

## 4P50H

Power MOSFET

### -4A, -500V P-CHANNEL POWER MOSFET

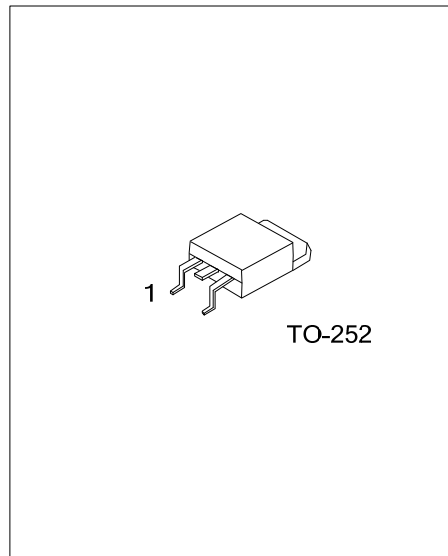
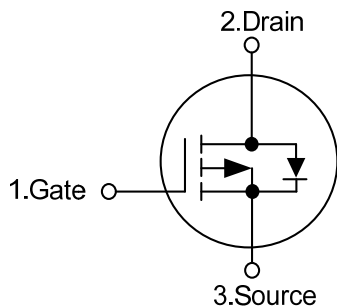
#### DESCRIPTION

The **4P50H** uses advanced proprietary, planar stripe, DMOS technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with low gate voltages. This device is suitable to be used in low voltage applications such as audio amplifier, high efficiency switching DC/DC converters, and DC motor control.

#### FEATURES

- \*  $R_{DS(ON)} < 5.5\Omega$  @  $V_{GS} = -10V, I_D = -2.0A$
- \* Low capacitance
- \* Low gate charge
- \* Fast switching capability
- \* Avalanche energy specified

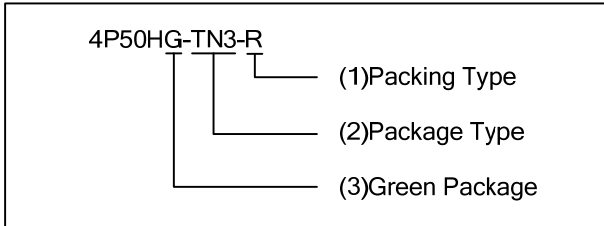
#### SYMBOL



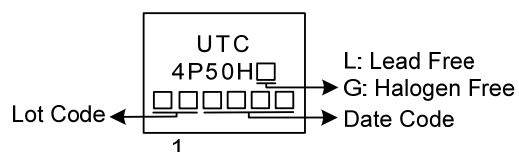
#### ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
4P50HL-TN3-R	4P50HG-TN3-R	TO-252	G	D	S	Tape Reel

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

<p>4P50HG-TN3-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) TN3: TO-252</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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#### MARKING



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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		$V_{DSS}$	-500	V
Gate-Source Voltage		$V_{GSS}$	$\pm 30$	V
Continuous Drain Current	Continuous	$I_D$	-4	A
Pulsed Drain Current	Pulsed (Note 2)	$I_{DM}$	-8	A
Single Pulsed Avalanche Energy	Single Pulsed (Note 3)	$E_{AS}$	438	mJ
Peak Diode Recovery $dv/dt$ (Note 4)		$dv/dt$	2	V/ns
Power Dissipation		$P_D$	44	W
Junction Temperature		$T_J$	+150	$^{\circ}\text{C}$
Storage Temperature		$T_{STG}$	-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.  $L=60\text{mH}$ ,  $I_{AS}=-3.8\text{A}$ ,  $V_{DD}=-150\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J=25^{\circ}\text{C}$

4.  $I_{SD} \leq -4.0\text{A}$ ,  $di/dt \leq 200\mu\text{A/s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J=25^{\circ}\text{C}$

■ THERMAL DATA

PARAMETER	SYMBOL	RATING	UNIT
Junction to Ambient	$\theta_{JA}$	110	$^{\circ}\text{C/W}$
Junction to Case	$\theta_{JC}$	2.7	$^{\circ}\text{C/W}$

