



30NM65-U2

Power MOSFET

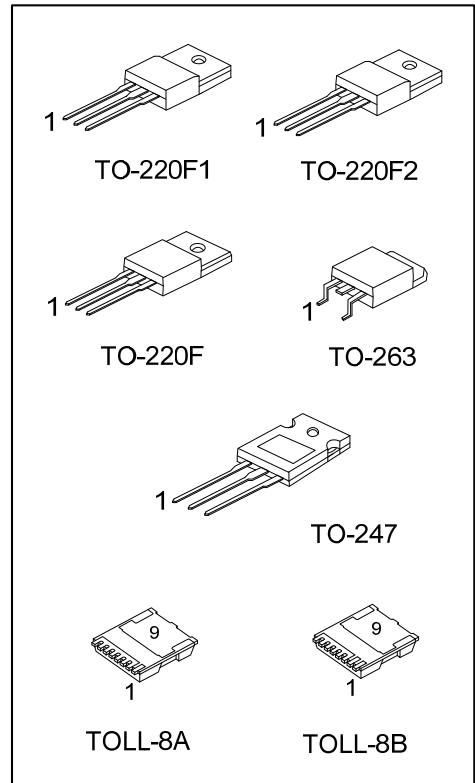
30A, 650V N-CHANNEL SUPER-JUNCTION MOSFET

DESCRIPTION

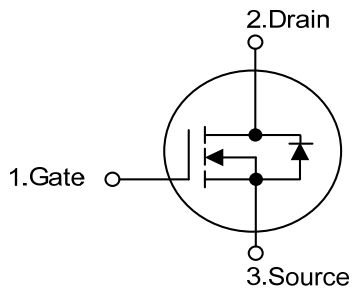
The **UTC 30NM65-U2** is a Super Junction MOSFET Structure and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and a high rugged avalanche characteristics. This power MOSFET is usually used at AC-DC converters for power applications.

FEATURES

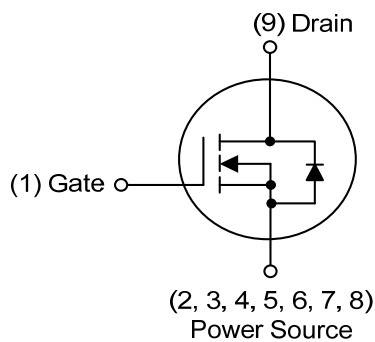
- * $R_{DS(ON)} \leq 0.13 \Omega$ @ $V_{GS}=10V$, $I_D=7.5A$
- * Fast switching capability
- * Avalanche energy tested
- * Improved dv/dt capability, high ruggedness



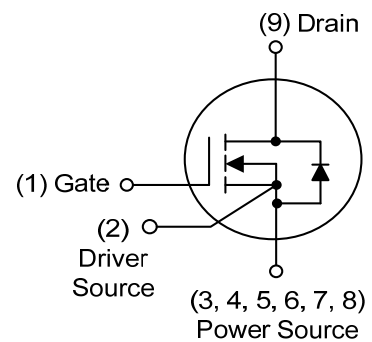
SYMBOL



TO-220F / TO-220F1
TO-220F2 / TO-247 / TO-263



TOLL-8A



TOLL-8B

ORDERING INFORMATION

Ordering Number		Package	Pin Assignment									Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	9	
30NM65L-U2-TF1-T	30NM65G-U2-TF1-T	TO-220F1	G	D	S	-	-	-	-	-	-	Tube
30NM65L-U2-TF2-T	30NM65G-U2-TF2-T	TO-220F2	G	D	S	-	-	-	-	-	-	Tube
30NM65L-U2-TF3-T	30NM65G-U2-TF3-T	TO-220F	G	D	S	-	-	-	-	-	-	Tube
30NM65L-U2-T47-T	30NM65G-U2-T47-T	TO-247	G	D	S	-	-	-	-	-	-	Tube
30NM65L-U2-TQ2-T	30NM65G-U2-TQ2-T	TO-263	G	D	S	-	-	-	-	-	-	Tube
30NM65L-U2-TQ2-R	30NM65G-U2-TQ2-R	TO-263	G	D	S	-	-	-	-	-	-	Tape Reel
30NM65L-U2-T8A-T	30NM65G-U2-T8A-T	TOLL-8A	G	S	S	S	S	S	S	S	S	Tape Reel
30NM65L-U2-T8B-T	30NM65G-U2-T8B-T	TOLL-8B	G	S	S	S	S	S	S	S	D	Tape Reel

