



10NM65-U2

Power MOSFET

10A, 650V N-CHANNEL SUPER-JUNCTION MOSFET

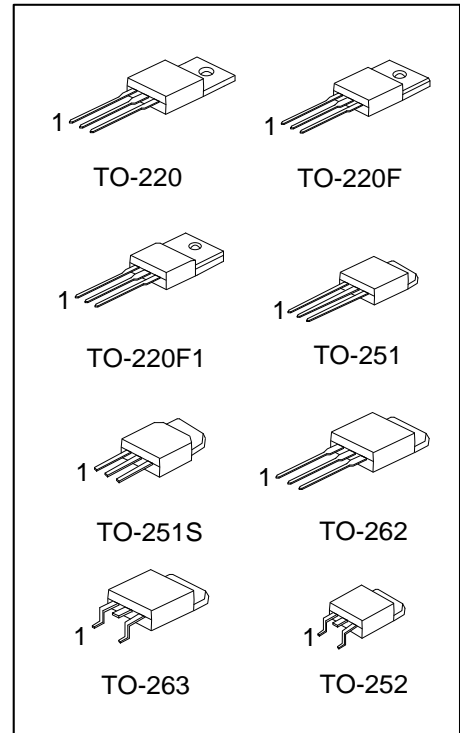
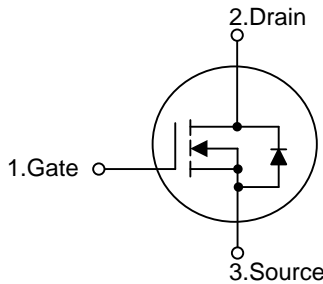
■ **DESCRIPTION**

The **UTC 10NM65-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**

- * $R_{DS(ON)} \leq 0.58\Omega$ @ $V_{GS}=10V, I_D=5.0A$
- * By using Super Junction Structure
- * Fast Switching
- * With 100% Avalanche Tested

■ **SYMBOL**



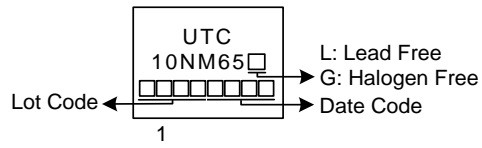
■ **ORDERING INFORMATION**

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
10NM65L-TA3-T	10NM65G-TA3-T	TO-220	G	D	S	Tube
10NM65L-TF3-T	10NM65G-TF3-T	TO-220F	G	D	S	Tube
10NM65L-TF1-T	10NM65G-TF1-T	TO-220F1	G	D	S	Tube
10NM65L-TM3-T	10NM65G-TM3-T	TO-251	G	D	S	Tube
10NM65L-TMS-T	10NM65G-TMS-T	TO-251S	G	D	S	Tube
10NM65L-TN3-R	10NM65G-TN3-R	TO-252	G	D	S	Tape Reel
10NM65L-T2Q-T	10NM65G-T2Q-T	TO-262	G	D	S	Tube
10NM65L-TQ2-T	10NM65G-TQ2-T	TO-263	G	D	S	Tube
10NM65L-TQ2-R	10NM65G-TQ2-R	TO-263	G	D	S	Tape Reel

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

<p>10NM65G-TA3-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) TA3: TO-220, TF1: TO-220F1, TF3: TO-220F TM3: TO-251, TMS: TO-251S, TN3: TO-252, T2Q: TO-262, TQ2: TO-263</p> <p>(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
Drain Current	Continuous	I _D	10	A
	Pulsed (Note 2)	I _{DM}	20	A
Avalanche Current (Note 2)		I _{AR}	1.9	A
Avalanche Energy	Single Pulsed (Note 3)	E _{AS}	312	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	5.6	V/ns
Power Dissipation	TO-220/TO-262/TO-263	P _D	78	W
	TO-220F/TO-220F1		25	W
	TO-251/TO-251S		52	W
	TO-252			
Junction Temperature		T _J	+150	°C
Storage Temperature Range		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=100mH, I_{AS}=2.5A, V_{DD}= 50V, R_G=25Ω, Starting T_J=25°C

