



1N60A

Power MOSFET

0.5 Amps, 600/650 Volts N-CHANNEL MOSFET

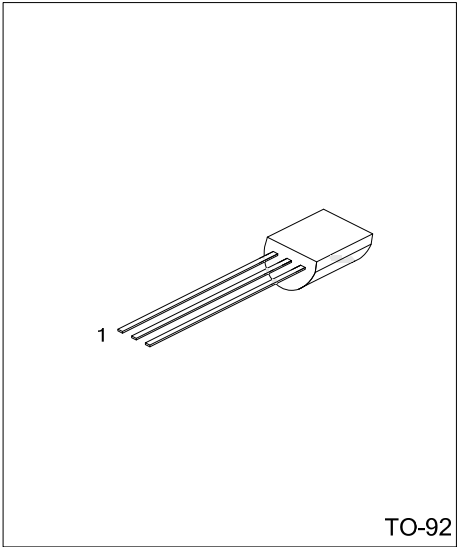
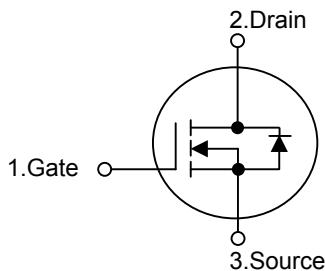
■ DESCRIPTION

The UTC **1N60A** is a high voltage MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics. This power MOSFET is usually used at high speed switching applications in power supplies, PWM motor controls, high efficient DC to DC converters and bridge circuits.

■ FEATURES

- * $R_{DS(ON)} = 15\Omega @ V_{GS} = 10V$.
- * Ultra Low gate charge (typical 8.0nC)
- * Low reverse transfer capacitance ($C_{RSS} = 3.0\text{ pF(max)}$)
- * 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	
1N60AL-x-T92-B	1N60AG-x-T92-B	TO-92	G	D	S	Tape Box
1N60AL-x-T92-K	1N60AG-x-T92-K	TO-92	G	D	S	Bulk

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

<p>1N60AL-x-T92-B</p>	<p>(1) Packing Type (2) Package Type (3) Drain-Source Voltage (4) Lead Plating</p>	<p>(1) B: Tape Box, K: Bulk (2) T92: TO-92 (3) A: 600V, B: 650V (4) H: Halogen Free, L: Lead Free</p>
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■ ABSOLUTE MAXIMUM RATINGS (T_C = 25°C, unless otherwise specified.)

PARAMETER		SYMBOL	RATINGS		UNIT
Drain-Source Voltage	1N60A-A	V _{DSS}	600		V
	1N60A-B		650		V
Gate-Source Voltage		V _{GSS}	±30		V
Continuous Drain Current		I _D	0.5		A
Pulsed Drain Current (Note 2)		I _{DM}	2		A
Avalanche Energy	Single Pulse(Note 3)	E _{AS}	50		mJ
	Repetitive(Note 2)	E _{AR}	3.6	4.0	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5		V/ns
Power Dissipation (T _C =25°C)		P _D	3		W
Derate above 25°C			25		mW/°C
Junction Temperature		T _J	+150		°C
Operating Temperature		T _{OPR}	-55 ~ +150		°C
Storage Temperature		T _{STG}	-55 ~ +150		°C

Note: 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=92mH, I_{AS}=0.8A, V_{DD}=50V, R_G=0Ω, Starting T_J=25°C
4. I_{SD}≤1.0A, di/dt≤100A/μs, V_{DD}≤BV_{DSS}, Starting T_J=25°C

■ THERMAL DATA

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Junction to Ambient	θ _{JA}			120	°C/W

