OFF)}			130		ns
Turn-OFF Fall Time		t _F			53		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I _S				6.4	A
Maximum Body-Diode Pulsed Current		I _{SM}				14	A
Drain-Source Diode Forward Voltage		V _{SD}	I _S =7.0A, V _{GS} =0V			1.4	V
Body Diode Reverse Recovery Time		t _{rr}	I _S =7.0A, V _{GS} =0V,		624		ns
Body Diode Reverse Recovery Charge		Q _{rr}	dI _F /dt=100A/μs (Note 4)		18.25		μC

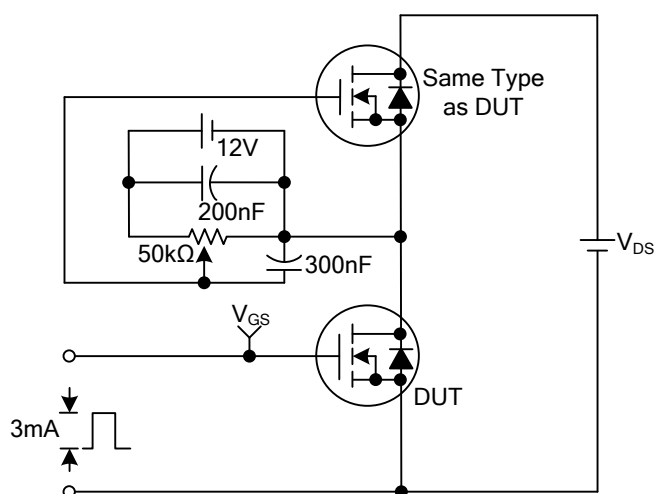
Notes: 1. Pulse Test : Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$

