



## UT20N04

## POWER MOSFET

### 20A, 40V N-CHANNEL POWER MOSFET

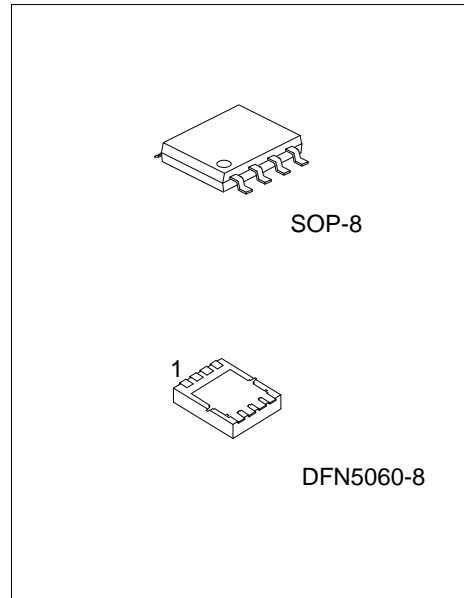
#### DESCRIPTION

The UTC **UT20N04** is a N-channel mode power MOSFET using UTC's advanced technology to provide customers with a minimum on-state resistance, low gate charge and high switching speed.

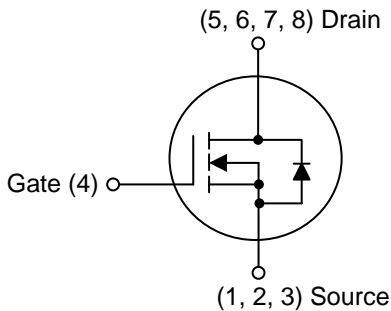
The UTC **UT20N04** is suitable for high voltage synchronous rectifier and DC/DC converters, etc.

#### FEATURES

- \*  $R_{DS(ON)} \leq 30 \text{ m}\Omega @ V_{GS}=10\text{V}, I_D=10\text{A}$
- \*  $R_{DS(ON)} \leq 50 \text{ m}\Omega @ V_{GS}=4.5\text{V}, I_D=10\text{A}$
- \* High Switching Speed
- \* High Cell Density Trench Technology



#### SYMBOL



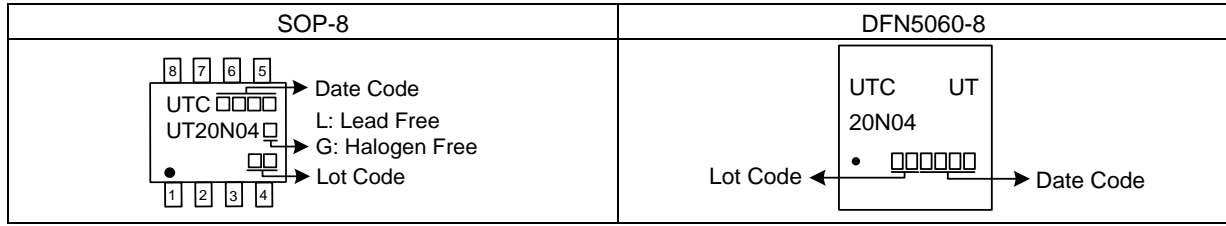
#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment						Packing		
Lead Free	Halogen Free		1	2	3	4	5	6		7	8
UT20N04L-S08-R	UT20N04G-S08-R	SOP-8	S	S	S	G	D	D	D	D	Tape Reel
UT20N04L-K08-5060-R	UT20N04G-K08-5060-R	DFN5060-8	S	S	S	G	D	D	D	D	Tape Reel

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

<p>UT20N04G-S08-R</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p>	<p>(1) R: Tape Reel</p> <p>(2) S08: SOP-8, K08-5060: DFN5060-8</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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## MARKING



