

**50NM60-U3****Power MOSFET****50A, 600V N-CHANNEL
SUPER-JUNCTION MOSFET****DESCRIPTION**

The **UTC 50NM60-U3** 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**TO-247/TOLL-8B**

* $R_{DS(ON)} \leq 63 \text{ m}\Omega$ @ $V_{GS}=10\text{V}$, $I_D=25\text{A}$

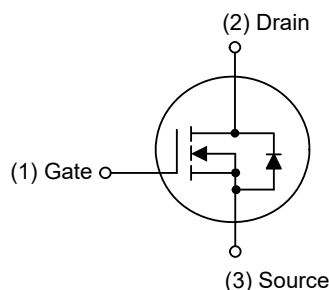
DFN8080-4

* $R_{DS(ON)} \leq 70 \text{ m}\Omega$ @ $V_{GS}=10\text{V}$, $I_D=25\text{A}$

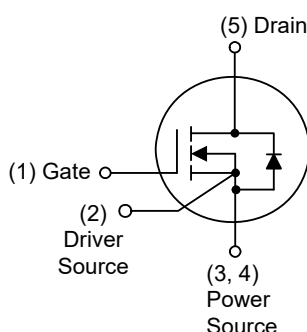
* Fast switching capability

* Avalanche energy tested

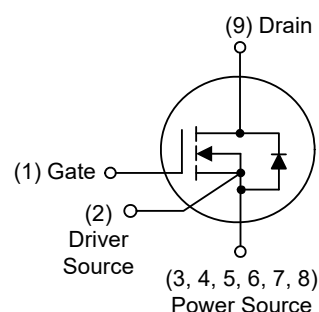
* Improved dv/dt capability, high ruggedness

SYMBOL

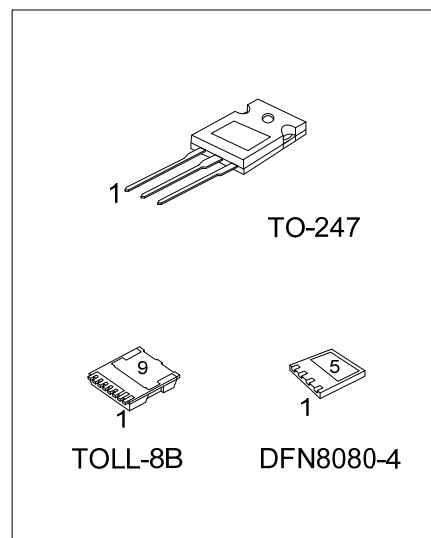
TO-247



DFN8080-4



TOLL-8B

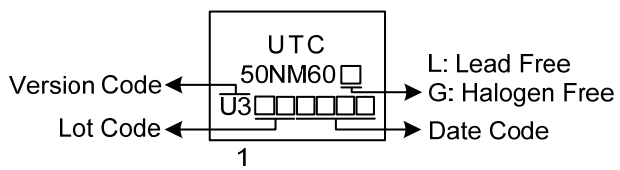
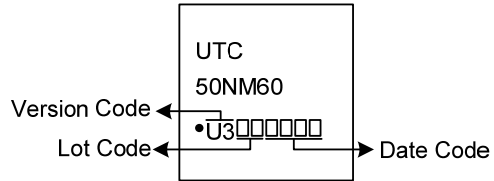
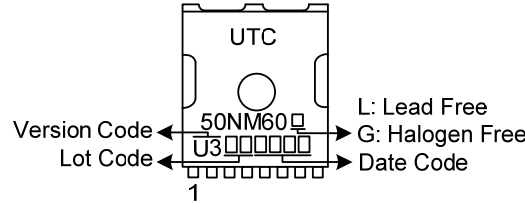
**ORDERING INFORMATION**

Ordering Number		Package	Pin Assignment									Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	9	
50NM60L-U3-T47-T	50NM60G-U3-T47-T	TO-247	G	D	S	-	-	-	-	-	-	Tube
50NM60L-U3-T8B-R	50NM60G-U3-T8B-R	TOLL-8B	G	S	S	S	S	S	S	S	D	Tape Reel
50NM60L-U3-K04-8080-R	50NM60G-U3-K04-8080-R	DFN8080-4	G	S	S	S	D	-	-	-	-	Tape Reel