4. I_{SD} ≤10A, di/dt ≤200A/μs, V_{DD} ≤BV_{DSS}, Starting T_J=25°C

■ THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT		
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-262 TO-263	θ _{JA}	62.5	°C/W		
	TO-251/TO-251S TO-252		110			
	Junction to Case		θ _{JC}		1.6	°C/W
					TO-220/TO-262/TO-263 TO-220F/TO-220F1	
TO-251/TO-251S TO-252		2.4 (Note)				

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

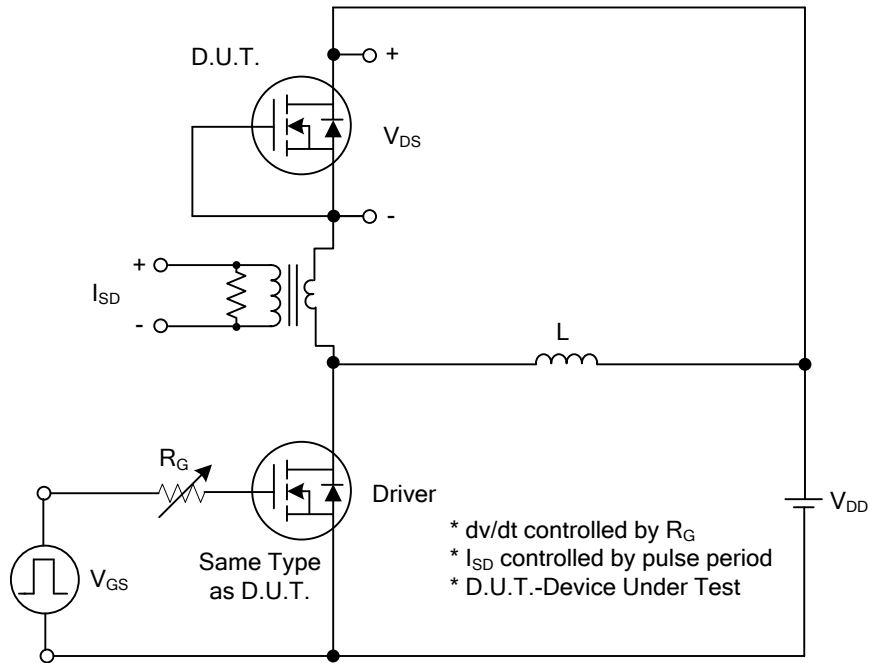
■ **ELECTRICAL CHARACTERISTICS** ($T_J=25^{\circ}\text{C}$, unless otherwise specified)

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	$V_{DS}=0V, V_{GS}=30V$ $V_{DS}=0V, V_{GS}=-30V$			100	nA
	Reverse				-100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.5		4.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=5.0A$			0.58	Ω
DYNAMIC PARAMETERS						
Input Capacitance	C_{ISS}	$V_{GS}=0V, V_{DS}=25V, f=1.0MHz$		610		pF
Output Capacitance	C_{OSS}			500		pF
Reverse Transfer Capacitance	C_{RSS}			40		pF
SWITCHING PARAMETERS						
Total Gate Charge (Note 1)	Q_G	$V_{DS}=520V, V_{GS}=10V, I_D=10A,$ $I_G=1mA$ (Note 1, 2)		27		nC
Gate to Source Charge	Q_{GS}			9.2		nC
Gate to Drain Charge	Q_{GD}			7.5		nC
Turn-ON Delay Time (Note 1)	$t_{D(ON)}$	$V_{DD}=100V, V_{GS}=10V,$ $I_D=10A, R_G=25\Omega$ (Note 1, 2)		8		ns
Rise Time	t_R			21		ns
Turn-OFF Delay Time	$t_{D(OFF)}$			63		ns
Fall-Time	t_F			36		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Maximum Body-Diode Continuous Current	I_S				10	A
Maximum Body-Diode Pulsed Current	I_{SM}				20	A
Drain-Source Diode Forward Voltage (Note 1)	V_{SD}	$I_S=10A, V_{GS}=0V$			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t_{rr}	$I_S=10A, V_{GS}=0V,$ $dI_F/dt=100A/\mu s$		380		ns
Body Diode Reverse Recovery Charge	Q_{rr}				5	μC

