



9N65-HD2

Power MOSFET

9A, 650V N-CHANNEL POWER MOSFET

DESCRIPTION

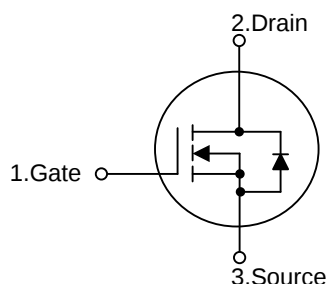
The UTC **9N65-HD2** is an N-channel mode power MOSFET using UTC's advanced technology to provide costumers with planar stripe and DMOS technology. This technology is specialized in allowing a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **9N65-HD2** is universally applied in active power factor correction and high efficient switched mode power supplies.

FEATURES

- * $R_{DS(ON)} \leq 1.2 \Omega$ @ $V_{GS}=10V$, $I_D=4.5A$
- * High switching speed
- * Improved dv/dt capability

SYMBOL

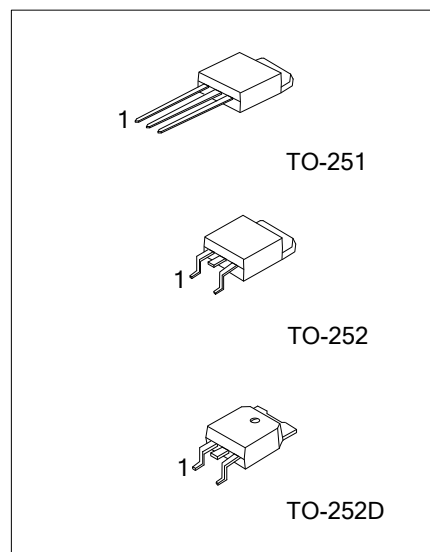


ORDERING INFORMATION

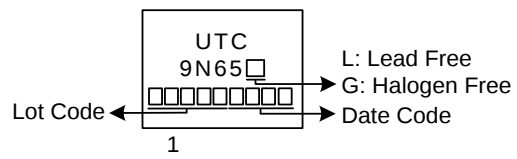
Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
9N65L-TM3-T	9N65G-TM3-T	TO-251	G	D	S	Tube
9N65L-TN3-R	9N65G-TN3-R	TO-252	G	D	S	Tape Reel
9N65L-TND-R	9N65G-TND-R	TO-252D	G	D	S	Tape Reel

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

9N65G-TM3-T	(1) T: Tube, R: Tape Reel (2) TM3: TO-251, TN3: TO-252, TND: TO-252D (3) G: Halogen Free and Lead Free, L: Lead Free
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■ MARKING



■ ABSOLUTE MAXIMUM RATINGS (T_C=25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain to Source Voltage		V _{DSS}	650	V
Gate to Source Voltage		V _{GSS}	±30	V
Continuous Drain Current	Continuous	I _D	9	A
	Pulsed (Note 2)	I _{DM}	18	A
Avalanche Energy	Single Pulsed (Note 3)	E _{AS}	331	mJ
Peak Diode Recovery dv/dt (Note 3)		dv/dt	4.3	V/ns
Power Dissipation		P _D	55	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 = 30mH, I_{AS} = 4.7A, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25°C

4. I_{SD} ≤ 9.0A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C.

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ _{JA}	110	°C/W
Junction to Case	θ _{JC}	2.27 (Note)	°C/W

