



# UTT60N10M

## POWER MOSFET

### 60A, 100V N-CHANNEL ENHANCEMENT MODE TRENCH POWER MOSFET

#### DESCRIPTION

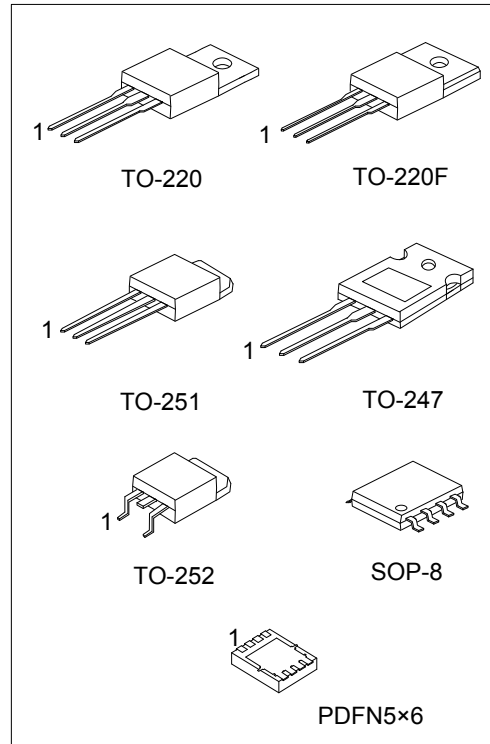
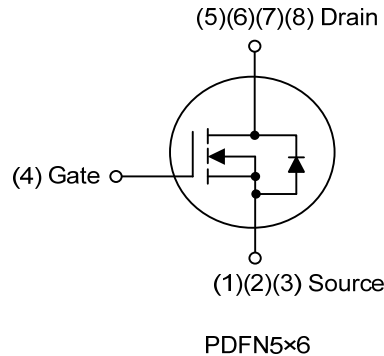
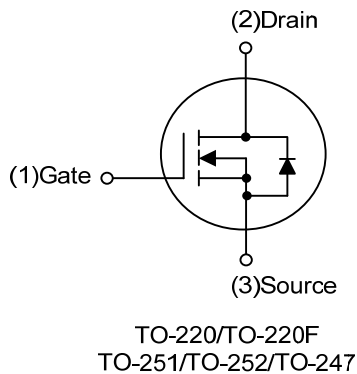
The UTC **UTT60N10M** is N-channel enhancement mode power MOSFET using UTC's advanced technology to provide customers with high switching speed, a extremely low  $R_{DS(ON)}$  and low gate charge.

The UTC **UTT60N10M** is suitable for high frequency Point-of-Load Synchronous, Networking DC-DC System, CCFL Back-light Inverter, etc.

#### FEATURES

- \*  $R_{DS(ON)} \leq 18\text{ m}\Omega @ V_{GS}=10\text{V}, I_D=30\text{A}$
- \*  $R_{DS(ON)} \leq 25\text{ m}\Omega @ V_{GS}=4.5\text{V}, I_D=15\text{A}$
- \* Green Device Available
- \* Low Gate Charge
- \* Surface mount package

#### SYMBOL



### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
UTT60N10ML-TA3-T	UTT60N10MG-TA3-T	TO-220	G	D	S	-	-	-	-	-	Tube
UTT60N10ML-TF3-T	UTT60N10MG-TF3-T	TO-220F	G	D	S	-	-	-	-	-	Tube
UTT60N10ML-TM3-T	UTT60N10MG-TM3-T	TO-251	G	D	S	-	-	-	-	-	Tube
UTT60N10ML-TN3-R	UTT60N10MG-TN3-R	TO-252	G	D	S	-	-	-	-	-	Tape Reel
UTT60N10ML-T47-T	UTT60N10MG-T47-T	TO-247	G	D	S	-	-	-	-	-	Tube
UTT60N10ML-S08-R	UTT60N10MG-S08-R	SOP-8	S	S	S	G	D	D	D	D	Tape Reel
UTT60N10ML-P5060-R	UTT60N10MG-P5060-R	PDFN5×6	S	S	S	G	D	D	D	D	Tape Reel