2. Essentially independent of operating temperature

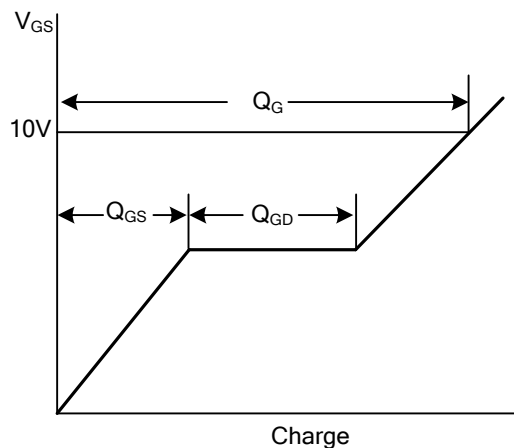
■ TEST CIRCUITS AND WAVEFORMS

Peak Diode Recovery dv/dt Test Circuit & Waveforms

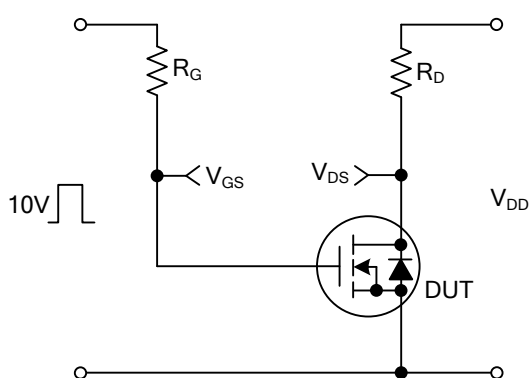
■ TEST CIRCUITS AND WAVEFORMS



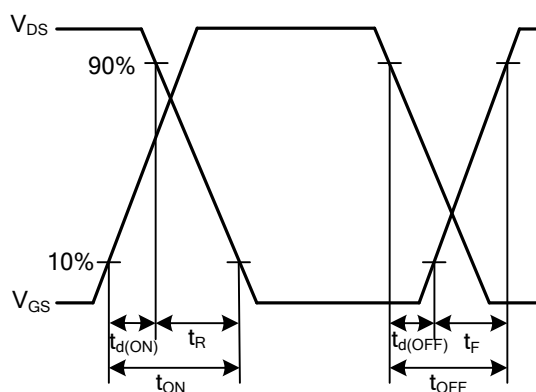
Gate Charge Test Circuit



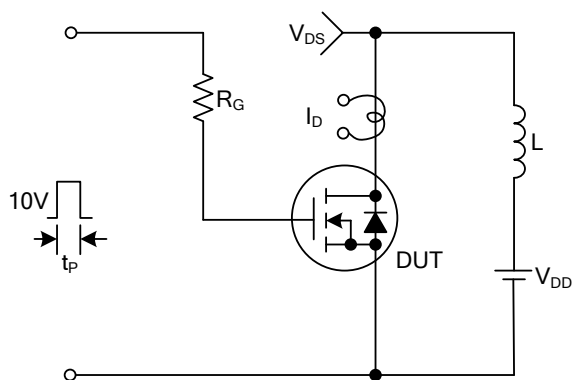