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

50NM60G-U3-T47-T	(1) Packing Type	(1) T: Tube, R: Tape Reel
	(2) Package Type	(2) T47: TO-247, T8B: TOLL-8B,
	(3) Version Code	K04-8080: DFN8080-4
	(4) Green Package	(3) Version U3
		(4) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING

PACKAGE	MARKING
TO-247	 Diagram of TO-247 marking: A rectangular package with 'UTC' at the top, '50NM60' below it, and 'U3' followed by six empty boxes below that. Arrows point from 'U3' to 'Version Code', from the first empty box to 'Lot Code', and from the last empty box to 'Date Code'. A small square is to the right of '50NM60', and 'L: Lead Free' and 'G: Halogen Free' are to its right. A '1' is at the bottom.
DFN8080-4	 Diagram of DFN8080-4 marking: A rectangular package with 'UTC' at the top, '50NM60' below it, and 'U3' followed by six empty boxes below that. Arrows point from 'U3' to 'Version Code', from the first empty box to 'Lot Code', and from the last empty box to 'Date Code'. A small circle is to the left of 'U3'. A '1' is at the bottom.
TOLL-8B	 Diagram of TOLL-8B marking: A rectangular package with 'UTC' at the top, '50NM60' below it, and 'U3' followed by six empty boxes below that. Arrows point from 'U3' to 'Version Code', from the first empty box to 'Lot Code', and from the last empty box to 'Date Code'. A small square is to the right of '50NM60', and 'L: Lead Free' and 'G: Halogen Free' are to its right. A '1' is at the bottom.

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

PARAMETER			SYMBOL	RATINGS	UNIT
Drain-Source Voltage			V _{DSS}	600	V
Gate-Source Voltage			V _{GSS}	±30	V
Drain Current	Continuous	T _C =25°C	I _D	50	A
		T _C =100°C		32.5	A
	Pulsed (Note 2)		I _{DM}	150	A
Avalanche Energy	Single Pulsed (Note 3)		E _{AS}	612	mJ
Peak Diode Recovery dv/dt (Note 4)			dv/dt	5.9	V/ns
Power Dissipation	TO-247		P _D	220	W
	TOLL-8B			300	W
	DFN8080-4			120	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. $L = 100\text{mH}$, $I_{AS} = 3.5\text{A}$, $V_{DD} = 90\text{V}$, $R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$

4. $I_{SD} \leq 30\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^{\circ}\text{C}$

■ **THERMAL DATA**

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-247/TOLL-8B	θ_{JA}	50	$^{\circ}\text{C}/\text{W}$
	DFN8080-4		35	$^{\circ}\text{C}/\text{W}$
Junction to Case	TO-247	θ_{JC}	0.56	$^{\circ}\text{C}/\text{W}$
	TOLL-8B		0.41	$^{\circ}\text{C}/\text{W}$
	DFN8080-4		1.04	$^{\circ}\text{C}/\text{W}$

