



**UT3415**

**POWER MOSFET**

**-4.0A, -20V P-CHANNEL  
POWER MOSFET**

■ **DESCRIPTION**

The UTC **UT3415** is a P-channel MOS Field Effect Transistor. it uses UTC's advanced technology to provide the customers with high switching speed and a minimum on-state resistance.

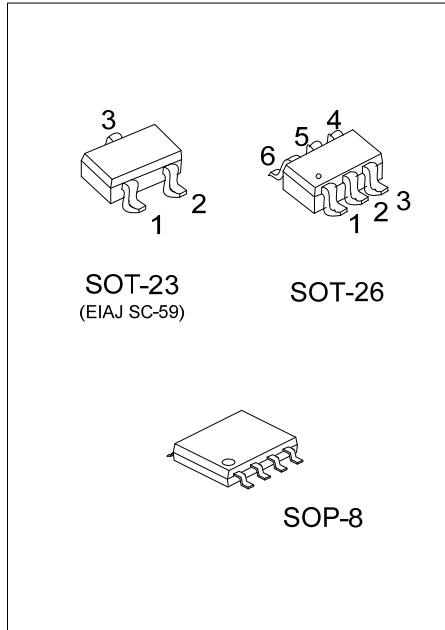
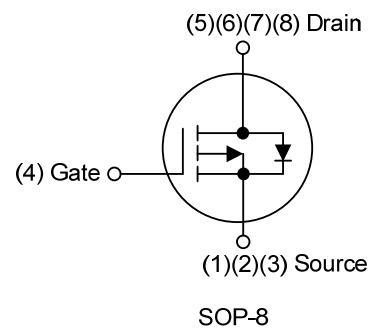
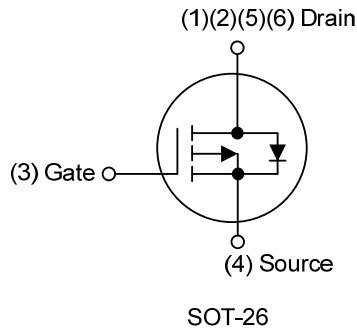
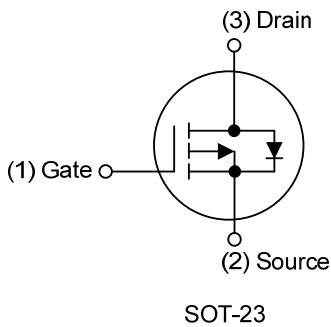
The UTC **UT3415** is suitable for high voltage switching applications.

■ **FEATURES**

- \*  $R_{DS(ON)} \leq 45 \text{ m}\Omega$  @  $V_{GS}=-4.5\text{V}$ ,  $I_D=-4.0\text{A}$
- $R_{DS(ON)} \leq 62 \text{ m}\Omega$  @  $V_{GS}=-2.5\text{V}$ ,  $I_D=-4.0\text{A}$
- $R_{DS(ON)} \leq 84 \text{ m}\Omega$  @  $V_{GS}=-1.8\text{V}$ ,  $I_D=-2.0\text{A}$
- $R_{DS(ON)} \leq 105 \text{ m}\Omega$  @  $V_{GS}=-1.5\text{V}$ ,  $I_D=-1.0\text{A}$

- \* High switching speed
- \* Low input capacitance

■ **SYMBOL**



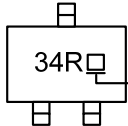
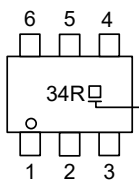
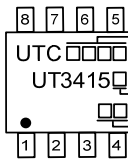
■ **ORDERING INFORMATION**

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
UT3415L-AE3-R	UT3415G-AE3-R	SOT-23	G	S	D	-	-	-	-	-	Tape Reel
UT3415L-AG6-R	UT3415G-AG6-R	SOT-26	D	D	G	S	D	D	-	-	Tape Reel
UT3415L-S08-R	UT3415G-S08-R	SOP-8	S	S	S	G	D	D	D	D	Tape Reel

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

<p>UT3415G-AE3-R</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) R: Tape Reel (2) AE3: SOT-23, AG6: SOT-26, S08: SOP-8 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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■ MARKING