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	1N60A-A	V _{GS} = 0V, I _D = 250μA	600			V
	1N60A-B		650			V
Drain-Source Leakage Current	I _{DSS}	V _{DS} = 600V, V _{GS} = 0V			10	μA
Gate-Source Leakage Current	Forward	V _{GS} = 20V, V _{DS} = 0V V _{GS} = -20V, V _{DS} = 0V			100	nA
	Reverse				-100	nA
Breakdown Voltage Temperature Coefficient	ΔBV _{DSS} /ΔT _J	I _D = 250μA referenced to 25°C		0.4		V/°C
ON CHARACTERISTICS						
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} = V _{GS} , I _D = 250μA	2.0		4.2	V
Static Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} = 10V, I _D = 0.5A		11	15	Ω
DYNAMIC CHARACTERISTICS						
Input Capacitance	C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1MHz			100	pF
Output Capacitance	C _{OSS}				20	pF
Reverse Transfer Capacitance	C _{RSS}				3	pF
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	t _{D(ON)}	V _{DD} =300V, I _D =0.5A, R _G =5Ω (Note 1, 2)		12	34	ns
Turn-On Rise Time	t _R			11	32	ns
Turn-Off Delay Time	t _{D(OFF)}			40	90	ns
Turn-Off Fall Time	t _F			18	46	ns
Total Gate Charge	Q _G	V _{DS} =480V, V _{GS} =10V, I _D =0.8A (Note 1, 2)		8	10	nC
Gate-Source Charge	Q _{GS}			1.8		nC
Gate-Drain Charge	Q _{GD}			4.0		nC

■ ELECTRICAL CHARACTERISTICS(Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS						
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_{SD} = 1.2A$			1.6	V
Maximum Continuous Drain-Source Diode Forward Current	I_S				1.2	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}				4.8	A
Reverse Recovery Time	t_{RR}	$V_{GS}=0V, I_{SD} = 1.2A$		136		ns
Reverse Recovery Charge	Q_{RR}	$di/dt = 100A/\mu s$		0.3		μC

