



# 12P10

Power MOSFET

## -9.4A, -100V P-CHANNEL POWER MOSFET

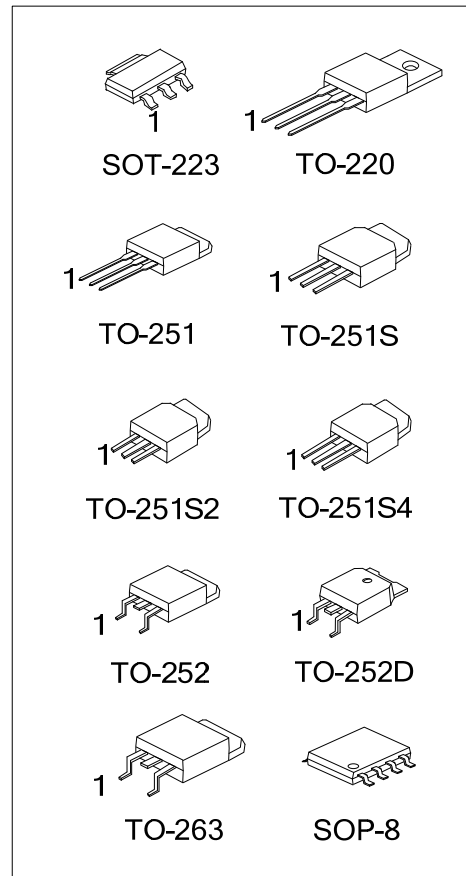
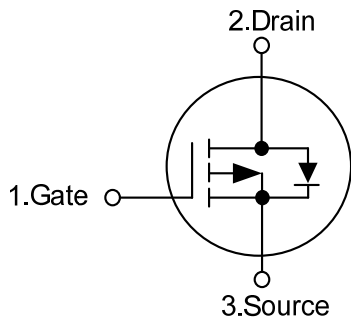
### DESCRIPTION

The **12P10** 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

- \*  $R_{DS(ON)} < 0.29\Omega$  @  $V_{GS} = -10V, I_D = -4.7A$
- \* Low capacitance
- \* Low gate charge
- \* Fast switching capability
- \* Avalanche energy specified

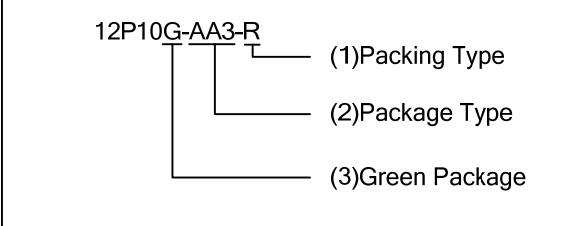
### SYMBOL



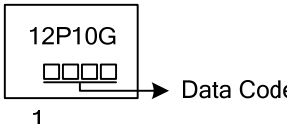
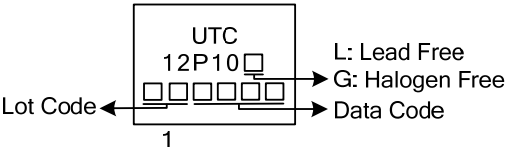
## ORDERING INFORMATION

Ordering Number		Package	Pin Assignment								Packing
Lead Free	Halogen Free		1	2	3	4	5	6	7	8	
-	12P10G-AA3-R	SOT-223	G	D	S	-	-	-	-	-	Tape Reel
12P10L-TA3-T	12P10G-TA3-T	TO-220	G	D	S	-	-	-	-	-	Tube
12P10L-TM3-T	12P10G-TM3-T	TO-251	G	D	S	-	-	-	-	-	Tube
12P10L-TMS-T	12P10G-TMS-T	TO-251S	G	D	S	-	-	-	-	-	Tube
12P10L-TMS2-T	12P10G-TMS2-T	TO-251S2	G	D	S	-	-	-	-	-	Tube
12P10L-TMS4-T	12P10G-TMS4-T	TO-251S4	G	D	S	-	-	-	-	-	Tube
12P10L-TN3-R	12P10G-TN3-R	TO-252	G	D	S	-	-	-	-	-	Tape Reel
12P10L-TND-R	12P10G-TND-R	TO-252D	G	D	S	-	-	-	-	-	Tape Reel
12P10L-TQ2-R	12P10G-TQ2-R	TO-263	G	D	S	-	-	-	-	-	Tape Reel
12P10L-TQ2-T	12P10G-TQ2-T	TO-263	G	D	S	-	-	-	-	-	Tube
-	12P10G-S08-R	SOP-8	S	S	S	G	D	D	D	D	Tape Reel