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

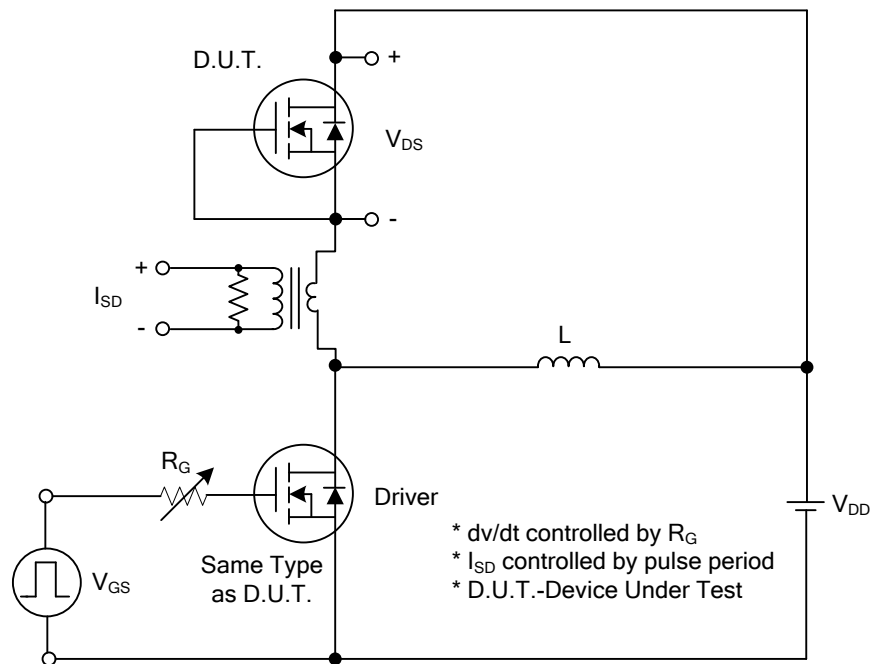
■ ELECTRICAL CHARACTERISTICS (T_J =25°C, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V, I _D =250μA	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	2.0		4.0	V
Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V, I _D =4.5A			1.2	Ω
DYNAMIC CHARACTERISTICS							
Input Capacitance		C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1MHz		1180		pF
Output Capacitance		C _{OSS}			107		pF
Reverse Transfer Capacitance		C _{RSS}			8.5		pF
DYNAMIC CHARACTERISTICS							
Total Gate Charge		Q _G	V _{DS} =520V, V _{GS} =10V, I _D =9A I _G =1mA (Note 1, 2)		31		nC
Gate-Source Charge		Q _{GS}			12		nC
Gate-Drain Charge		Q _{GD}			7.5		nC