Notes: 1. Pulse Test: Pulse Width \leq 300 μs , Duty Cycle \leq 2%

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

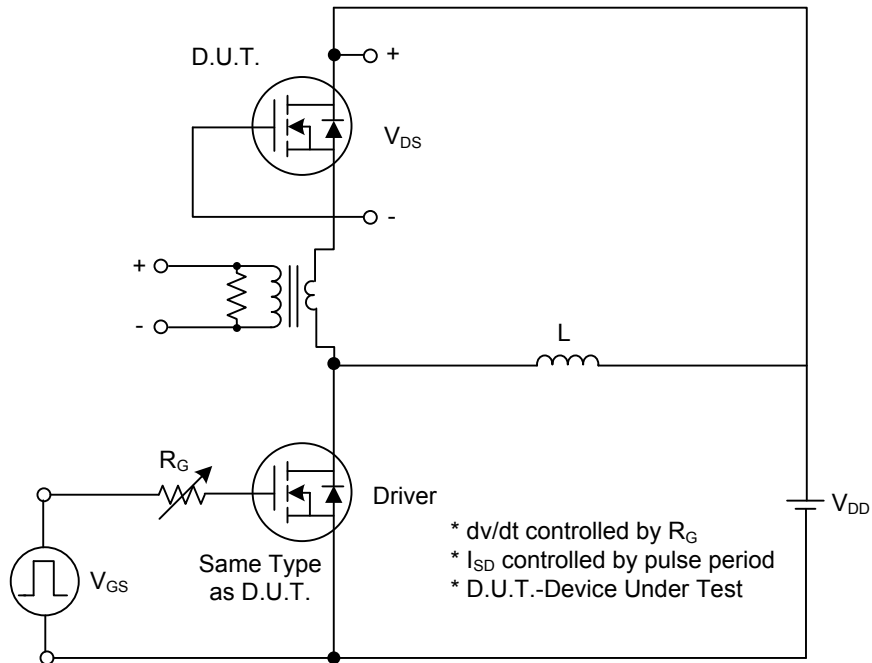


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

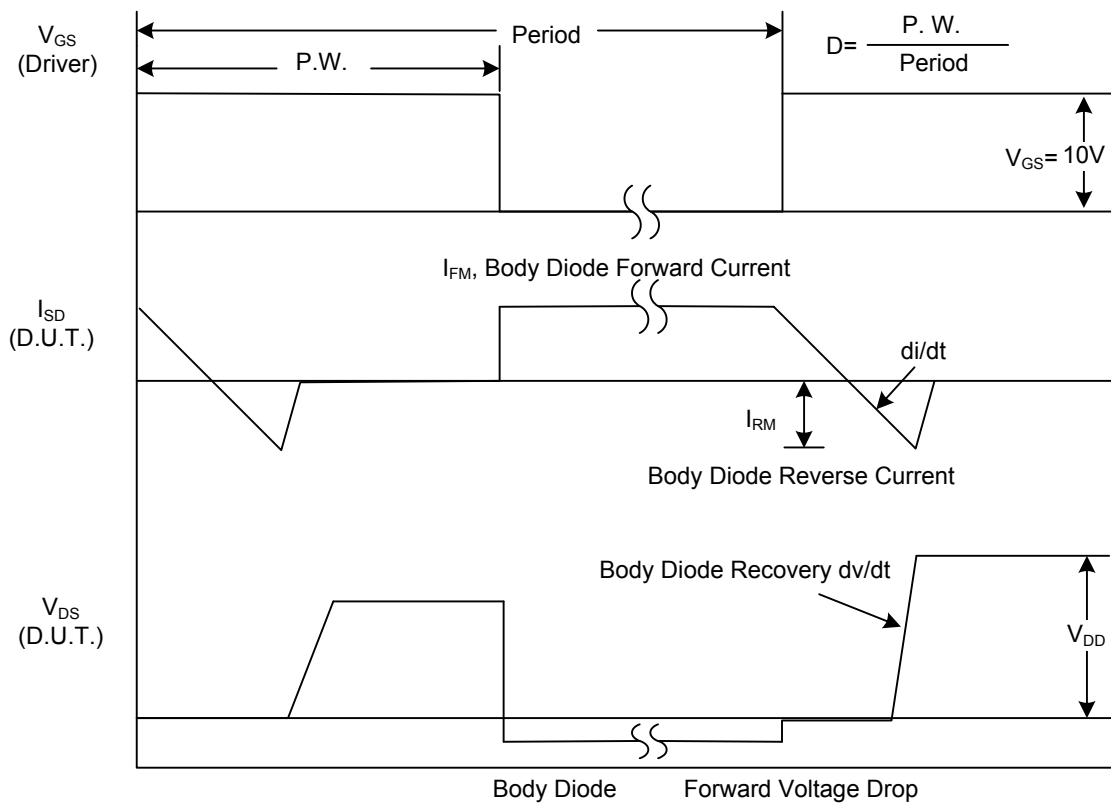


Fig. 1B Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)