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

 <p>12P10G-AA3-R</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p>	<p>(1) R: Tape Reel, T: Tube</p> <p>(2) AA3: SOT-223, TA3: TO-220, TM3: TO-251, TMS: TO-251S, TMS2: TO-251S2, TMS4: TO-251S4, TN3: TO-252, TND: TO-252D, TQ2: TO-263, S08: SOP-8</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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## MARKING

PACKAGE	MARKING
SOT-223	 <p>12P10G</p> <p>□ □ □ → Data Code</p> <p>1</p>
TO-220 TO-251 TO-251S TO-251S2	TO-251S4 TO-252 TO-252D TO-263
SOP-8	 <p>UTC □ □ □ □ → Date Code</p> <p>12P10G</p> <p>□ □ → Lot Code</p>

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

PARAMETER		SYMBOL	RATINGS	UNIT
Drain-Source Voltage		$V_{DSS}$	-100	V
Gate-Source Voltage		$V_{GSS}$	$\pm 30$	V
Continuous Drain Current		$I_D$	-9.4	A
Pulsed Drain Current (Note 2)		$I_{DM}$	-37.6	A
Avalanche Current (Note 2)		$I_{AR}$	-9.4	A
Single Pulsed Avalanche Energy (Note 3)		$E_{AS}$	280	mJ
Repetitive Avalanche Energy (Note 2)		$E_{AR}$	5.0	mJ
Power Dissipation	TO-220/TO-263	$P_D$	73	W
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		50	W
	SOT-223		8	W
	SOP-8		5	W
	Junction Temperature		$T_J$	+150
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. Pulse width limited by  $T_{J(MAX)}$

3.  $L=6.3\text{mH}$ ,  $I_{AS}=-9.4\text{A}$ ,  $V_{DD}=-25\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J=25^{\circ}\text{C}$

4.  $I_{SD}\leq -11.5\text{A}$ ,  $di/dt\leq 300\mu\text{A/V s}$ ,  $V_{DD}\leq BV_{DSS}$ , Starting  $T_J=25^{\circ}\text{C}$

■ THERMAL DATA

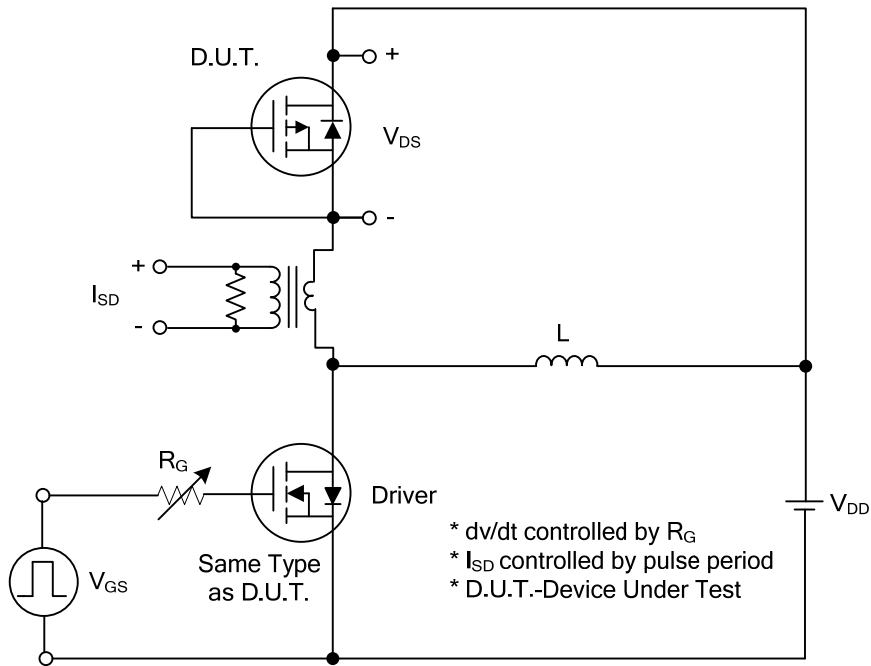
PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	TO-220/TO-263	$\theta_{JA}$	62.5	$^{\circ}\text{C/W}$
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		110	$^{\circ}\text{C/W}$
	TO-263		62.5	$^{\circ}\text{C/W}$
	SOT-223		125	$^{\circ}\text{C/W}$
	SOP-8		150	$^{\circ}\text{C/W}$
	Junction to Case		$\theta_{JC}$	1.9
Junction to Case	TO-220/TO-263	$\theta_{JC}$	2.5	$^{\circ}\text{C/W}$
	TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D		2.5	$^{\circ}\text{C/W}$
	SOT-223		14	$^{\circ}\text{C/W}$
	SOP-8		25	$^{\circ}\text{C/W}$