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### ■ ABSOLUTE MAXIMUM RATING (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	I <sub>D</sub>	20	A
	Pulsed (Note 2)	I <sub>DM</sub>	40	A
Avalanche Energy (Note 3)	Single Pulsed (Note 3)	E <sub>AS</sub>	72.6	mJ
Power Dissipation	SOP-8	P <sub>D</sub>	6	W
	DFN5060-8		30	W
Junction Temperature		T <sub>J</sub>	+150	°C
Storage Temperature Range		T <sub>STG</sub>	-20 ~ +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=30mH, I<sub>AS</sub>=2.2A, V<sub>DD</sub>=30V, R<sub>G</sub> = 25Ω, Starting T<sub>J</sub> = 25°C
4. I<sub>SD</sub> ≤ 20A, di/dt ≤ 200A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>, T<sub>J</sub> ≤ 25°C

### ■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOP-8	θ <sub>JA</sub>	69.4	°C/W
	DFN5060-8		83.3	°C/W
Junction to Case	SOP-8	θ <sub>JC</sub>	20.8	°C/W
	DFN5060-8		4.16	°C/W

Note: The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.

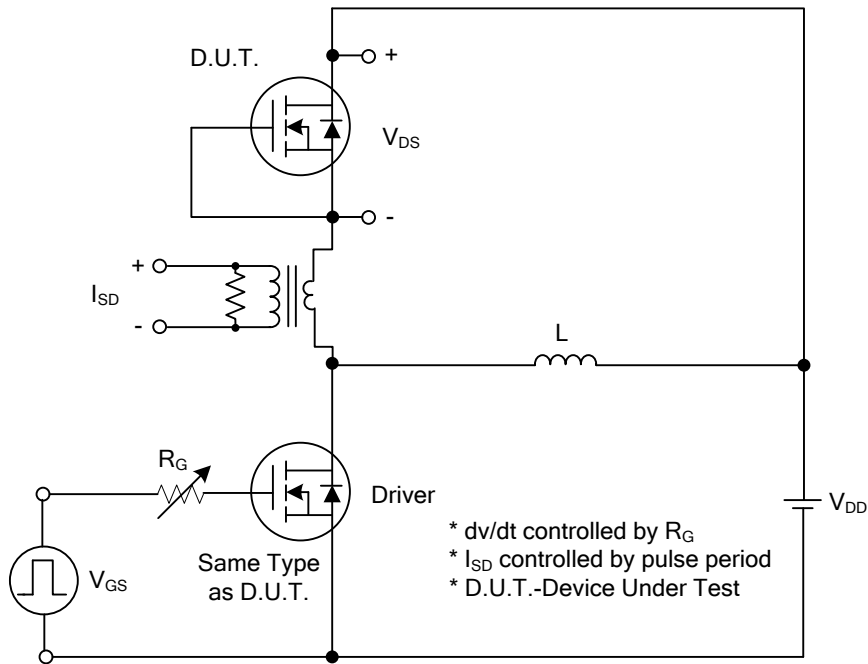
### ■ ELECTRICAL CHARACTERISTICS (T<sub>J</sub> =25°C, unless otherwise specified)

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	40			V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V			1	μA
Gate-Source Leakage Current		I <sub>GSS</sub>	V <sub>GS</sub> =+20V, V <sub>DS</sub> =0V		+100	nA
				V <sub>GS</sub> =-20V, V <sub>DS</sub> =0V		-100
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =1mA	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> =10A			30	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =10A			50	mΩ
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1.0MHz		370		pF
Output Capacitance	C <sub>OSS</sub>			50		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			43		pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge (Note 1)	Q <sub>G</sub>	V <sub>DS</sub> =96V, V <sub>GS</sub> =10V, I <sub>D</sub> =20A I <sub>G</sub> =1mA (Note 1, 2)		12		nC
Gate to Source Charge	Q <sub>GS</sub>			1.7		nC
Gate to Drain Charge	Q <sub>GD</sub>			2		nC
Turn-on Delay Time (Note 1)	t <sub>D(ON)</sub>	V <sub>DS</sub> =40V, V <sub>GS</sub> =10V, I <sub>D</sub> =20A, R <sub>G</sub> =3Ω (Note 1, 2)		3.2		ns
Rise Time	t <sub>R</sub>			14		ns
Turn-off Delay Time	t <sub>D(OFF)</sub>			54		ns
Fall-Time	t <sub>F</sub>			18		ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	I <sub>S</sub>				20	A
Maximum Body-Diode Pulsed Current	I <sub>SM</sub>				40	A
Drain-Source Diode Forward Voltage (Note 1)	V <sub>SD</sub>	I <sub>S</sub> =20A, V <sub>GS</sub> =0V			1.4	V

