



2NM65

Power MOSFET

2.0A, 650V N-CHANNEL SUPER-JUNCTION MOSFET

DESCRIPTION

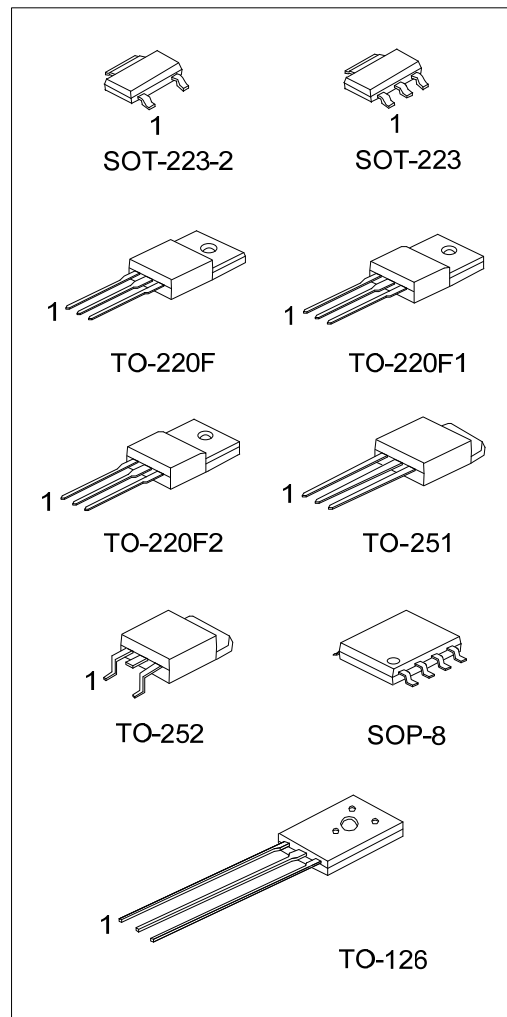
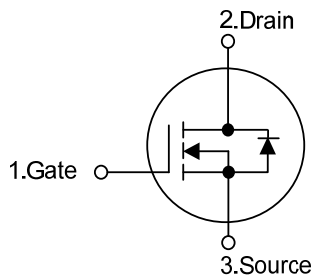
The UTC **2NM65** is a Super Junction MOSFET Structure. It uses UTC advanced planar stripe, DMOS technology to provide customers perfect switching performance, minimal on-state resistance.

The UTC **2NM65** is universally applied in electronic lamp ballasts based on half bridge topology, high efficiency switched mode power supplies, active power factor correction, etc.

FEATURES

- * $R_{DS(ON)} \leq 2.52 \Omega @ V_{GS}=10V, I_D=1.0A$
- * Fast switching capability
- * Avalanche energy specified
- * 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	
2NM65L-AA2-R	2NM65G-AA2-R	SOT-223-2	G	D	S	-	-	-	-	-	Tape Reel
2NM65L-AA3-R	2NM65G-AA3-R	SOT-223	G	D	S	-	-	-	-	-	Tape Reel
2NM65L-TF1-T	2NM65G-TF1-T	TO-220F1	G	D	S	-	-	-	-	-	Tube
2NM65L-TF2-T	2NM65G-TF2-T	TO-220F2	G	D	S	-	-	-	-	-	Tube
2NM65L-TF3-T	2NM65G-TF3-T	TO-220F	G	D	S	-	-	-	-	-	Tube
2NM65L-TM3-T	2NM65G-TM3-T	TO-251	G	D	S	-	-	-	-	-	Tube
2NM65L-TN3-R	2NM65G-TN3-R	TO-252	G	D	S	-	-	-	-	-	Tape Reel
2NM65L-S08-R	2NM65G-S08-R	SOP-8	S	S	S	G	D	D	D	D	Tape Reel
2NM65L-T60-K	2NM65G-T60-K	TO-126	G	D	S	-	-	-	-	-	Bulk

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

<p>2NM65G-AA3-R</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) R: Tape Reel, T: Tube, K: Bulk (2) AA2: SOT-223-2, AA3: SOT-223, TF1: TO-220F1, TF2: TO-220F2, TF3: TO-220F, TM3: TO-251, TN3: TO-252, S08: SOP-8, T60: TO-126 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING