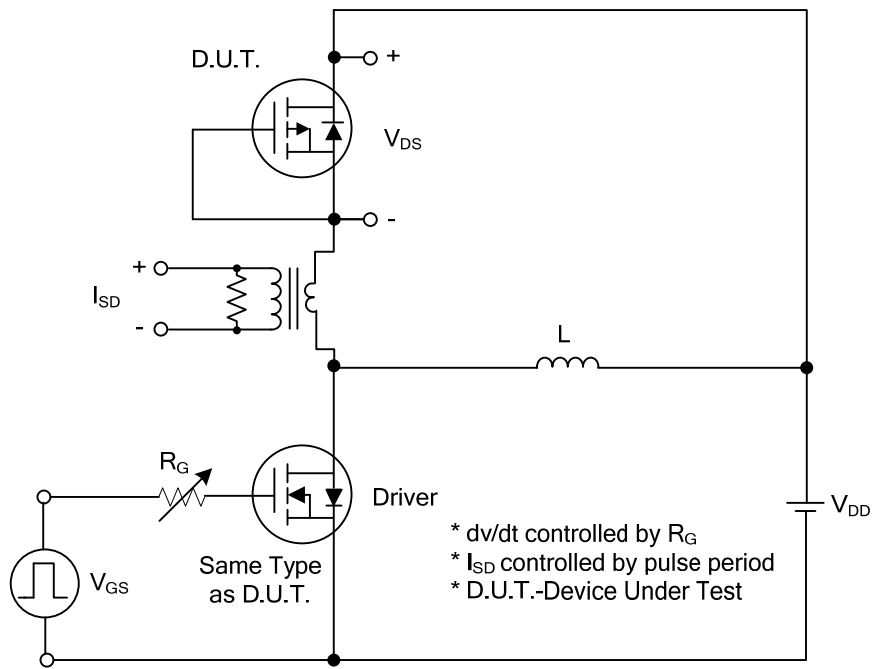
■ ELECTRICAL CHARACTERISTICS ( $T_J=25^{\circ}\text{C}$ , unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
<b>OFF CHARACTERISTICS</b>								
Drain-Source Breakdown Voltage		$BV_{DSS}$	$V_{GS}=0\text{V}$ , $I_D=-250\mu\text{A}$	-500			V	
Drain-Source Leakage Current		$I_{DSS}$	$V_{DS}=-500\text{V}$ , $V_{GS}=0\text{V}$			-10	$\mu\text{A}$	
Gate-Source Leakage Current	Forward	$I_{GSS}$	$V_{DS}=0\text{V}$ , $V_{GS}=+30\text{V}$			100	nA	
	Reverse		$V_{DS}=0\text{V}$ , $V_{GS}=-30\text{V}$			-100	nA	
<b>ON CHARACTERISTICS</b>								
Gate Threshold Voltage		$V_{GS(TH)}$	$V_{DS}=V_{GS}$ , $I_D=-250\mu\text{A}$	-3.0		-5.0	V	
Static Drain-Source On-Resistance		$R_{DS(ON)}$	$V_{GS}=-10\text{V}$ , $I_D=-2.0\text{A}$			5.5	$\Omega$	
<b>DYNAMIC PARAMETERS</b>								
Input Capacitance		$C_{ISS}$	$V_{DS}=-25\text{V}$ , $V_{GS}=0\text{V}$ , $f=1.0\text{MHz}$		576		pF	
Output Capacitance		$C_{OSS}$				85		pF
Reverse Transfer Capacitance		$C_{RSS}$				10		pF
<b>SWITCHING PARAMETERS</b>								
Total Gate Charge (Note 1)		$Q_G$	$V_{DS}=-50\text{V}$ , $V_{GS}=-10\text{V}$ , $I_D=-1.3\text{A}$ $I_G=-100\mu\text{A}$ (Note 1, 2)		52		nC	
Gate Source Charge		$Q_{GS}$			5.2		nC	
Gate Drain Charge		$Q_{GD}$			8.4		nC	
Turn-ON Delay Time (Note 1)		$t_{D(ON)}$	$V_{DD}=-30\text{V}$ , $V_{GS}=-10\text{V}$ , $I_D=-0.5\text{A}$ , $R_G=25\Omega$ (Note 1, 2)		9.6		ns	
Turn-ON Rise Time		$t_R$			15.4		ns	
Turn-OFF Delay Time		$t_{D(OFF)}$			40.4		ns	
Turn-OFF Fall-Time		$t_F$			28.7		ns	
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>								
Maximum Body-Diode Continuous Current		$I_S$				-4	A	
Maximum Pulsed Drain-Source Diode Forward Current		$I_{SM}$				-8	A	
Diode Forward Voltage (Note 1)		$V_{SD}$	$I_S=-4.0\text{A}$ , $V_{GS}=0\text{V}$			-3.5	V	
Body Diode Reverse Recovery Time(Note 1)		$t_{rr}$	$I_S=-4.0\text{A}$ , $V_{GS}=0\text{V}$ ,		230		ns	
Body Diode Reverse Recovery Charge		$Q_{rr}$	$di/dt=100\text{A}/\mu\text{s}$		2.2		$\mu\text{C}$	