PACKAGE	MARKING
SOT-23	 <p>34R□ → L: Lead Free G: Halogen Free</p>
SOT-26	 <p>34R□ → L: Lead Free G: Halogen Free</p>
SOP-8	 <p>8 7 6 5 → Date Code UTC □ □ □ □ UT3415 □ → L: Lead Free G: Halogen Free ● → Lot Code 1 2 3 4</p>

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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		$V_{DSS}$	-20	V
Gate-Source Voltage		$V_{GSS}$	$\pm 8$	V
Drain Current	DC	$I_D$	-4	A
	Pulsed (Note 2)	$I_{DM}$	-8	A
Single Avalanche Energy (Note 3)		$E_{AS}$	48	mJ
Peak Diode Recovery dv/dt (Note 4)		dv/dt	1.38	V/ns
Power Dissipation	SOT-23	$P_D$	0.7	W
	SOT-26		0.6	W
	SOP-8		1	W
Junction Temperature		$T_J$	+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.  $L=0.1\text{mH}$ ,  $I_{AS}=-31.1\text{A}$ ,  $V_{DD}=-20\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J=25^{\circ}\text{C}$ .

4.  $I_{SD}\leq-1.0\text{A}$ ,  $di/dt\leq 200\text{A}/\mu\text{s}$ ,  $V_{DD}\leq BV_{DSS}$ , Starting  $T_J=25^{\circ}\text{C}$ .

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-23	$\theta_{JA}$	177	$^{\circ}\text{C}/\text{W}$
	SOT-26		208	$^{\circ}\text{C}/\text{W}$
	SOP-8		125	$^{\circ}\text{C}/\text{W}$

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

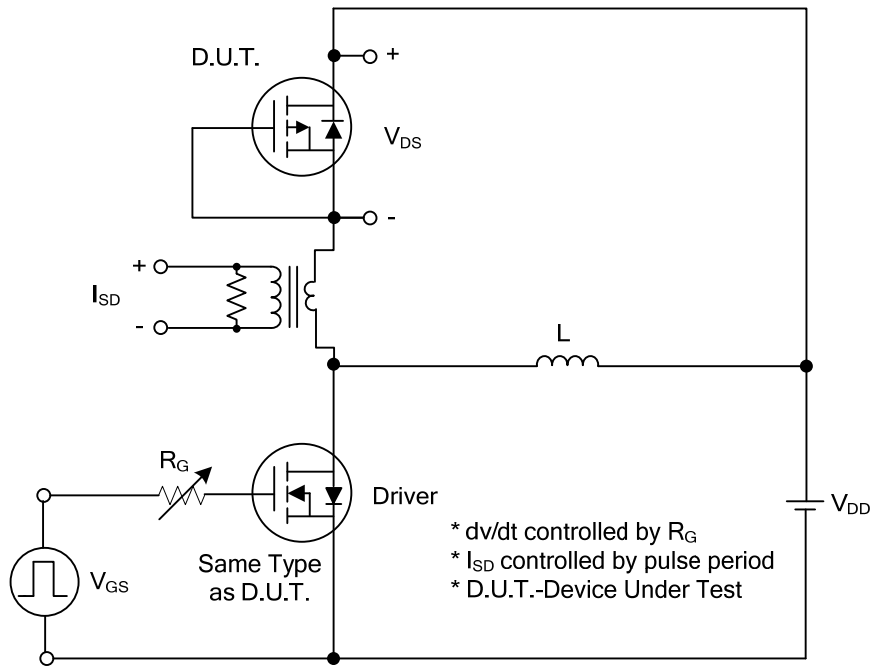
■ ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0 V, I <sub>D</sub> =-250 μA	-20			V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V			-1.0	μA
Gate-Source Leakage Current	Forward	I <sub>GSS</sub> V <sub>GS</sub> =+8V, V <sub>DS</sub> =0V			+100	nA
	Reverse		V <sub>GS</sub> =-8V, 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> =-250μA	-0.3		-0.9	V
Static Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-4.0A			45	mΩ
		V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-4.0A			62	mΩ
		V <sub>GS</sub> =-1.8V, I <sub>D</sub> =-2.0A			84	mΩ
		V <sub>GS</sub> =-1.5V, I <sub>D</sub> =-1.0A			105	mΩ
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =-10V, f=1.0MHz		1000		pF
Output Capacitance	C <sub>OSS</sub>			200		pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			170		pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge	Q <sub>G</sub>	V <sub>DS</sub> =-10V, V <sub>GS</sub> =-10V, I <sub>D</sub> =-4.0A , I <sub>G</sub> =-1mA (Note 1, 2)		30		nC
Gate to Source Charge	Q <sub>GS</sub>			1.5		nC
Gate to Drain Charge	Q <sub>GD</sub>			4		nC
Turn-ON Delay Time	t <sub>D(ON)</sub>	V <sub>DD</sub> =-10V, V <sub>GS</sub> =-10V, I <sub>D</sub> =-4.0A, R <sub>G</sub> =3Ω (Note 1, 2)		4		ns
Rise Time	t <sub>R</sub>			17		ns
Turn-OFF Delay Time	t <sub>D(OFF)</sub>			44		ns
Fall-Time	t <sub>F</sub>			26		ns
<b>SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Continuous Drain-Source Diode Forward Current	I <sub>S</sub>				-4	A
Maximum Pulsed Drain-Source Diode Forward Current	I <sub>SM</sub>				-8	A
Diode Forward Voltage	V <sub>SD</sub>	I <sub>F</sub> =-4.0A, V <sub>GS</sub> =0V			-1.4	V

