



## UT60N04

Power MOSFET

### 60A, 40V N-CHANNEL POWER MOSFET

#### DESCRIPTION

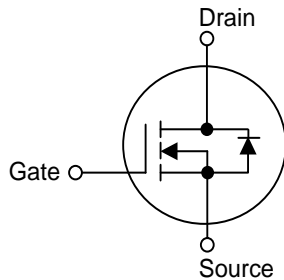
The UTC **UT60N04** is a N-channel enhancement MOSFET using UTC's advanced technology to provide the customers with perfect  $R_{DS(ON)}$  and high switching speed.

The UTC **UT60N04** is suitable for all commercial-industrial applications at power dissipation levels to approximately 50 watts, etc.

#### FEATURES

- \*  $R_{DS(ON)} \leq 11.5 \text{ m}\Omega @ V_{GS}=4.5V, I_D=20A$
- $R_{DS(ON)} \leq 8.0 \text{ m}\Omega @ V_{GS}=10V, I_D=30A$
- \* High Switching Speed

#### SYMBOL

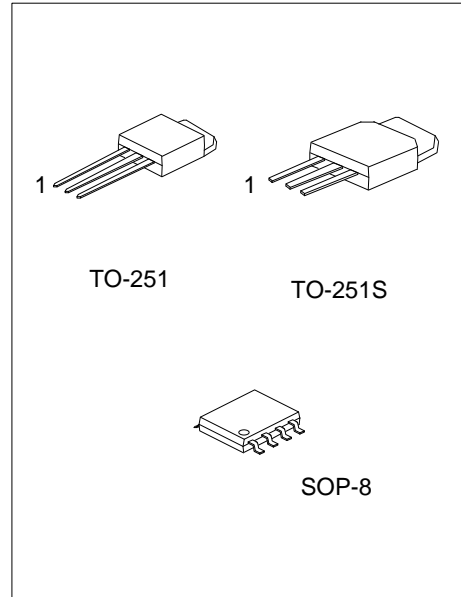


#### ORDERING INFORMATION

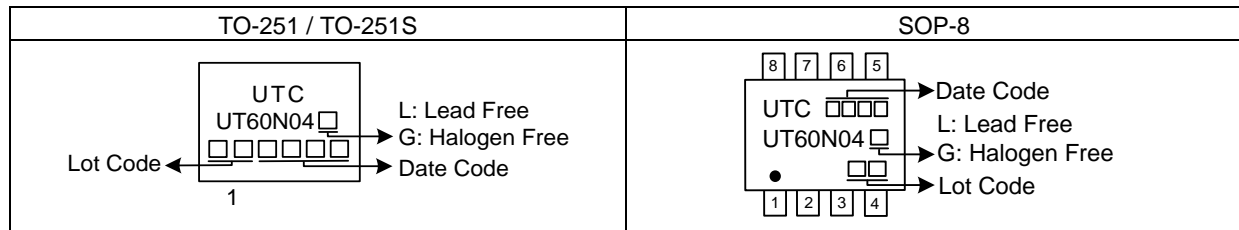
Ordering Number		Package	Pin Assignment								Packing	
Lead Free	Halogen Free		1	2	3	4	5	6	7	8		
UT60N04L-TM3-T	UT60N04G-TM3-T	TO-251	G	D	S	-	-	-	-	-	-	Tube
UT60N04L-TMS-T	UT60N04G-TMS-T	TO-251S	G	D	S	-	-	-	-	-	-	Tube
UT60N04L-S08-R	UT60N04G-S08-R	SOP-8	S	S	S	G	D	D	D	D	D	Tape Reel

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

<p>UT60N04G-TM3-T</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p>	<p>(1) T: Tube, R: Tape Reel</p> <p>(2) TM3: TO-251, TMS: TO-251S, S08: SOP-8</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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## MARKING