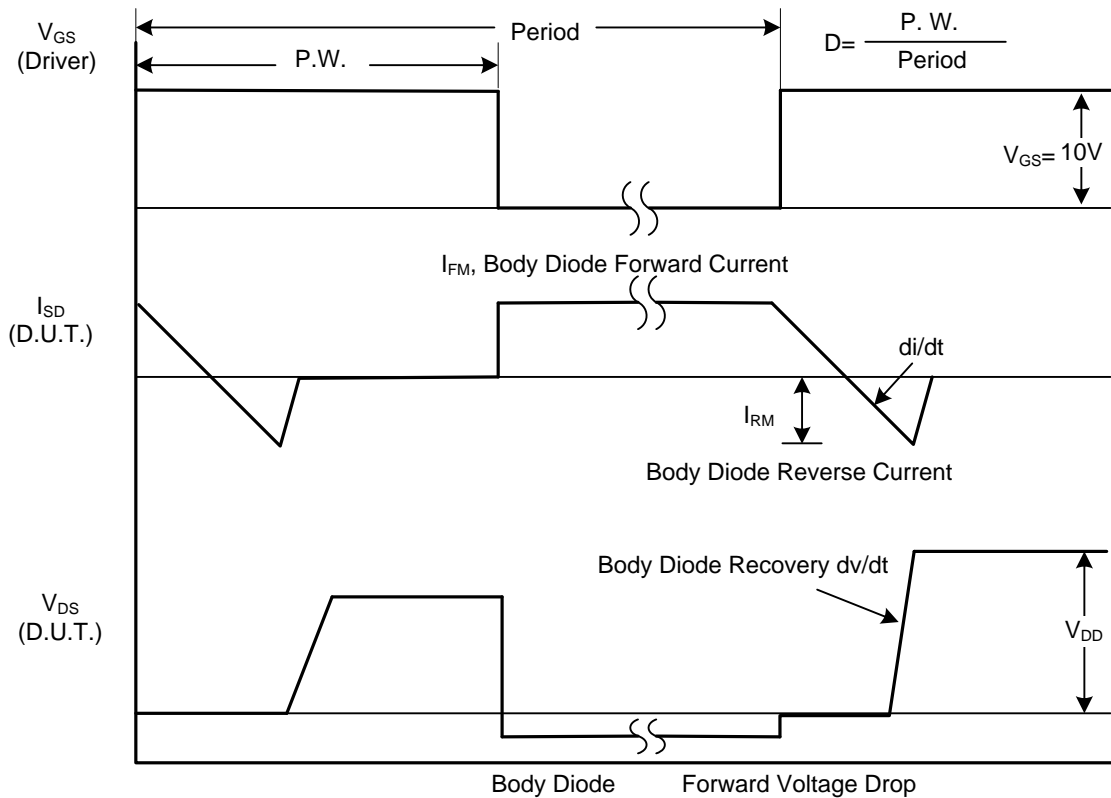
Notes: 1. Pulse Test : Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

