



9NM95-Q

Power MOSFET

9.0A, 950V N-CHANNEL SUPER-JUNCTION MOSFET

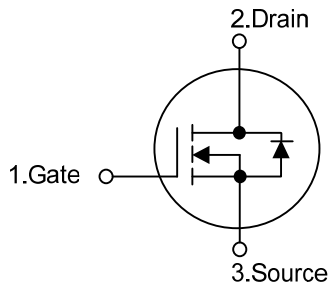
DESCRIPTION

The **UTC 9NM95-Q** 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

- * $R_{DS(ON)} \leq 1.3 \Omega$ @ $V_{GS}=10V$, $I_D=4.5A$
- * Fast switching capability
- * Avalanche energy tested
- * Improved dv/dt capability, high ruggedness

SYMBOL



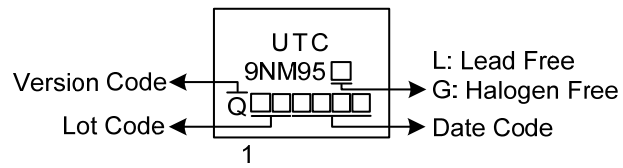
ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
9NM95L-TA3-T	9NM95G-TA3-T	TO-220	G	D	S	Tube
9NM95L-TF1-T	9NM95G-TF1-T	TO-220F1	G	D	S	Tube
9NM95L-TF3-T	9NM95G-TF3-T	TO-220F	G	D	S	Tube
9NM95L-TN3-R	9NM95G-TN3-R	TO-252	G	D	S	Tape Reel
9NM95L-TQ2-T	9NM95G-TQ2-T	TO-263	G	D	S	Tube
9NM95L-TQ2-R	9NM95G-TQ2-R	TO-263	G	D	S	Tape Reel
9NM95L-T3P-T	9NM95G-T3P-T	TO-3P	G	D	S	Tube
9NM95L-T47-T	9NM95G-T47-T	TO-247	G	D	S	Tube

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

9NM95G-TA3-T (1)Packing Type (2)Package Type (3)Green Package	(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF1: TO-220F1, TF3: TO-220F, TN3: TO-252, TQ2: TO-263, T3P: TO-3P, T47: TO-247 (3) G: Halogen Free and Lead Free, L: Lead Free
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■ MARKING



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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V_{DS}	950	V
Gate-Source Voltage		V_{GS}	± 30	V
Continuous Drain Current	Continuous	I_D	9	A
Pulsed Drain Current	Pulsed (Note 2)	I_{DM}	27	A
Single Pulsed Avalanche Energy	Single Pulsed (Note 3)	E_{AS}	242	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	1.7	V/ns
Power Dissipation	TO-220/TO-263	P_D	60	W
	TO-220F/TO-220F1		26	W
	TO-252		31	W
	TO-247		100	W
	TO-3P		110	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. $L = 100\text{mH}$, $I_{AS} = 2.2\text{A}$, $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$.

4. $I_{SD} \leq 9.0\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^{\circ}\text{C}$.

■ THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220/TO-220F TO-220F1/TO-263	θ_{JA}	62.5	$^{\circ}\text{C}/\text{W}$
	TO-252		110	$^{\circ}\text{C}/\text{W}$
	TO-247		40	$^{\circ}\text{C}/\text{W}$
	TO-3P		30	$^{\circ}\text{C}/\text{W}$
Junction to Case	TO-220/TO-263	θ_{JC}	2.08	$^{\circ}\text{C}/\text{W}$
	TO-220F/TO-220F1		4.8	$^{\circ}\text{C}/\text{W}$
	TO-252		4.03	$^{\circ}\text{C}/\text{W}$
	TO-247		1.25	$^{\circ}\text{C}/\text{W}$
	TO-3P		1.14	$^{\circ}\text{C}/\text{W}$