SOT-223-2 / SOT-223	TO-220F1 / TO-220F2 / TO-220F / TO-251 / TO-252
<p>L: Lead Free G: Halogen Free Date Code 1</p>	<p>UTC L: Lead Free G: Halogen Free Date Code Lot Code 1</p>
TO-126	SOP-8
<p>Date Code L: Lead Free G: Halogen Free 1</p>	<p>Date Code L: Lead Free G: Halogen Free Lot Code 1</p>

■ 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	2	A
	Pulsed (Note 2)	I_{DM}	4	A
Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	38	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	2.7	V/ns
Power Dissipation	SOT-223-2/SOT-223	P_D	10	W
	TO-220F1/TO-220F2		24	W
	TO-220F			
	TO-251/TO-252		44	W
	TO-126		12.5	W
	SOP-8		2	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. $L=30\text{mH}$, $I_{AS}=1.6\text{A}$, $V_{DD}=50\text{V}$, $R_G=25\ \Omega$, Starting $T_J = 25^\circ\text{C}$

4. $I_{SD}\leq 2.0\text{A}$, $di/dt\leq 200\text{A}/\mu\text{s}$, $V_{DD}\leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-223-2/SOT-223	θ_{JA}	150	$^\circ\text{C}/\text{W}$
	TO-220F1/TO-220F2		62.5	$^\circ\text{C}/\text{W}$
	TO-220F			
	TO-251/TO-252		100	$^\circ\text{C}/\text{W}$
	TO-126		132	$^\circ\text{C}/\text{W}$
	SOP-8		190	$^\circ\text{C}/\text{W}$
Junction to Case	SOT-223-2/SOT-223	θ_{JC}	12	$^\circ\text{C}/\text{W}$
	TO-220F1/TO-220F2		5.2	$^\circ\text{C}/\text{W}$
	TO-220F			
	TO-251/TO-252		2.8 (Note)	$^\circ\text{C}/\text{W}$
	TO-126		10.42	$^\circ\text{C}/\text{W}$
	SOP-8		62.5 (Note)	$^\circ\text{C}/\text{W}$

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

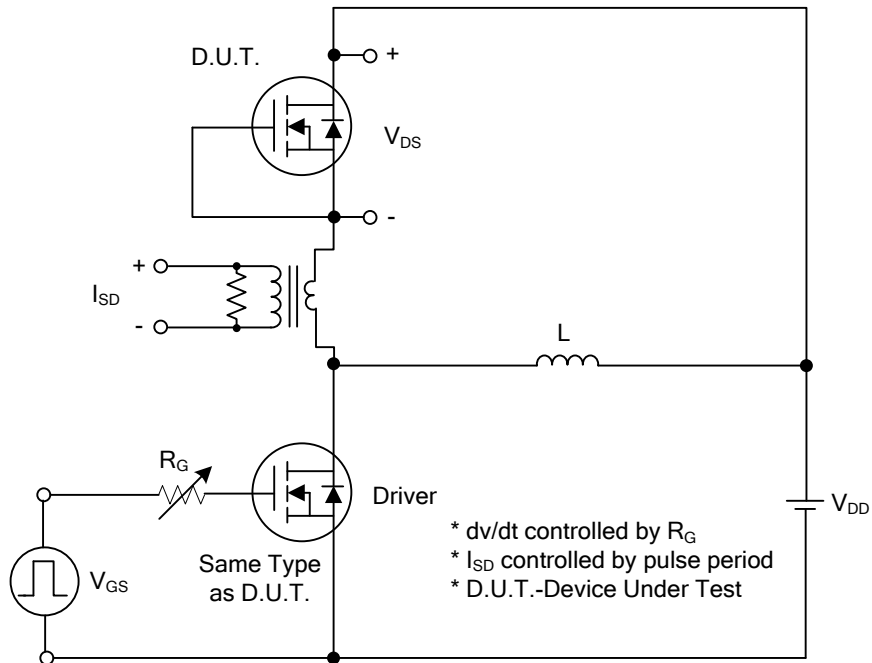
■ ELECTRICAL CHARACTERISTICS ($T_J=25^\circ\text{C}$, unless otherwise specified)