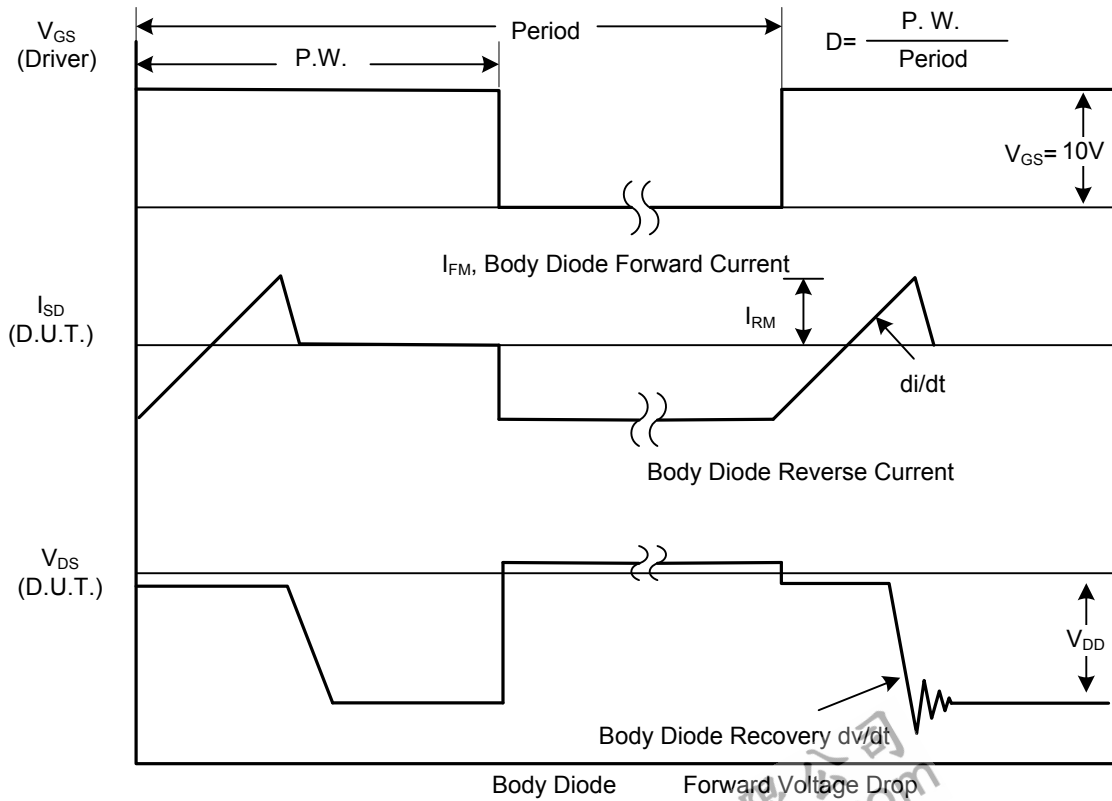
Notes: 1. Pulse Test : Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$ .