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

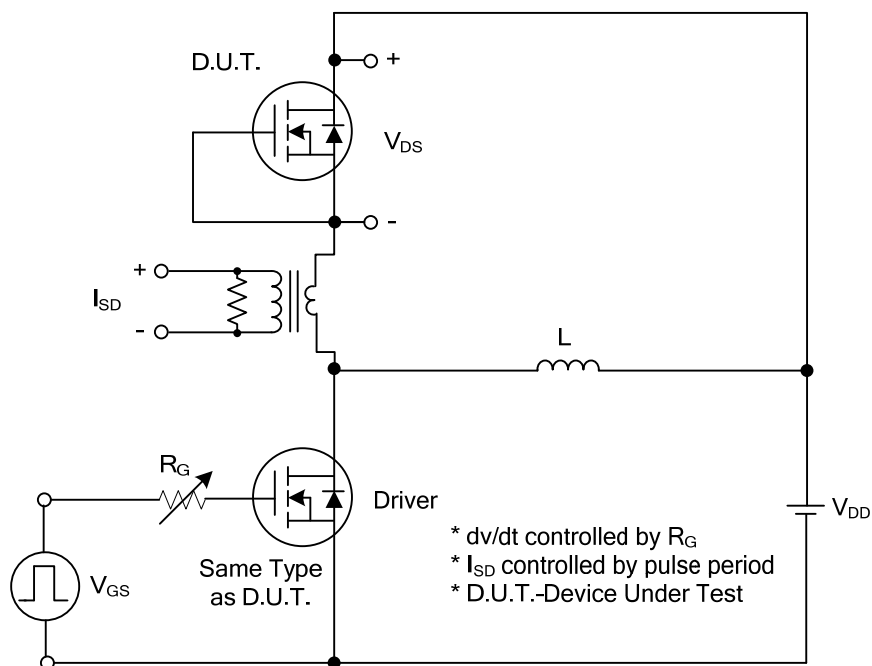
■ ELECTRICAL CHARACTERISTICS (T_J=25°C, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V, I _D =250μA	600			V
Drain-Source Leakage Current		I _{DSS}	V _{DS} =600V, V _{GS} =0V			10	μA
Gate-Source Leakage Current		I _{GSS}	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	TO-247	R _{DS(ON)}	V _{GS} =10V, I _D =25A		52	63	mΩ
	TOLL-8B						
	DFN8080-4				58	70	mΩ
DYNAMIC CHARACTERISTICS							
Input Capacitance		C _{ISS}	V _{GS} =0V, V _{DS} =50V, f=1MHz		3450		pF
Output Capacitance		C _{OSS}			1075		pF
Reverse Transfer Capacitance		C _{RSS}			44		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge		Q _G	V _{DS} =480V, V _{GS} =10V, I _D =50A (Note 1, 2)		145		nC
Gate-Source Charge		Q _{GS}			25		nC
Gate-Drain Charge		Q _{DD}			70		nC
Turn-On Delay Time		t _{D(ON)}	V _{DD} =100V, V _{GS} =10V, I _D =50A, R _G =3.3Ω (Note 1, 2)		21		ns
Turn-On Rise Time		t _R			28		ns
Turn-Off Delay Time		t _{D(OFF)}			122		ns
Turn-Off Fall Time		t _F			30		ns
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Maximum Continuous Drain-Source Diode Forward Current		I _S				50	A
Maximum Pulsed Drain-Source Diode Forward Current		I _{SM}				150	A
Drain-Source Diode Forward Voltage		V _{SD}	I _S =50A, V _{GS} =0V			1.4	V
Body Diode Reverse Recovery Time		t _{rr}	I _S =30A, V _{GS} =0V,		607		nS
Body Diode Reverse Recovery Charge		Q _{rr}	dI _F /dt=100A/μs		12.6		μC

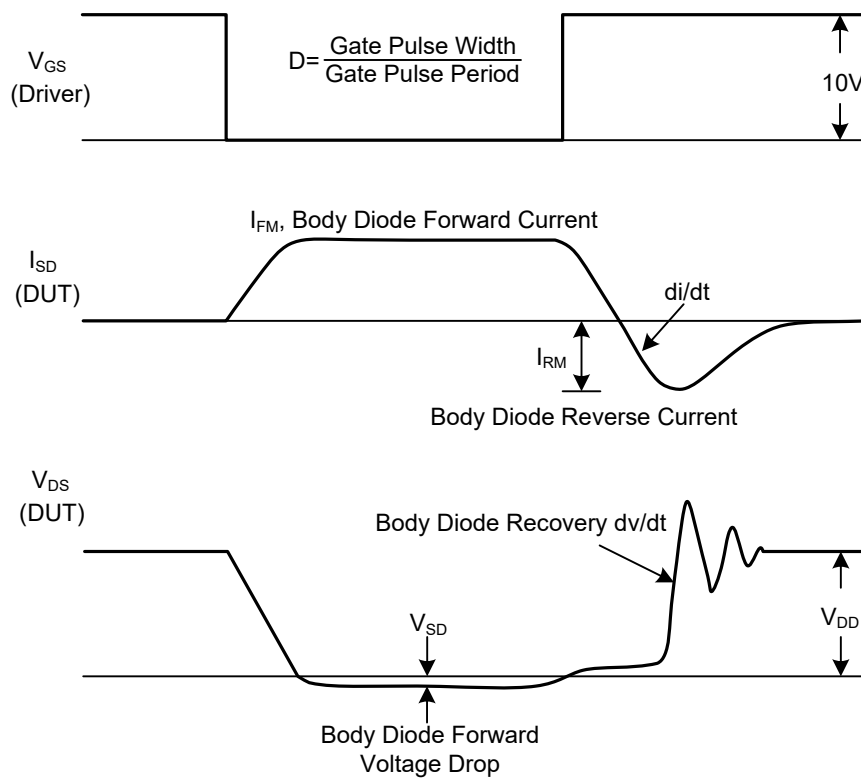
Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