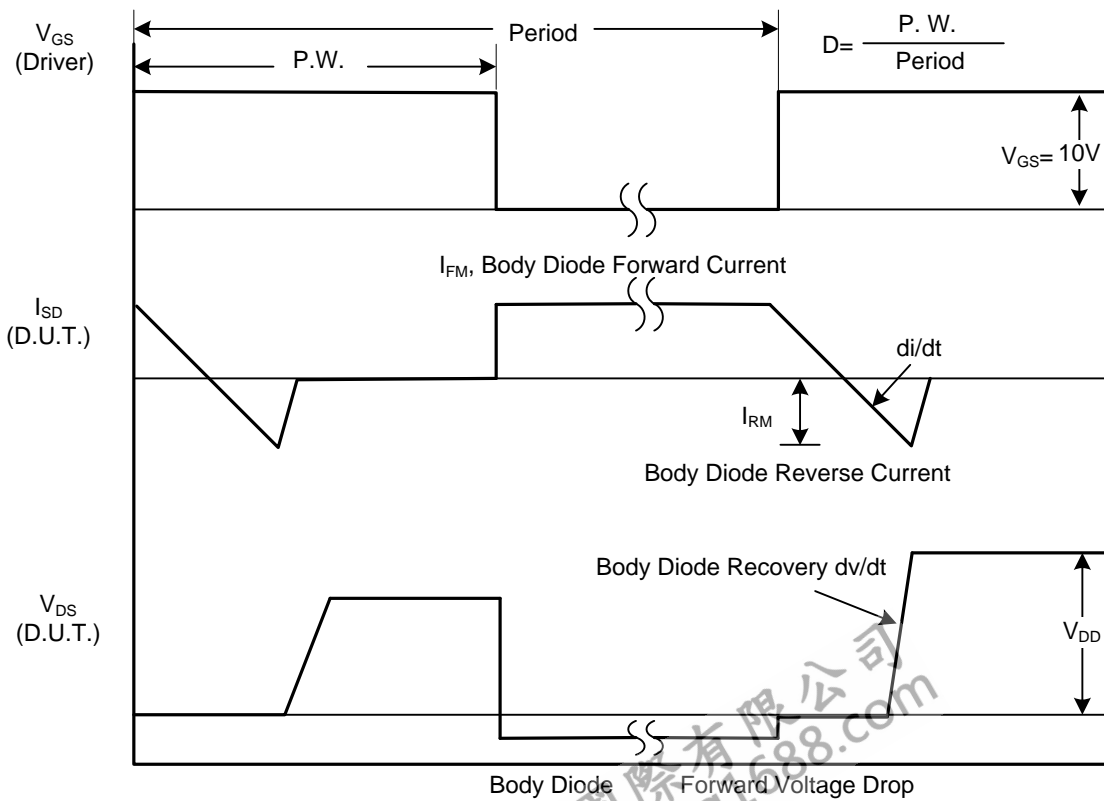
Notes: 1. Pulse Test : Pulse width ≤ 300 μs, Duty cycle ≤ 2 %.