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

30NM65G-U2-TF1-T (1) Packing Type (2) Package Type (3) Version Code (4) Green Package	(1) T: Tube, R: Tape Reel (2) TF1: TO-220F1, TF2: TO-220F2, TF3: TO-220F, T47: TO-247, TQ2: TO-263, T8A: TOLL-8A, T8B: TOLL-8B (3) Version U2 (4) G: Halogen Free and Lead Free, L: Lead Free
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MARKING

TO-220F / TO-220F1 TO-220F2 / TO-263 / TO-247	TOLL-8A / TOLL-8A
UTC 30NM60 U2 Date Code Version Code Lot Code L: Lead Free G: Halogen Free	UTC 30NM65 U2 Date Code Version Code Lot Code L: Lead Free G: Halogen Free

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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V _{DSS}	650	V
Gate-Source Voltage		V _{GSS}	±30	V
Drain Current	Continuous	I _D	30	A
	Pulsed (Note 2)	I _{DM}	90	A
Avalanche Energy	Single Pulsed (Note 3)	E _{AS}	450	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	1.6	V/ns
Power Dissipation	TO-220F/TO-220F1 TO-220F2	P _D	35	W
	TO-247		150	W
	TO-263		127	W
	TOLL-8A/TOLL-8B		225	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. $L = 100\text{mH}$, $I_{AS} = 3.0\text{A}$, $V_{DD} = 90\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$

4. $I_{SD} \leq 30\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^{\circ}\text{C}$

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220F/TO-220F1 TO-220F2/TO-263	θ_{JA}	65.5	$^{\circ}\text{C}/\text{W}$
	TO-247/TOLL-8A TOLL-8B		40	$^{\circ}\text{C}/\text{W}$
Junction to Case	TO-220F/TO-220F1 TO-220F2	θ_{JC}	3.57	$^{\circ}\text{C}/\text{W}$
	TO-247		0.83	$^{\circ}\text{C}/\text{W}$
	TO-263		0.98 (Note)	$^{\circ}\text{C}/\text{W}$
	TOLL-8A/TOLL-8B		0.55 (Note)	$^{\circ}\text{C}/\text{W}$

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

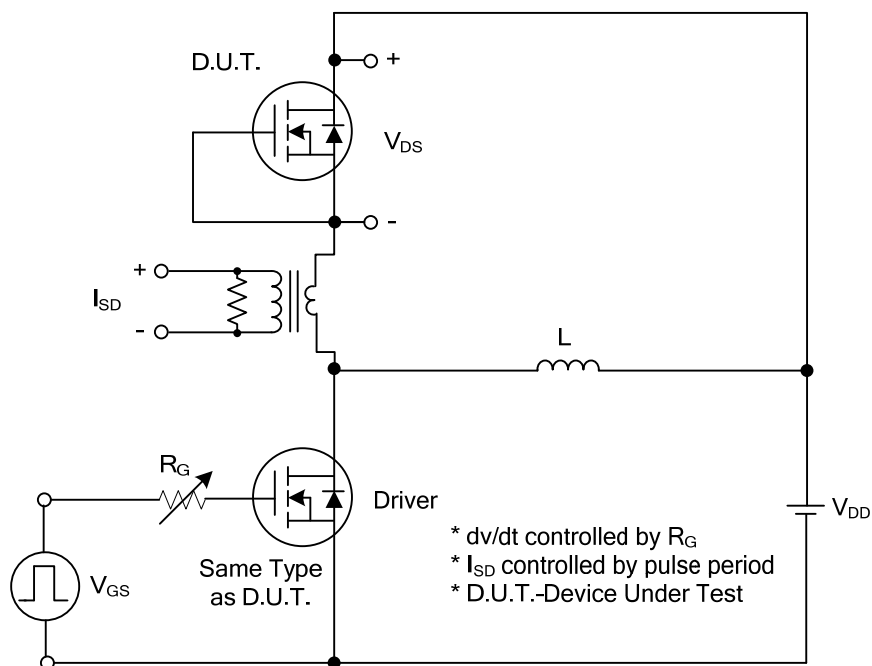
■ **ELECTRICAL CHARACTERISTICS** ($T_J=25^\circ\text{C}$, unless otherwise specified)