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

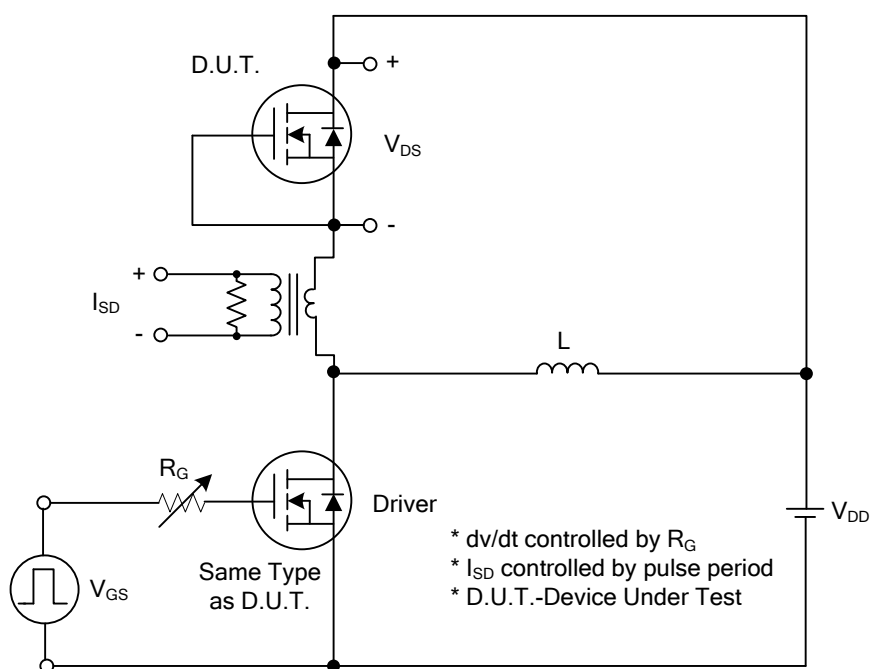
■ ELECTRICAL CHARACTERISTICS (T_J=25°C, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V, I _D =250μA	950			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =950V, 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 =4.5A		1.1	1.3	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =50V, f=1.0MHz		580		pF
Output Capacitance		C _{OSS}			70		pF
Reverse Transfer Capacitance		C _{RSS}			3		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge (Note 1)		Q _G	V _{DS} =760V, V _{GS} =10V, I _D =9.0A (Note 1,2)		35		nC
Gate to Source Charge		Q _{GS}			9		nC
Gate to Drain Charge		Q _{GD}			16		nC
Turn-ON Delay Time (Note 1)		t _{D(ON)}	V _{DD} =100V, V _{GS} =10V, I _D =9.0A, R _G =25Ω (Note 1,2)		10		nS
Rise Time		t _R			20		nS
Turn-OFF Delay Time		t _{D(OFF)}			60		nS
Fall-Time		t _F			36		nS
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I _S				9	A
Maximum Body-Diode Pulsed Current		I _{SM}				27	A
Drain-Source Diode Forward Voltage (Note 1)		V _{SD}	I _S =9.0A, V _{GS} =0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)		t _{rr}	I _S =9.0A, V _{GS} =0V,		500		nS
Body Diode Reverse Recovery Charge		Q _{rr}	dl _F /dt=100A/μs		6.5		μC

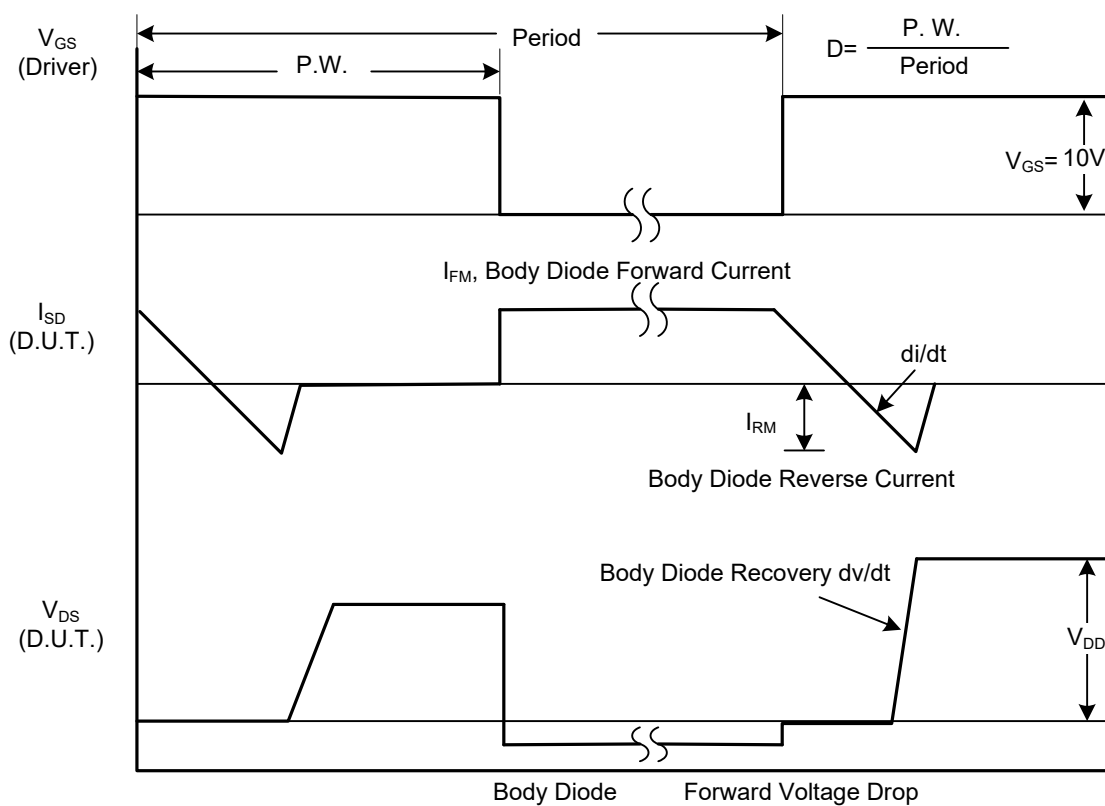
Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating ambient temperature.