2. Essentially independent of operating temperature.

■ TEST CIRCUITS AND WAVEFORMS

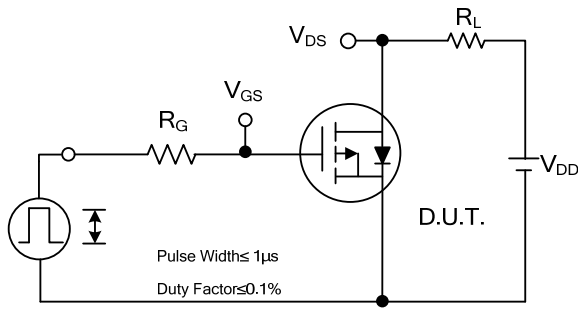


Peak Diode Recovery  $dv/dt$  Test Circuit

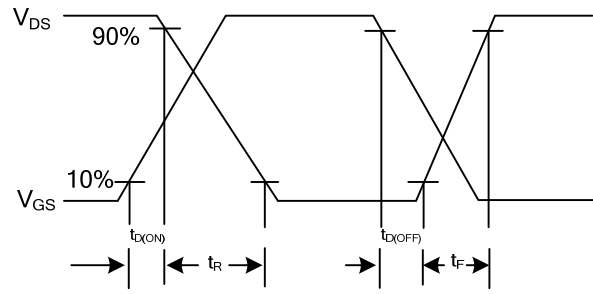


Peak Diode Recovery  $dv/dt$  Waveforms