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	I_{GSS}	$V_{GS}=\pm 30V, V_{DS}=0V$			± 100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.5		4.5	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=7.5A$			0.13	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ISS}	$V_{GS}=0V, V_{DS}=50V, f=1MHz$		1864		pF
Output Capacitance	C_{OSS}			781		pF
Reverse Transfer Capacitance	C_{RSS}			68		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge	Q_G	$V_{DS}=520V, V_{GS}=10V, I_D=30A$ (Note 1, 2)		87		nC
Gate-Source Charge	Q_{GS}			13		nC
Gate-Drain Charge	Q_{DD}			56		nC
Turn-On Delay Time	$t_{D(ON)}$	$V_{DD}=100V, V_{GS}=10V, I_D=30A,$ $R_G=25\Omega$ (Note 1, 2)		34		ns
Turn-On Rise Time	t_R			91		ns
Turn-Off Delay Time	$t_{D(OFF)}$			246		ns
Turn-Off Fall Time	t_F			99		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Continuous Drain-Source Diode Forward Current	I_S				30	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}				90	A
Drain-Source Diode Forward Voltage	V_{SD}	$I_S=30A, V_{GS}=0V$			1.4	V
Body Diode Reverse Recovery Time	t_{rr}	$I_S=30A, V_{GS}=0V,$		538		nS
Body Diode Reverse Recovery Charge	Q_{rr}	$dI_F/dt=100A/\mu s$		10.6		μC

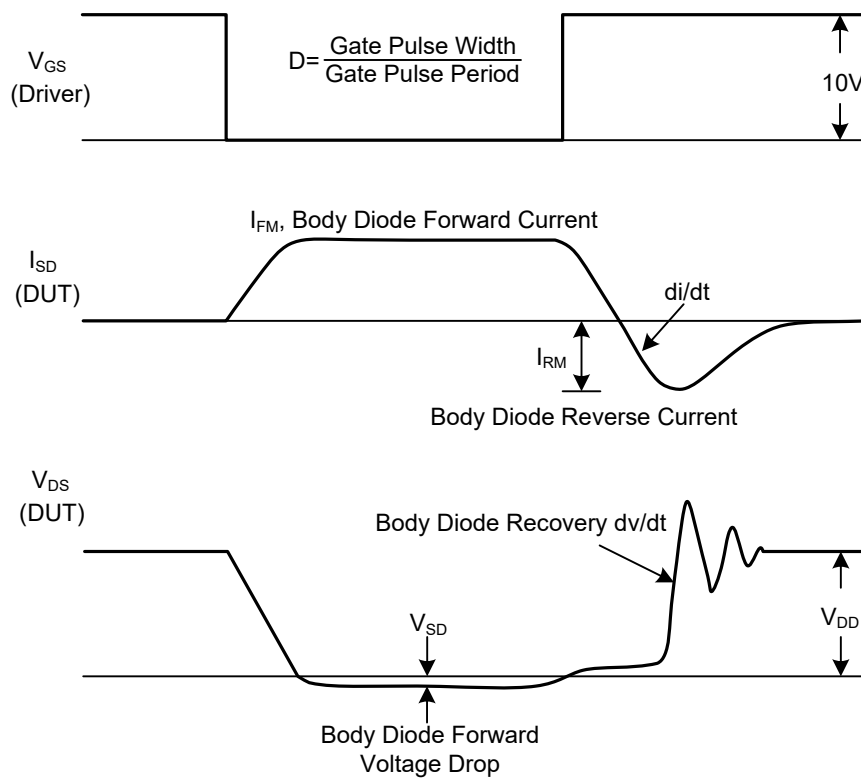
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