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	Forward	I_{GSS}			100	nA
	Reverse					
		$V_{GS} = -30V, V_{DS} = 0V$			-100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	2.5		4.5	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 1.0A$			2.52	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C_{ISS}	$V_{GS} = 0V, V_{DS} = 50V, f = 1MHz$		156		pF
Output Capacitance	C_{OSS}			35		pF
Reverse Transfer Capacitance	C_{RSS}			2.1		pF
SWITCHING CHARACTERISTICS						
Total Gate Charge (Note 1)	Q_G	$V_{DS}=520V, V_{GS}=10V, I_D=2.0A$ (Note 1, 2)		13		nC
Gate-Source Charge	Q_{GS}			6		nC
Gate-Drain Charge	Q_{GD}			3		nC
Turn-On Delay Time (Note 1)	$t_{D(ON)}$	$V_{DD}=100V, V_{GS}=10V, I_D=2.0A,$ $R_G=25\Omega$ (Note 1, 2)		4		ns
Turn-On Rise Time	t_R			17		ns
Turn-Off Delay Time	$t_{D(OFF)}$			21		ns
Turn-Off Fall Time	t_F			26		ns
DRAIN-SOURCE DIODE CHARACTERISTICS						
Continuous Drain-Source Current	I_S				2	A
Maximum Body-Diode Pulsed Current	I_{SM}				4	A
Drain-Source Diode Forward Voltage (Note 1)	V_{SD}	$I_S=2.0A, V_{GS}=0V$			1.4	V
Body Diode Reverse Recovery Time (Note 1)	t_{rr}	$I_S=2.0A, V_{GS}=0V$ $dI/dt=100A/\mu s$		196		nS
Body Diode Reverse Recovery Charge	Q_{rr}				1	

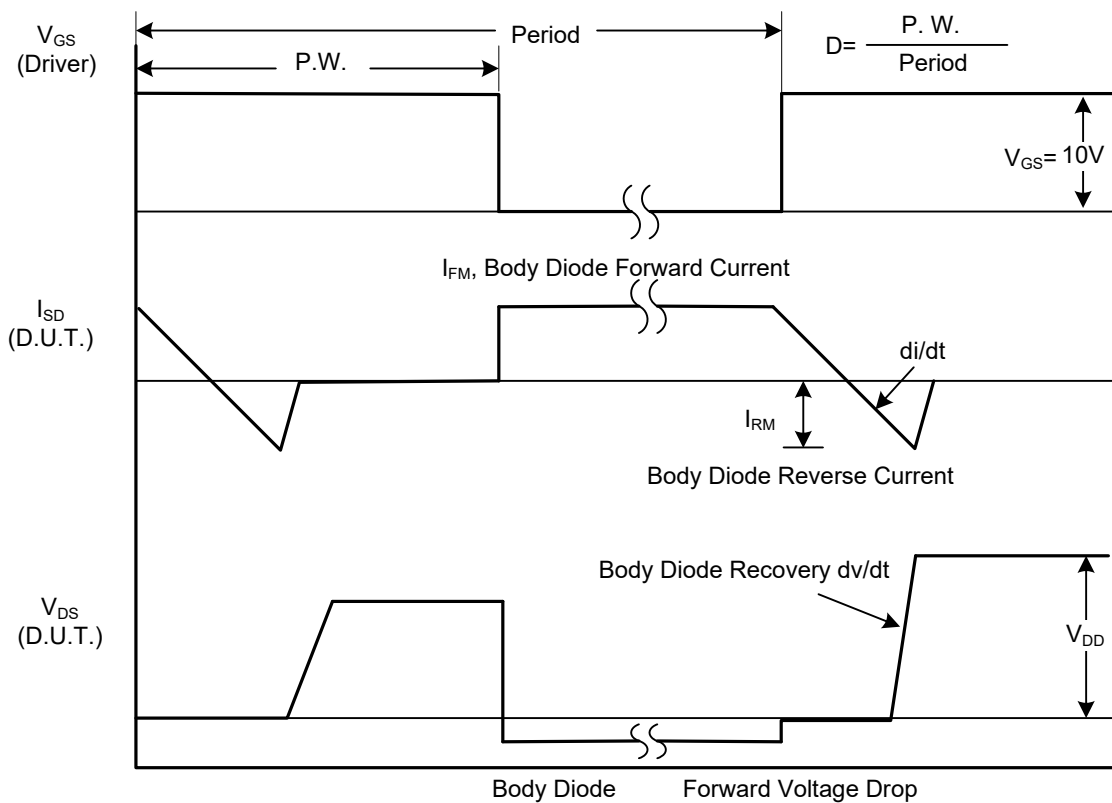
Notes: 1. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