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

<p>UTT60N10MG-TA3-T</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) T: Tube, R: Tape Reel (2) TA3: TO-220, TF3: TO-220F, TM3: TO-251, TN3: TO-252, T47: TO-247, S08: SOP-8, P5060: PDFN5×6 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
--	---

### MARKING

Package	Marking
TO-220 / TO-220F TO-247 / TO-251 TO-252	<p>Lot Code ← UTC UTT 60N10M → Date Code</p> <p>1</p> <p>L: Lead Free G: Halogen Free Date Code</p>
SOP-8	<p>8 7 6 5 UTC → Date Code UTT60N10M → Lot Code • → Lot Code 1 2 3 4</p>
PDFN5×6	<p>Lot Code ← UTC UTT 60N10M • → Date Code</p>

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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		$V_{DSS}$	100	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	Continuous	TO-220/TO-220F TO-251/TO-252	60	A
		SOP-8	30	A
		PDFN5x6	40	A
	Pulsed (Note 2)	TO-220/TO-220F TO-251/TO-252	100	A
		SOP-8	50	A
		PDFN5x6	67	A
Avalanche Current		$I_{AS}$	20	A
Avalanche Energy (Note 3)		$E_{AS}$	200	mJ
Power Dissipation	TO-220	$P_D$	125	W
	TO-220F		30	W
	TO-247		312	W
	TO-251/TO-252		50	W
	SOP-8		6	W
	PDFN5x6		14	W
Junction Temperature		$T_J$	-40 ~ +150	$^\circ\text{C}$
Storage Temperature Range		$T_{STG}$	-55 ~ +150	$^\circ\text{C}$

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.  $L=1\text{mH}$ ,  $I_{AS}=20\text{A}$ ,  $V_{DD}=25\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J = 25^\circ\text{C}$

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-220F TO-247	$\theta_{JA}$	62.5	$^\circ\text{C/W}$
	TO-251/TO-252		110	$^\circ\text{C/W}$
	SOP-8		90	$^\circ\text{C/W}$
	PDFN5x6		65	$^\circ\text{C/W}$
Junction to Case	TO-220	$\theta_{JC}$	1	$^\circ\text{C/W}$
	TO-220F		4.17	$^\circ\text{C/W}$
	TO-247		0.4	$^\circ\text{C/W}$
	TO-251/TO-252		2.5	$^\circ\text{C/W}$
	SOP-8		20.8	$^\circ\text{C/W}$
	PDFN5x6		8.93	$^\circ\text{C/W}$