Turn-on Delay Time (Note 1)		t _{D(ON)}	V _{DS} =100V, V _{GS} =10V, I _D =9A, R _G =25Ω (Note 1, 2)		18		ns
Rise Time		t _R			19		ns
Turn-off Delay Time		t _{D(OFF)}			82		ns
Fall-Time		t _F			32		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Continuous Drain-Source Diode Forward Current		I _S				9	A
Maximum Pulsed Drain-Source Diode Forward Current		I _{SM}				18	A
Drain-Source Diode Forward Voltage (Note 1)		V _{SD}	I _S =9A, V _{GS} =0V			1.4	V
Body Diode Reverse Recovery Time (Note 1)		t _{rr}	I _S =9A, V _{GS} =0V,		480		ns
Body Diode Reverse Recovery Charge		Q _{rr}	dI _F /dt=100A/μs		4		μC

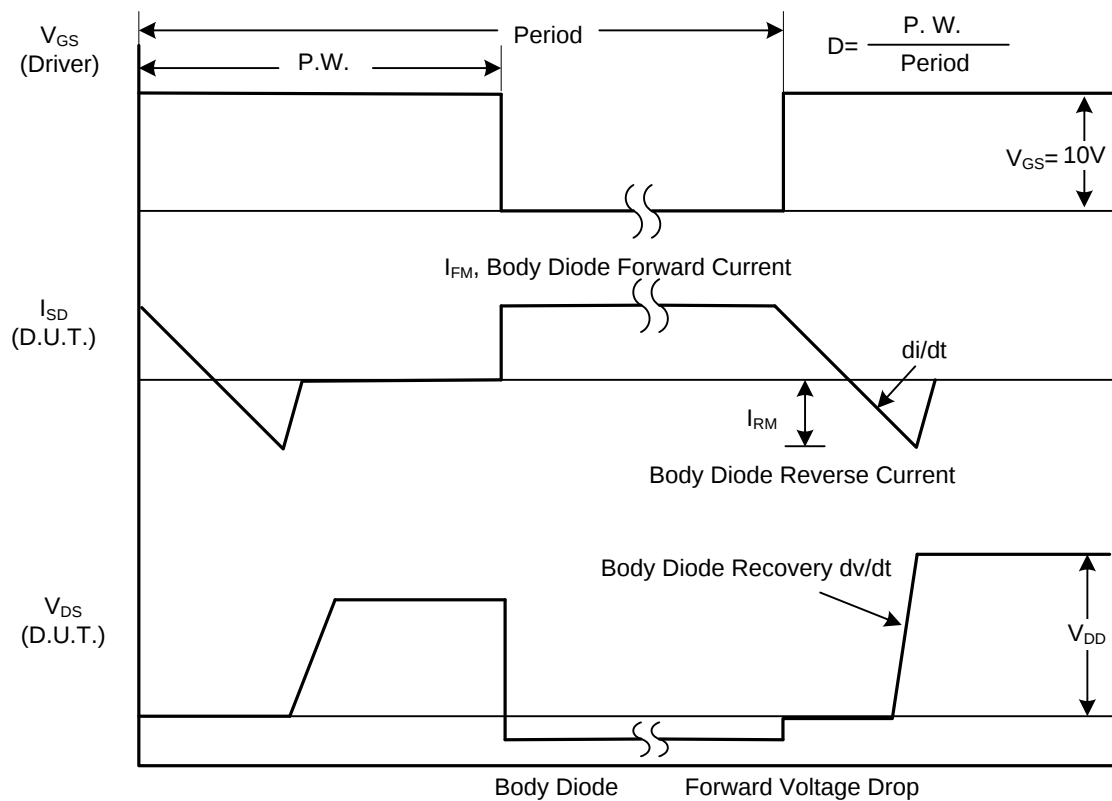
Notes: 1. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

