



1N60A

Power MOSFET

0.5 Amps, 600 Volts N-CHANNEL MOSFET

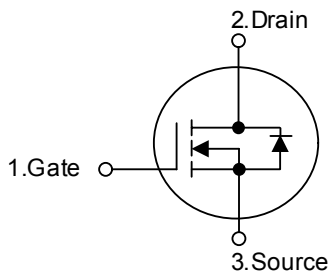
■ DESCRIPTION

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

- * $R_{DS(ON)} = 11\Omega @ V_{GS} = 10V$.
- * 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

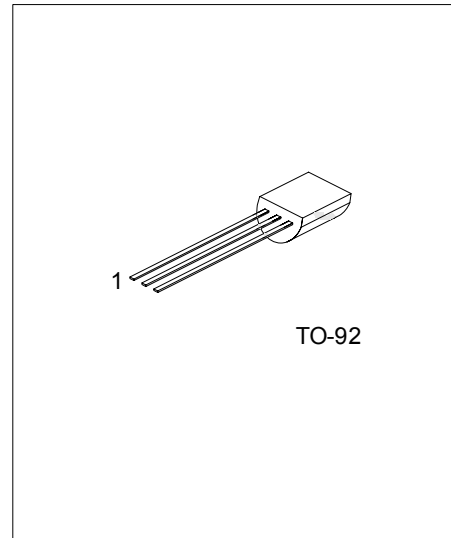


■ ORDERING INFORMATION

Order Number		Package	Pin Assignment			Packing
Normal	Lead Free Plating		1	2	3	
1N60A-T92-B	1N60AL-T92-B	TO-92	G	D	S	Tape Box
1N60A-T92-K	1N60AL-T92-K	TO-92	G	D	S	Bulk
1N60A-T92-R	1N60AL-T92-R	TO-92	G	D	S	Tape Reel

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

<p>1N60AL-T92-B</p> <p>(1) Packing Type (2) Package Type (3) Lead Plating</p>	<p>(1) B: Tape Box, K: Bulk, R: Tape Reel (2) T92: TO-92 (3) L: Lead Free Plating Blank: Pb/Sn</p>
---------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------



*Pb-free plating product number: 1N60AL

■ ABSOLUTE MAXIMUM RATINGS($T_C = 25$, unless otherwise specified.)

PARAMETER		SYMBOL	RATINGS		UNIT
Drain-Source Voltage		V_{DSS}	600		V
Gate-Source Voltage		V_{GSS}	± 30		V
Continuous Drain Current	$T_C = 25$	I_D	0.5		A
	$T_C = 100$		0.4		
Drain Current-Pulsed (Note 2)		I_{DP}	2		A
Avalanche Energy	Repetitive(Note 1)	E_{AR}	3.6	4.0	mJ
	Single Pulse(Note 2)	E_{AS}	50		mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5		V/ns
Total Power Dissipation	$T_C=25$	P_D	3		W
	Derate above 25°C		25		mW/
Operation Junction Temperature		T_J	-55 ~ +150		
Storage Temperature		T_{STG}	-55 ~ +150		

Note: 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.

■ THERMAL DATA

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Thermal Resistance Junction-Ambient	θ_{JA}			120	/W
Thermal Resistance Case-Sink	θ_{CS}		0.5		

■ ELECTRICAL CHARACTERISTICS ($T_J=25$, Unless Otherwise Specified.)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Off Characteristics							
Drain-Source Breakdown Voltage		BV_{DSS}	$V_{GS} = 0V, I_D = 250\mu A$	600			V
Breakdown Voltage Temperature Coefficient		BV_{DSS}/T_J	$I_D = 250\mu A$, referenced to 25		0.4		V/
Zero Gate Voltage Drain Current		I_{DSS}	$V_{DS} = 600V, V_{GS} = 0V$			1	μA
			$V_{DS} = 480V, T_C = 125$				
Gate-Body Leakage Current	Forward	I_{GSS}	$V_{GS} = 20V, V_{DS} = 0V$			10	μA
	Reverse		$V_{GS} = -20V, V_{DS} = 0V$			-10	μA
On Characteristics							
Gate Threshold Voltage		$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	2.0		4.0	V
Static Drain-Source On-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	$t_{D(ON)}$	$V_{DD}=300V, I_D=0.5A, R_G=5\Omega$ (Note 4,5)			12	34	ns
Rise Time	t_R				11	32	ns
Turn-Off Delay Time	$t_{D(OFF)}$				40	90	ns
Fall Time	t_F				18	46	ns
Total Gate Charge	Q_G				8	10	nC
Gate-Source Charge	Q_{GS}	$V_{DS}=480V, V_{GS}=10V, I_D=0.8A$ (Note 4,5)			1.8		nC
Gate-Drain Charge	Q_{GD}				4.0		nC