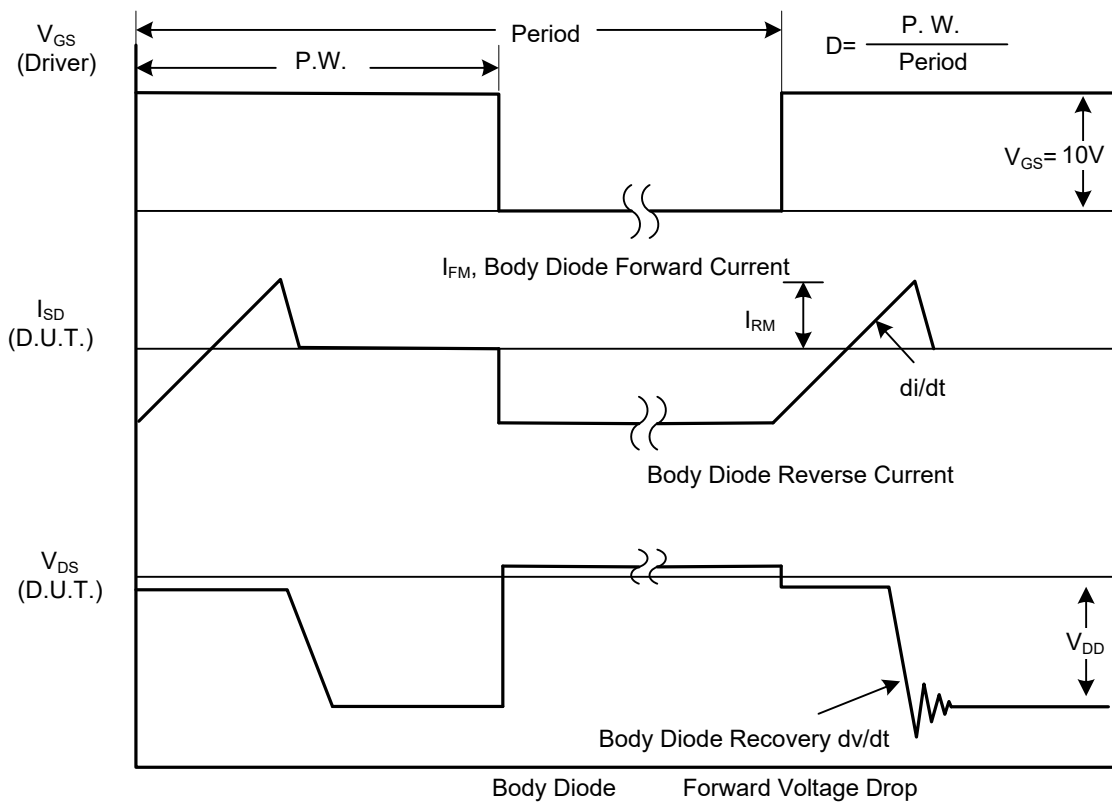
Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 2%.