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

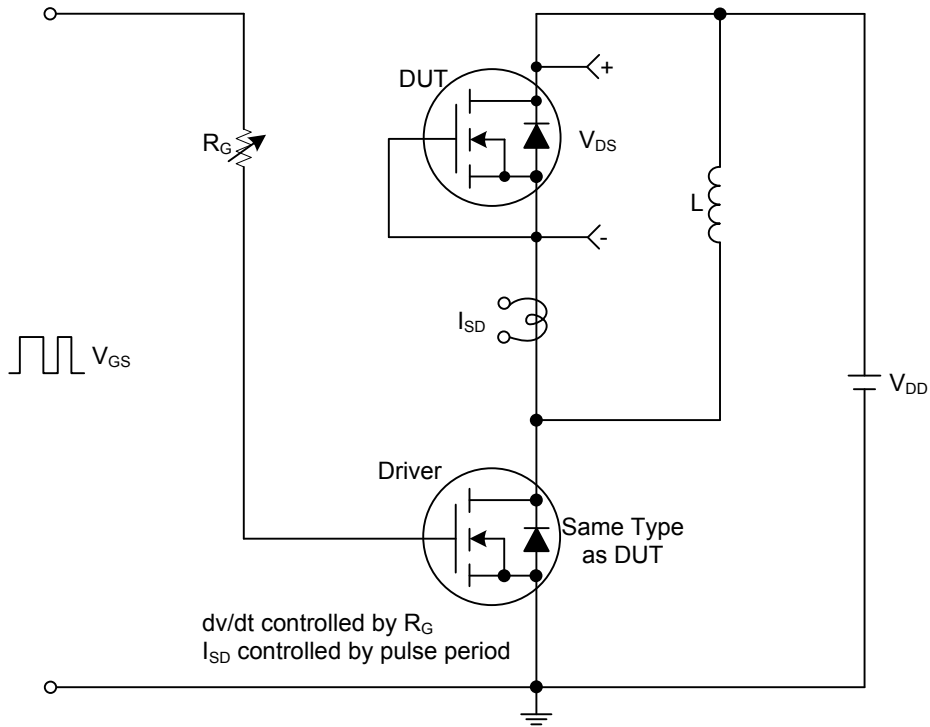
■ ELECTRICAL CHARACTERISTICS (T<sub>J</sub> =25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	100			V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =100V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C			1	μA
Gate-Source Leakage Current	Forward	I <sub>GSS</sub>				
	Reverse					
		V <sub>GS</sub> =-20V, V <sub>DS</sub> =0V			-100	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1.0		3.0	V
Static Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =30A			18	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =15A			25	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =-10V, I <sub>D</sub> =-20A		30		S
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1.0MHz		5500		pF
Output Capacitance	C <sub>OSS</sub>			250		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			160		pF
Gate Resistance	R <sub>G</sub>		V <sub>DS</sub> =0V, f=1.0MHz		1	
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge (Note 1)	Q <sub>G</sub>	V <sub>DS</sub> =80V, V <sub>GS</sub> =10V, I <sub>D</sub> =60A I <sub>G</sub> = 1mA (Note1, 2)		100		nC
Gate to Source Charge	Q <sub>GS</sub>			12		nC
Gate to Drain Charge	Q <sub>GD</sub>			18		nC
Turn-on Delay Time (Note 1)	t <sub>D(ON)</sub>	V <sub>DS</sub> =50V, V <sub>GS</sub> =10V, I <sub>D</sub> =60A, R <sub>G</sub> =3Ω (Note1, 2)		12		ns
Rise Time	t <sub>R</sub>			17		ns
Turn-off Delay Time	t <sub>D(OFF)</sub>			64		ns
Fall-Time	t <sub>F</sub>			20		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	I <sub>S</sub>				60	A
Forward On Voltage (Note 1)	V <sub>SD</sub>	I <sub>S</sub> =60A, V <sub>GS</sub> =0V			1.2	V
Reverse Recovery Time (Note 1)	t <sub>rr</sub>	I <sub>S</sub> =30A, V <sub>GS</sub> =0V, di/dt=100A/μs		100		ns
Reverse Recovery Charge	Q <sub>rr</sub>				210	

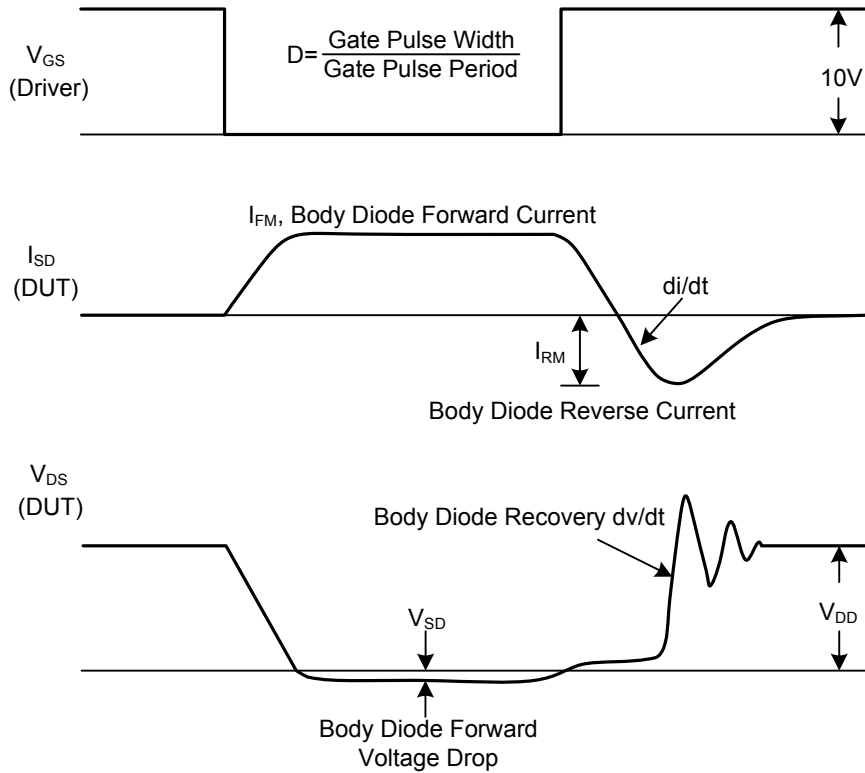
Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