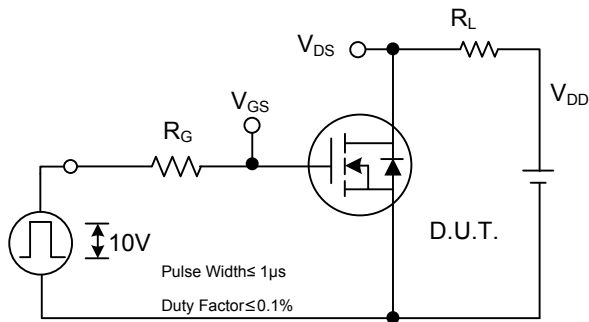


Fig. 2A Switching Test Circuit

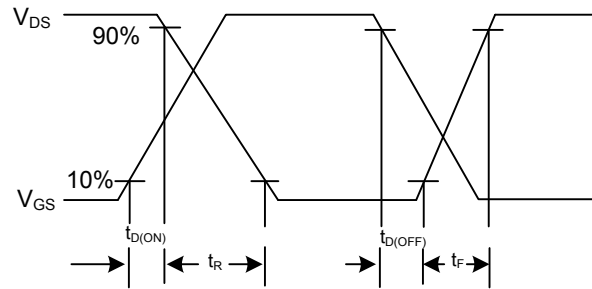


Fig. 2B Switching Waveforms

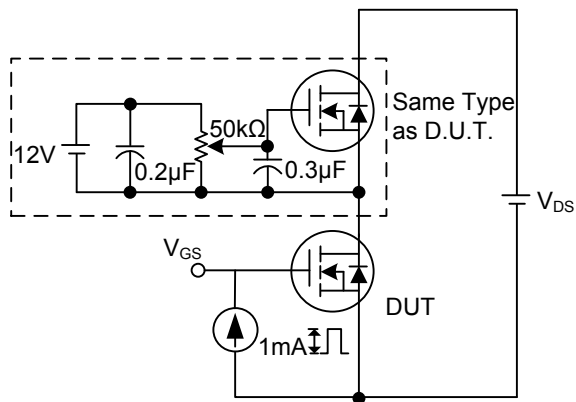


Fig. 3A Gate Charge Test Circuit

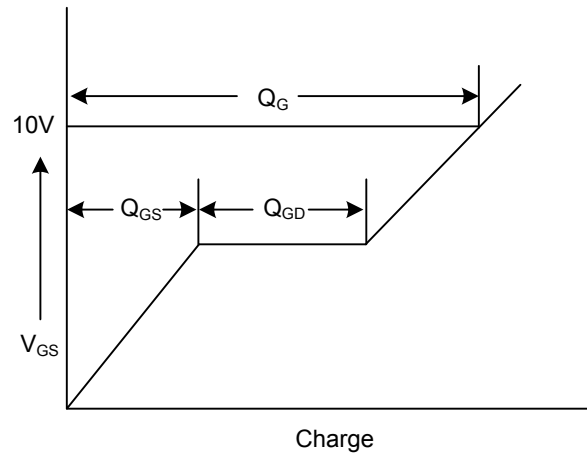


Fig. 3B Gate Charge Waveform

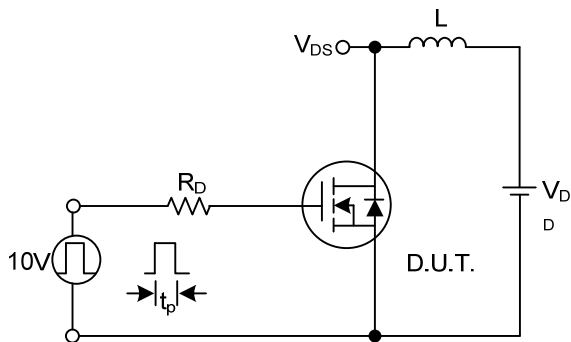


