



7NM65

Power MOSFET

7A, 650V N-CHANNEL SUPER-JUNCTION MOSFET

DESCRIPTION

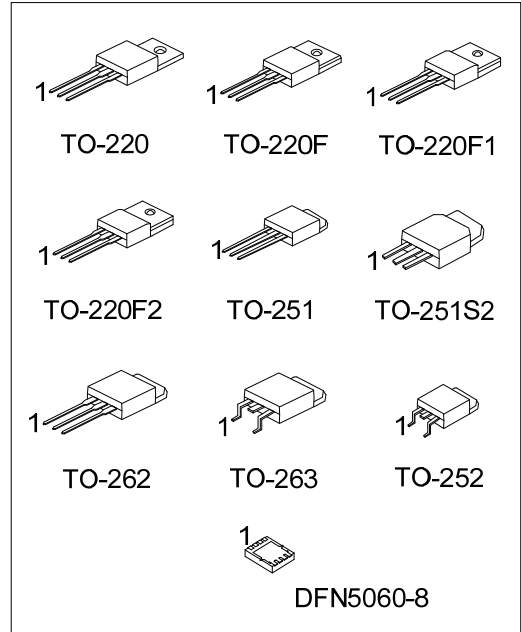
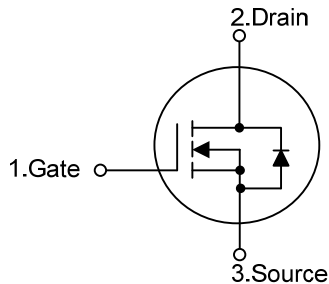
The UTC **7NM65** is a Super Junction MOSFET Structure. It uses UTC advanced planar stripe, DMOS technology to provide customers perfect switching performance, minimal on-state resistance.

The UTC **7NM65** is universally applied in electronic lamp ballasts based on half bridge topology, high efficiency switched mode power supplies, active power factor correction, etc.

FEATURES

- * $R_{DS(ON)} \leq 0.95 \Omega @ V_{GS}=10V, I_D=3.5A$
- * 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	4	5	6	7	8	
7NM65L-TA3-T	7NM65G-TA3-T	TO-220	G	D	S	-	-	-	-	-	Tube
7NM65L-TF3-T	7NM65G-TF3-T	TO-220F	G	D	S	-	-	-	-	-	Tube
7NM65L-TF1-T	7NM65G-TF1-T	TO-220F1	G	D	S	-	-	-	-	-	Tube
7NM65L-TF2-T	7NM65G-TF2-T	TO-220F2	G	D	S	-	-	-	-	-	Tube
7NM65L-TM3-T	7NM65G-TM3-T	TO-251	G	D	S	-	-	-	-	-	Tube
7NM65L-TMS2-T	7NM65G-TMS2-T	TO-251S2	G	D	S	-	-	-	-	-	Tube
7NM65L-TN3-R	7NM65G-TN3-R	TO-252	G	D	S	-	-	-	-	-	Tape Reel
7NM65L-T2Q-T	7NM65G-T2Q-T	TO-262	G	D	S	-	-	-	-	-	Tube
7NM65L-TQ2-T	7NM65G-TQ2-T	TO-263	G	D	S	-	-	-	-	-	Tube
7NM65L-TQ2-R	7NM65G-TQ2-R	TO-263	G	D	S	-	-	-	-	-	Tape Reel
7NM65G-K08-5060-R	7NM65G-K08-5060-R	DFN5060-8	S	S	S	G	D	D	D	D	Tape Reel

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

7NM65G-TA3-T (1) Packing Type (2) Package Type (3) Green Package	(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF1: TO-220F1, TF2: TO-220F2, TF3: TO-220F, TM3: TO-251, TN3: TO-252, TMS2: TO-251S2, T2Q: TO-262, TQ2: TO-263, K08-3030: DFN5060-8 (3) G: Halogen Free and Lead Free, L: Lead Free
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MARKING