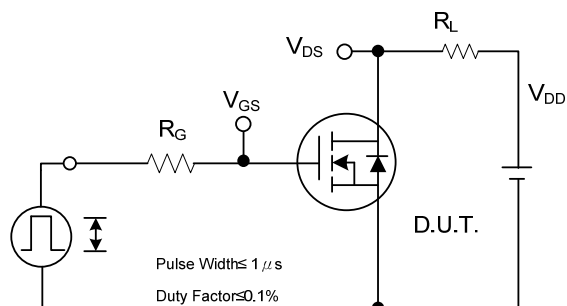


Peak Diode Recovery dv/dt Test Circuit

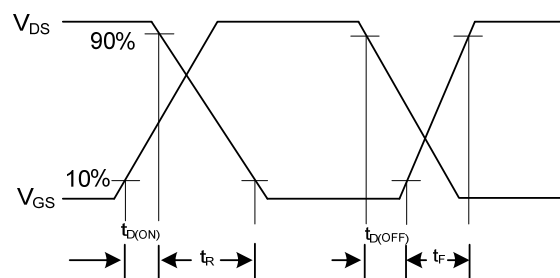


Peak Diode Recovery dv/dt Waveforms

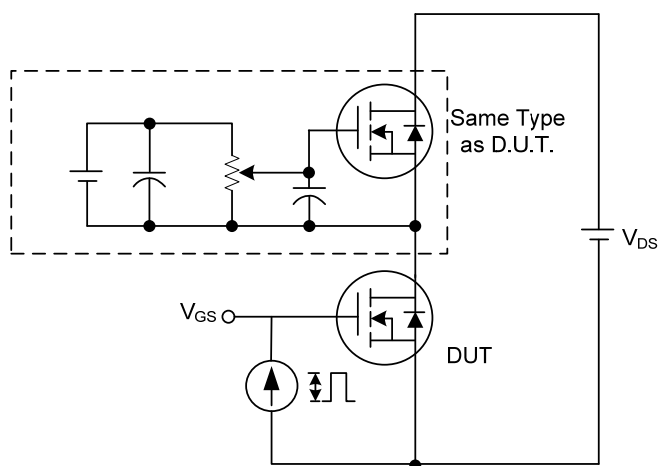
■ TEST CIRCUITS AND WAVEFORMS



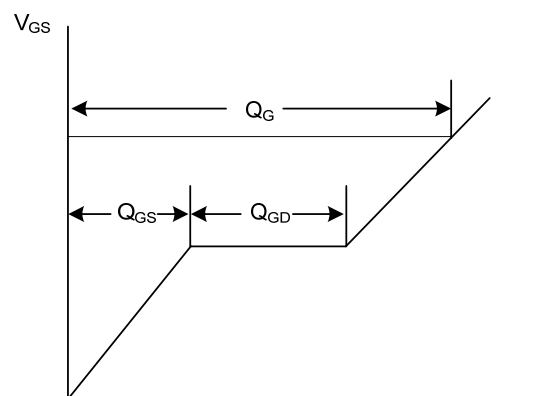
Switching Test Circuit



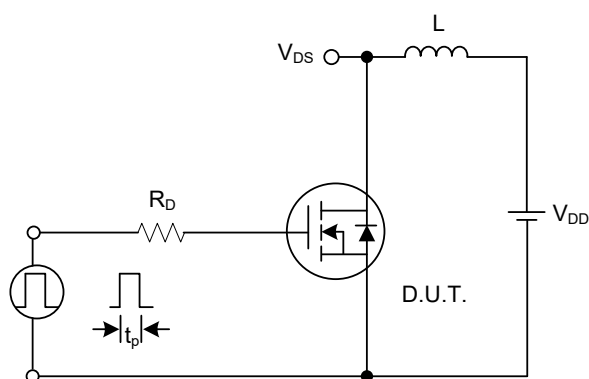
Switching Waveforms