■ ELECTRICAL CHARACTERISTICS(Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Drain-Source Diode Characteristics						
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S = 0.8A,$			1.6	V
Continuous Drain-Source Current	I_{SD}				1.2	A
Pulsed Drain-Source Current	I_{SM}				4.8	A
Reverse Recovery Time	t_{RR}	$V_{GS}=0V, I_S = 0.8A$		136		ns
Reverse Recovery Charge	Q_{RR}	$di/dt = 100A/\mu s$		0.3		μC

Note: 1. Repeatability rating: pulse width limited by junction temperature

2. $L=92mH, I_{AS}=1.0A, V_{DD}=50V, R_G=0\Omega, \text{Starting } T_J=25$

3. $I_{SD}\leq 1.0A, di/dt\leq 100A/\mu s, V_{DD}\leq BV_{DSS}, \text{Starting } T_J=25$

4. Pulse Test: Pulse Width $\leq 300\mu s, \text{Duty Cycle}\leq 2\%$

5. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

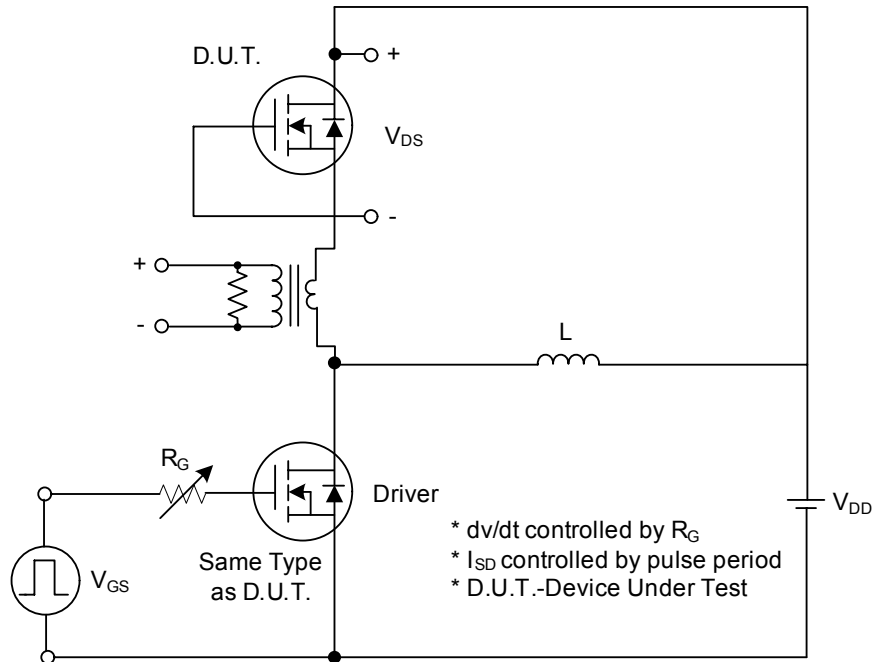


Fig. 1A Peak Diode Recovery dv/dt Test Circuit

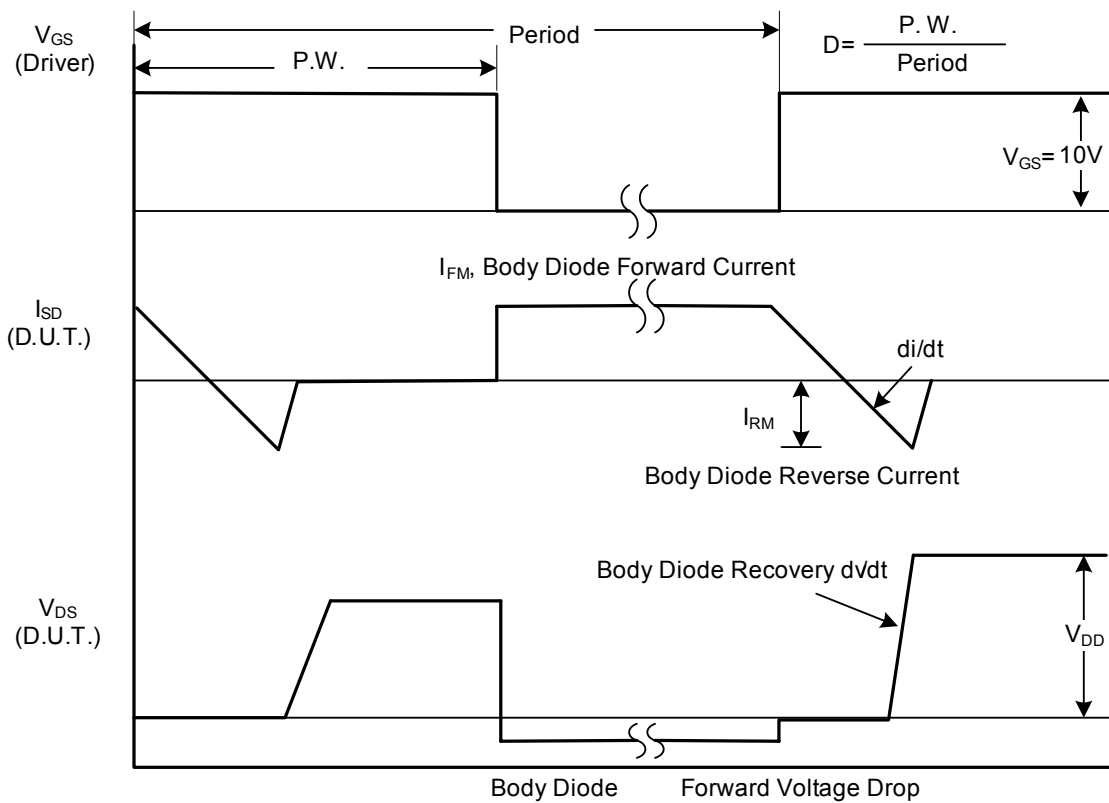


Fig. 1B Peak Diode Recovery dv/dt Waveforms

■ TEST CIRCUITS AND WAVEFORMS (Cont.)