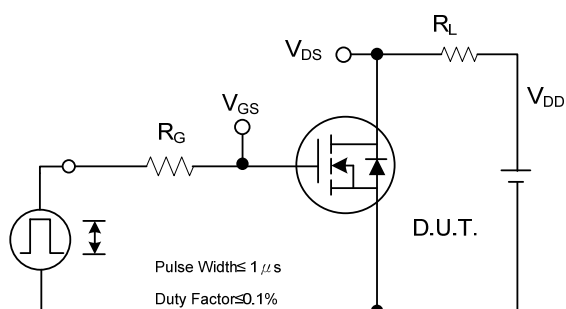


Peak Diode Recovery dv/dt Test Circuit

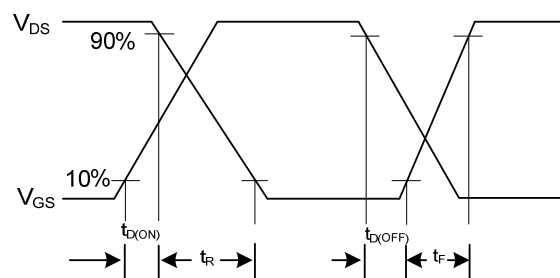


Peak Diode Recovery dv/dt Waveforms

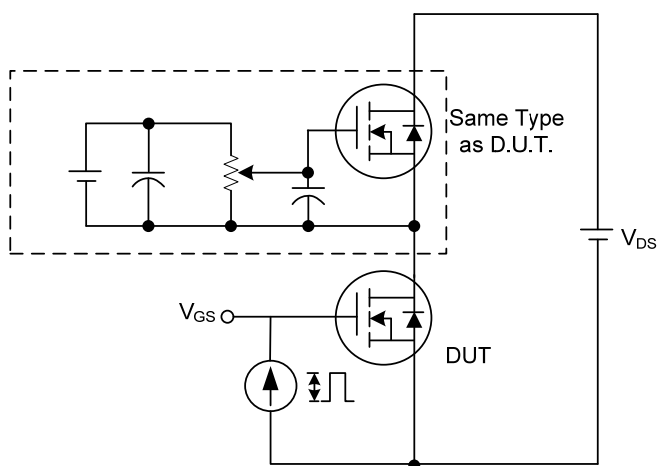
■ TEST CIRCUITS AND WAVEFORMS



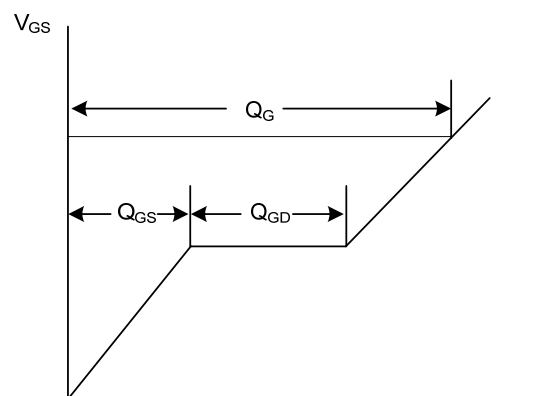
Switching Test Circuit



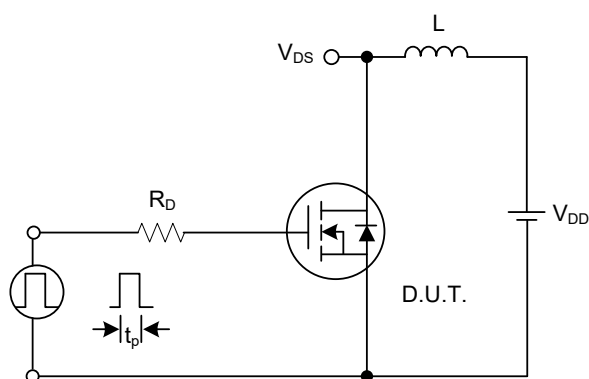