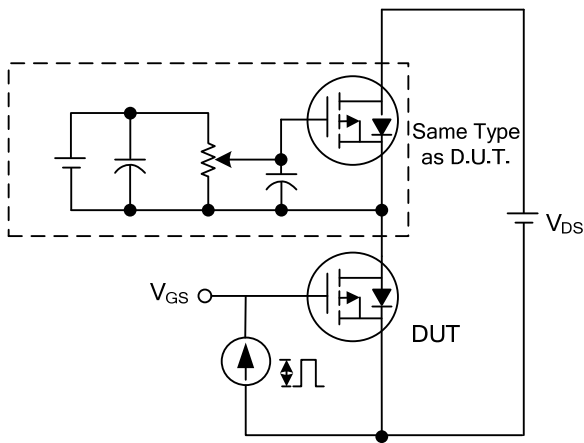
■ TEST CIRCUITS AND WAVEFORMS



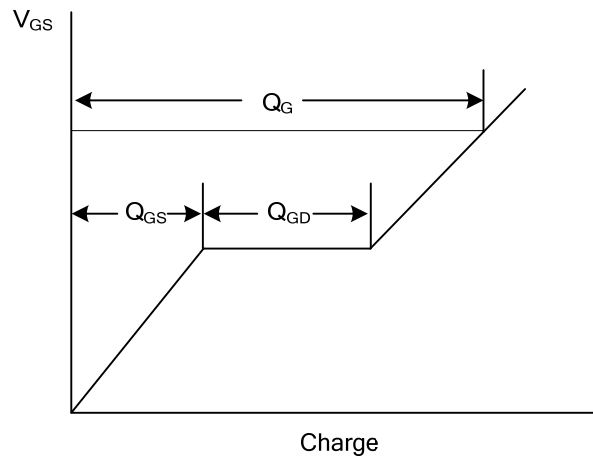
Switching Test Circuit



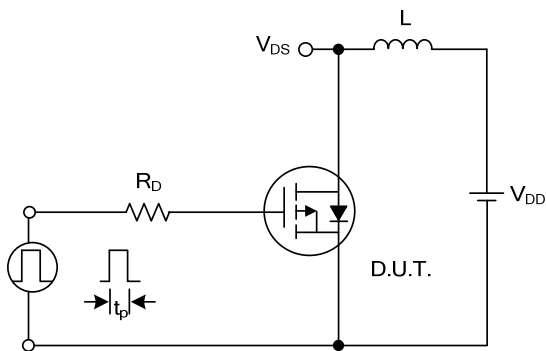
Switching Waveforms



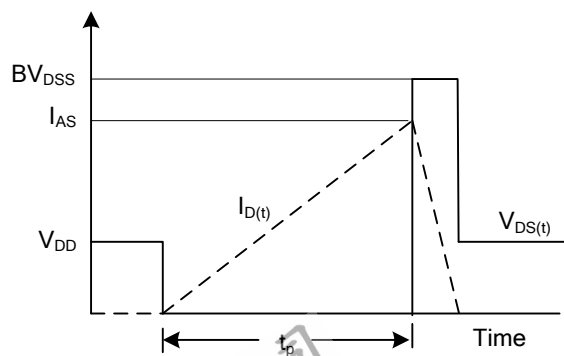
Gate Charge Test Circuit