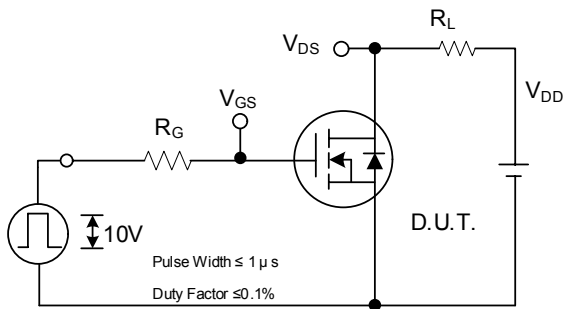


Fig. 2A Switching Test Circuit

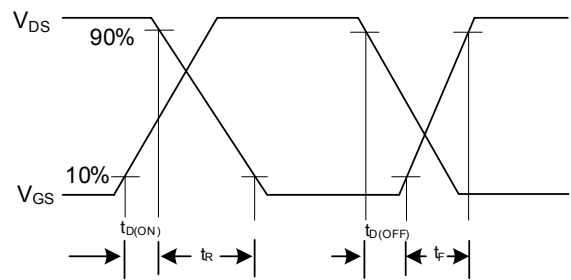


Fig. 2B Switching Waveforms

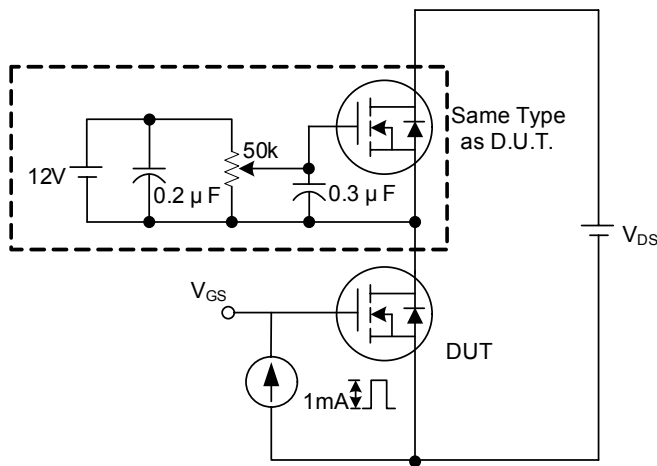


Fig. 3A Gate Charge Test Circuit

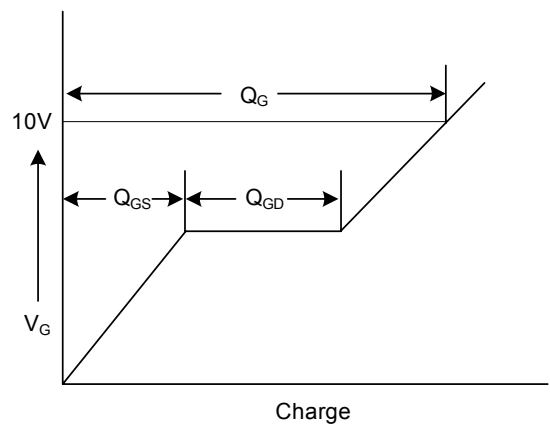


Fig. 3B Gate Charge Waveform