Switching Waveforms



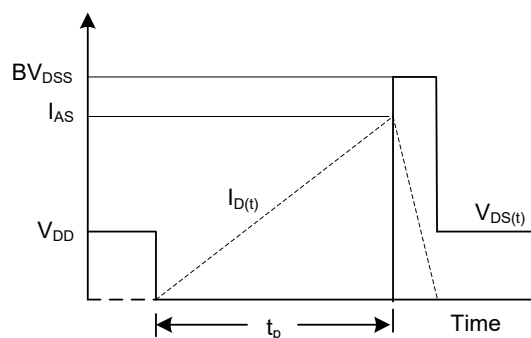
Gate Charge Test Circuit



Gate Charge Waveform

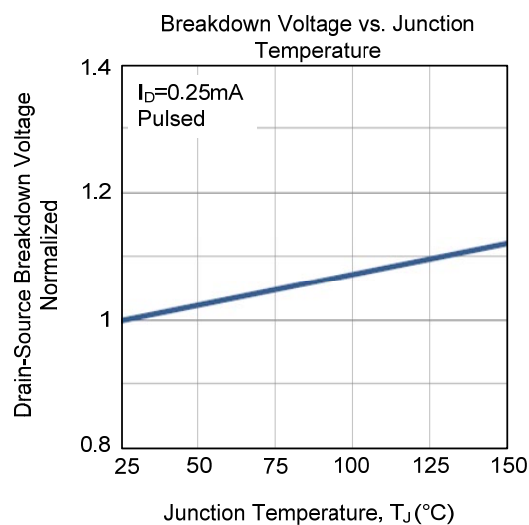
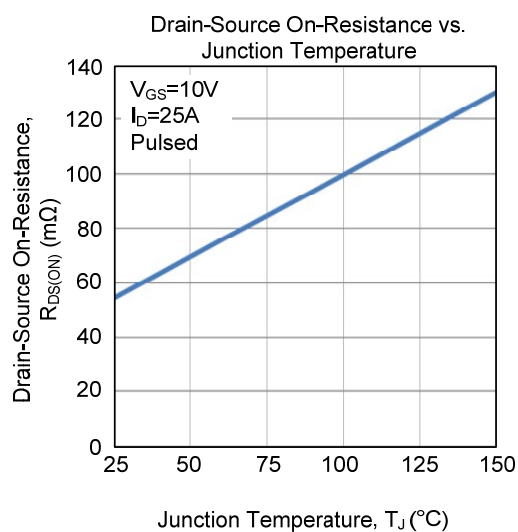
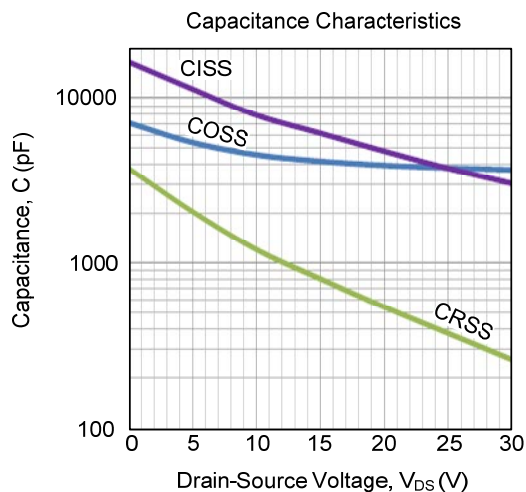
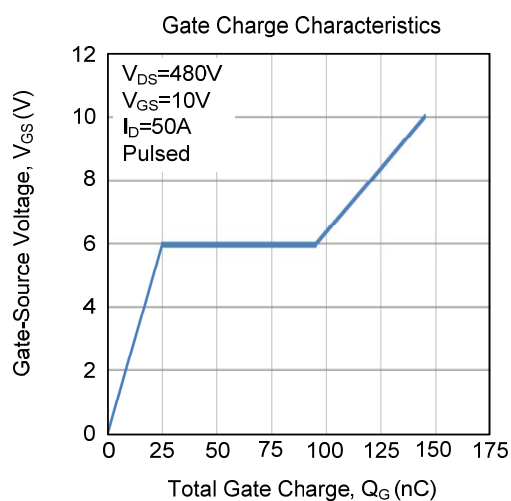
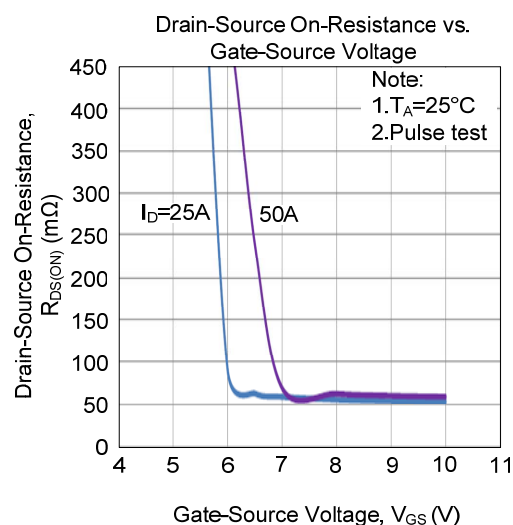
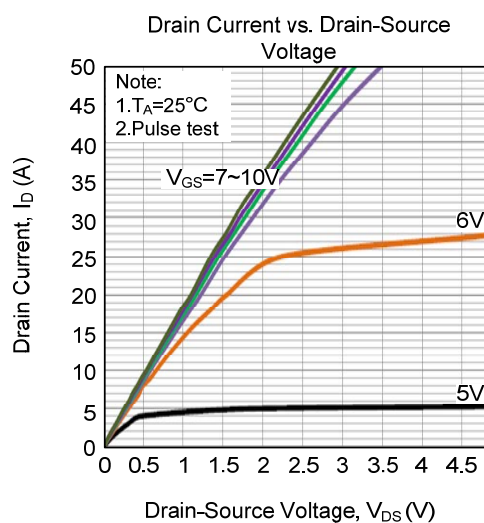