■ TEST CIRCUITS AND WAVEFORMS

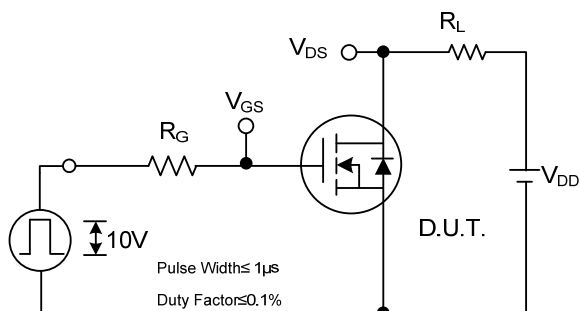


Peak Diode Recovery dv/dt Test Circuit

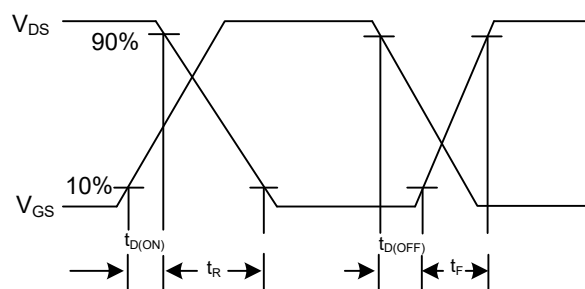


Peak Diode Recovery dv/dt Waveforms

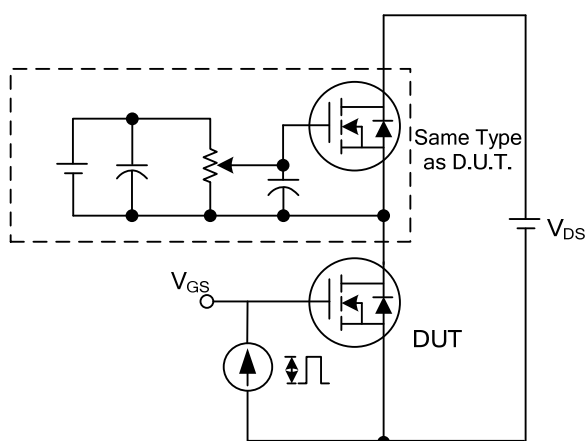
■ TEST CIRCUITS AND WAVEFORMS



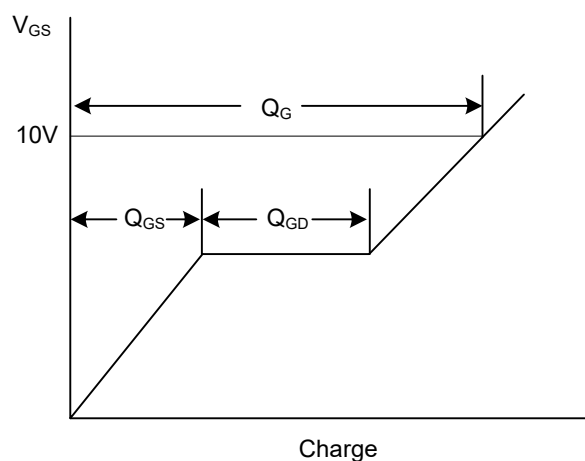
Switching Test Circuit



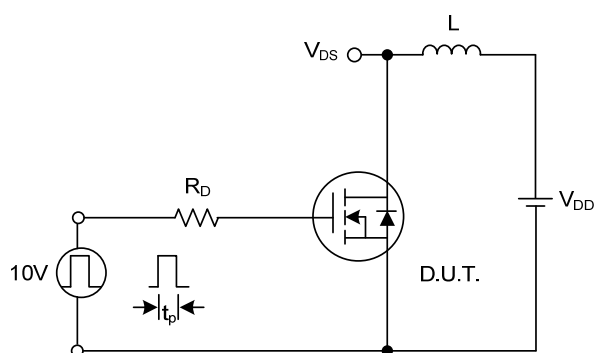