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

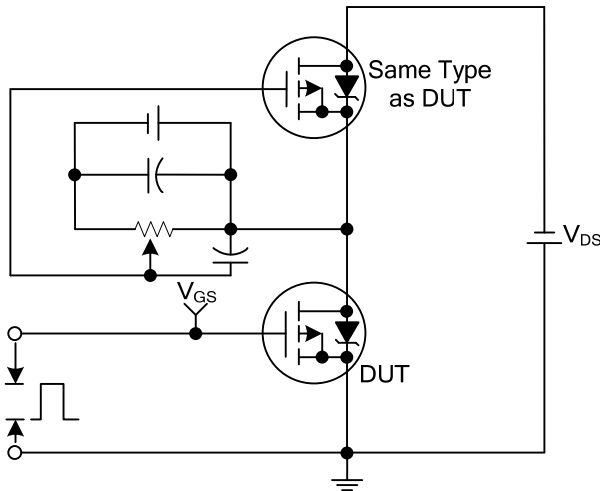


Peak Diode Recovery  $dv/dt$  Test Circuit

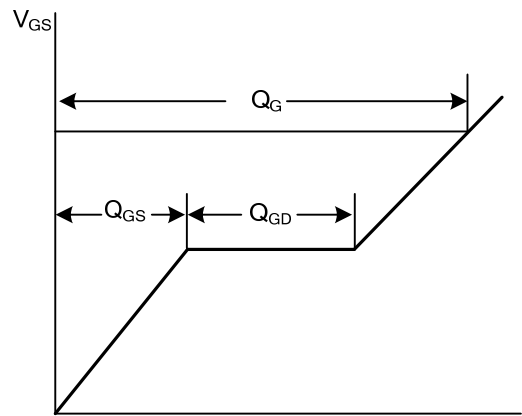


Peak Diode Recovery  $dv/dt$  Waveforms

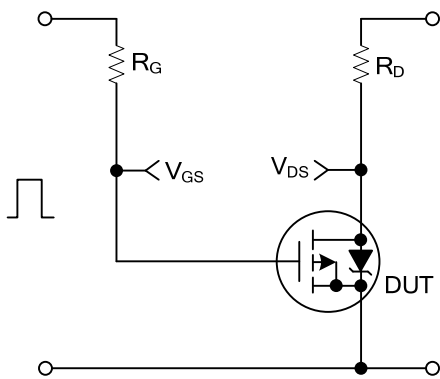
■ TEST CIRCUITS AND WAVEFORMS



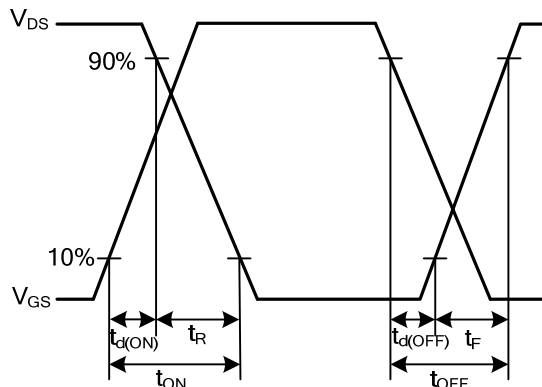
Gate Charge Test Circuit



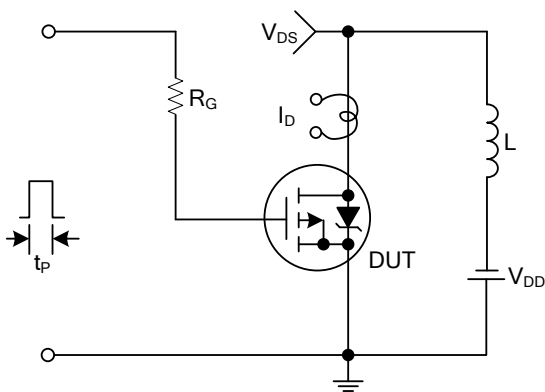