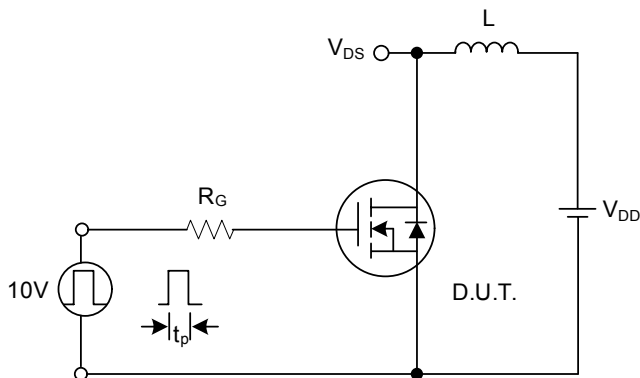


Fig. 4A Unclamped Inductive Switching Test Circuit

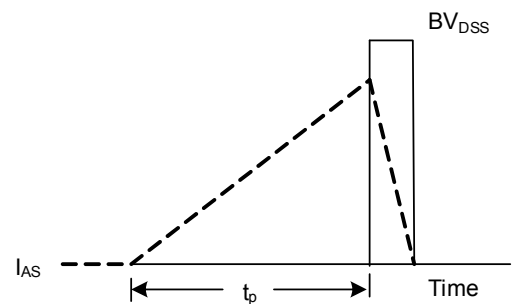
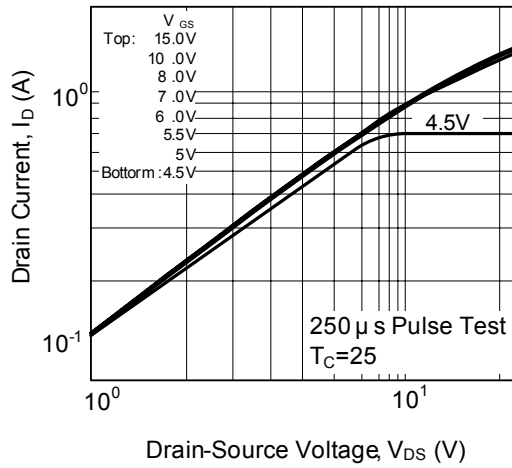


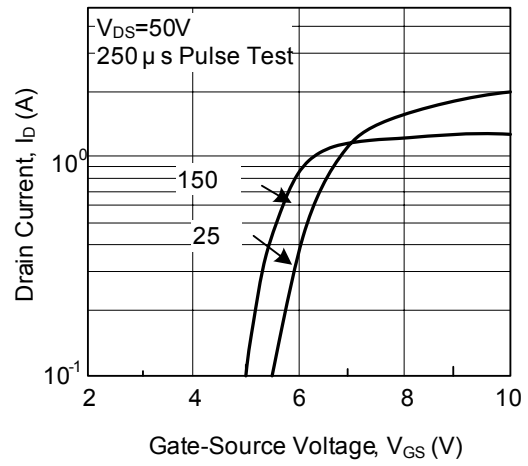
Fig. 4B Unclamped Inductive Switching Waveforms