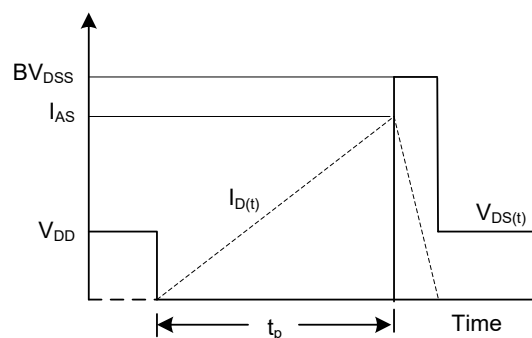
Gate Charge Test Circuit



Charge
Gate Charge Waveform

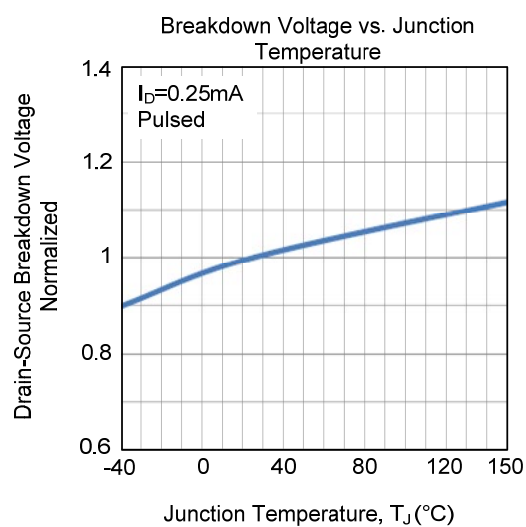
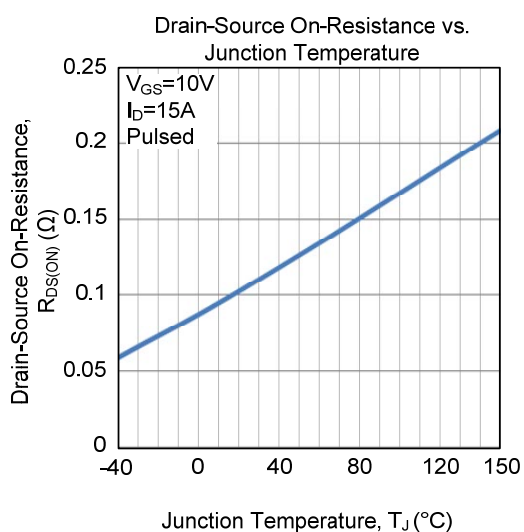
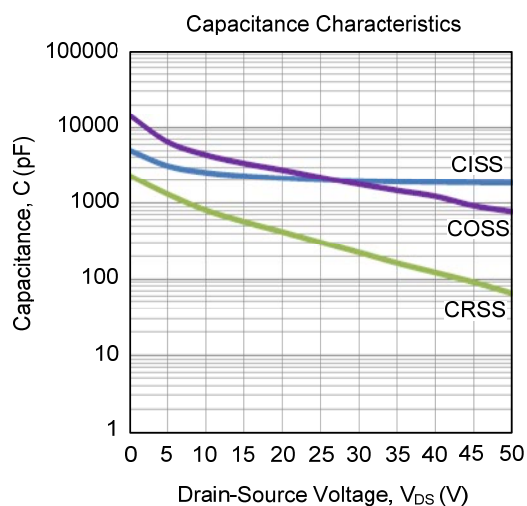
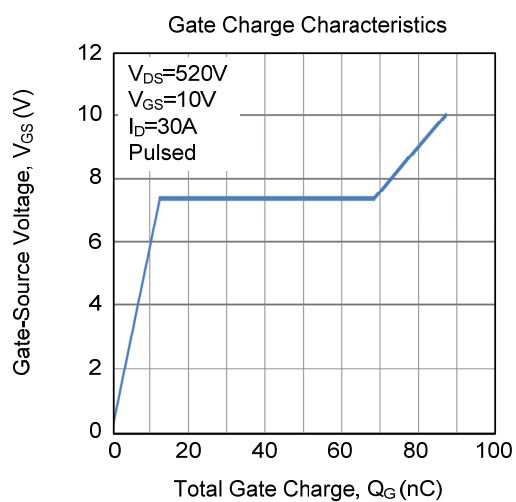
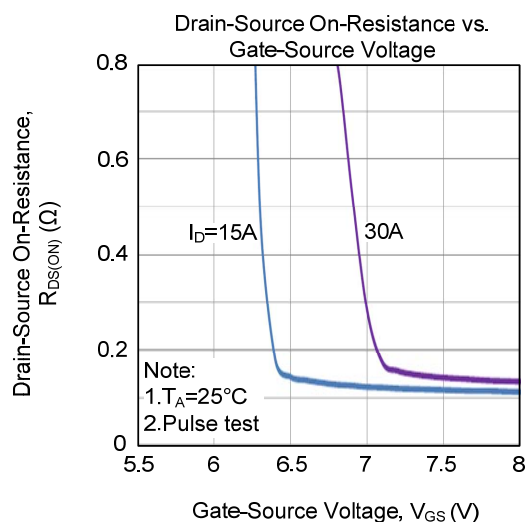
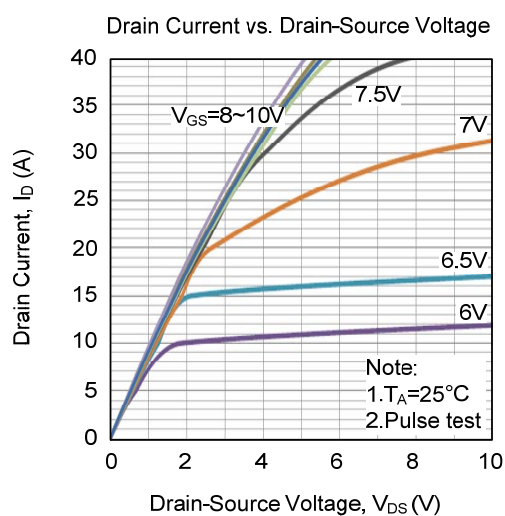