Fig. 4A Unclamped Inductive Switching Test Circuit

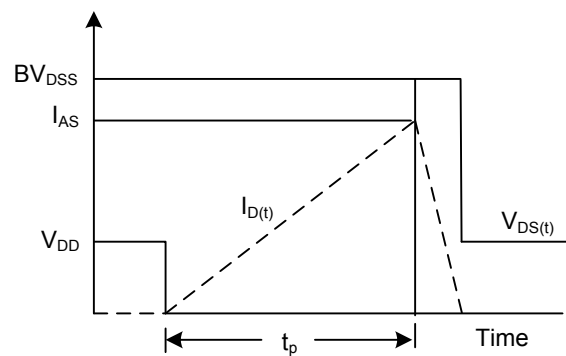
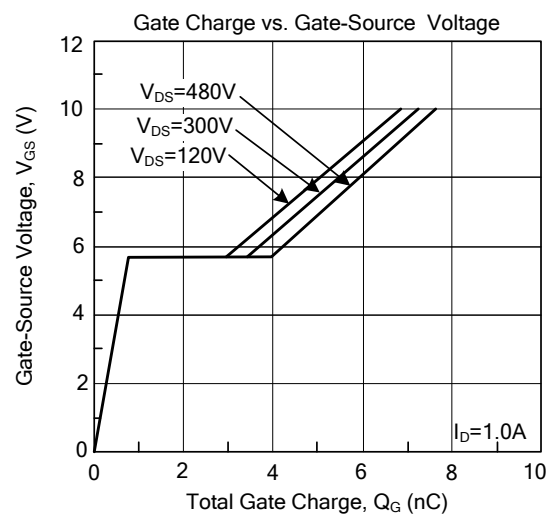
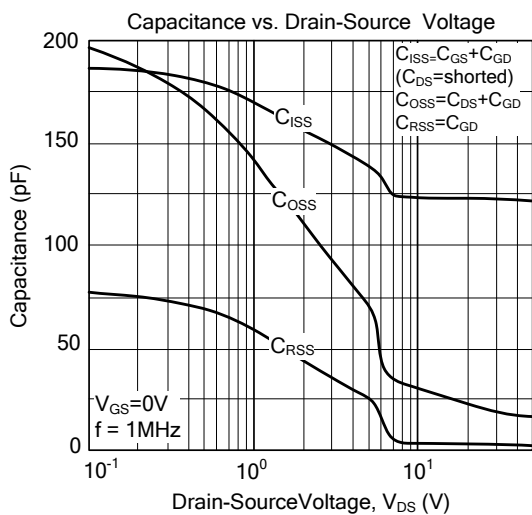
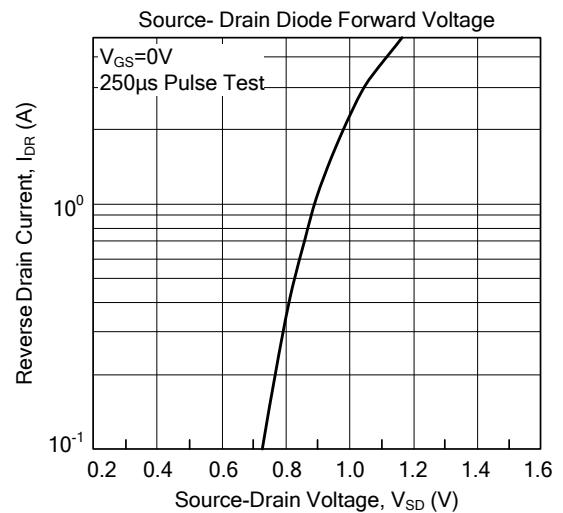
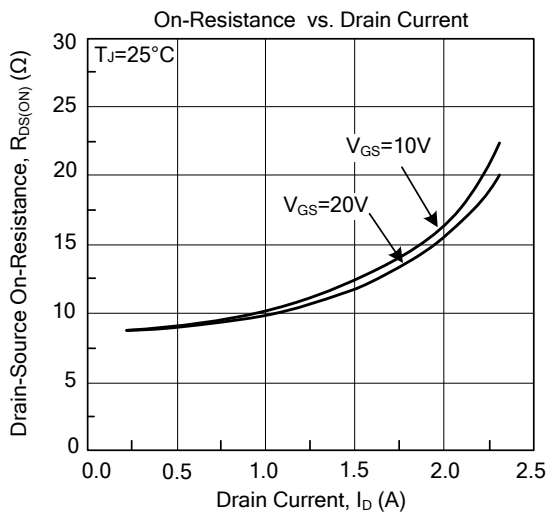
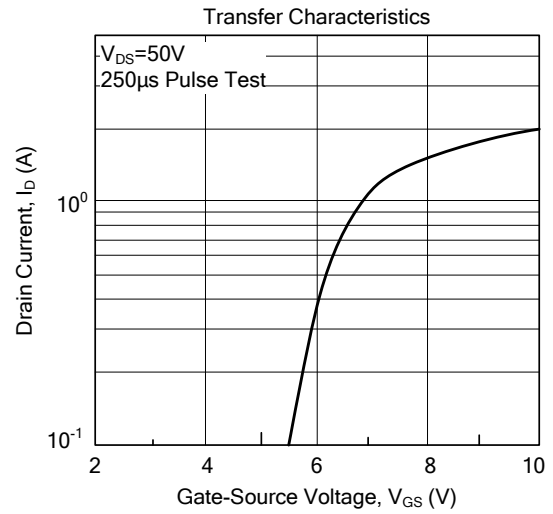
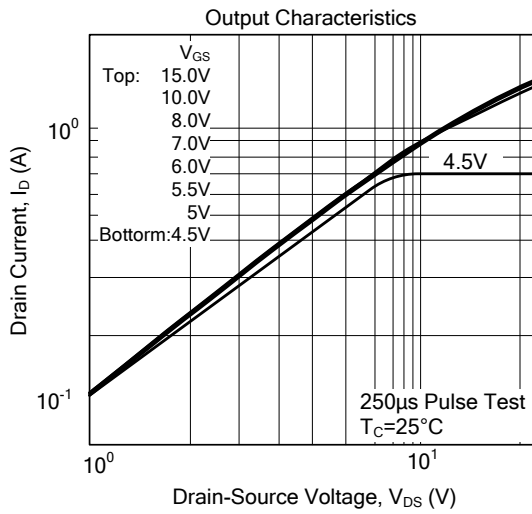
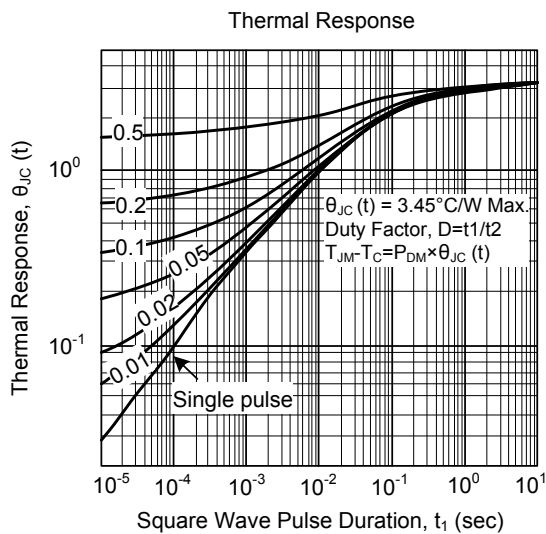