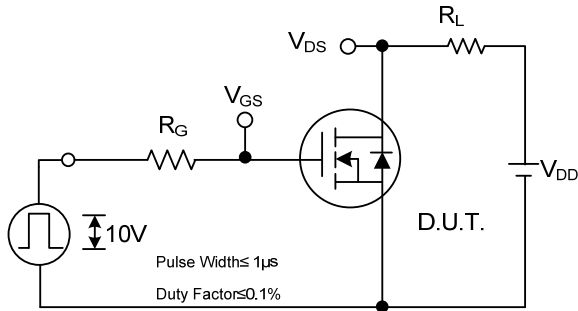


Peak Diode Recovery dv/dt Test Circuit

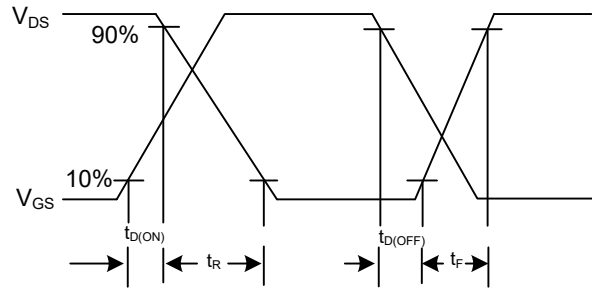


Peak Diode Recovery dv/dt Waveforms

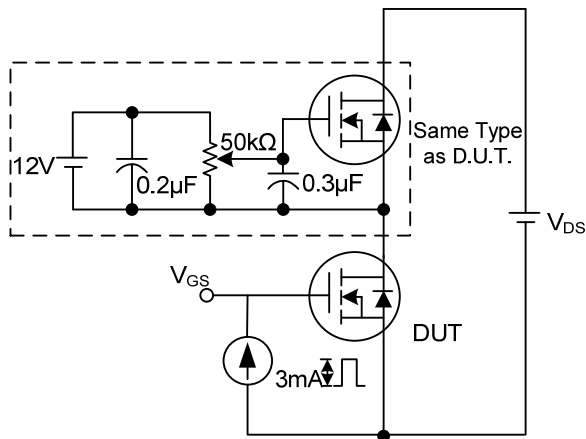
TEST CIRCUITS AND WAVEFORMS



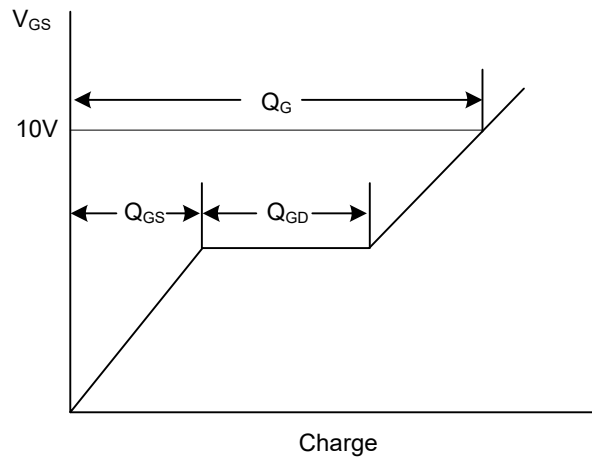
Switching Test Circuit



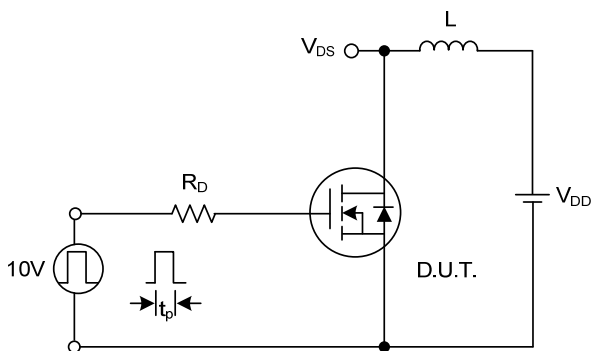