2. Essentially independent of operating temperature.

## TEST CIRCUITS AND WAVEFORMS

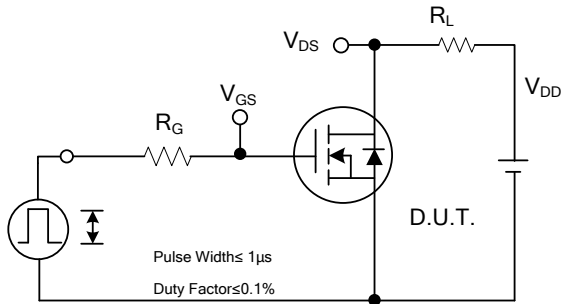


Peak Diode Recovery  $dv/dt$  Test Circuit

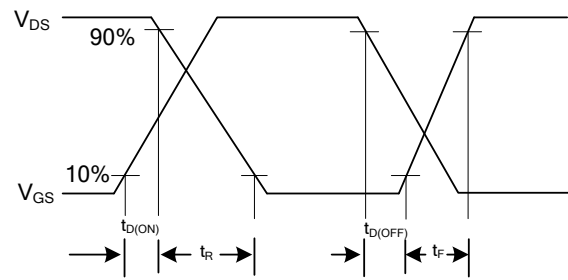


Peak Diode Recovery  $dv/dt$  Waveforms

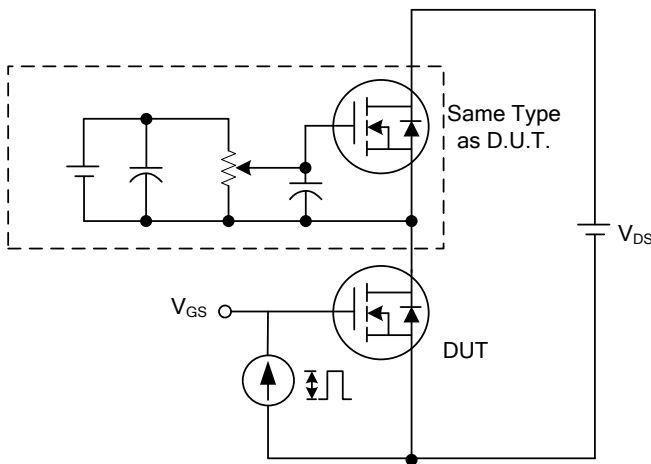
## TEST CIRCUITS AND WAVEFORMS



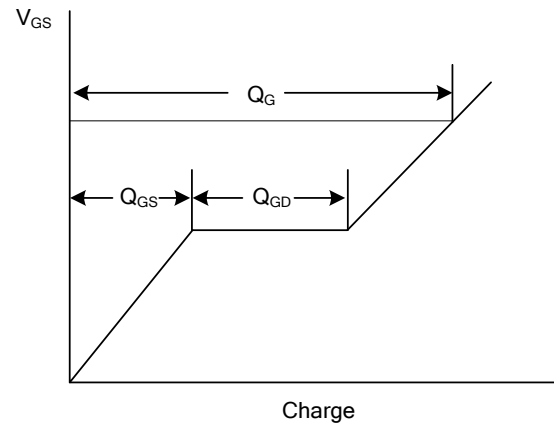
Switching Test Circuit