Switching Waveforms



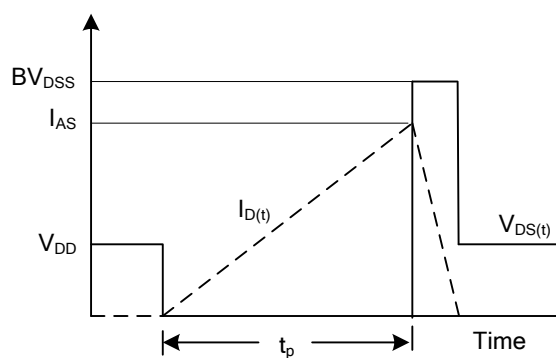
Gate Charge Test Circuit



Gate Charge Waveform

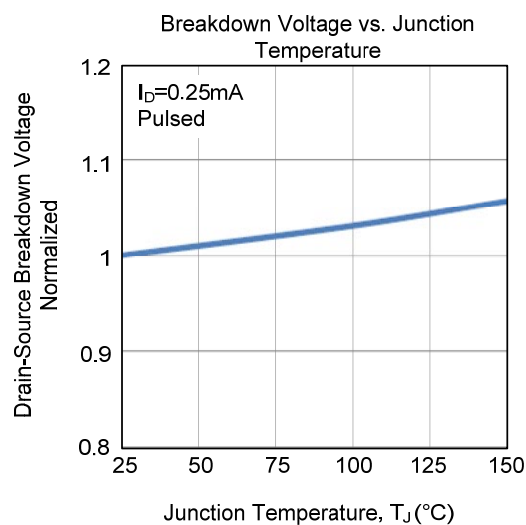
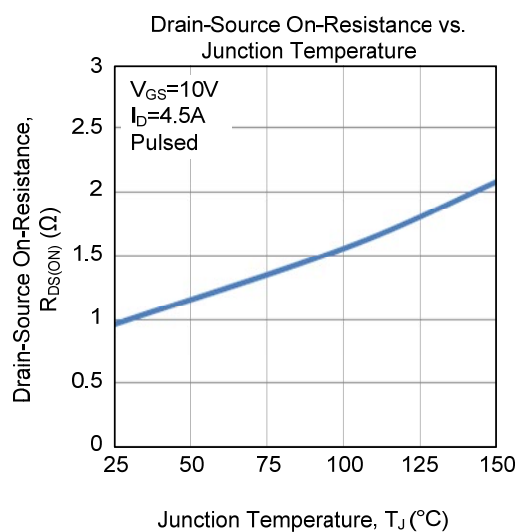
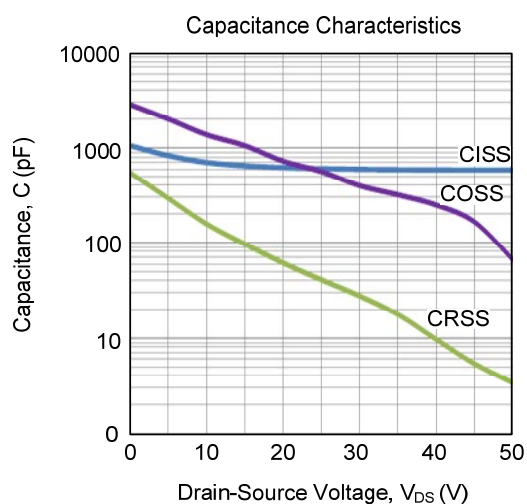
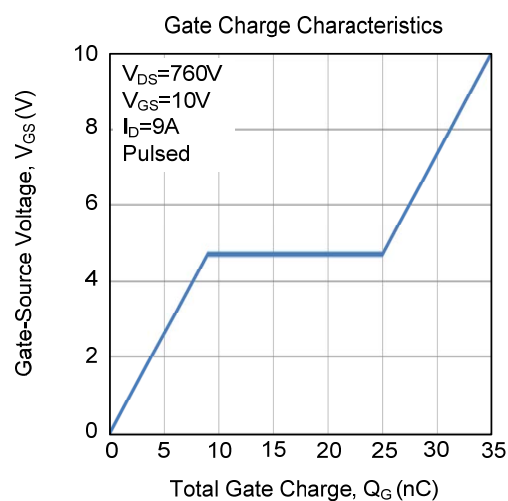
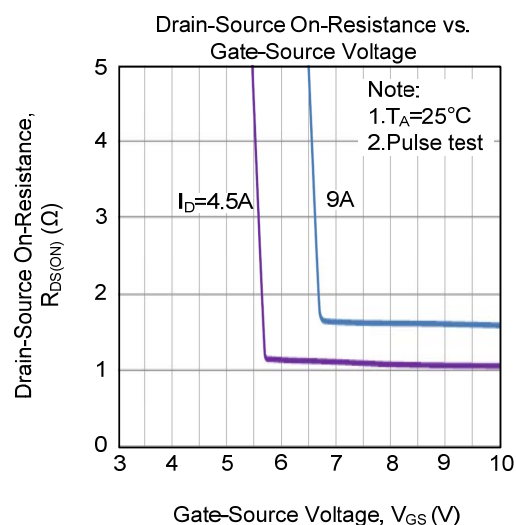
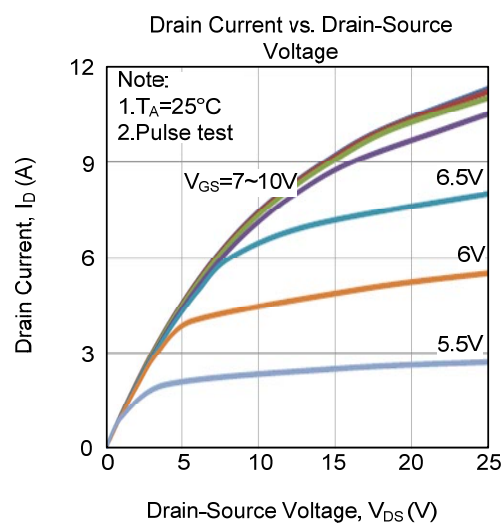