TYPICAL PERFORMANCE CHARACTERISTICS

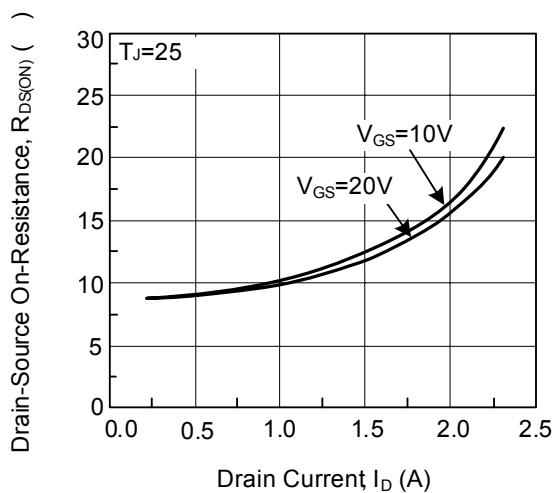
Output Characteristics



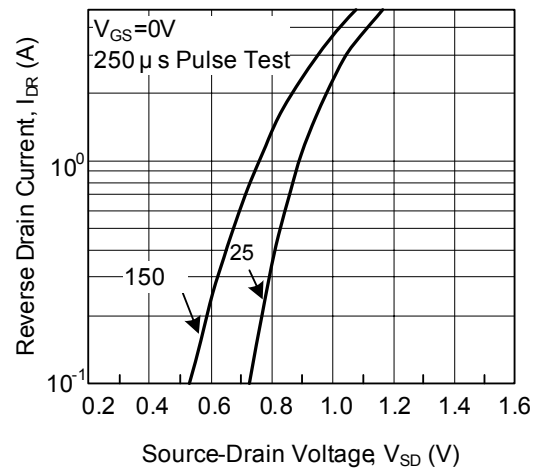
Transfer Characteristics



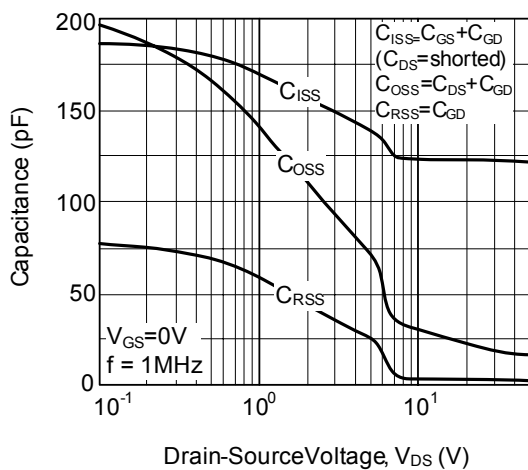
On-Resistance vs. Drain Current



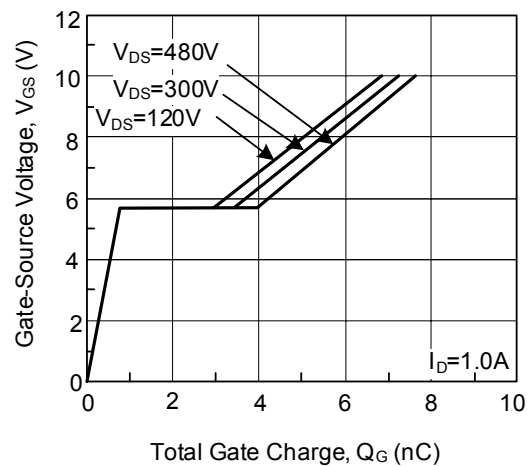
Source- Drain Diode Forward Voltage



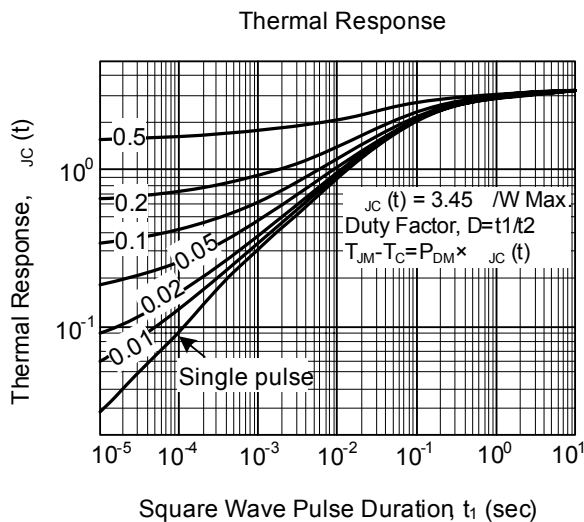