Unclamped Inductive Switching Test Circuit

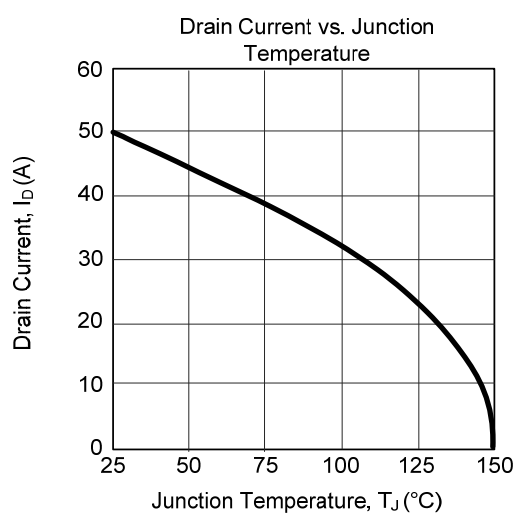
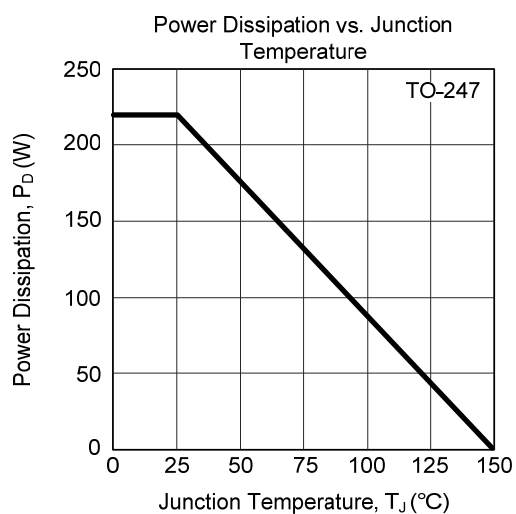
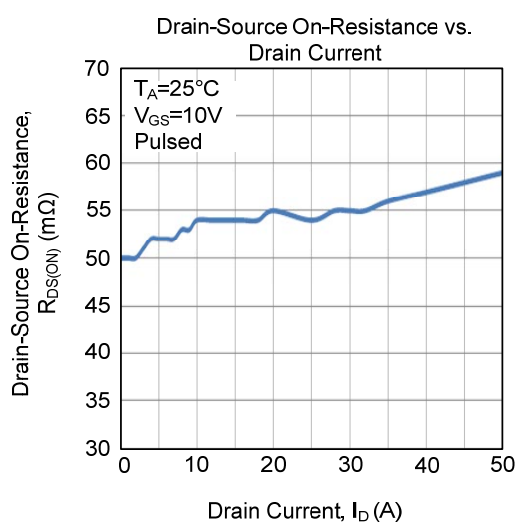
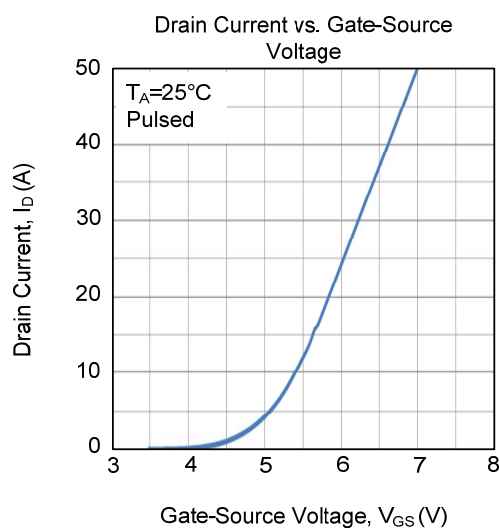
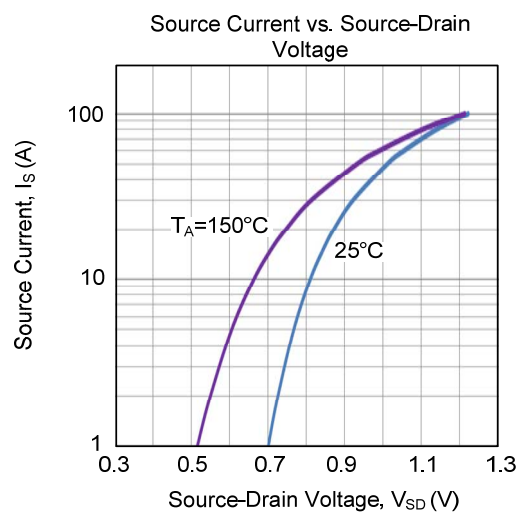
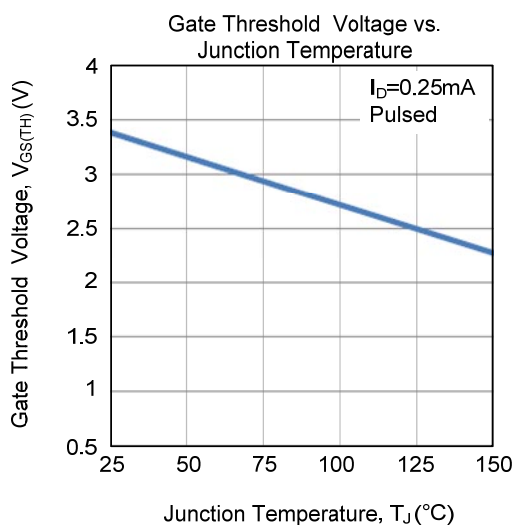