TEST CIRCUITS AND WAVEFORMS

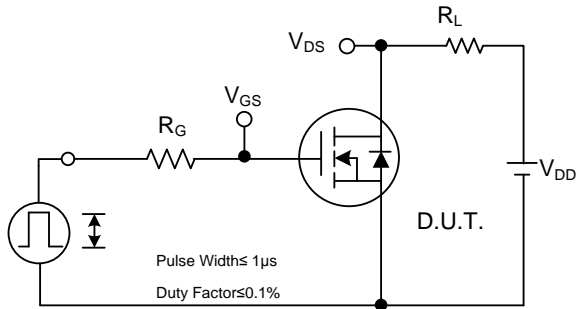


Peak Diode Recovery dv/dt Test Circuit

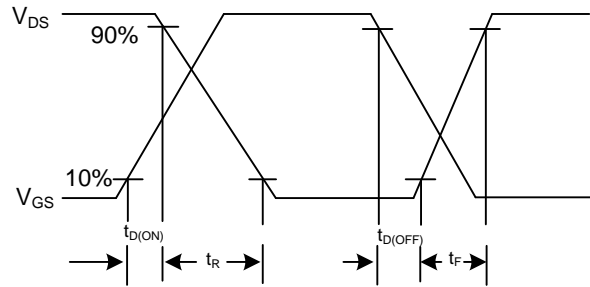


Peak Diode Recovery dv/dt Waveforms

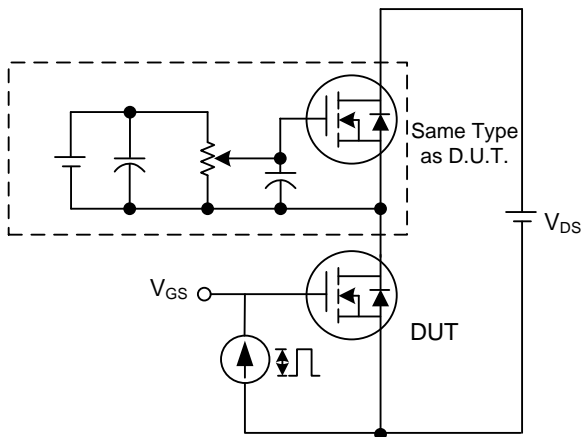
TEST CIRCUITS AND WAVEFORMS



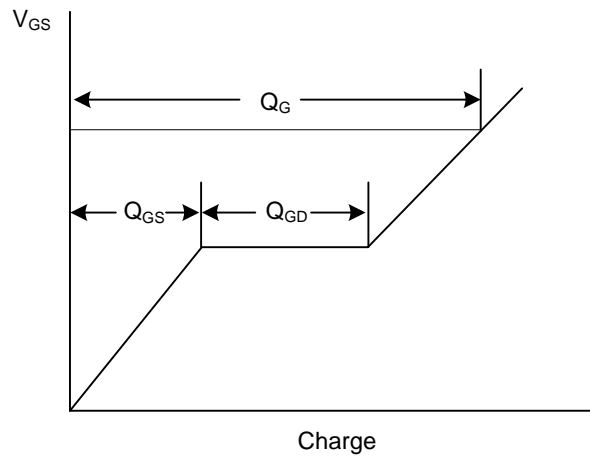
Switching Test Circuit



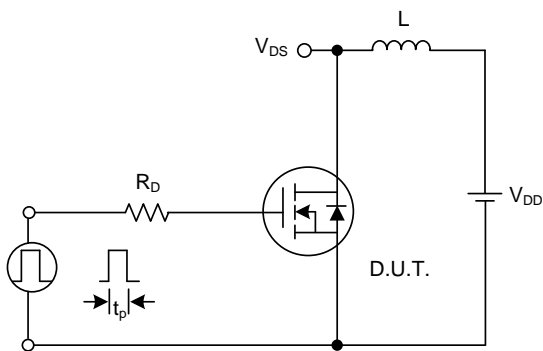