Unclamped Inductive Switching Test Circuit

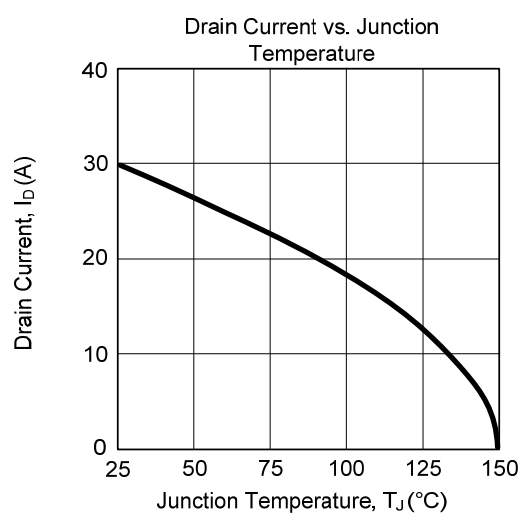
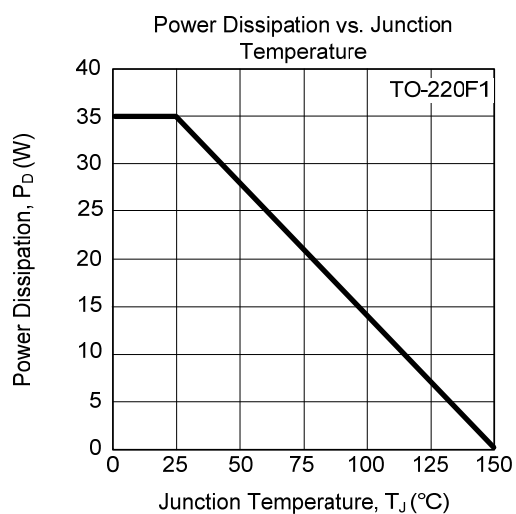
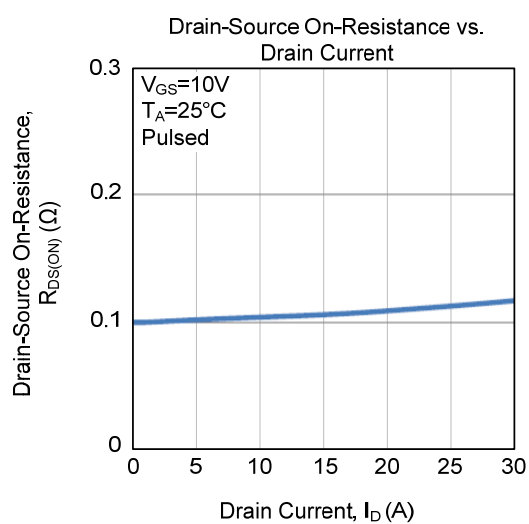
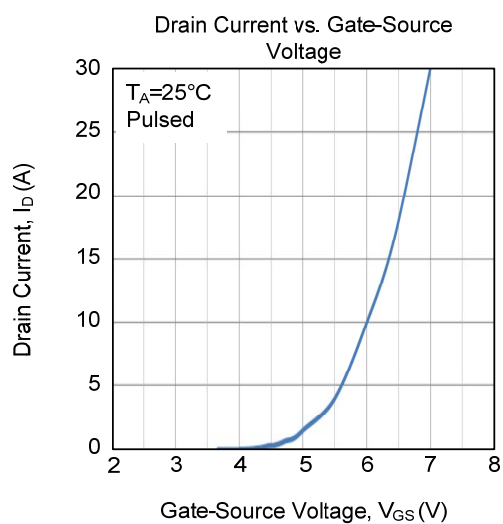
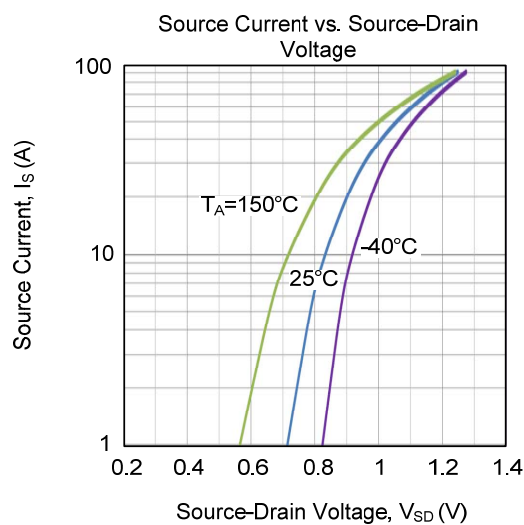