Unclamped Inductive Switching Waveforms

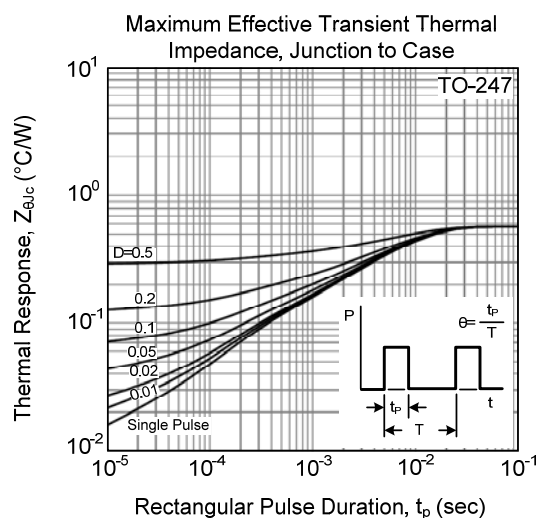
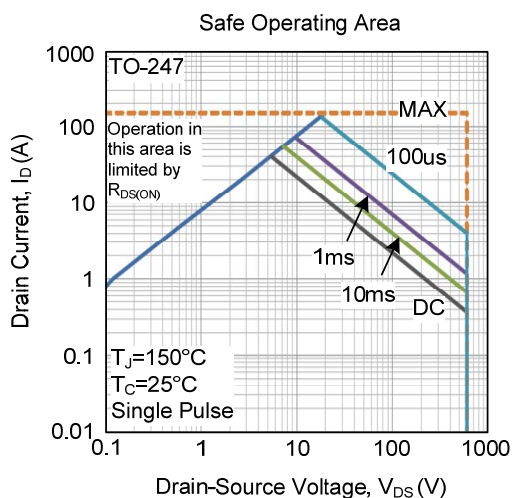
■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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.