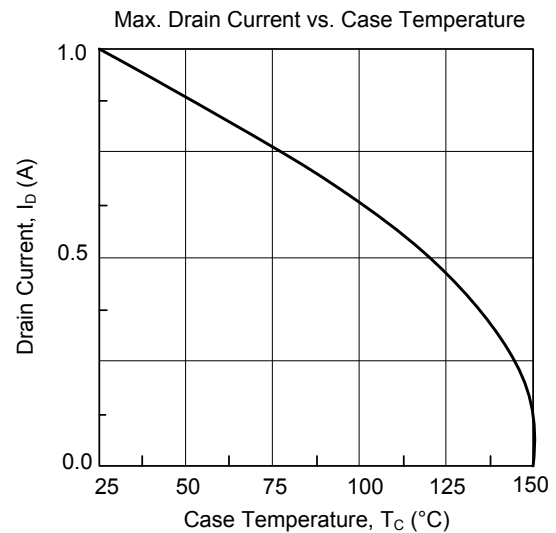
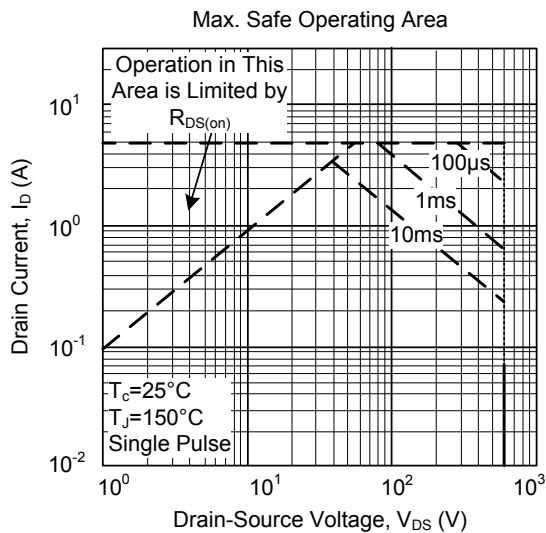
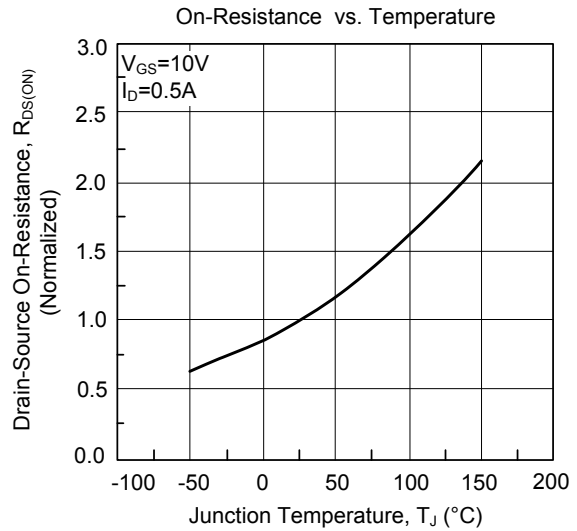
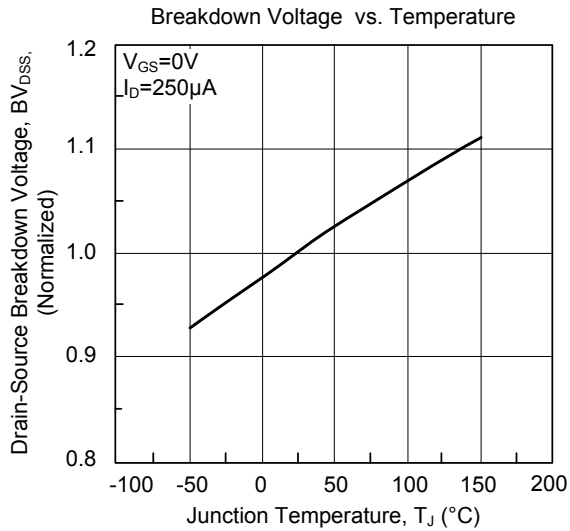


Fig. 4B Unclamped Inductive Switching Waveforms

TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS (Cont.)



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