Gate Charge Waveforms



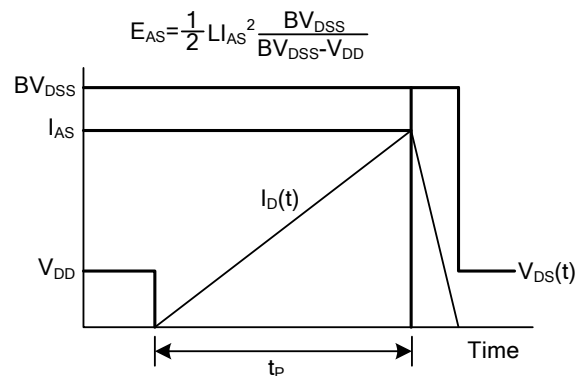
Resistive Switching Test Circuit



Resistive Switching Waveforms

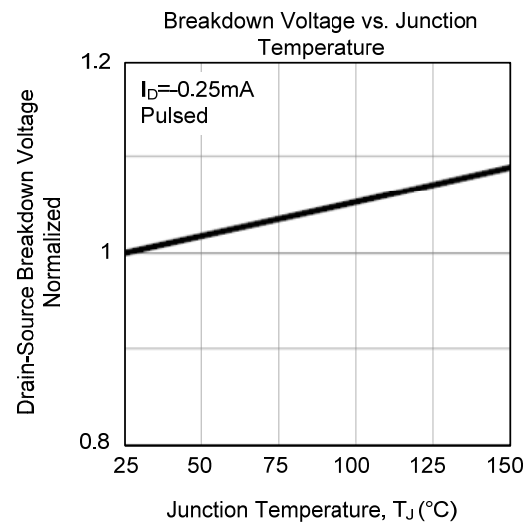
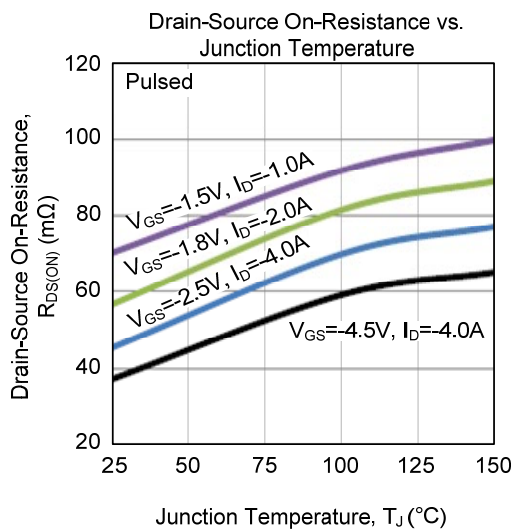
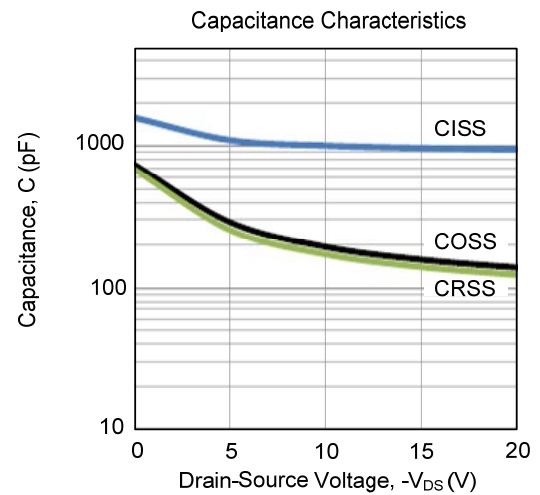
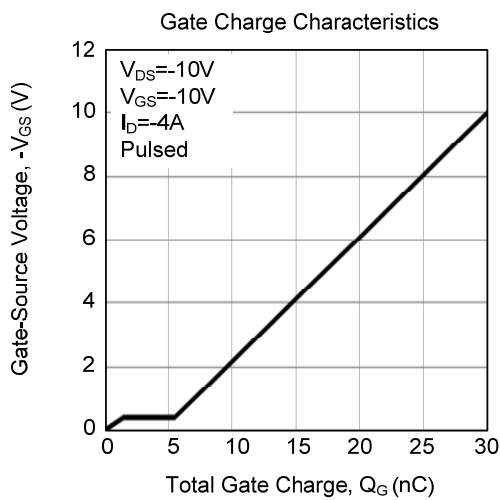
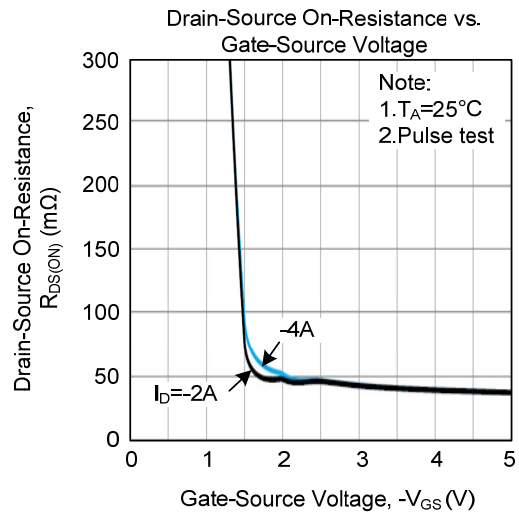
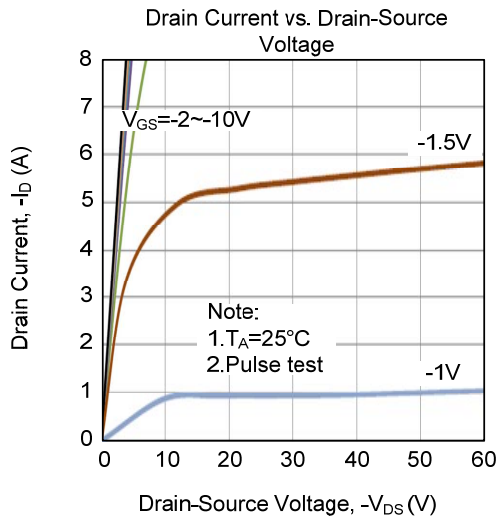