Gate Charge Waveform

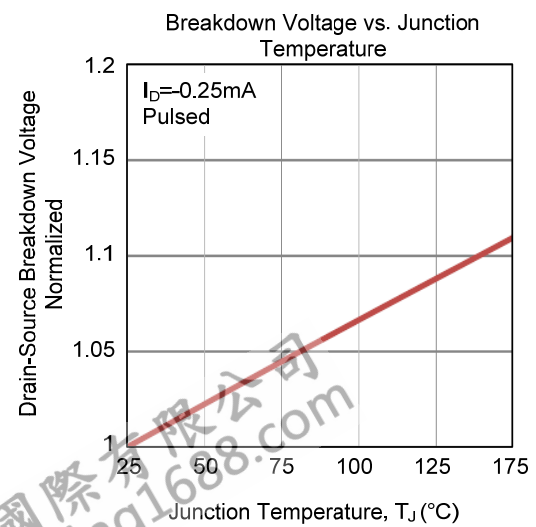
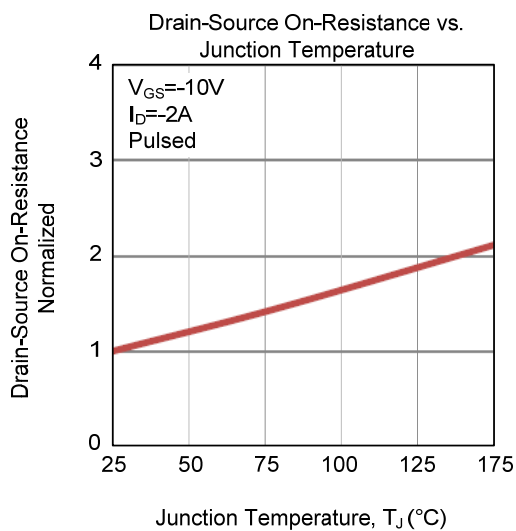
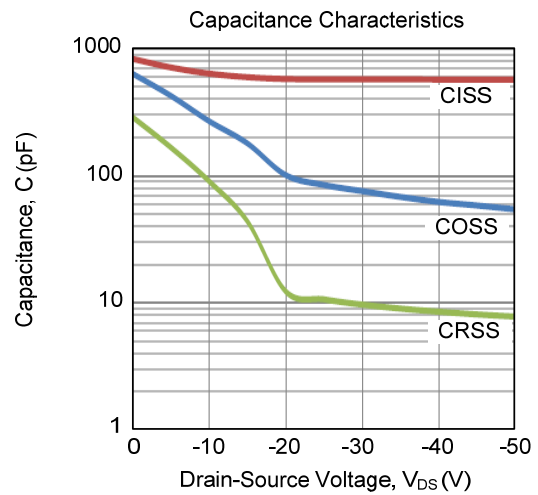
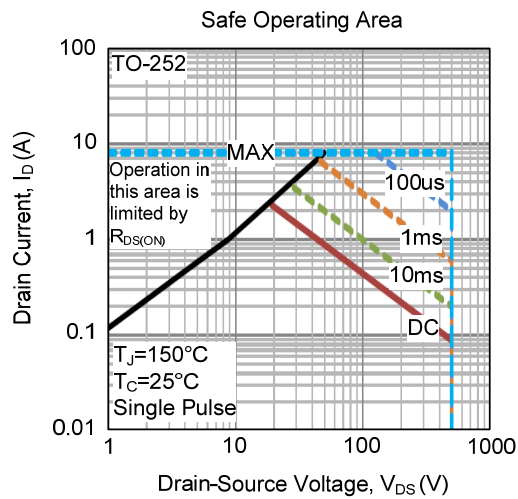
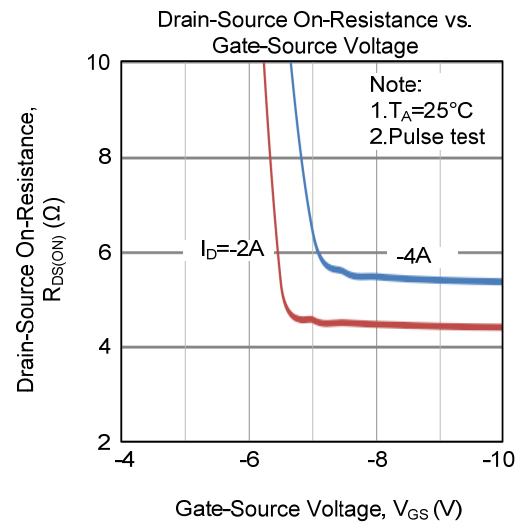
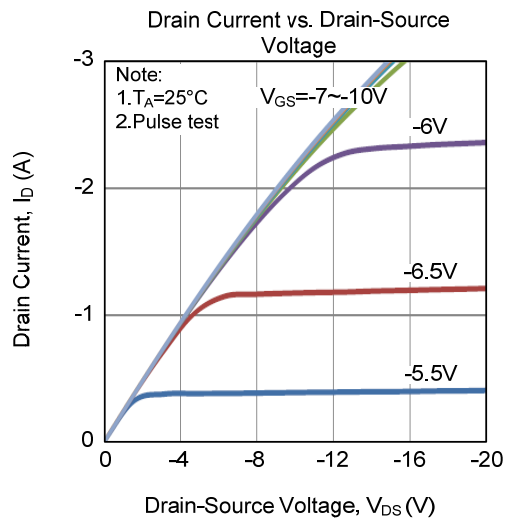


Unclamped Inductive Switching Test Circuit

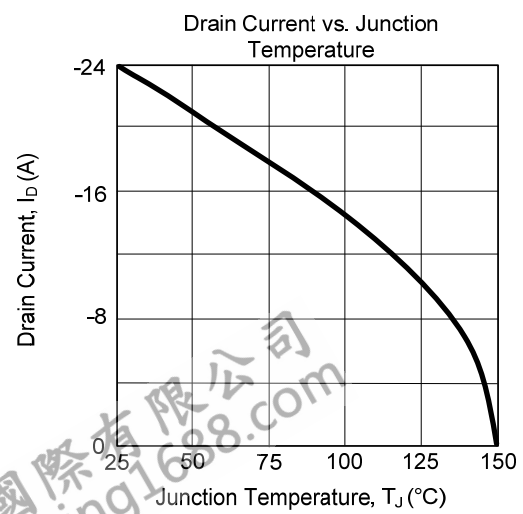
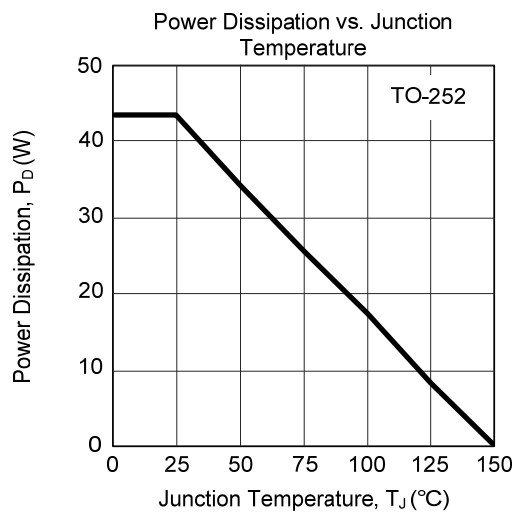
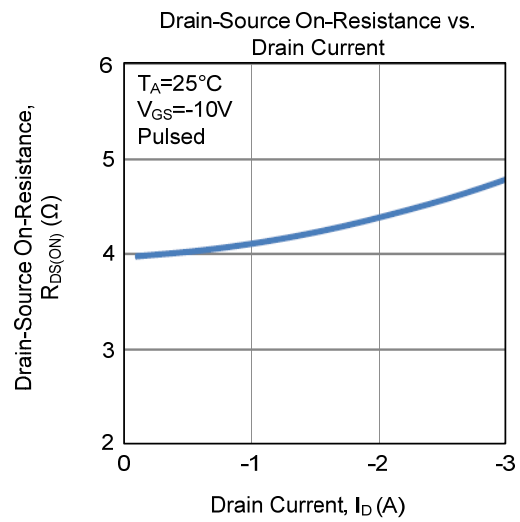
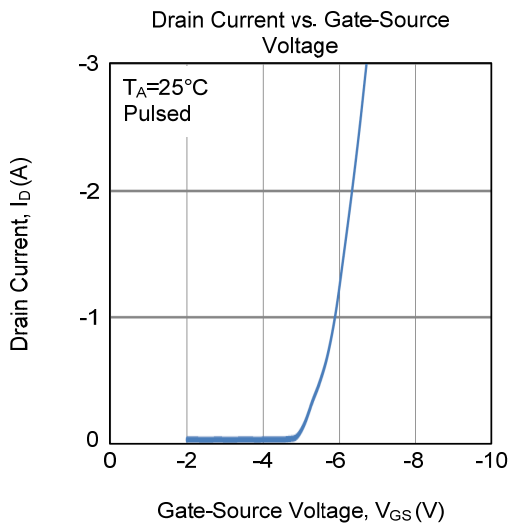
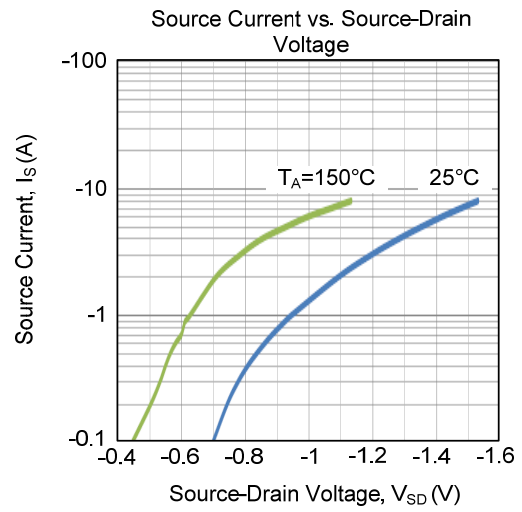
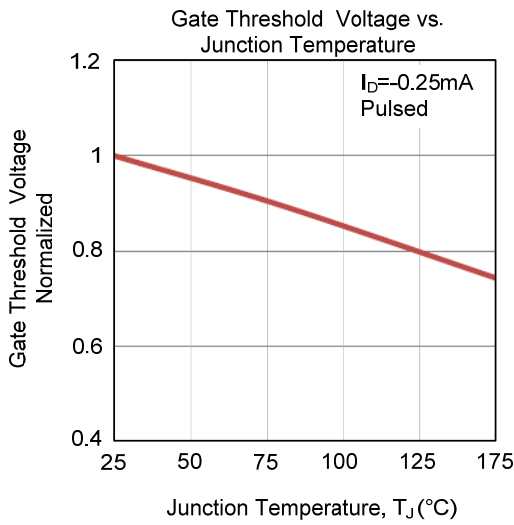


Unclamped Inductive Switching Waveforms

## TYPICAL CHARACTERISTICS



## TYPICAL CHARACTERISTICS (Cont.)



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