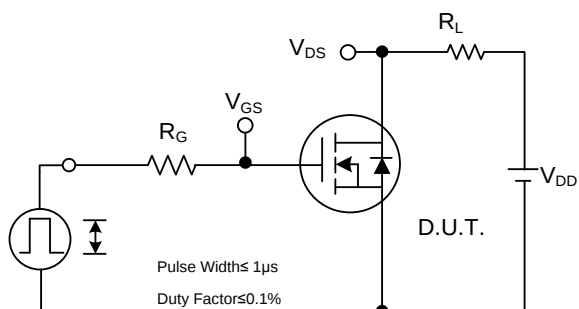


Peak Diode Recovery dv/dt Test Circuit

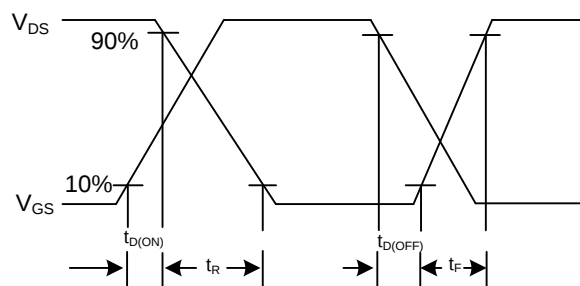


Peak Diode Recovery dv/dt Waveforms

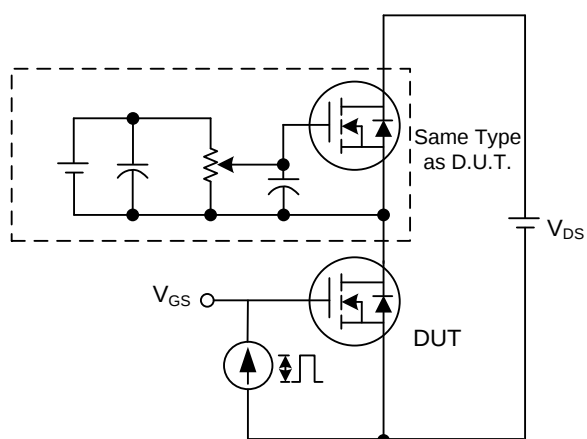
■ TEST CIRCUITS AND WAVEFORMS



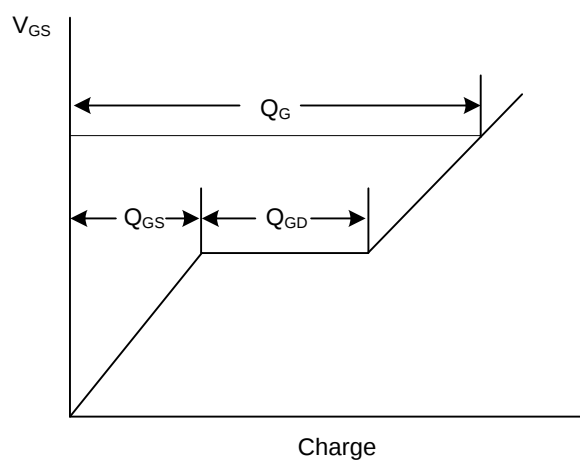
Switching Test Circuit



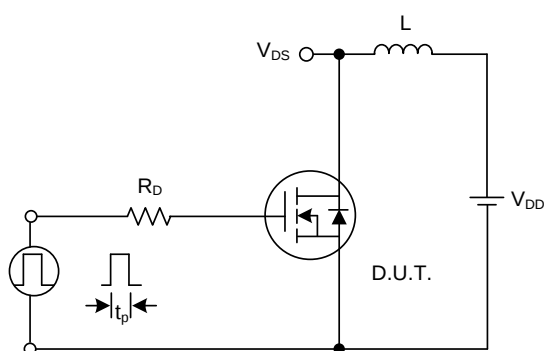