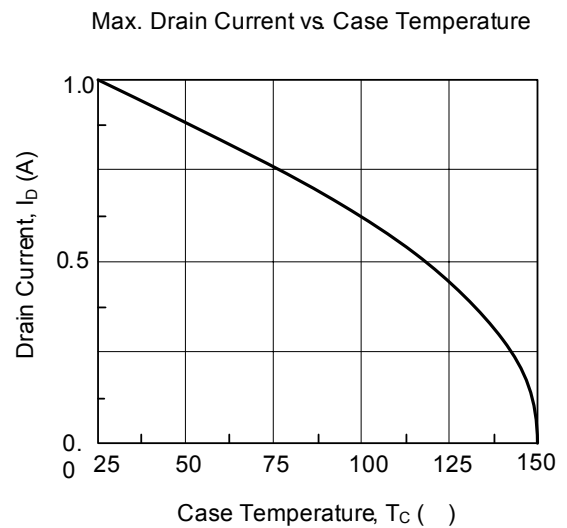
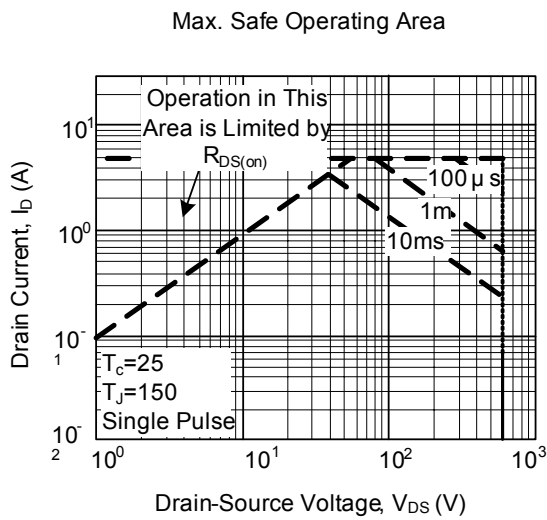
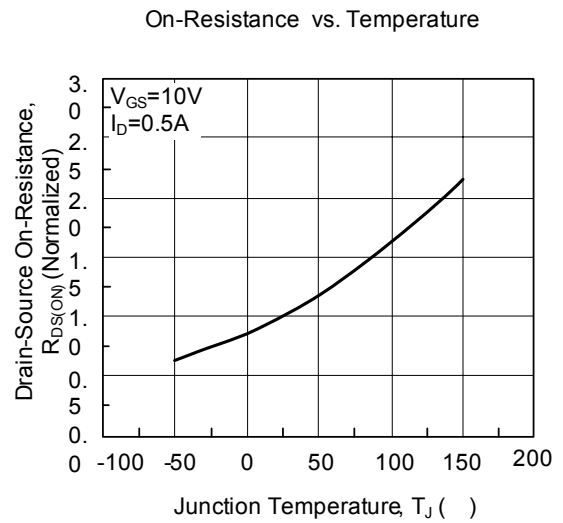
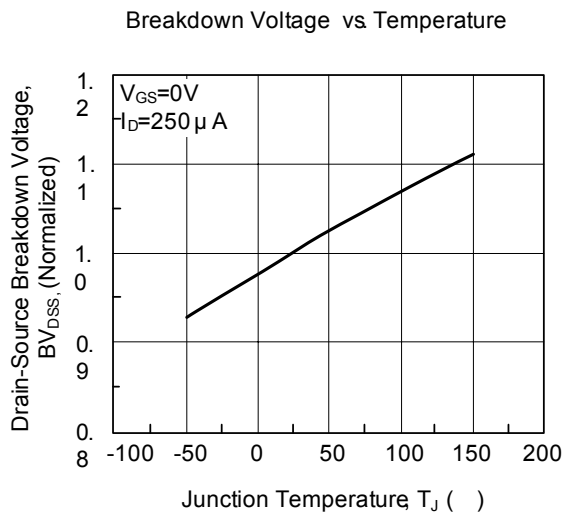
Capacitance vs. Drain-Source Voltage



Gate Charge vs. Gate-Source Voltage



TYPICAL PERFORMANCE CHARACTERISTICS(Cont.)



UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice.