



2N40-CB

POWER MOSFET

2.0A, 400V N-CHANNEL POWER MOSFET

■ DESCRIPTION

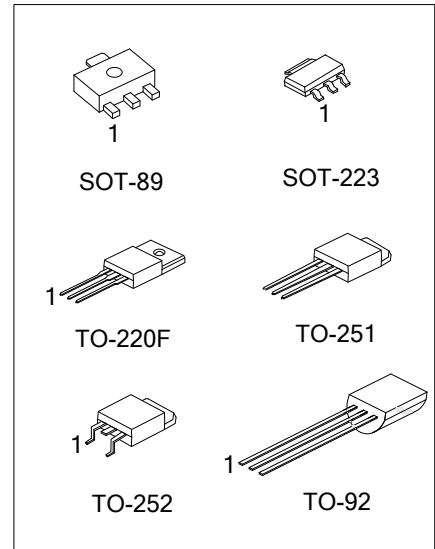
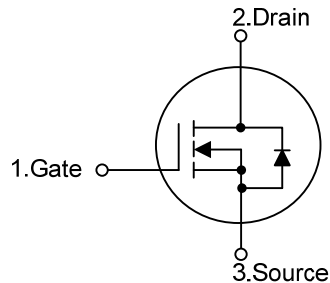
The UTC **2N40-CB** is a N-channel mode power MOSFET using UTC's advanced technology to provide customers with planar stripe and DMOS technology. This technology specializes in allowing a minimum on-state resistance and superior switching performance. It also can withstand high energy pulse in the avalanche and commutation mode.

The UTC **2N40-CB** is universally applied in electronic lamp ballast based on half bridge topology and high efficient switched mode power supply.

■ FEATURES

- * $R_{DS(ON)} \leq 5.0 \Omega$ @ $V_{GS} = 10V$, $I_D = 1.0A$
- * High Switching Speed
- * 100% Avalanche Tested

■ SYMBOL



ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
2N40L-AA3-R	2N40G-AA3-R	SOT-223	G	D	S	Tape Reel
2N40L-AB3-R	2N40G-AB3-R	SOT-89	G	D	S	Tape Reel
2N40L-TF3-T	2N40G-TF3-T	TO-220F	G	D	S	Tube
2N40L-TM3-T	2N40G-TM3-T	TO-251	G	D	S	Tube
2N40L-TN3-R	2N40G-TN3-R	TO-252	G	D	S	Tape Reel
2N40L-T92-B	2N40G-T92-B	TO-92	G	D	S	Tape Box
2N40L-T92-K	2N40G-T92-K	TO-92	G	D	S	Bulk

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

2N40G-AA3-R (1)Packing Type (2)Package Type (3)Green Package	(1) R: Tape Reel, T: Tube, B: Tape Box, K: Bulk (2) AA3: SOT-223, TF3: TO-220F, TM3: TO-251 TN3: TO-252, T92: TO-92 (3) G: Halogen Free and Lead Free, L: Lead Free
--	---

MARKING

SOT-89	SOT-223
TO-220F / TO-251 / TO-252	TO-92

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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V _{DSS}	400	V
Gate-Source Voltage		V _{GSS}	±30	V
Drain Current (T _C =25°C)	Continuous	I _D	2	A
	Pulsed (Note 2)	I _{DM}	6	A
Avalanche Energy	Single Pulsed (Note 3)	E _{AS}	12.8	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	5	V/ns
Power Dissipation	SOT-89	P _D	6	W
	TO-223		1.6	W
	TO-220F		16	W
	TO-251/TO-252		24	W
	TO-92		1.4	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 = 10 mH, I_{AS} = 1.6A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C

4. I_{SD} ≤ 2.0A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C

■ THERMAL DATA

PARAMETER	PACKAGE	SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-89	θ _{JA}	130	°C/W
	SOT-223		150	°C/W
	TO-220F		62.5	°C/W
	TO-251/TO-252		110	°C/W
	TO-92		180	°C/W
Junction to Case	SOT-89	θ _{JC}	20.8 (Note)	°C/W
	SOT-223		78 (Note)	°C/W
	TO-220F		7.8	°C/W
	TO-251/TO-252		5.2 (Note)	°C/W
	TO-92		88	°C/W

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

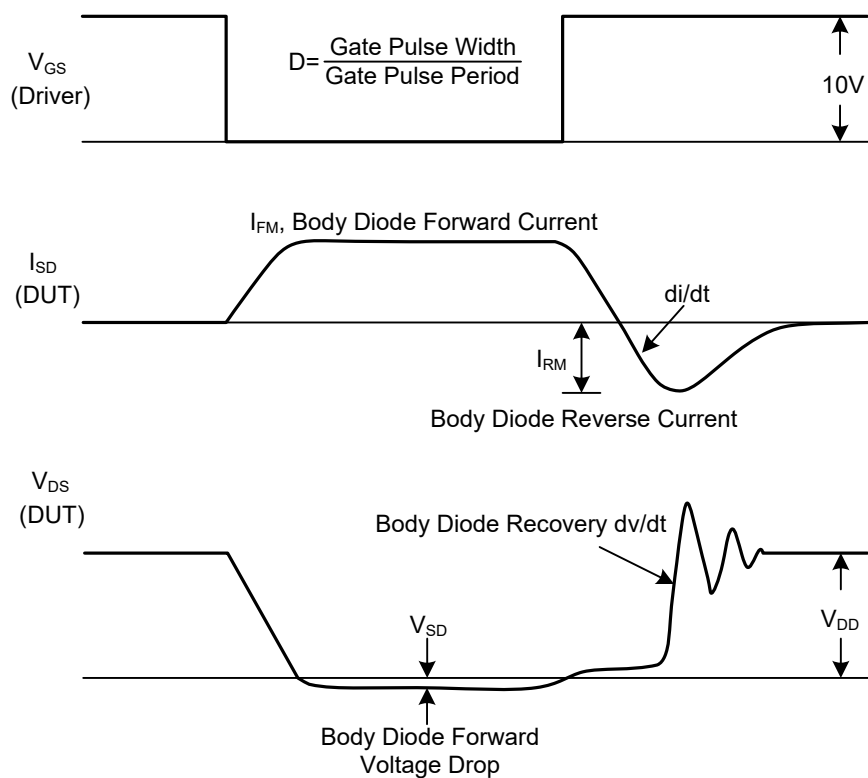
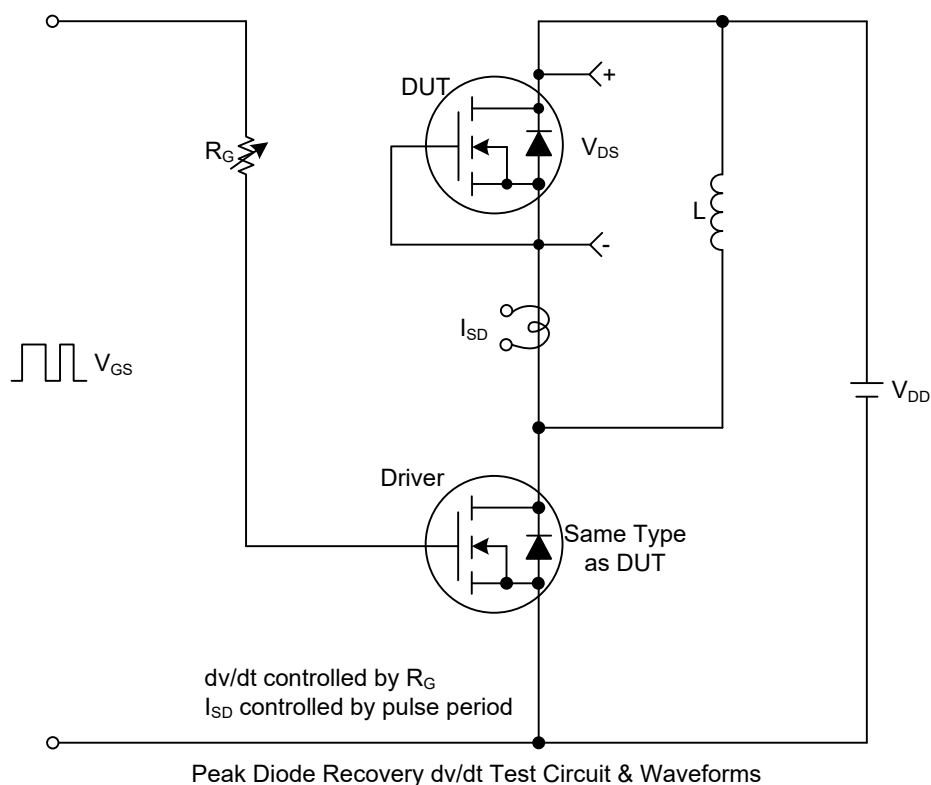
■ **ELECTRICAL CHARACTERISTICS** ($T_c=25^\circ\text{C}$, unless otherwise noted)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	I _D =250μA, V _{GS} =0V	400			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =400V, 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
Static Drain-Source On-State Resistance		R _{DS(ON)}	V _{GS} =10V, I _D =1.0A			5.0	Ω
DYNAMIC PARAMETERS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =25V, f=1.0MHz		149		pF
Output Capacitance		C _{OSS}			24		pF
Reverse Transfer Capacitance		C _{RSS}			2		pF
SWITCHING PARAMETERS							
Total Gate Charge		Q _G	V _{DS} =320V, V _{GS} =10V, I _D =2.0A (Note 1, 2)		10		nC
Gate to Source Charge		Q _{GS}			5		nC
Gate to Drain Charge		Q _{GD}			1		nC
Turn-ON Delay Time		t _{D(ON)}	V _{DD} =100V, V _{GS} =10V, I _D =2.0A, R _G =25Ω (Note 1, 2)		5		ns
Rise Time		t _R			17		ns
Turn-OFF Delay Time		t _{D(OFF)}			10		ns
Fall-Time		t _F			21		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Body-Diode Continuous Current		I _S				2	A
Maximum Body-Diode Pulsed Current		I _{SM}				8	A
Drain-Source Diode Forward Voltage		V _{SD}	V _{GS} =0V, I _S =2.0A			1.4	V
Reverse Recovery Time		t _{rr}	V _{GS} =0V, I _S =2.0A		137		ns
Reverse Recovery Charge		Q _{rr}	dI _F /dt=100A/μs		0.4		μC

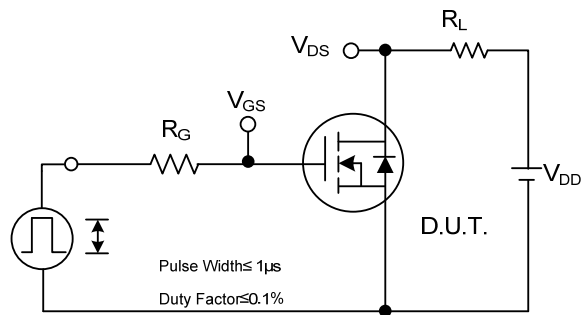
Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

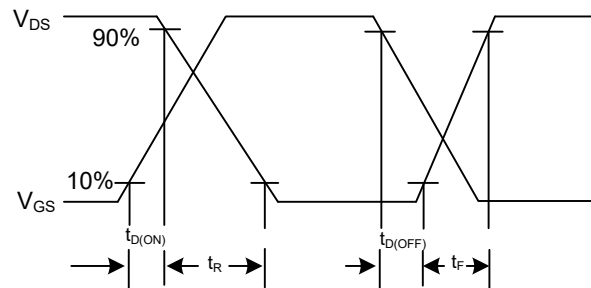
■ TEST CIRCUITS AND WAVEFORMS



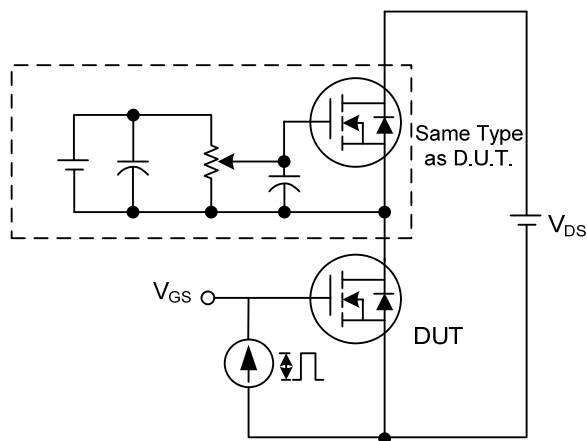
■ TEST CIRCUITS AND WAVEFORMS



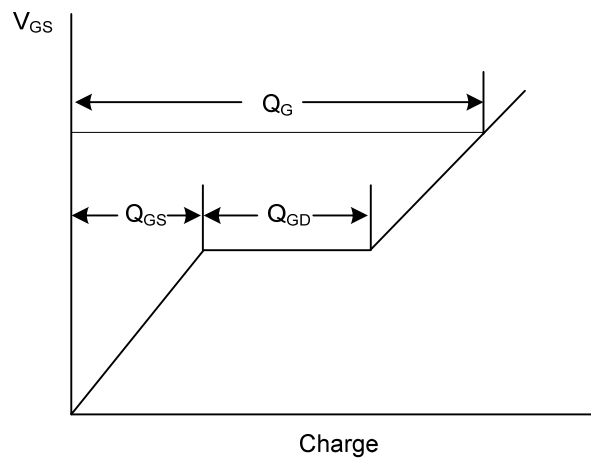
Switching Test Circuit



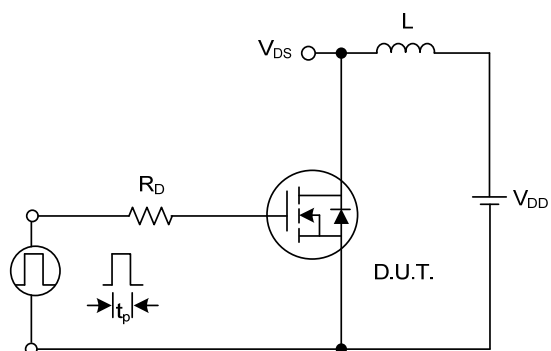
Switching Waveforms



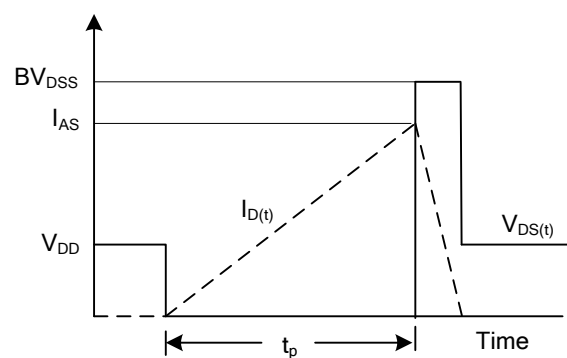
Gate Charge Test Circuit



Gate Charge Waveform

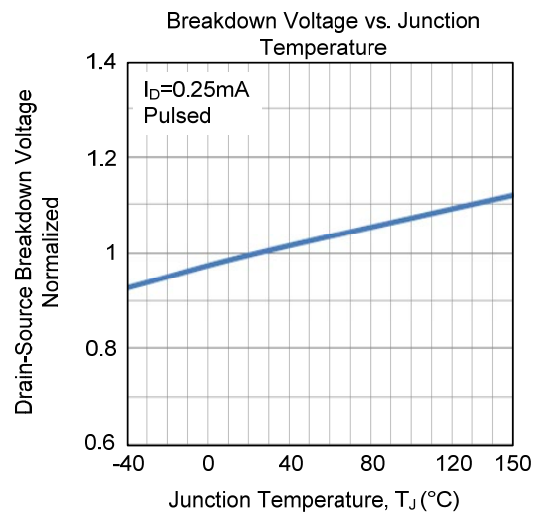
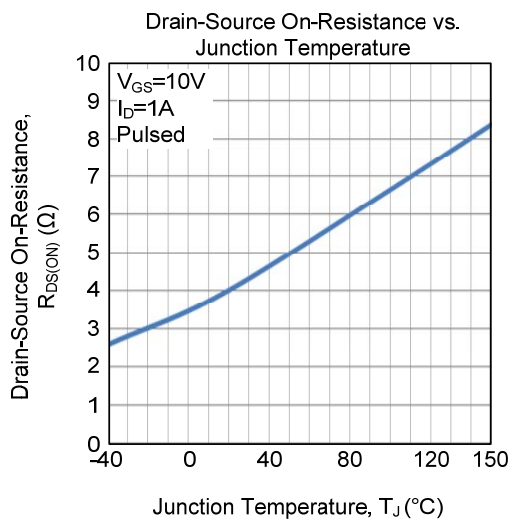
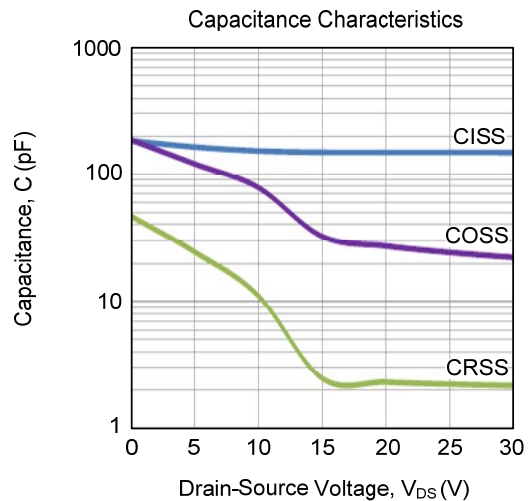
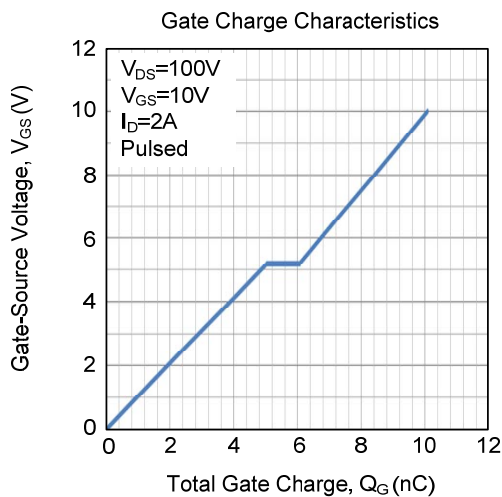
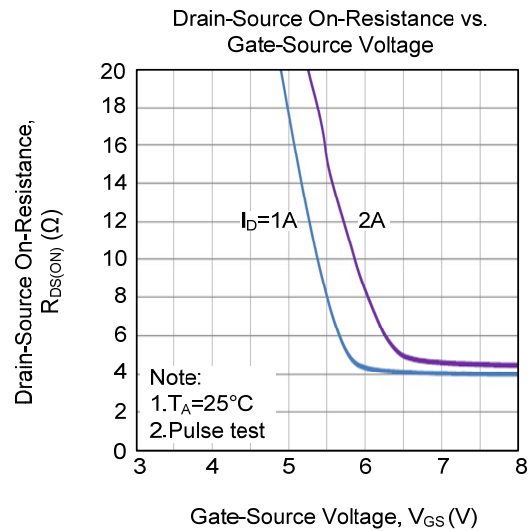
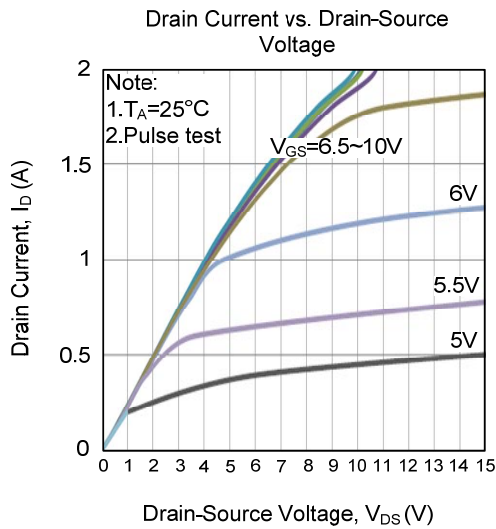