Switching Waveforms



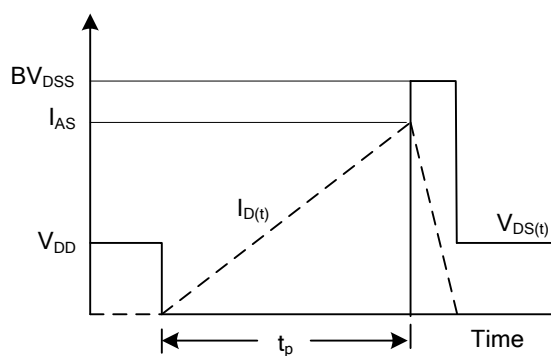
Gate Charge Test Circuit



Gate Charge Waveform

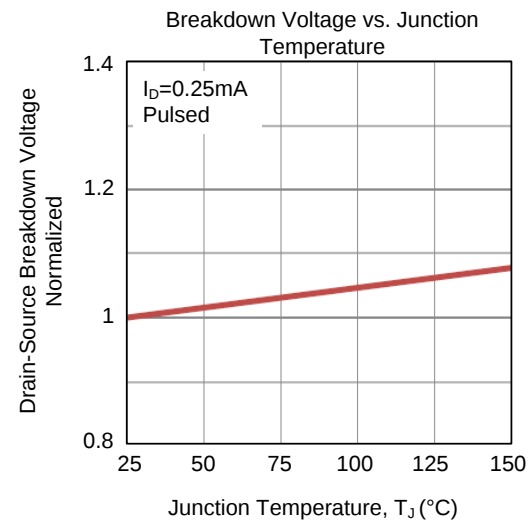
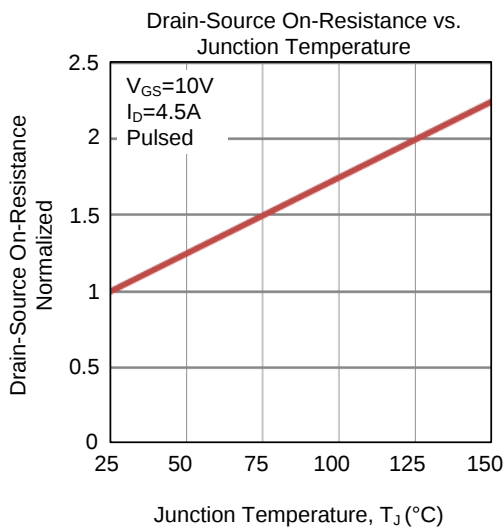
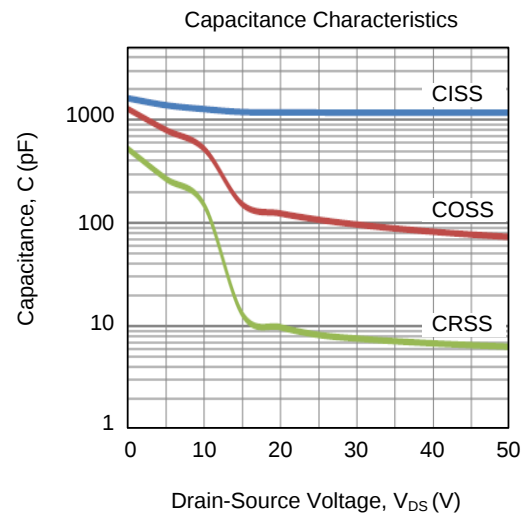
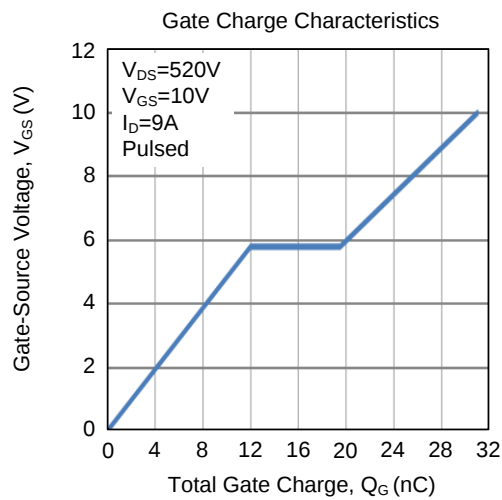
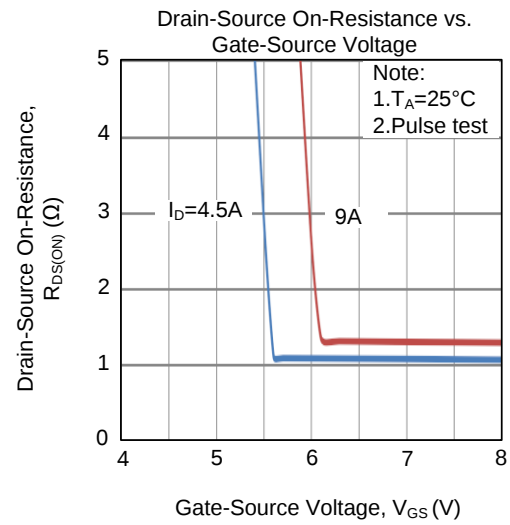
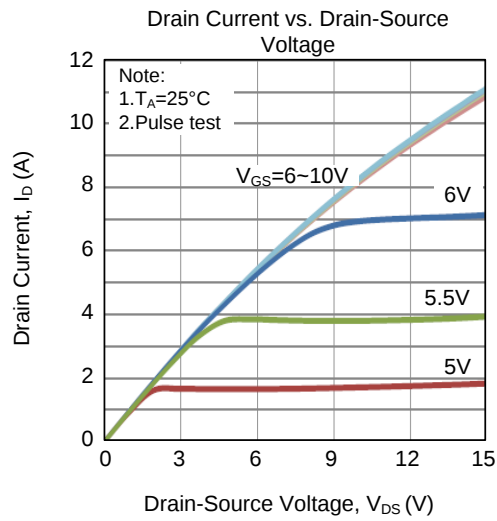