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

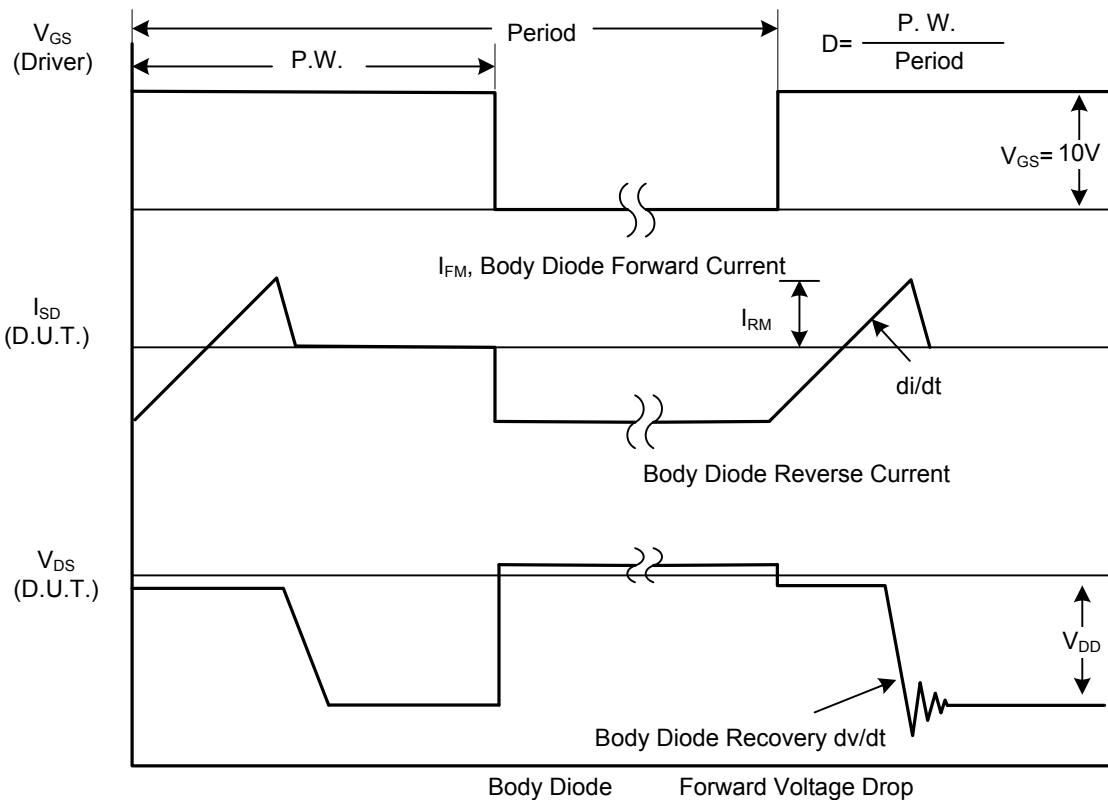
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0 V, I <sub>D</sub> =-250μA	-100			V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =-100V, V <sub>GS</sub> =0V			-1	μA
		V <sub>DS</sub> =-100V, T <sub>C</sub> =125°C			-10	μA
Gate-Source Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> =0V, V <sub>GS</sub> =±30V			±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	-2.0		-4.0	V
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =-10V, I <sub>D</sub> =-4.7A		0.24	0.29	Ω
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =-40V, I <sub>D</sub> =-4.7A (Note 1)		6.3		S
<b>DYNAMIC PARAMETERS</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>DS</sub> =-25V, V <sub>GS</sub> =0V, f=1.0MHz		570	800	pF
Output Capacitance	C <sub>OSS</sub>			115	290	pF
Reverse Transfer Capacitance	C <sub>RSS</sub>			30	85	pF
<b>SWITCHING PARAMETERS</b>						
Total Gate Charge	Q <sub>G</sub>	V <sub>DS</sub> =-50V, I <sub>D</sub> =-1.3A, V <sub>GS</sub> =-10V(Note 1, 2)		21	27	nC
Gate Source Charge	Q <sub>GS</sub>			4.6		nC
Gate Drain Charge	Q <sub>GD</sub>			4		nC
Turn-ON Delay Time	t <sub>D(ON)</sub>	V <sub>DD</sub> =-30V, I <sub>D</sub> =-0.5A, R <sub>G</sub> =25Ω (Note 1, 2)		40	50	ns
Turn-ON Rise Time	t <sub>R</sub>			64	100	ns
Turn-OFF Delay Time	t <sub>D(OFF)</sub>			255	275	ns
Turn-OFF Fall-Time	t <sub>F</sub>			70	90	ns
<b>SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS</b>						
Maximum Body-Diode Continuous Current	I <sub>S</sub>				-9.4	A
Maximum Pulsed Drain-Source Diode Forward Current	I <sub>SM</sub>				-37.6	A
Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =-9.4A			-4.0	V

Notes: 1. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%  
2. Essentially independent of operating temperature