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### ■ ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub>=25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		V <sub>DSS</sub>	40	V
Gate-Source Voltage		V <sub>GSS</sub>	±20	V
Drain Current	Continuous (V <sub>GS</sub> =10V)	I <sub>D</sub>	60	A
	Pulsed (Note 2)	I <sub>DM</sub>	120	A
Avalanche Energy	Single Pulsed (Note 3)	E <sub>AS</sub>	57	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	4.5	V/ns
Power Dissipation	TO-251/TO-251S	P <sub>D</sub>	50	W
	SOP-8		1.8	W
Junction Temperature		T <sub>J</sub>	+150	°C
Storage Temperature		T <sub>STG</sub>	-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=0.1mH, I<sub>AS</sub>=33.8A, V<sub>DD</sub>=25V, R<sub>G</sub>=25Ω, Starting T<sub>J</sub>=25°C

4. I<sub>SD</sub> ≤ 30A, di/dt ≤ 200A/μs, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, Starting T<sub>J</sub> = 25°C

### ■ THERMAL DATA (NOTE)

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-251/TO-251S	θ <sub>JA</sub>	50	°C/W
	SOP-8		90	
Junction to Case	TO-251/TO-251S	θ <sub>JC</sub>	2.5	°C/W
	SOP-8		69	

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

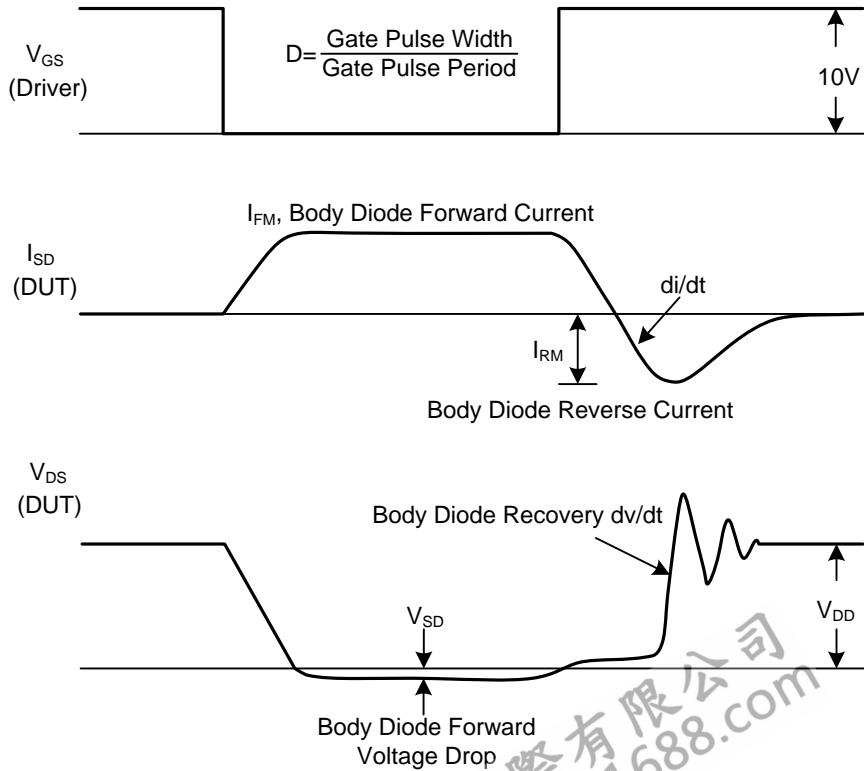
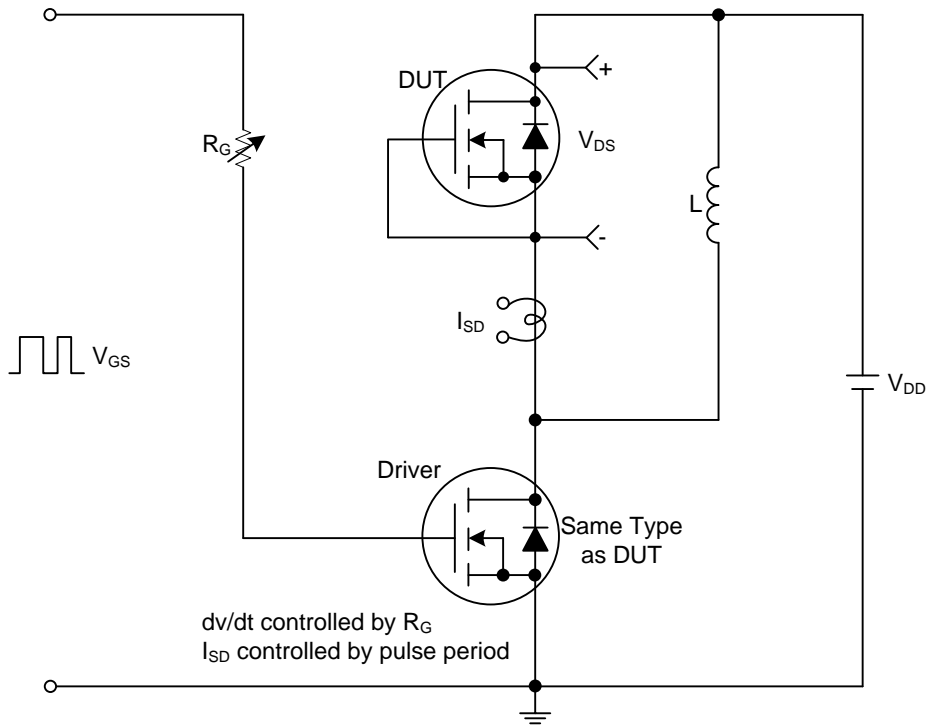
### ■ ELECTRICAL CHARACTERISTICS (T<sub>J</sub>=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	40			V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =40V, V <sub>GS</sub> =0V			1	μA
Gate- Source Leakage Current	Forward	V <sub>GS</sub> =+20V, V <sub>DS</sub> =0V			+100	nA