Switching Waveforms



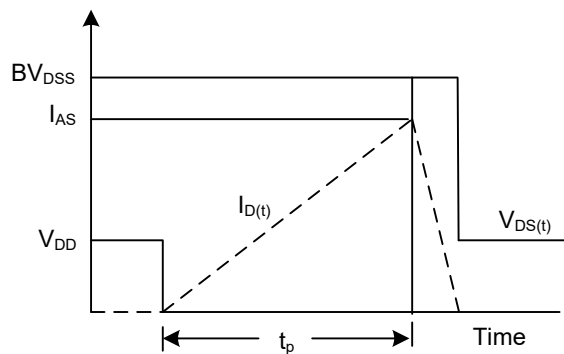
Gate Charge Test Circuit



Gate Charge Waveform

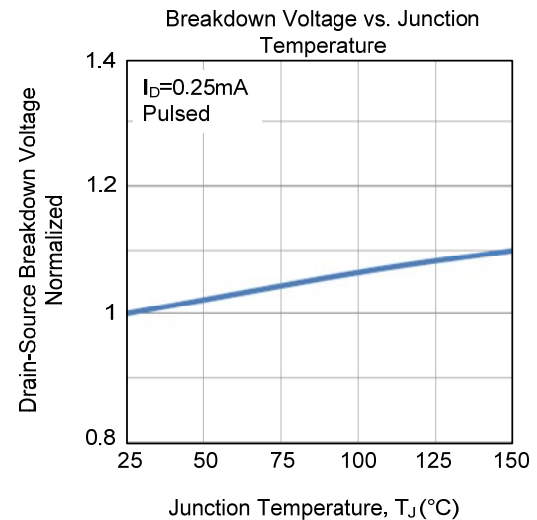
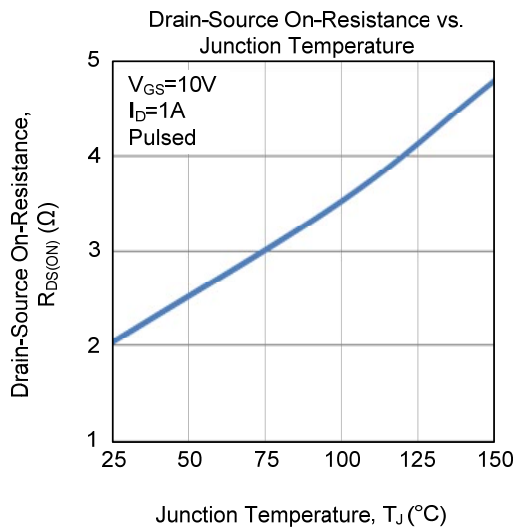
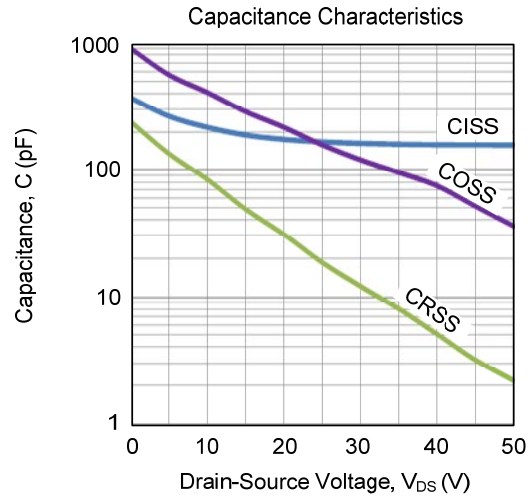
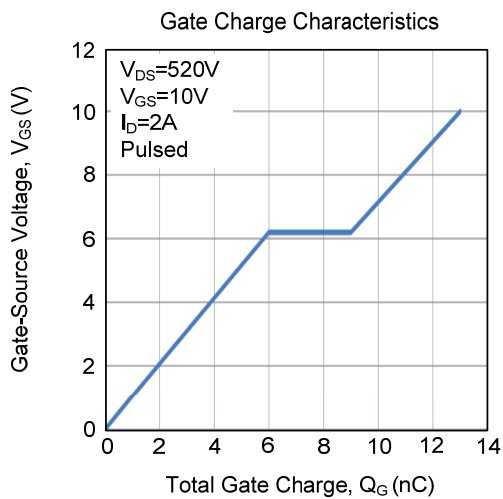
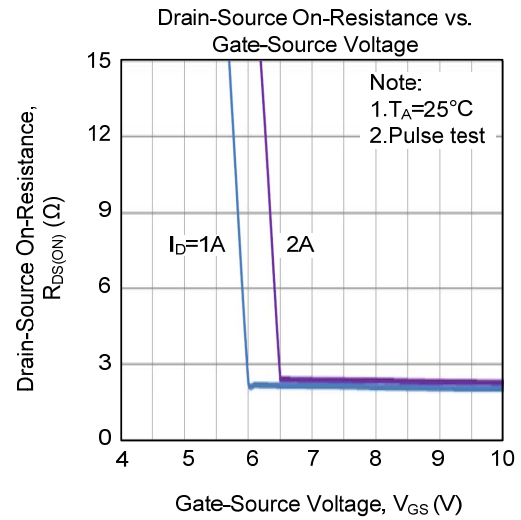
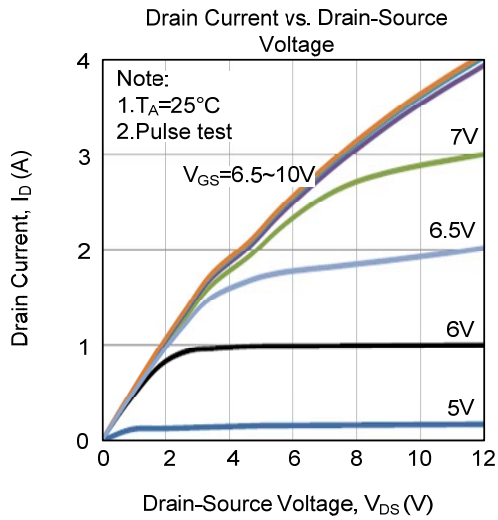