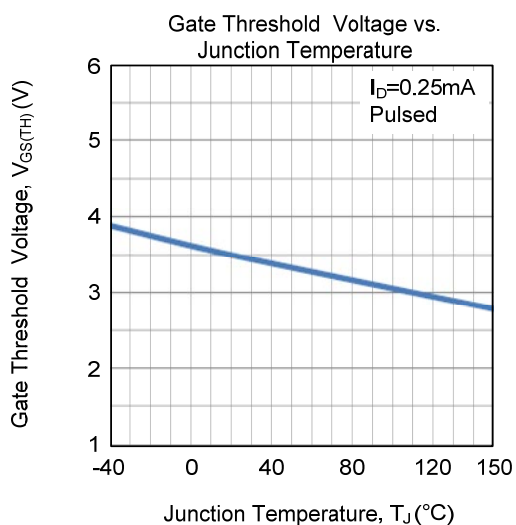


Unclamped Inductive Switching Waveforms

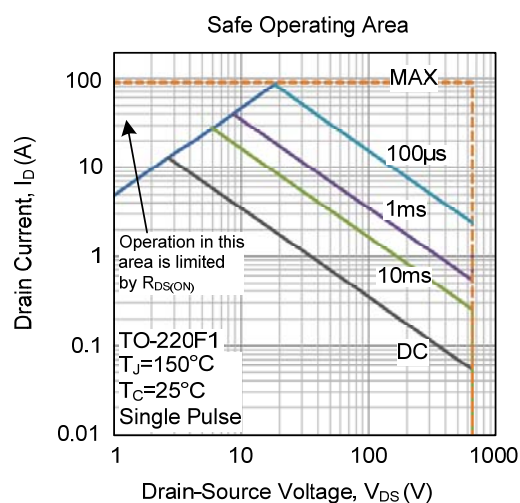
TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS (Cont.)



TYPICAL CHARACTERISTICS (Cont.)



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