PACKAGE		MARKING
TO-220 TO-220F TO-220F1 TO-220F2	TO-251 TO-251S2 TO-252 TO-262 TO-263	UTC 7NM65 Lot Code → Date Code 1 L: Lead Free G: Halogen Free
DFN5060-8		UTC 7NM65 Lot Code → Date Code

■ **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	7	A
	Pulsed (Note 2)	I_{DM}	14	A
Avalanche Current (Note 2)		I_{AR}	1.7	A
Avalanche Energy		E_{AS}	208	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.0	V/ns
Power Dissipation	TO-220/TO-262 TO-263	P_D	74	W
	TO-220F/TO-220F1 TO-220F2		26	W
	TO-251/ TO-251S2 TO-252		48	W
	DFN5060-8		24	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. $L = 144 \text{ mH}$, $I_{AS} = 1.7 \text{ A}$, $V_{DD} = 50 \text{ V}$, $R_G = 25 \Omega$, 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	PACKAGE	SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-220F2 TO-262/TO-263	θ_{JA}	62.5	$^\circ\text{C}/\text{W}$
	TO-251/ TO-251S2 TO-252		110	$^\circ\text{C}/\text{W}$
	DFN5060-8		75	$^\circ\text{C}/\text{W}$
Junction to Case	TO-220/TO-262 TO-263	θ_{JC}	1.68	$^\circ\text{C}/\text{W}$
	TO-220F/TO-220F1 TO-220F2		4.8	$^\circ\text{C}/\text{W}$
	TO-251/ TO-251S2 TO-252		2.6	$^\circ\text{C}/\text{W}$
	DFN5060-8		5.2	$^\circ\text{C}/\text{W}$

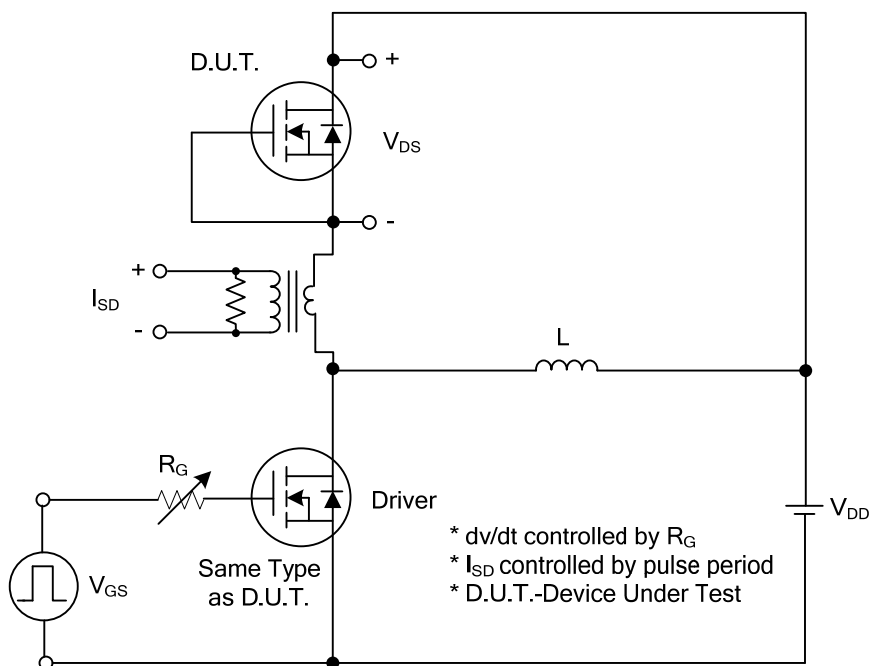
■ **ELECTRICAL CHARACTERISTICS** ($T_J = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} = 0V, I _D = 250μA	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	2.5		4.5	V
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} = 10V, I _D = 3.5A			0.95	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =25V, f=1.0 MHz		430		pF
Output Capacitance		C _{OSS}			250		pF
Reverse Transfer Capacitance		C _{RSS}			22		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge (Note 1)		Q _G	V _{DS} =520V, V _{GS} =10V, I _D =7A I _G =1mA		22		nC
Gate-Source Charge		Q _{GS}			3.6		nC
Gate-Drain Charge		Q _{GD}			7.6		nC
Turn-On Delay Time (Note 1)		t _{D(ON)}	V _{DD} =100V, V _{GS} =10V, I _D =7A, R _G =10Ω (Note 1, 2)		5		ns
Turn-On Rise Time		t _R			15		ns
Turn-Off Delay Time		t _{D(OFF)}			35		ns
Turn-Off Fall Time		t _F			19		ns
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS							
Maximum Continuous Drain-Source Diode Forward Current		I _S				7	A
Maximum Pulsed Drain-Source Diode Forward Current		I _{SM}				14	A
Drain-Source Diode Forward Voltage (Note 1)		V _{SD}	V _{GS} =0V, I _S =7.0A			1.4	V
Body Diode Reverse Recovery Time (Note 1)		t _{rr}	V _{GS} =0V, I _S =7.0A,		300		nS
Body Diode Reverse Recovery Charge		Q _{rr}	dl _F /dt=100A/μs		3		μC

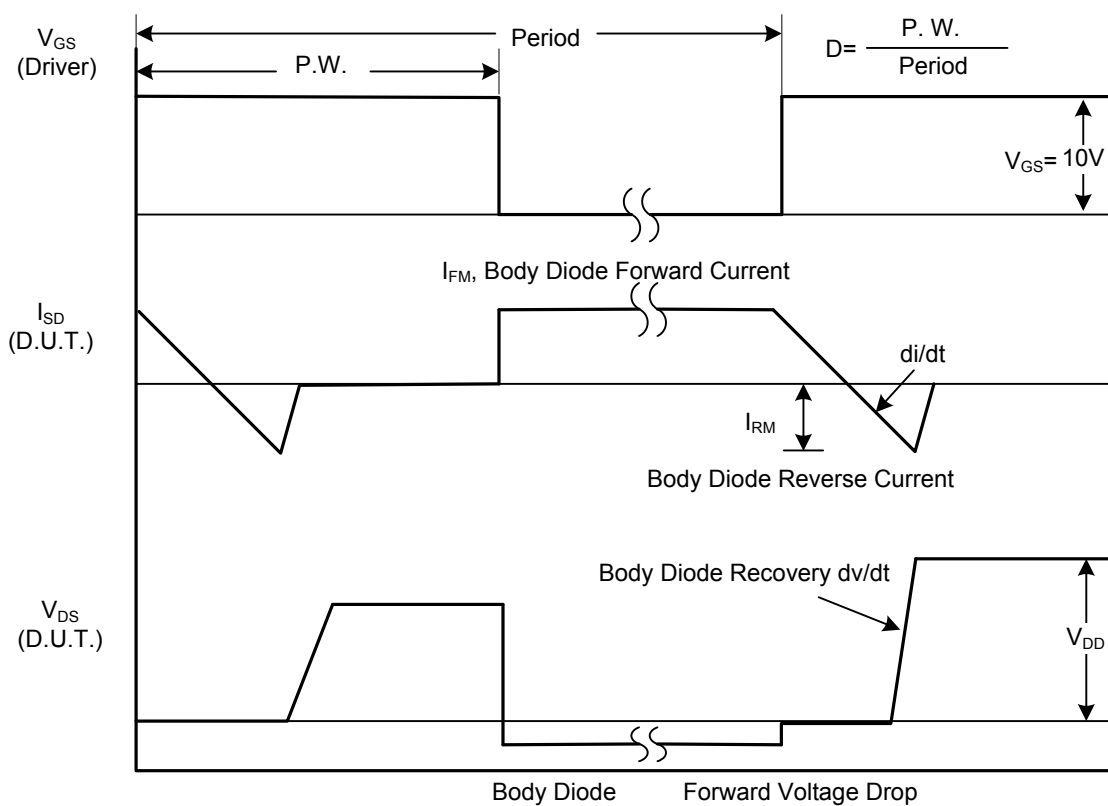
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$

2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

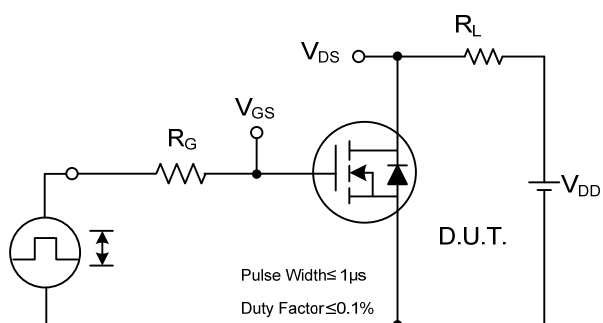


Peak Diode Recovery dv/dt Test Circuit

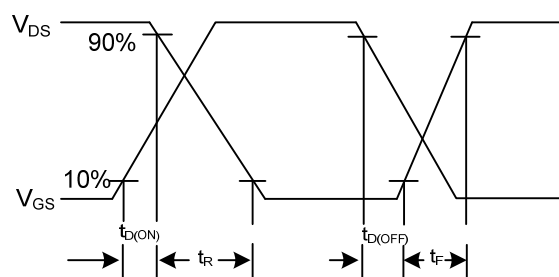


Peak Diode Recovery dv/dt Waveforms

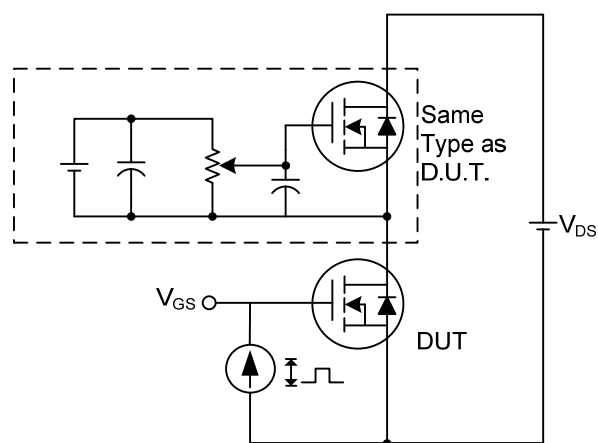
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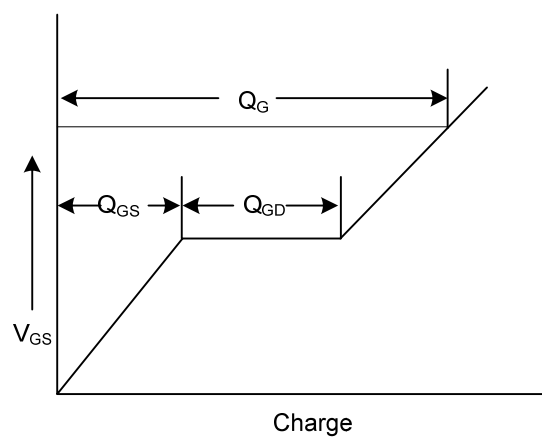
Switching Test Circuit



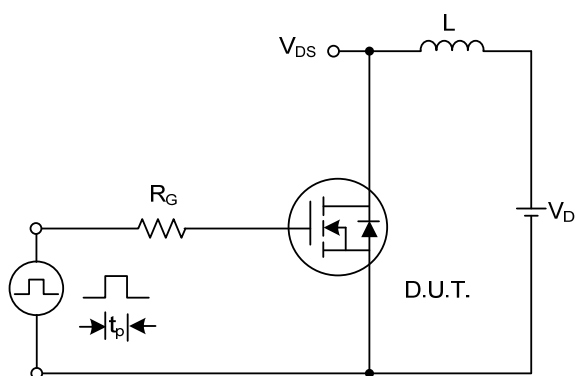
Switching Waveforms



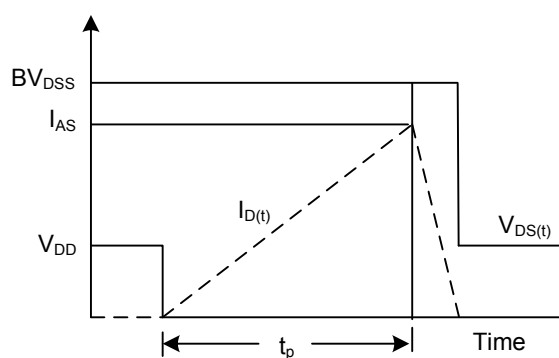
Gate Charge Test Circuit



Gate Charge Waveform

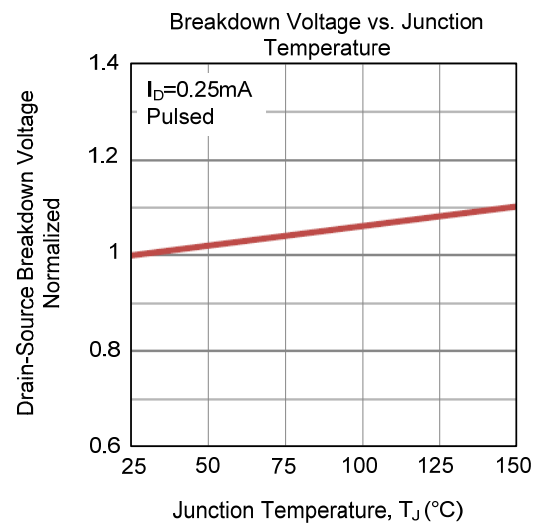
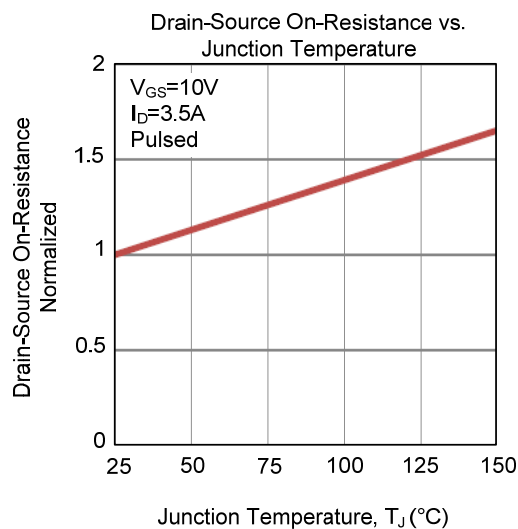
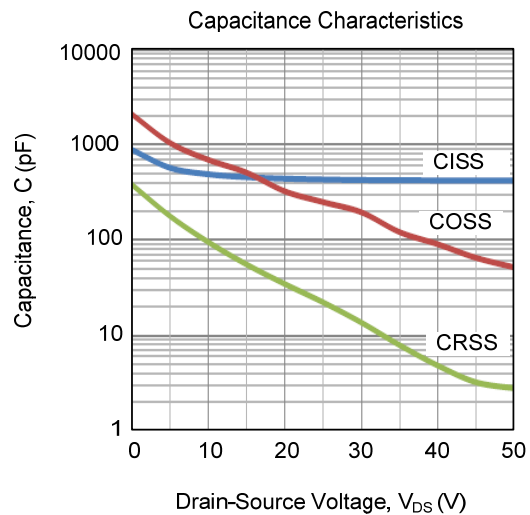
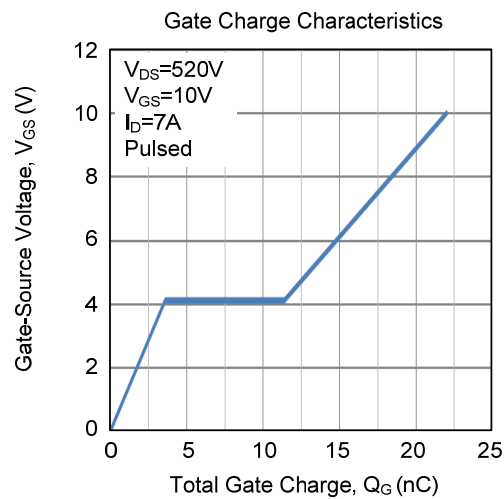
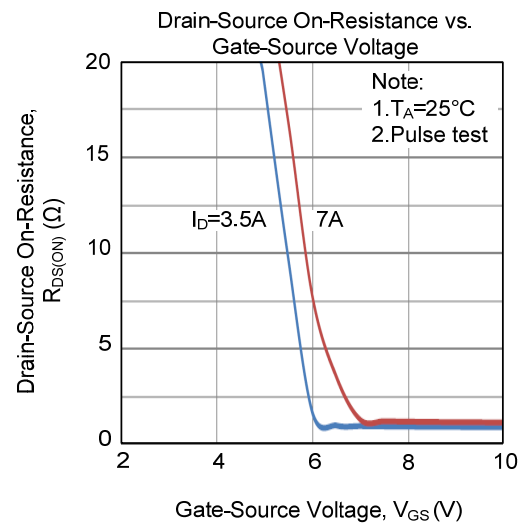
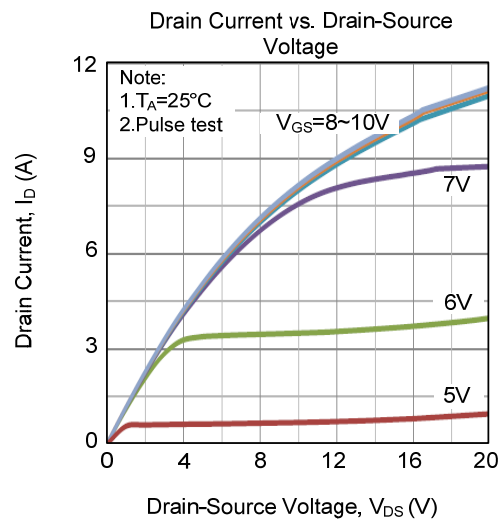