Unclamped Inductive Switching Test Circuit

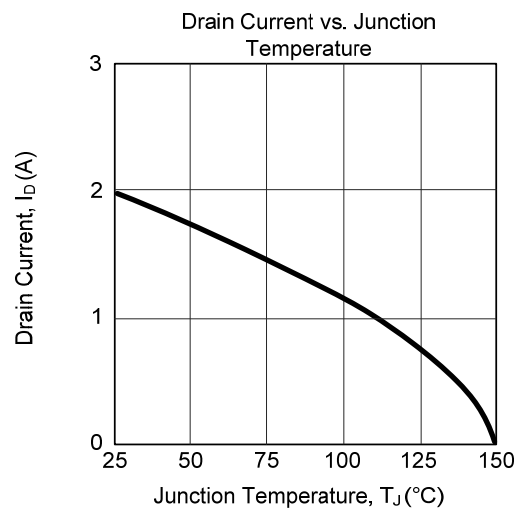
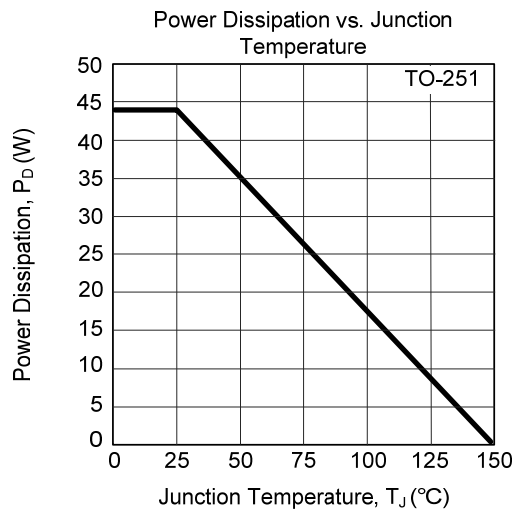
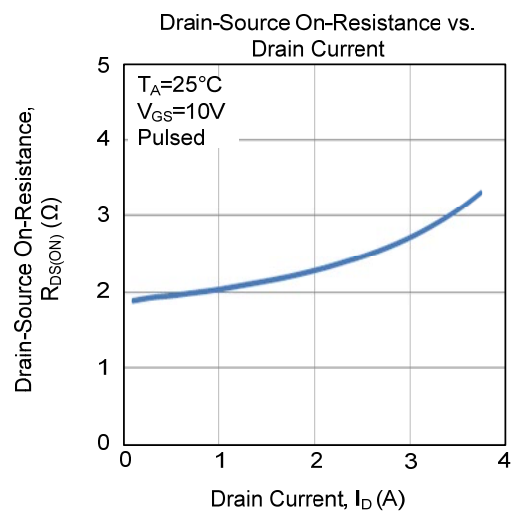
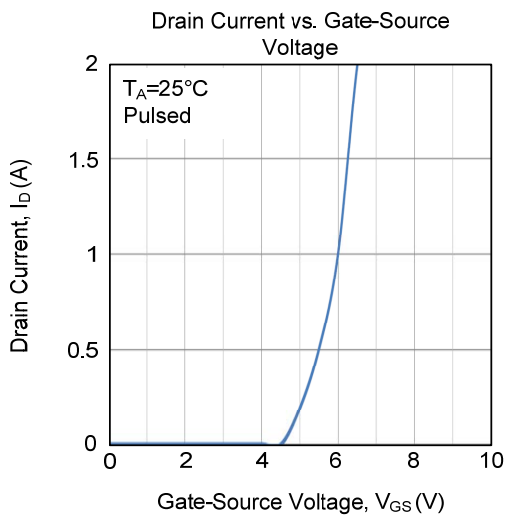
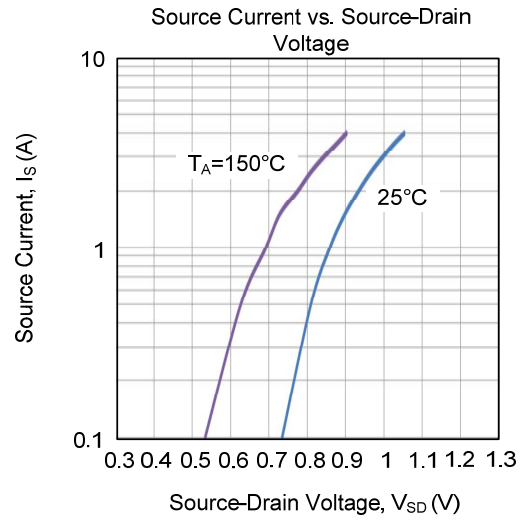