	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> =4.5V, I <sub>D</sub> =20A			11.5	mΩ
		V <sub>GS</sub> =10V, I <sub>D</sub> =30A			8.0	mΩ
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =20V, f=1.0MHz		1200		pF
Output Capacitance	C <sub>OSS</sub>			215		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			160		pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge	Q <sub>G</sub>	V <sub>DS</sub> =20V, V <sub>GS</sub> =10V, I <sub>D</sub> =60A I <sub>G</sub> =1mA (Note 2)		25		nC
Gate to Source Charge	Q <sub>GS</sub>			3		nC
Gate to Drain Charge	Q <sub>GD</sub>			6		nC
Turn-ON Delay Time	t <sub>D(ON)</sub>	V <sub>DD</sub> =20V, V <sub>GS</sub> =60V, I <sub>D</sub> =25A, R <sub>G</sub> =25Ω, (Note 2)		10		ns
Rise Time	t <sub>R</sub>			21		ns
Turn-OFF Delay Time	t <sub>D(OFF)</sub>			150		ns
Fall-Time	t <sub>F</sub>			90		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Continuous Drain-Source Diode Forward Current	I <sub>S</sub>				60	A
Maximum Pulsed Drain-Source Diode Forward Current	I <sub>SM</sub>				120	A
Drain-Source Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> =50A, V <sub>GS</sub> =0V			1.4	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> =30A, V <sub>GS</sub> =0V, di/dt=100A/μs		40		ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>			25		nC

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

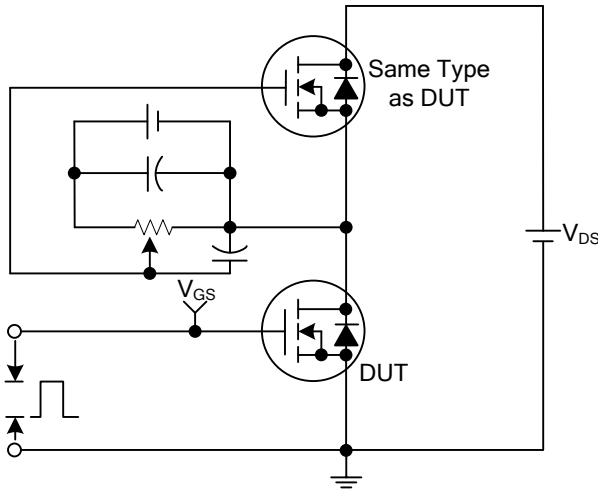
2. Essentially independent of operating ambient temperature.

## TEST CIRCUITS AND WAVEFORMS

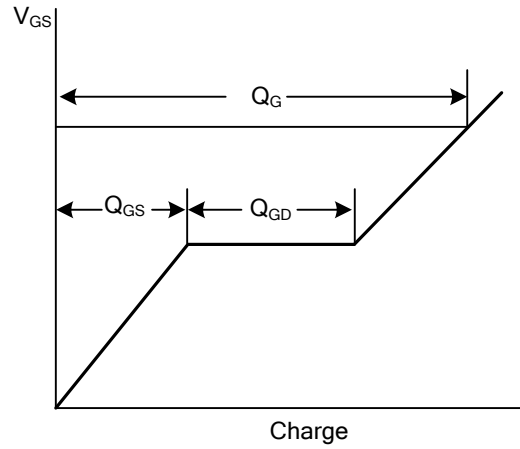


Peak Diode Recovery dv/dt Test Circuit and Waveforms

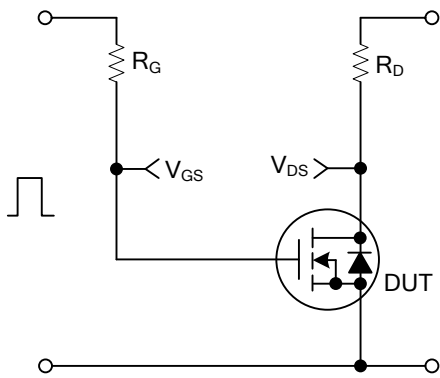
## TEST CIRCUITS AND WAVEFORMS



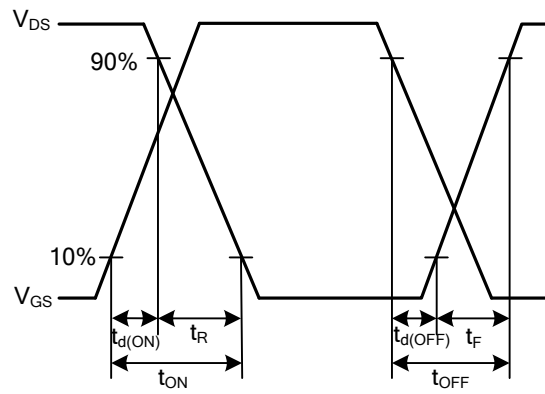
Gate Charge Test Circuit



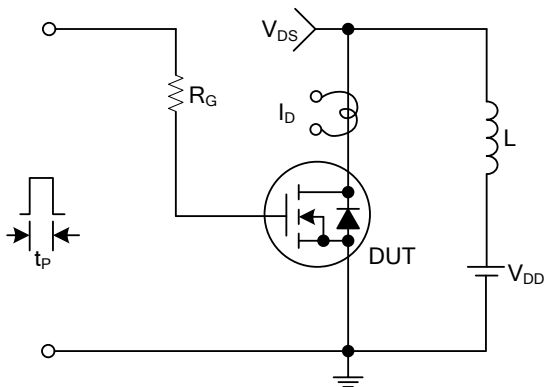
Gate Charge Waveforms



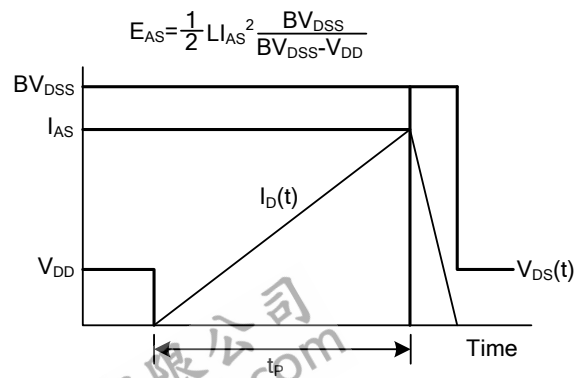
Resistive Switching Test Circuit



Resistive Switching Waveforms

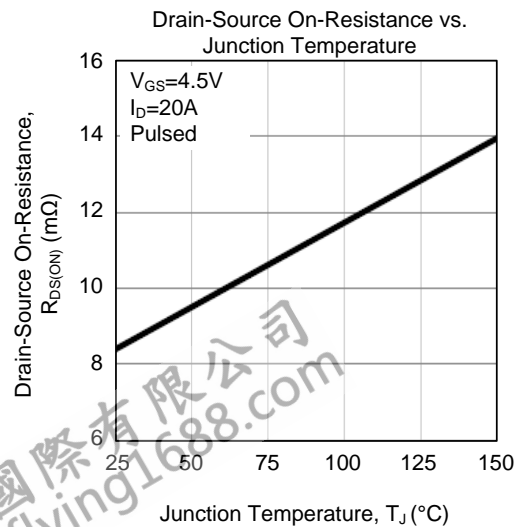
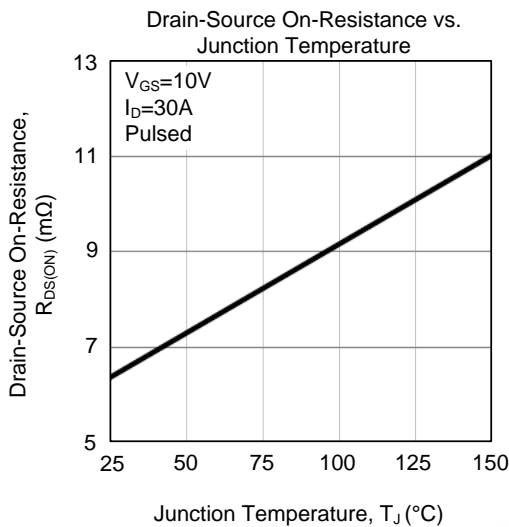
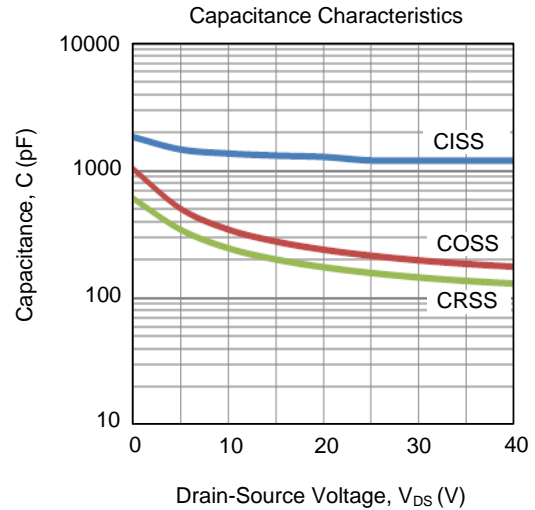
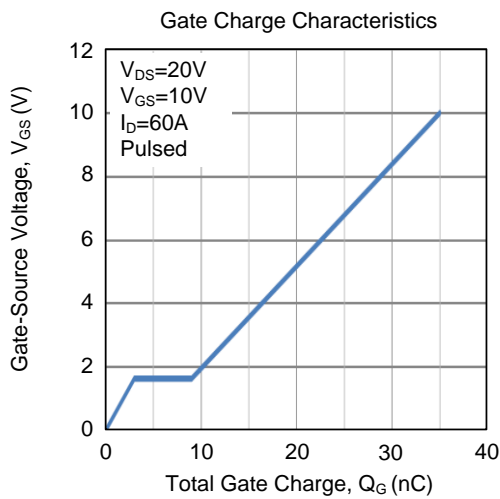
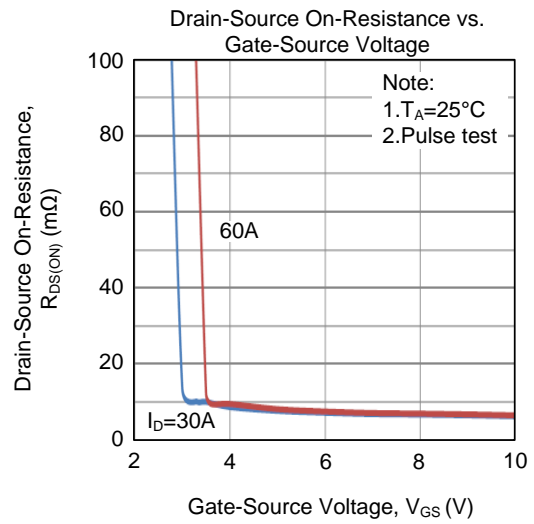
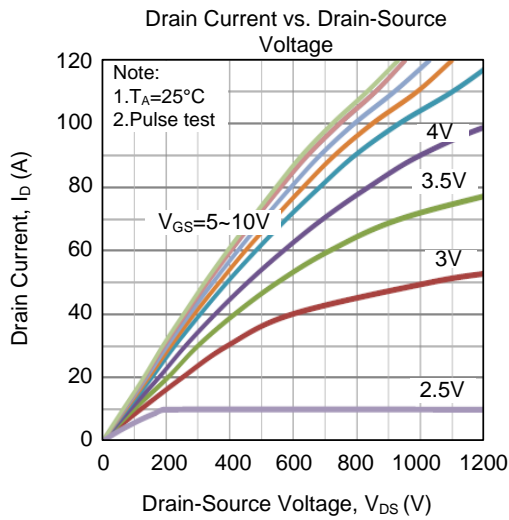


Unclamped Inductive Switching Test Circuit

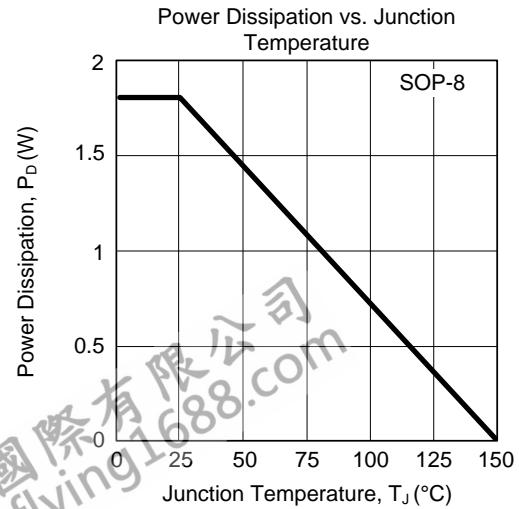
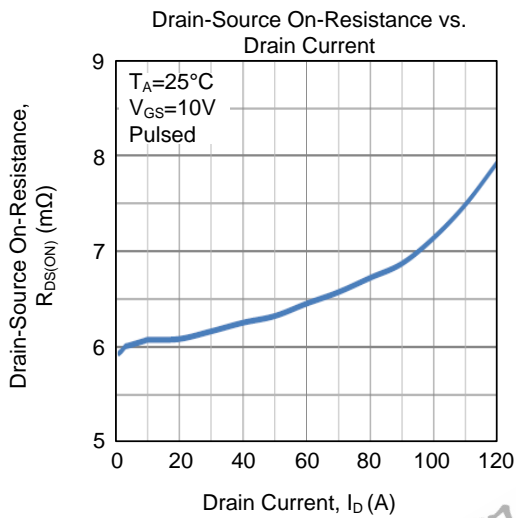
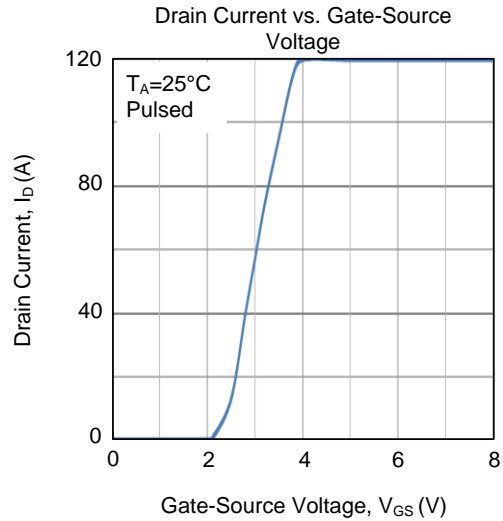
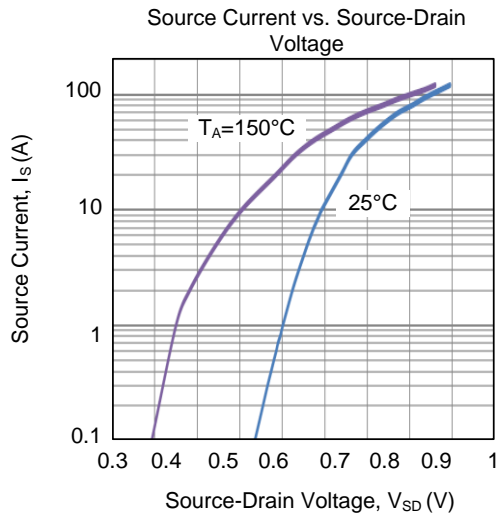
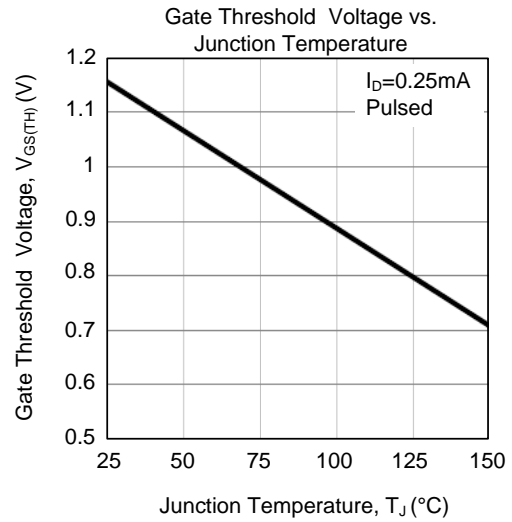
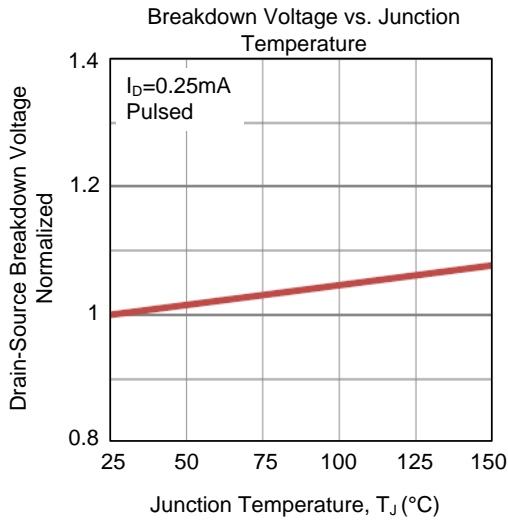


Unclamped Inductive Switching Waveforms

## TYPICAL CHARACTERISTICS

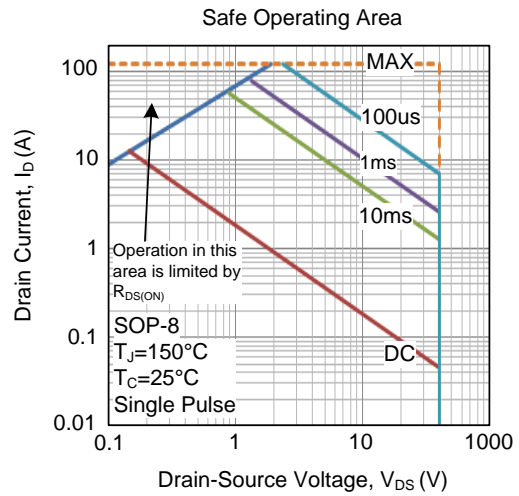
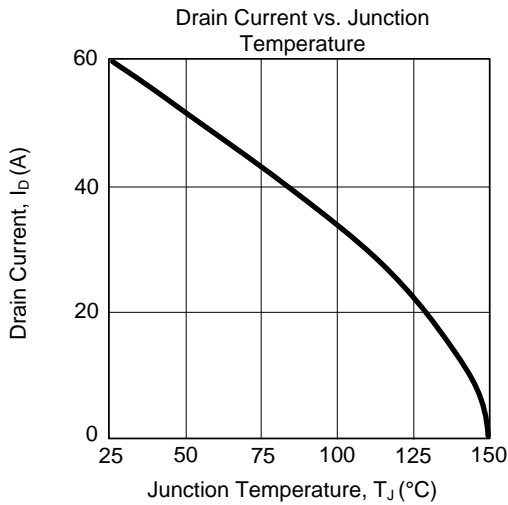


## ■ TYPICAL CHARACTERISTICS (Cont.)





### ■ TYPICAL CHARACTERISTICS (Cont.)



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