## TEST CIRCUITS AND WAVEFORMS



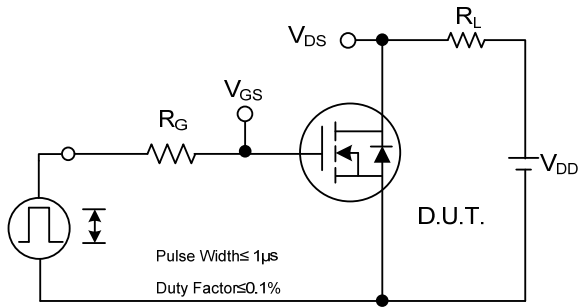
**Peak Diode Recovery dv/dt Test Circuit**



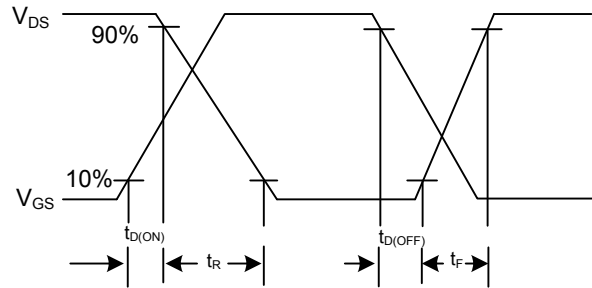
**Peak Diode Recovery dv/dt Test Circuit and Waveforms**

**Peak Diode Recovery dv/dt Waveforms**

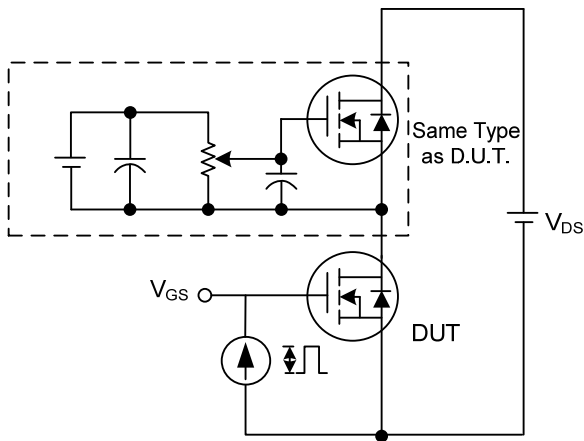
## TEST CIRCUITS AND WAVEFORMS



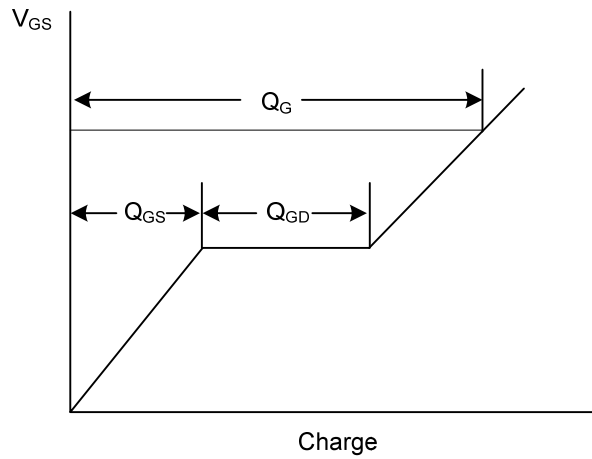
**Switching Test Circuit**



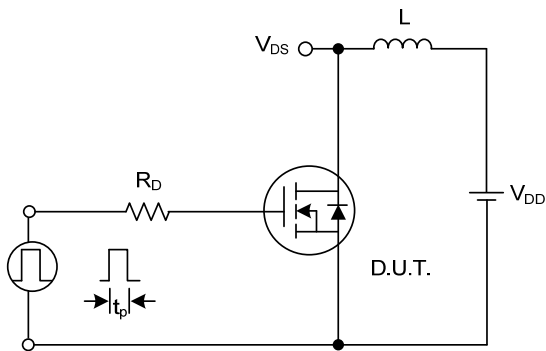
**Switching Waveforms**



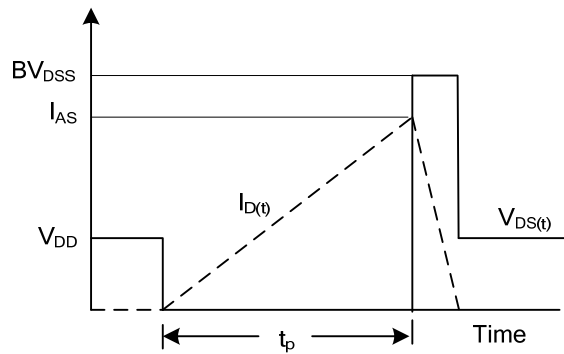
**Gate Charge Test Circuit**



**Gate Charge Waveform**

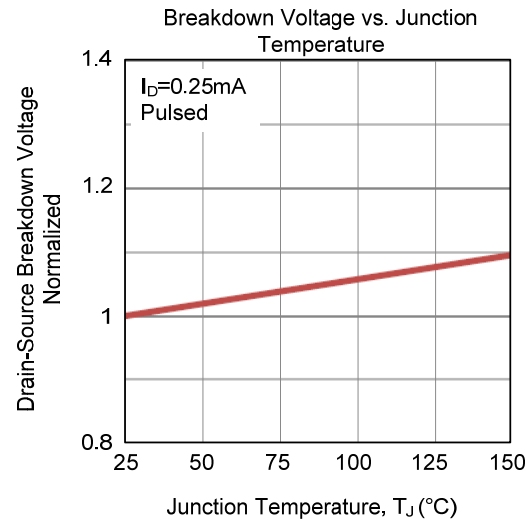
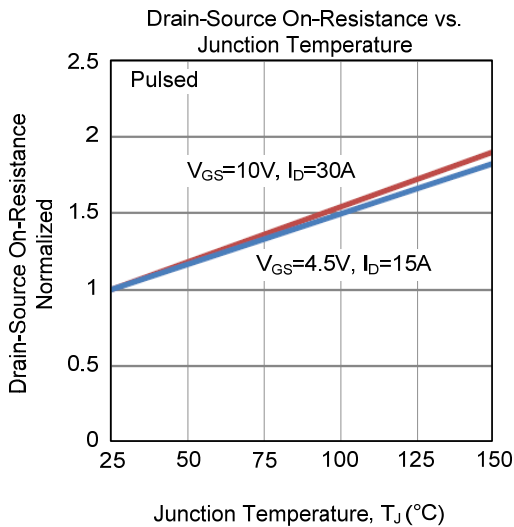
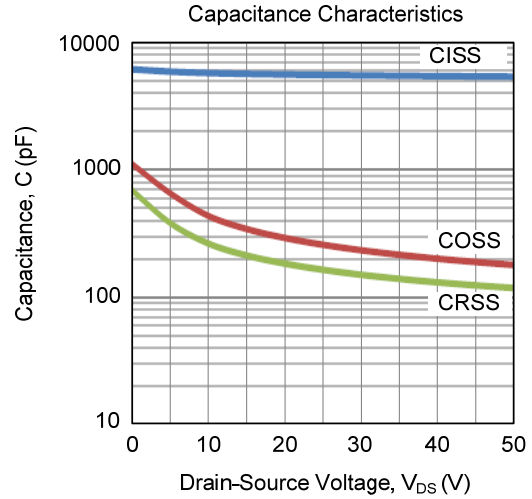
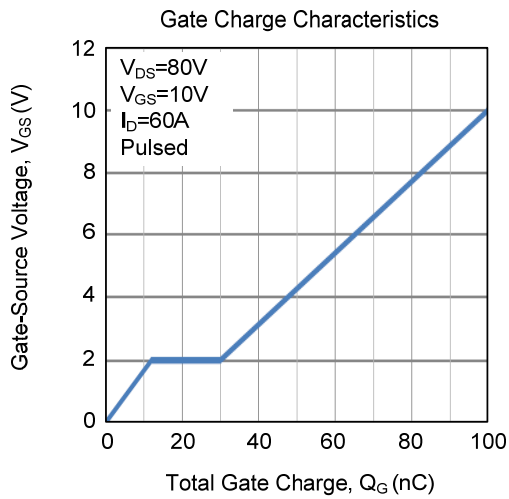
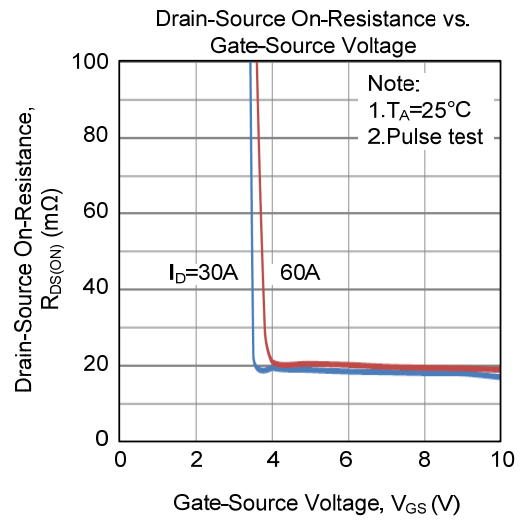
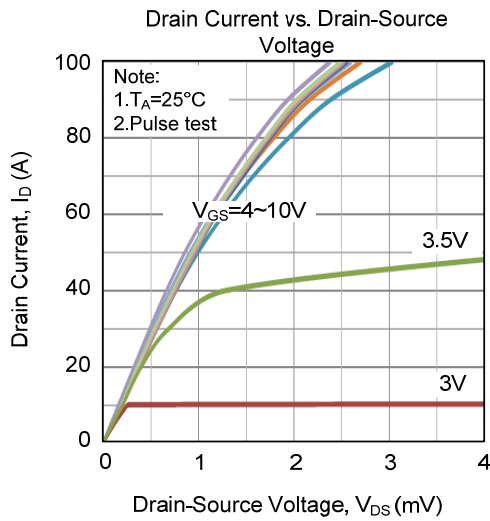


**Unclamped Inductive Switching Test Circuit**

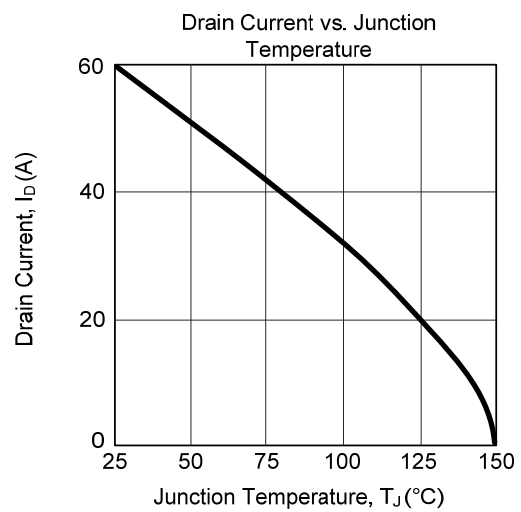
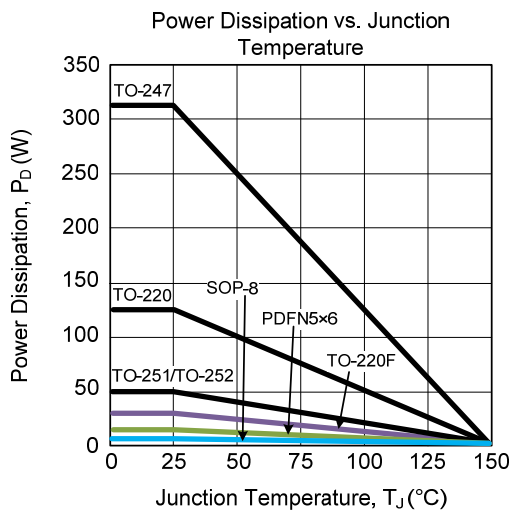
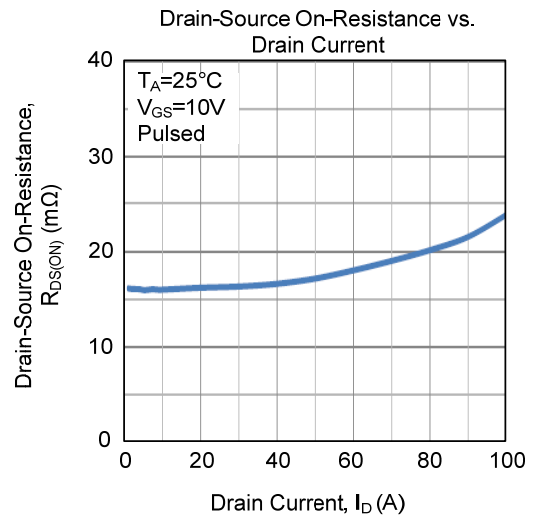
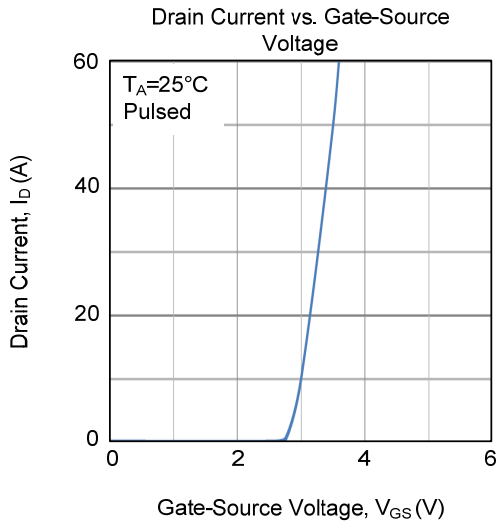
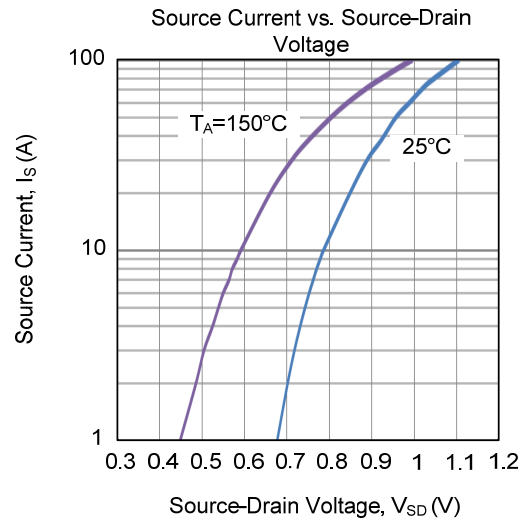
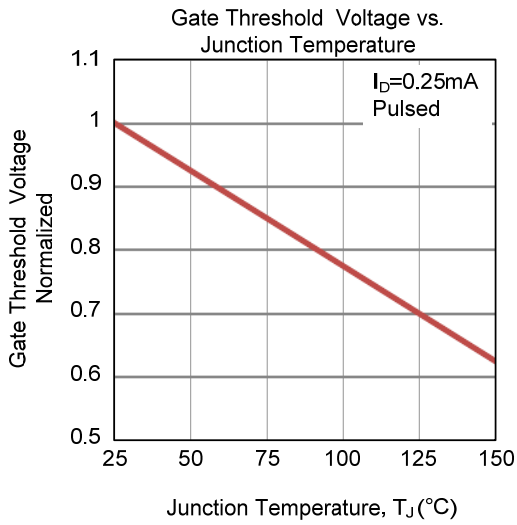


**Unclamped Inductive Switching Waveforms**

## TYPICAL CHARACTERISTICS

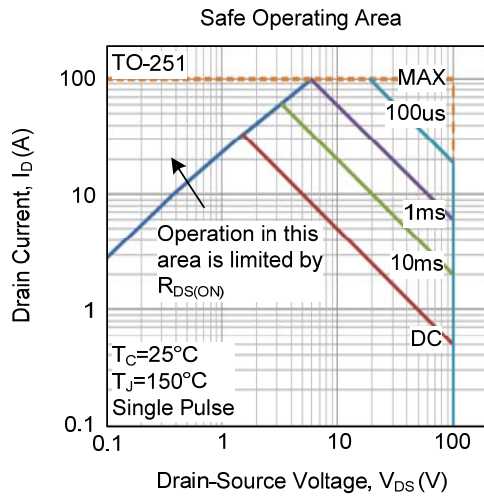


■ TYPICAL CHARACTERISTICS (Cont.)





■ 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.