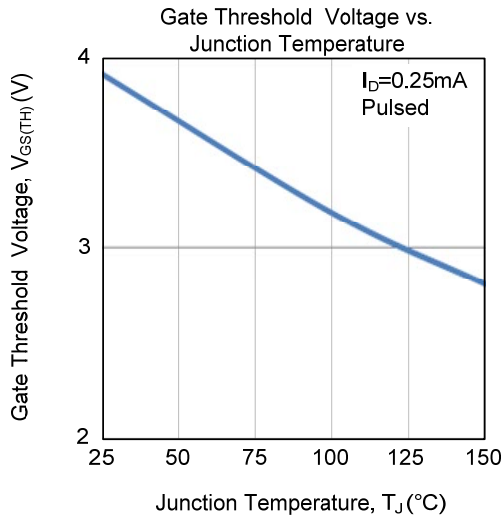


Unclamped Inductive Switching Waveforms

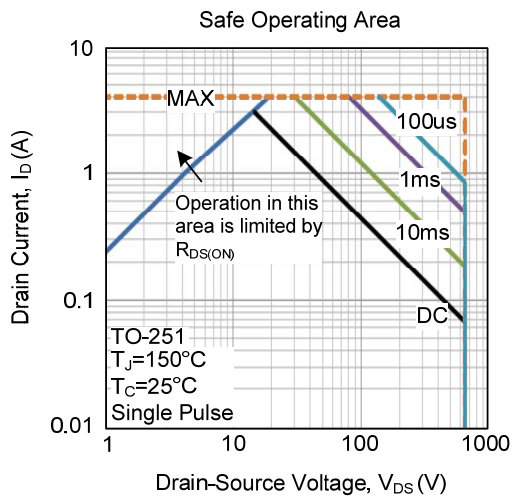
TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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