Unclamped Inductive Switching Test Circuit

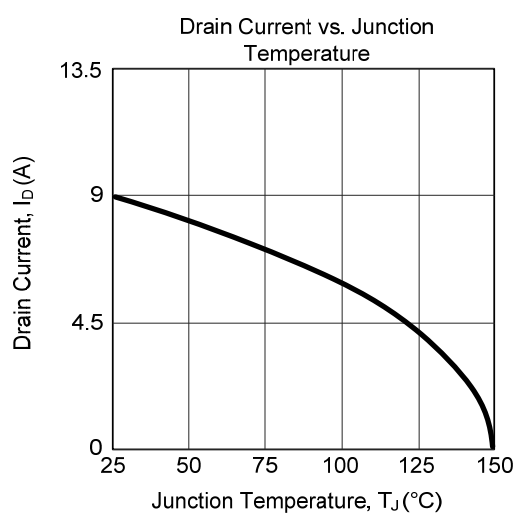
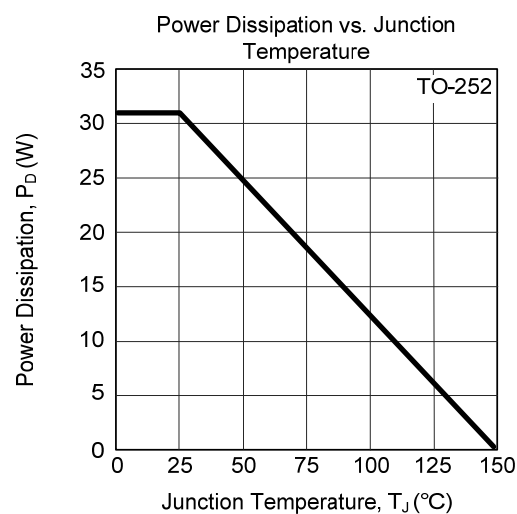
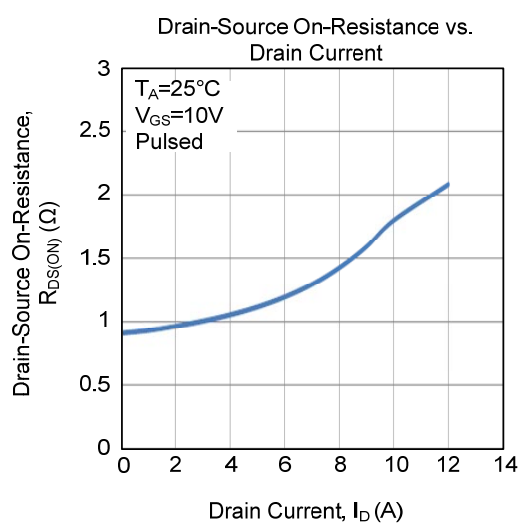
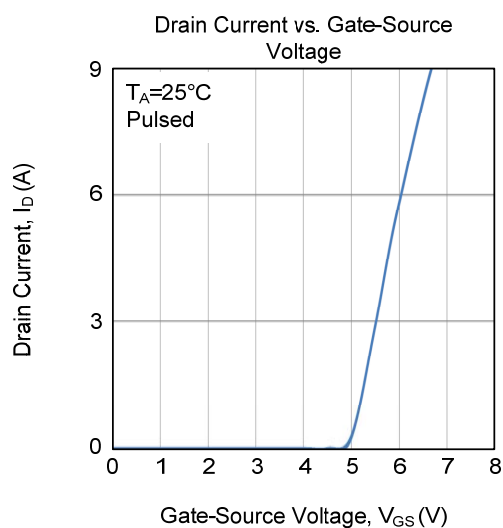
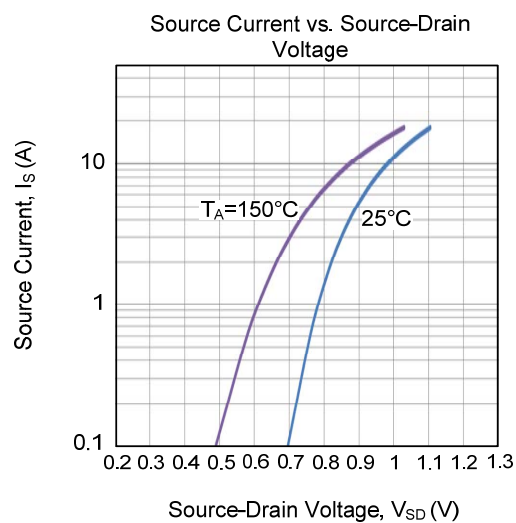