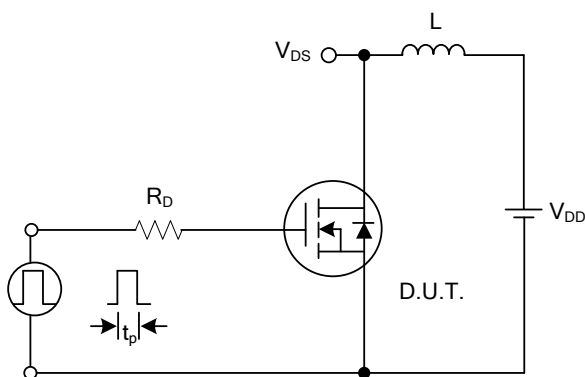
Switching Waveforms



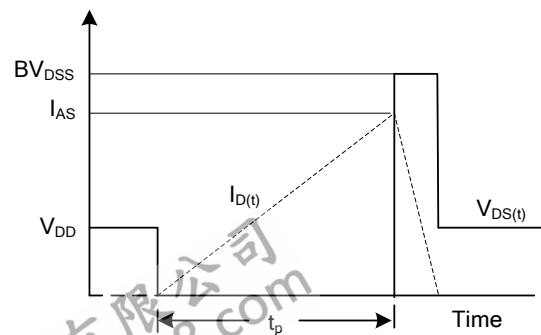
Gate Charge Test Circuit



Gate Charge Waveform

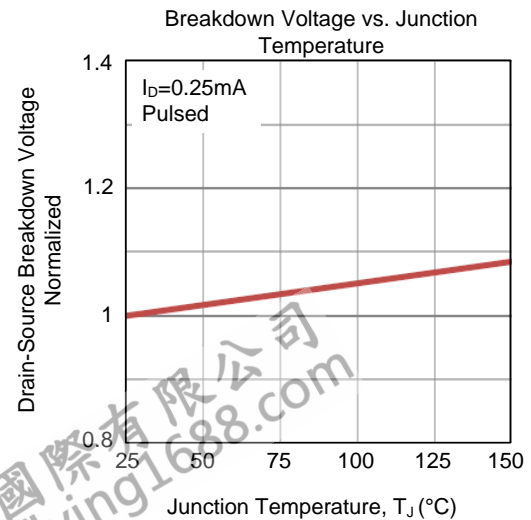
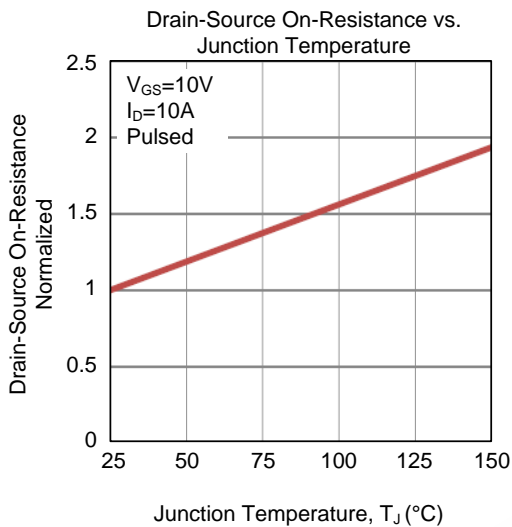
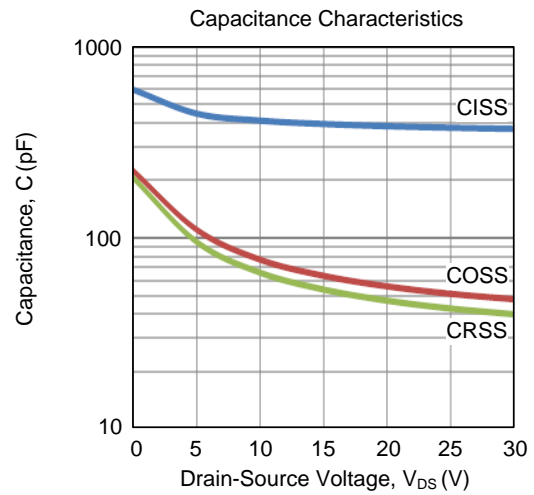
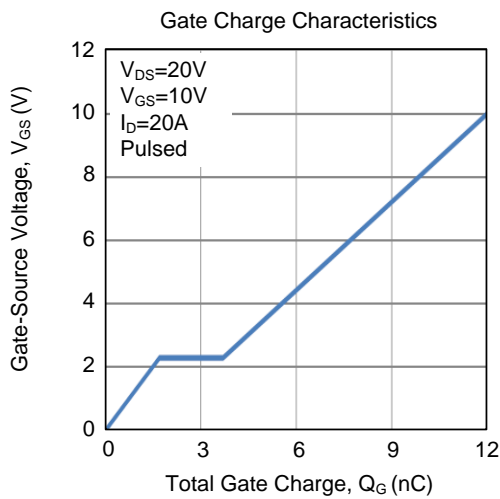
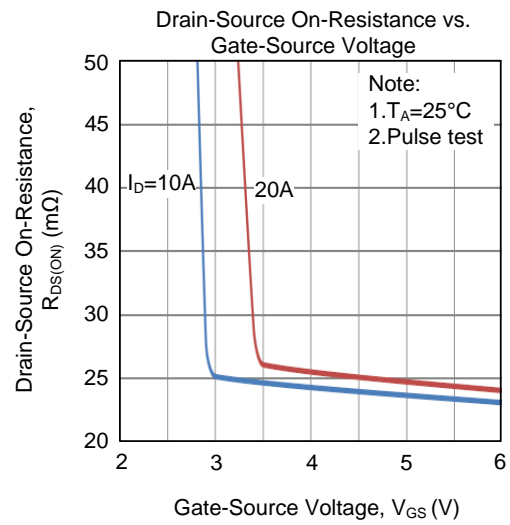
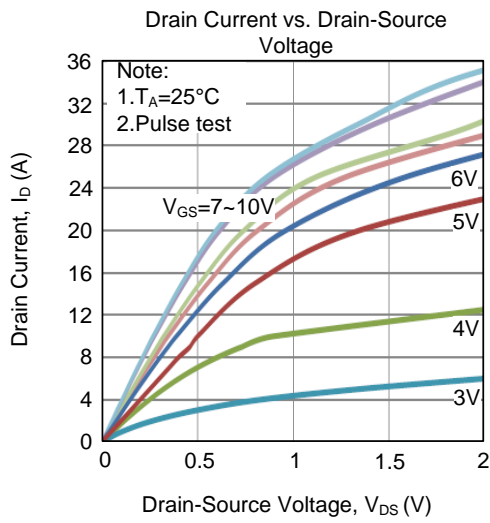