Gate Charge Waveforms



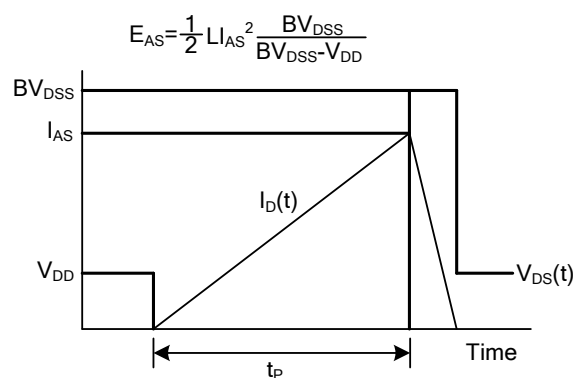
Resistive Switching Test Circuit



Resistive Switching Waveforms

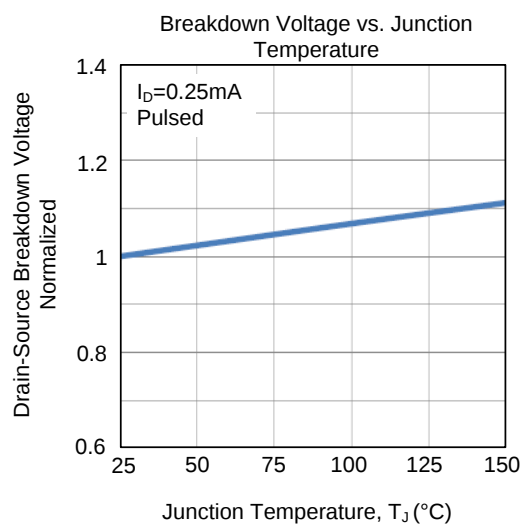
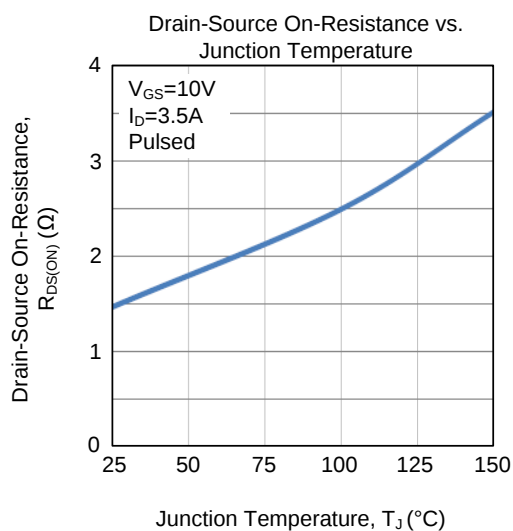
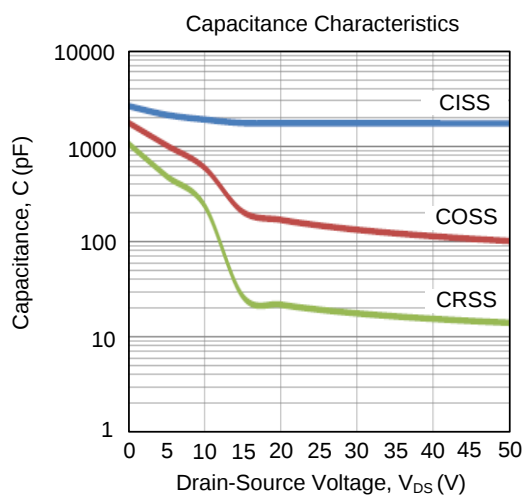
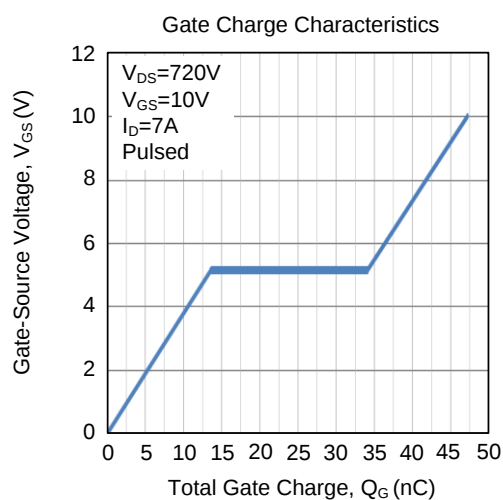
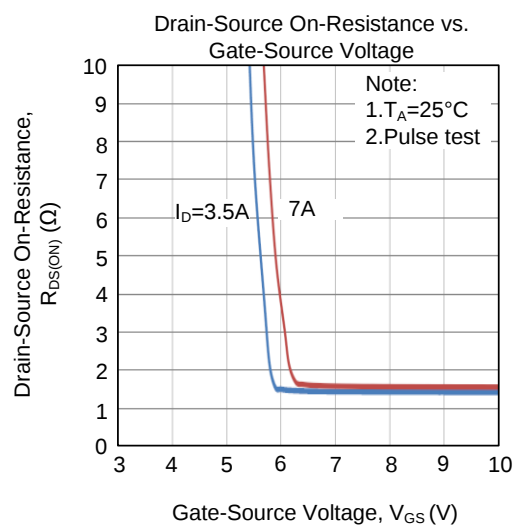
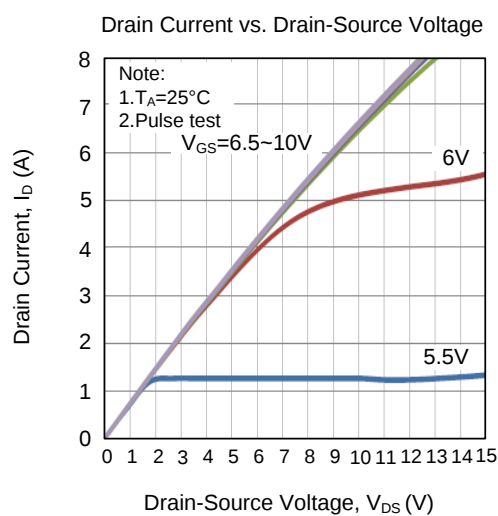