Unclamped Inductive Switching Test Circuit

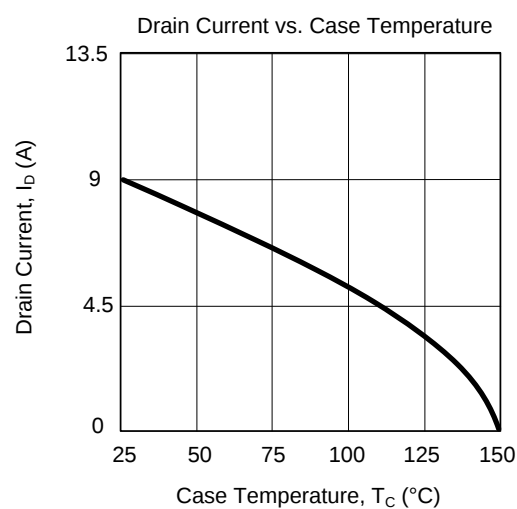
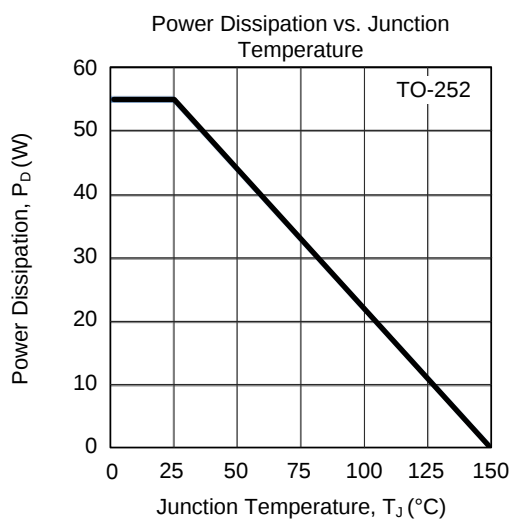
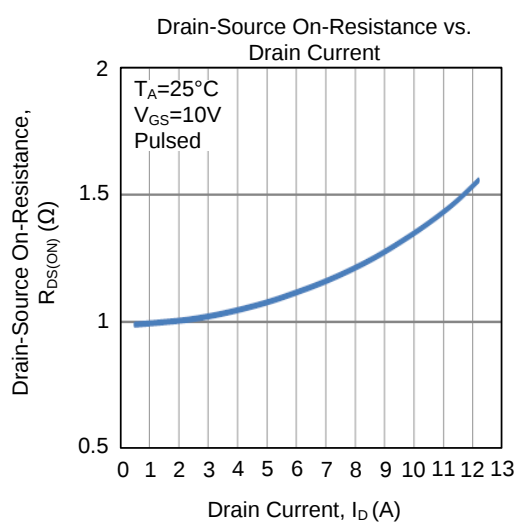
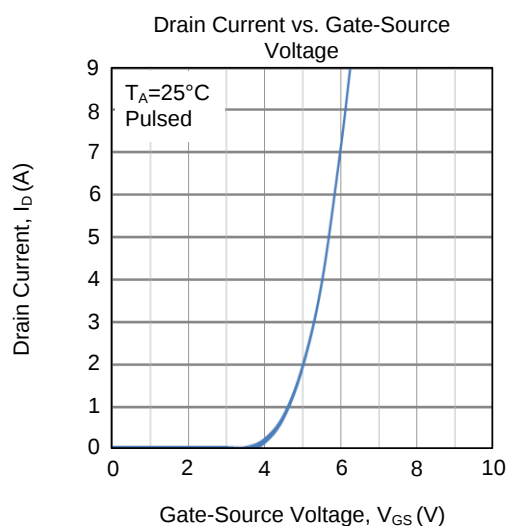
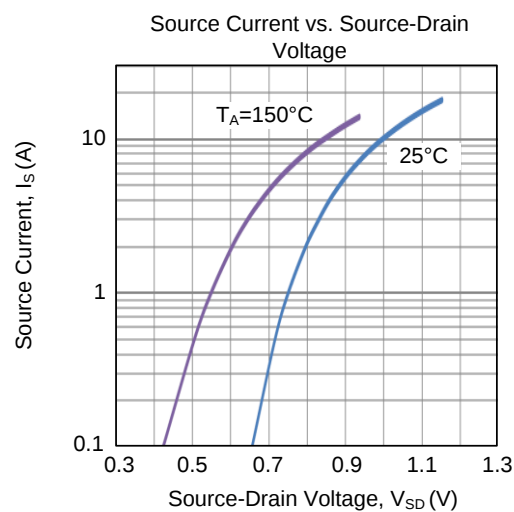
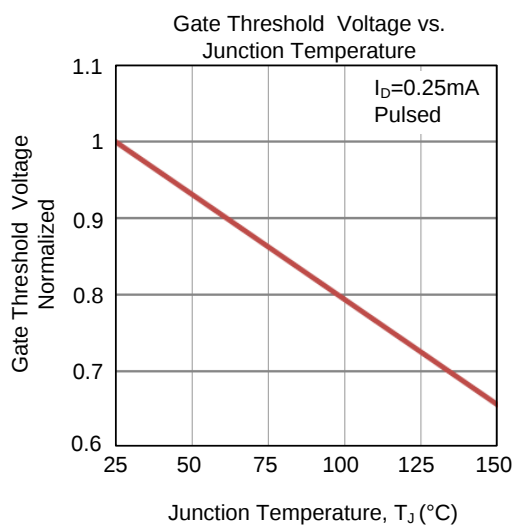


Unclamped Inductive Switching Waveforms

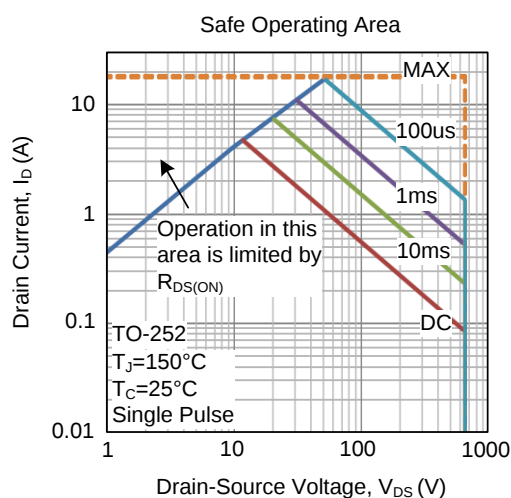
TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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