Unclamped Inductive Switching Test Circuit

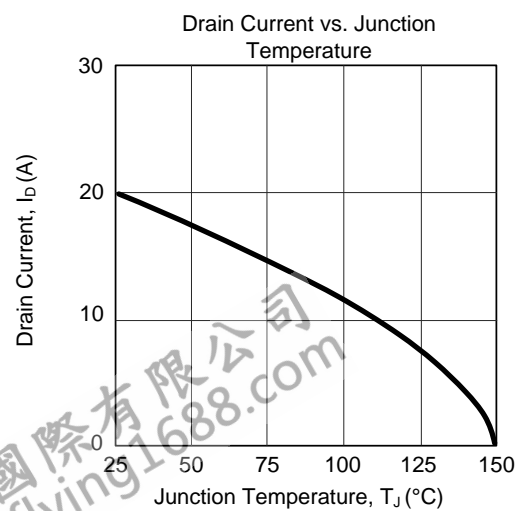
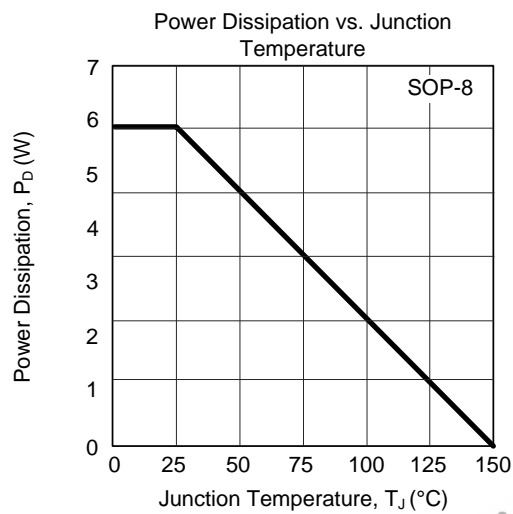
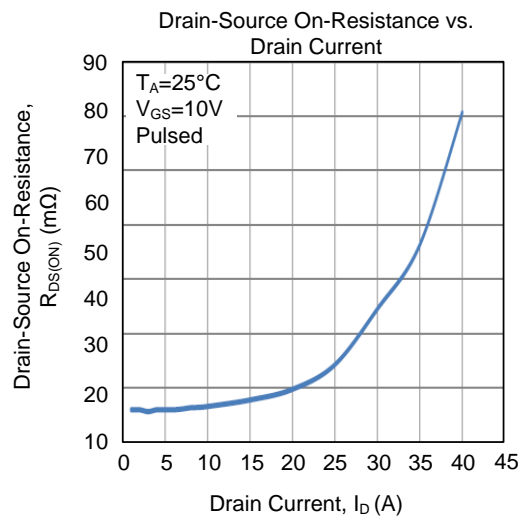
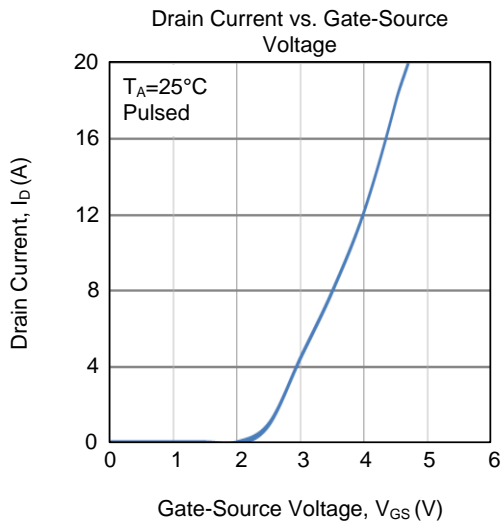
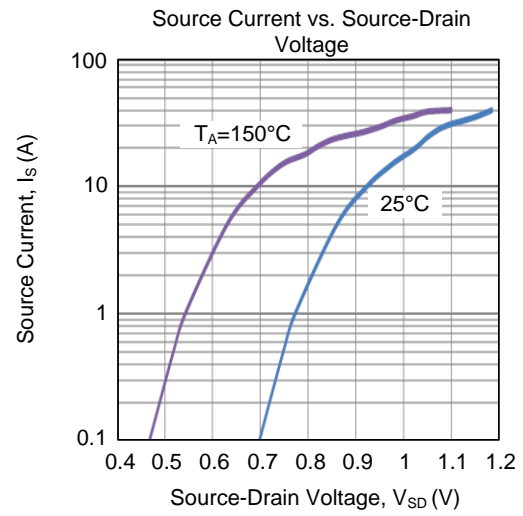