Unclamped Inductive Switching Test Circuit

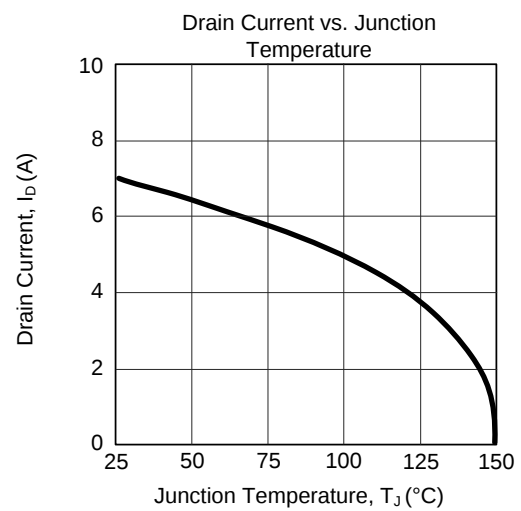
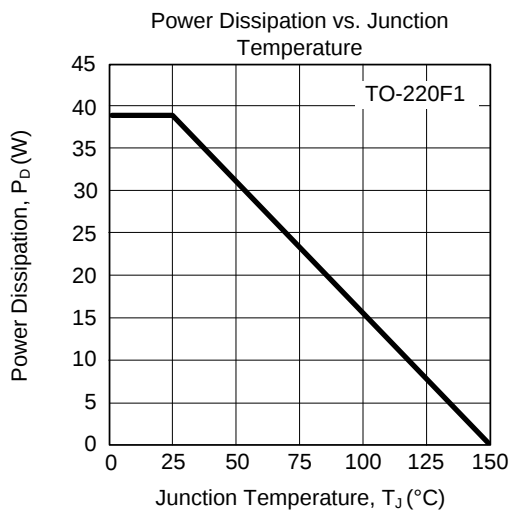
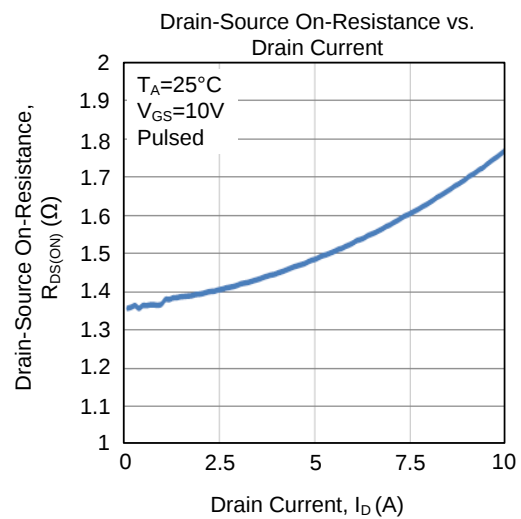
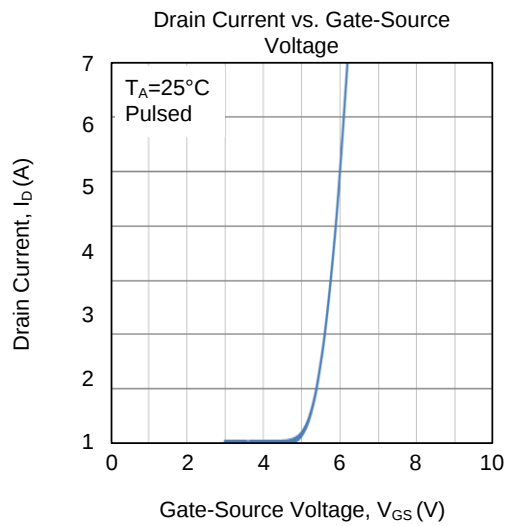
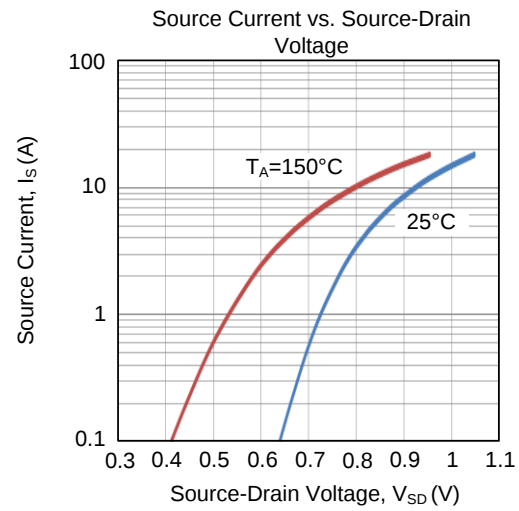
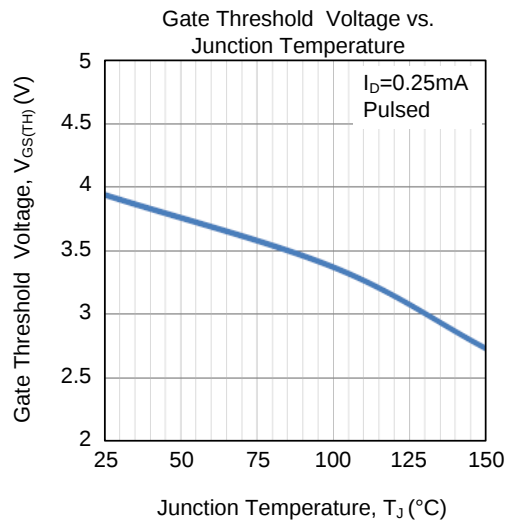


Unclamped Inductive Switching Waveforms

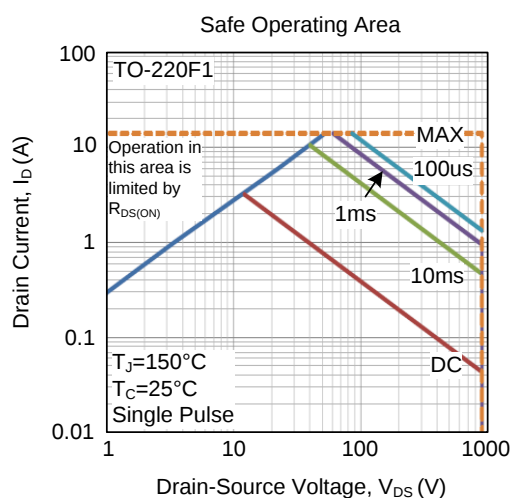
■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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