Unclamped Inductive Switching Test Circuit

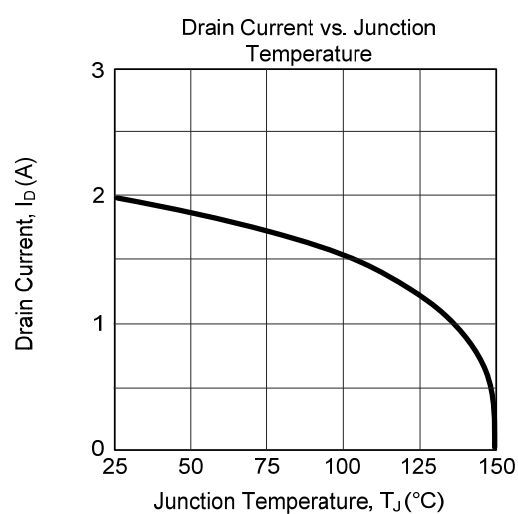
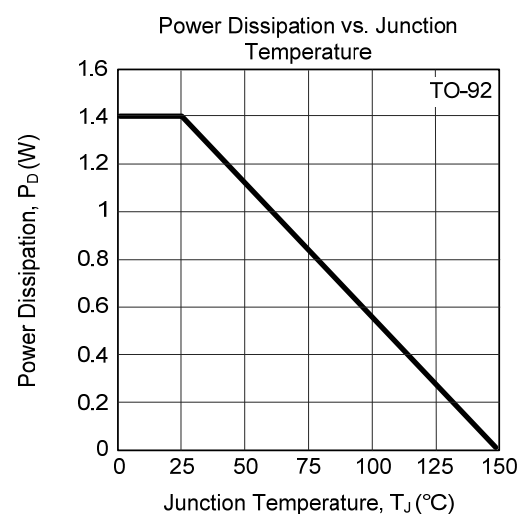
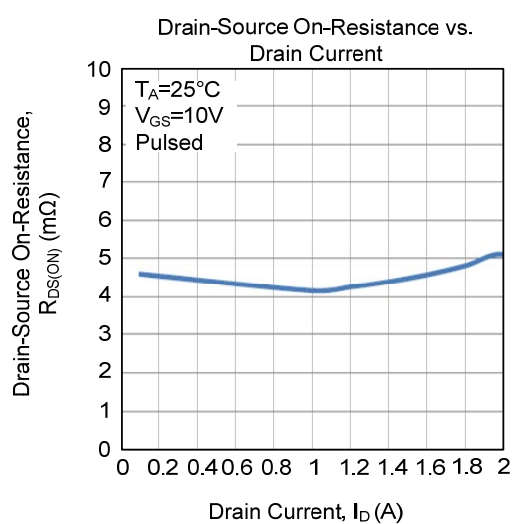
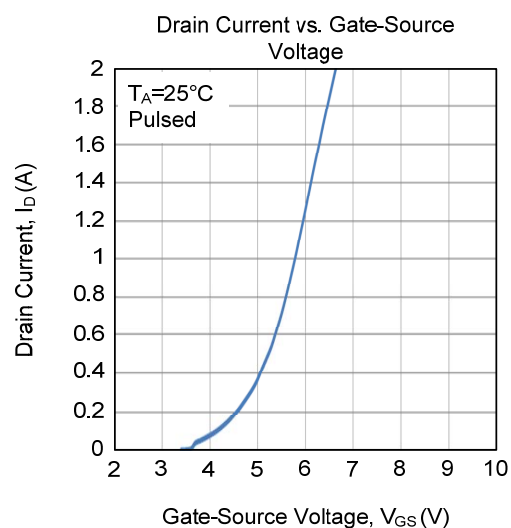
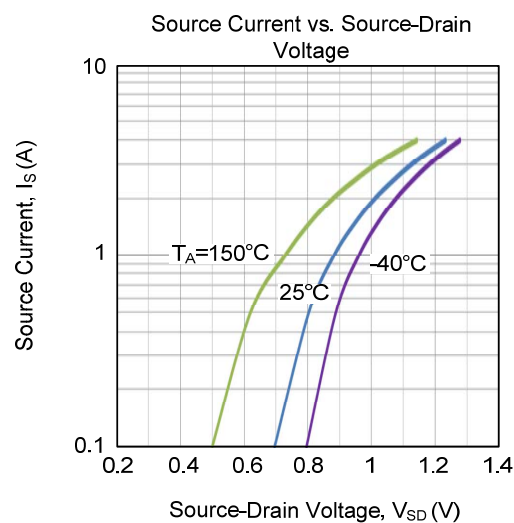
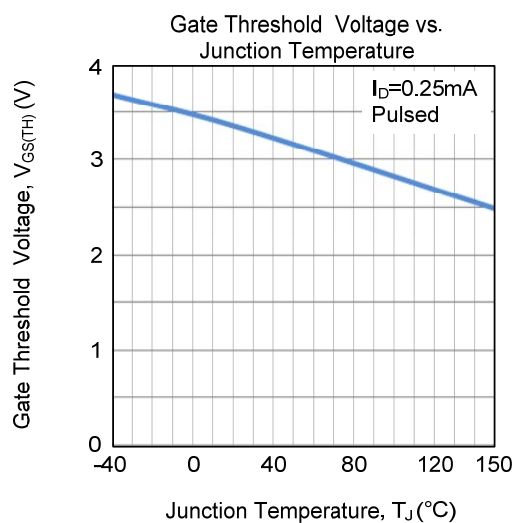


Unclamped Inductive Switching Waveforms

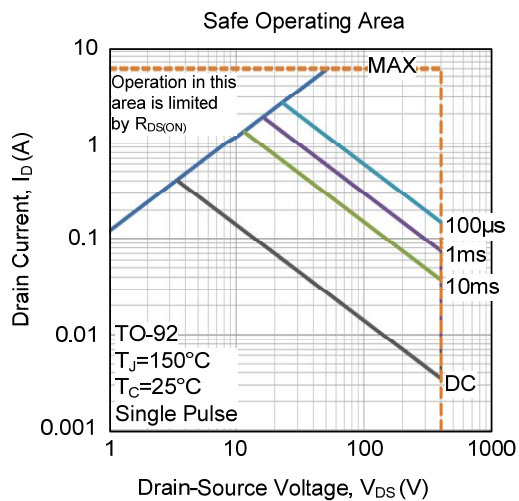
TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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. UTC reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.