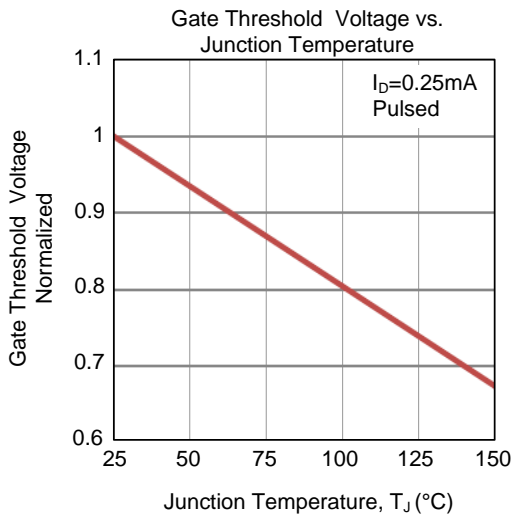


Unclamped Inductive Switching Waveforms

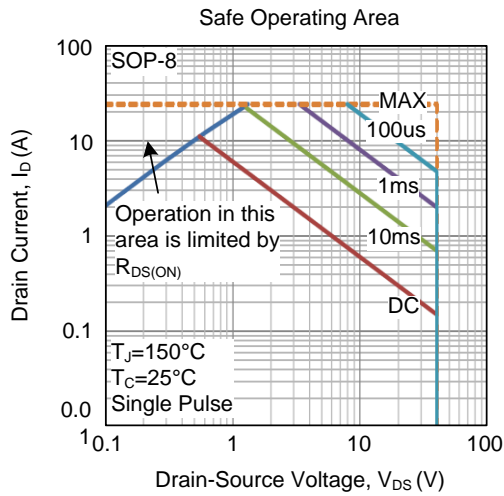
## TYPICAL CHARACTERISTICS



## TYPICAL CHARACTERISTICS (Cont.)



■ TYPICAL CHARACTERISTICS (Cont.)



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