Switching Waveforms



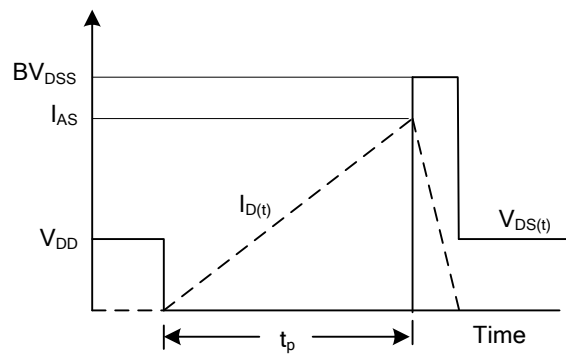
Gate Charge Test Circuit



Gate Charge Waveform

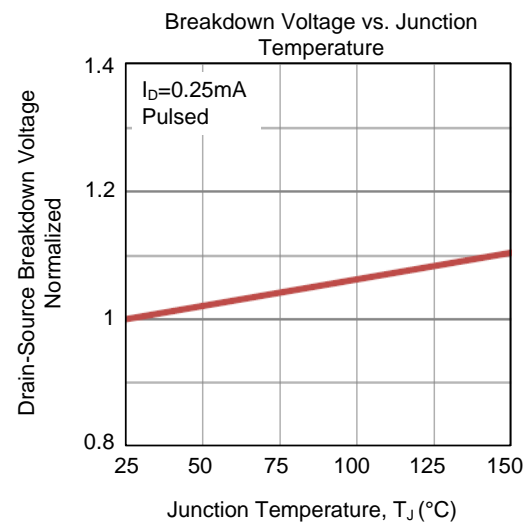
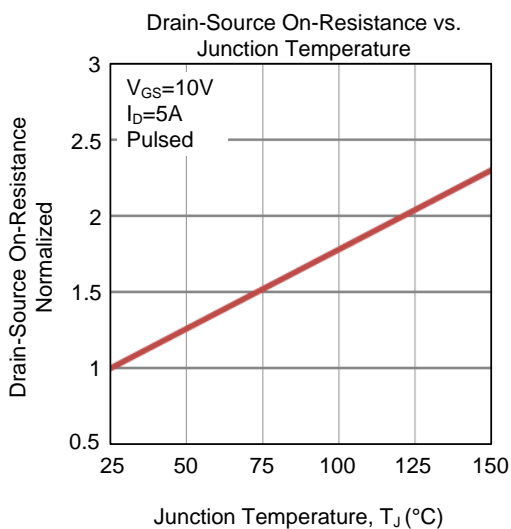
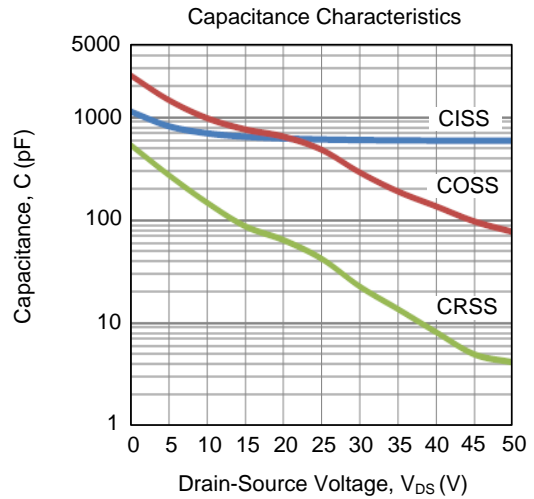
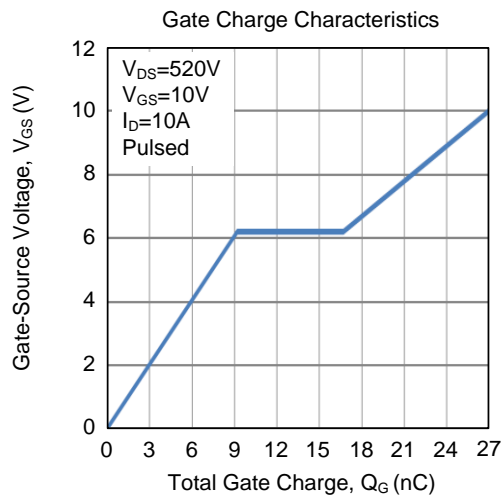
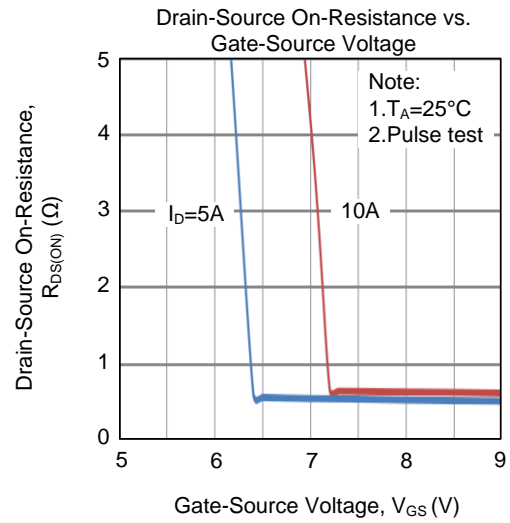
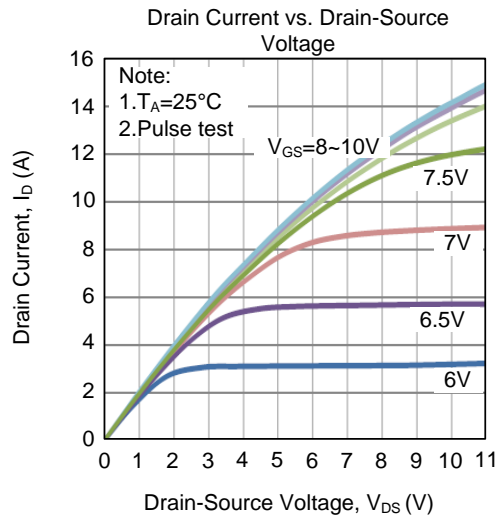


Unclamped Inductive Switching Test Circuit

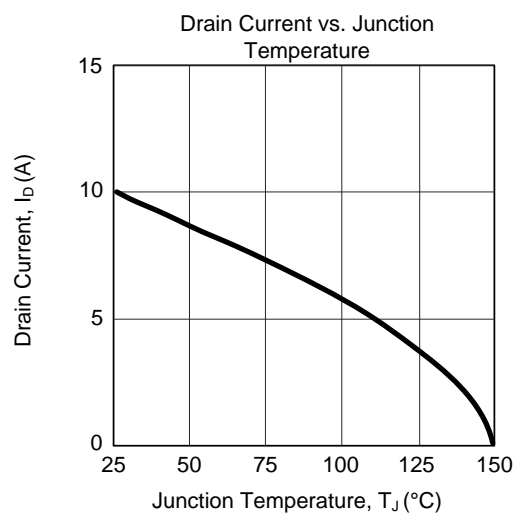
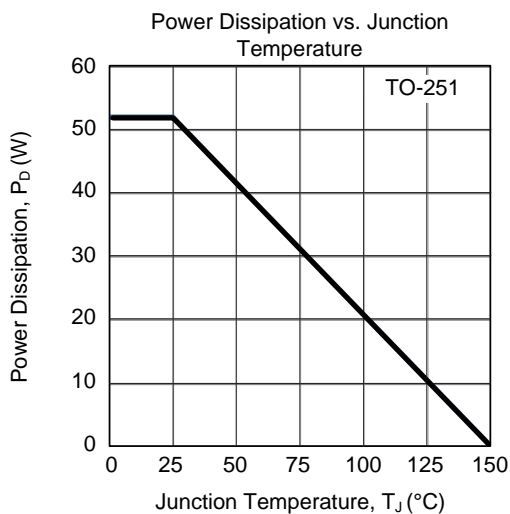
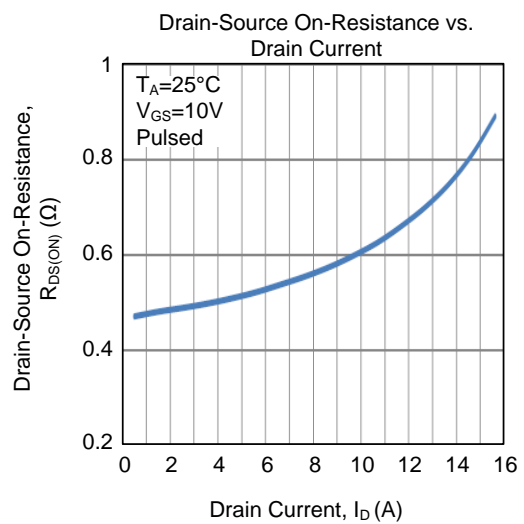
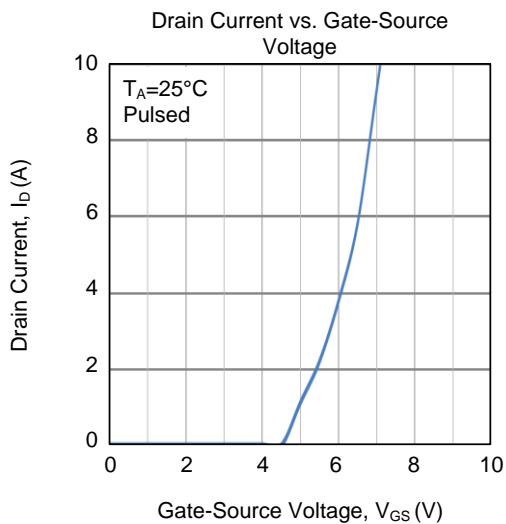
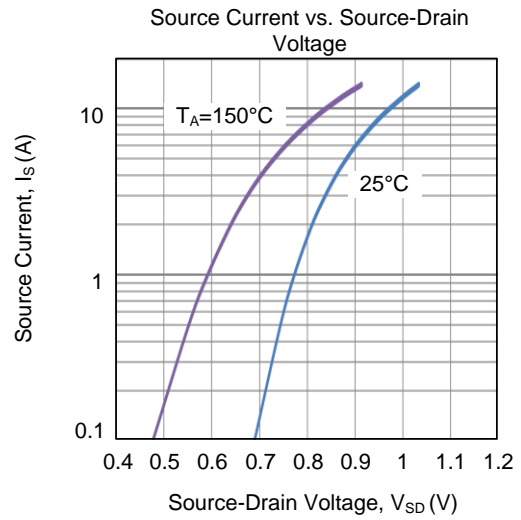
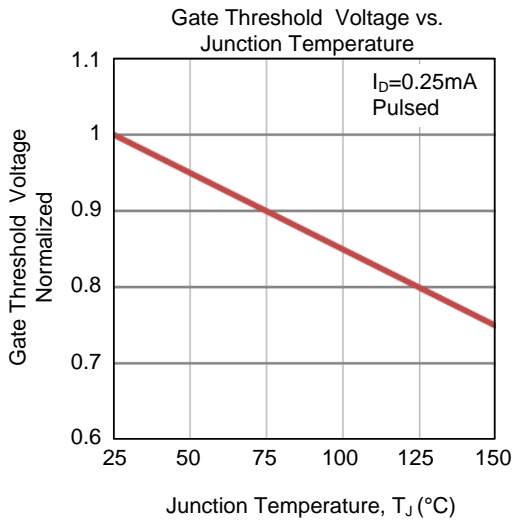


Unclamped Inductive Switching Waveforms

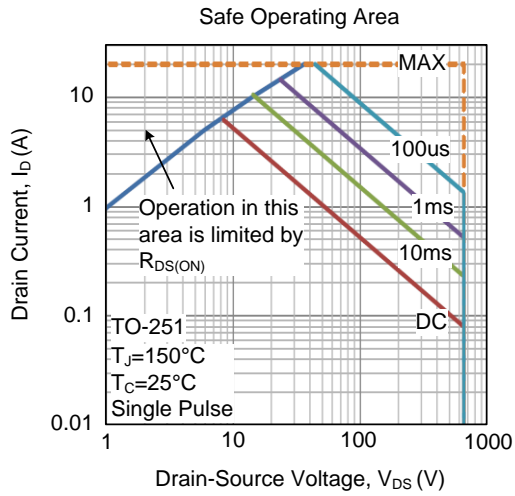
TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS



■ **TYPICAL CHARACTERISTICS (Cont.)**



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