Unclamped Inductive Switching Test Circuit

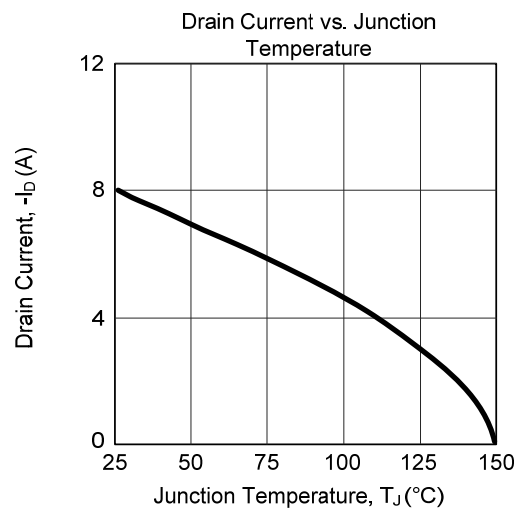
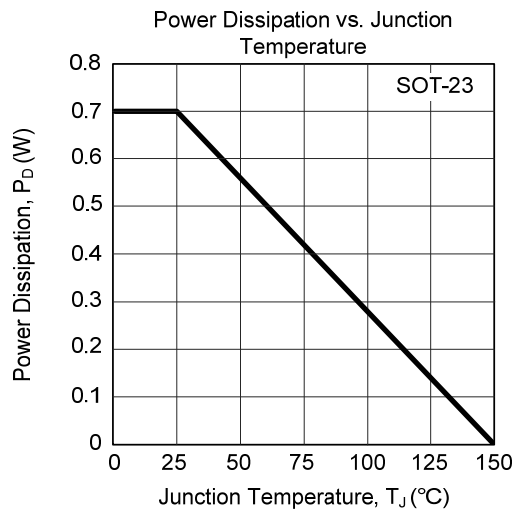
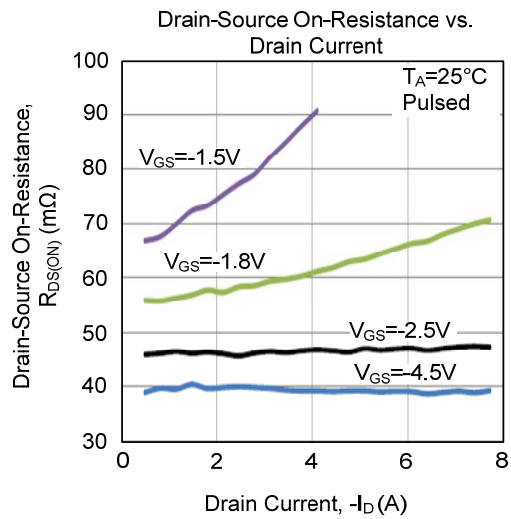
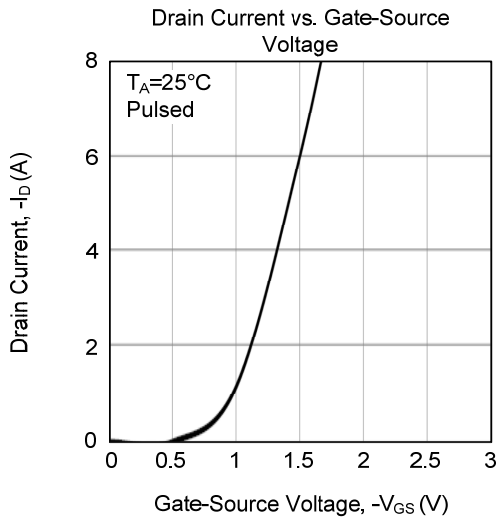
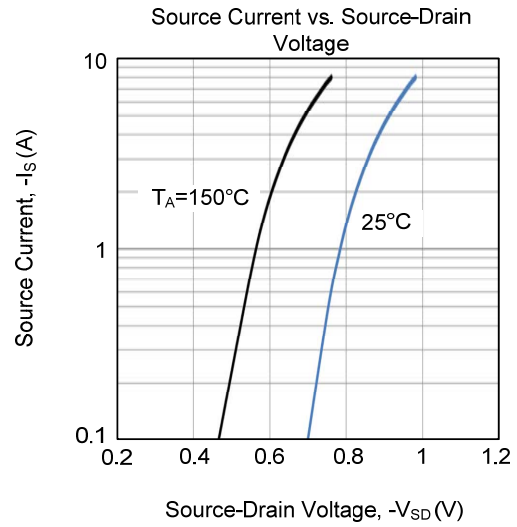