Unclamped Inductive Switching Test Circuit

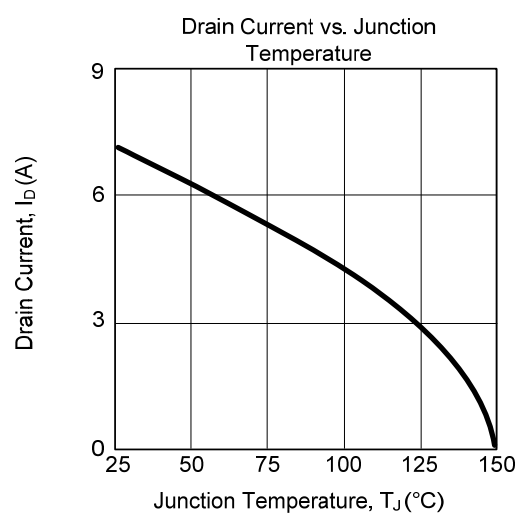
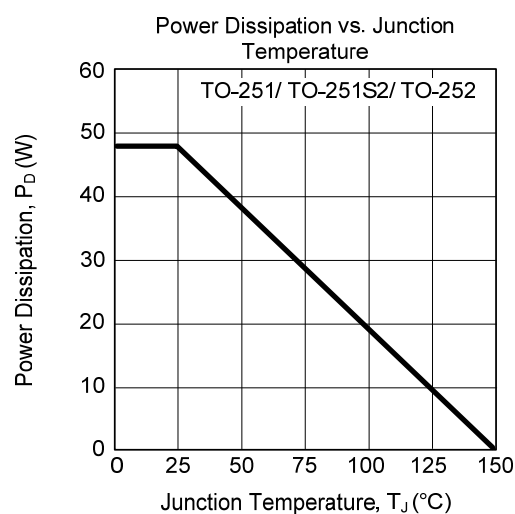
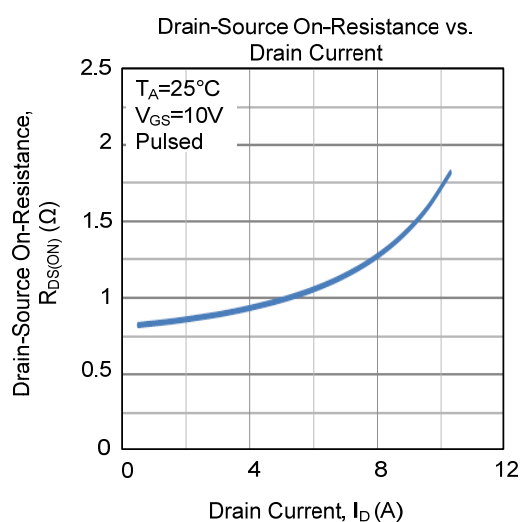
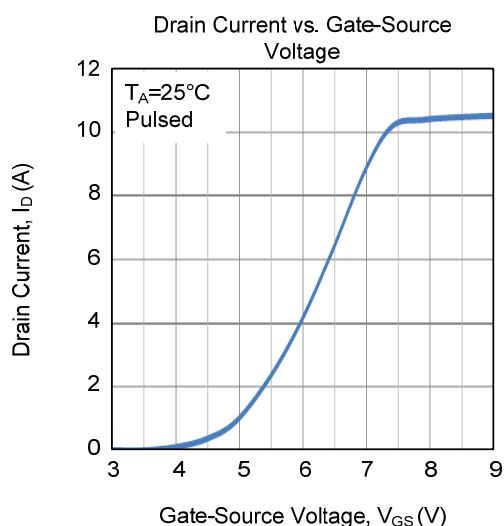
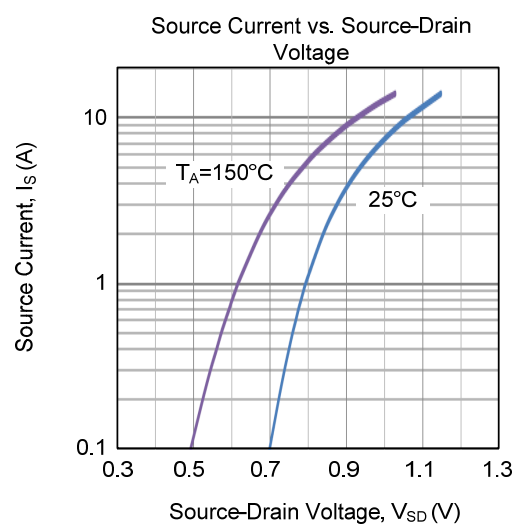
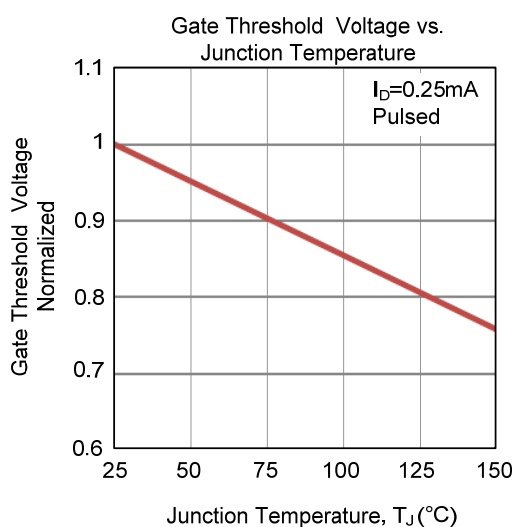


Unclamped Inductive Switching Waveforms

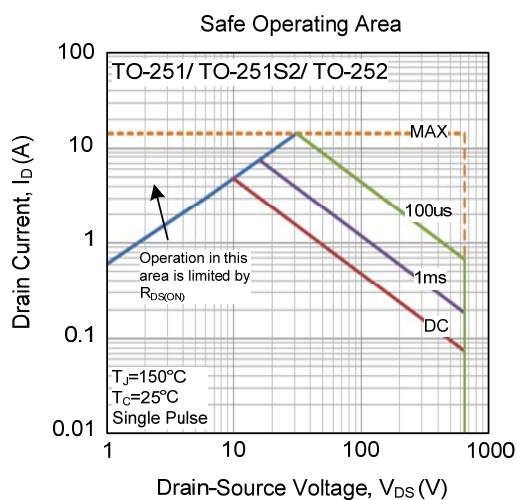
TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



TYPICAL CHARACTERISTICS (Cont.)



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