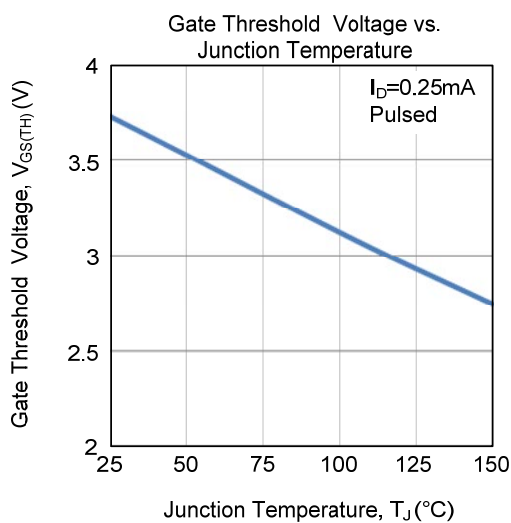


Unclamped Inductive Switching Waveforms

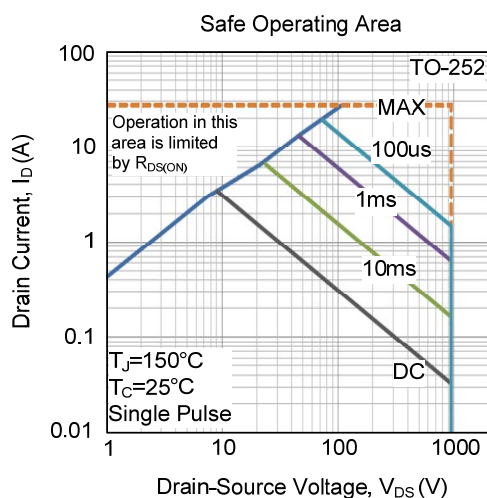
TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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