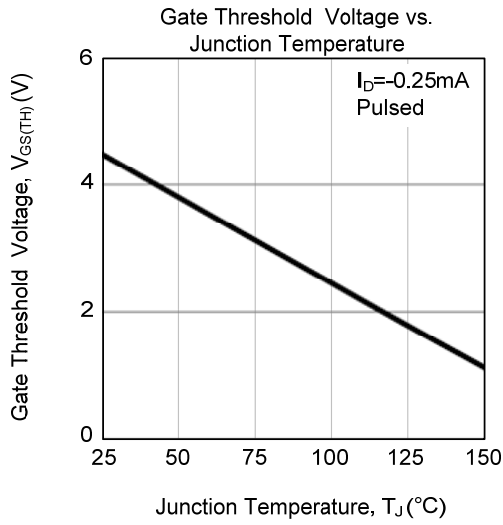


Unclamped Inductive Switching Waveforms

■ TYPICAL CHARACTERISTICS

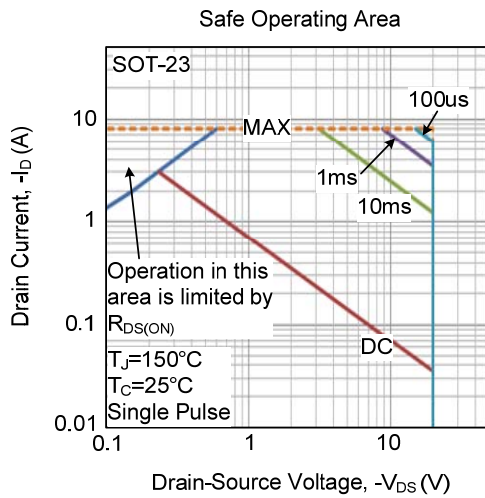


■ TYPICAL CHARACTERISTICS (Cont.)





■ TYPICAL CHARACTERISTICS (Cont.)



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