■ TEST CIRCUITS AND WAVEFORMS

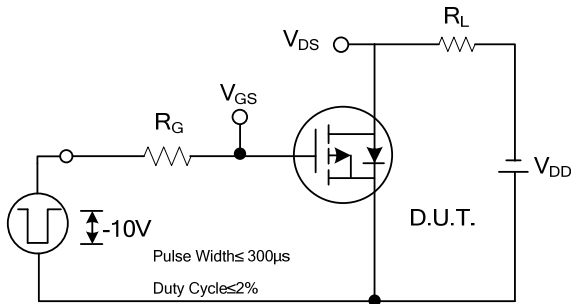


Peak Diode Recovery dv/dt Test Circuit

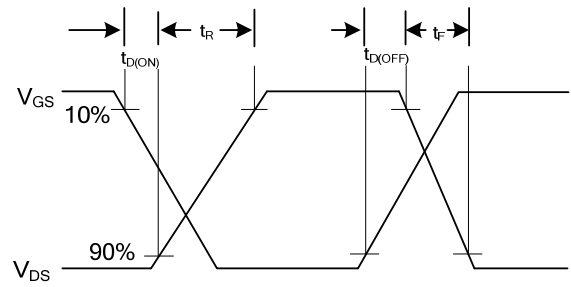


Peak Diode Recovery dv/dt Waveforms

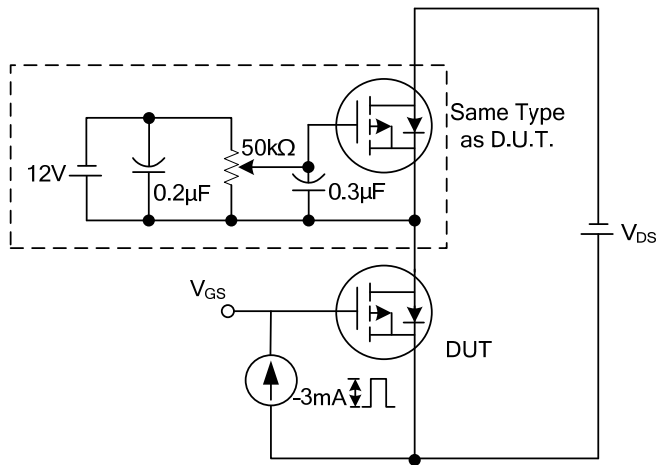
## TEST CIRCUITS AND WAVEFORMS (Cont.)



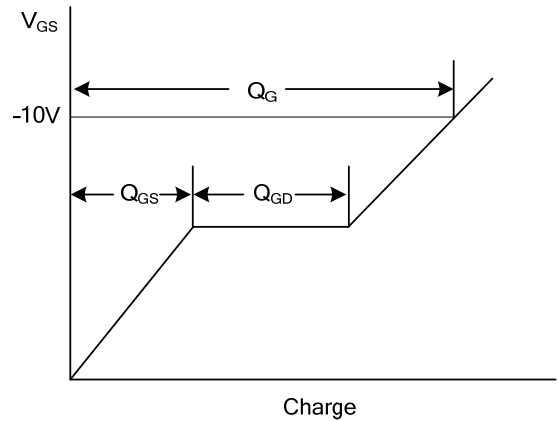
**Switching Test Circuit**



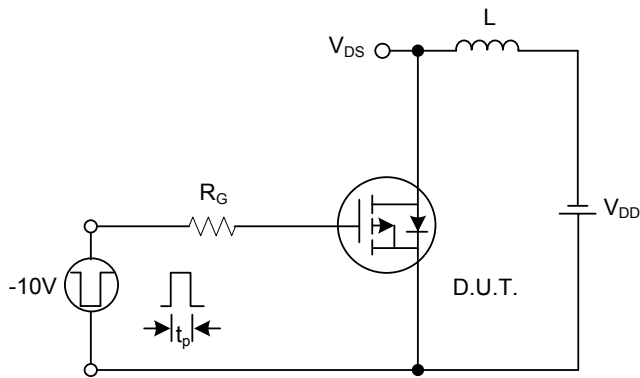
**Switching Waveforms**



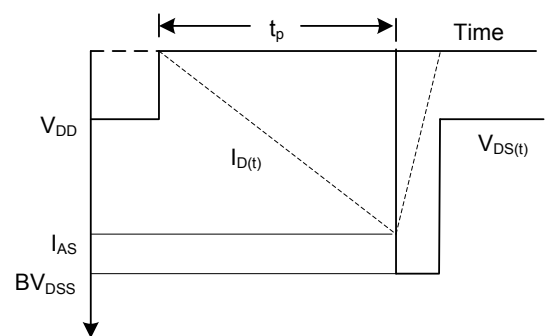
**Gate Charge Test Circuit**



**Gate Charge Waveform**

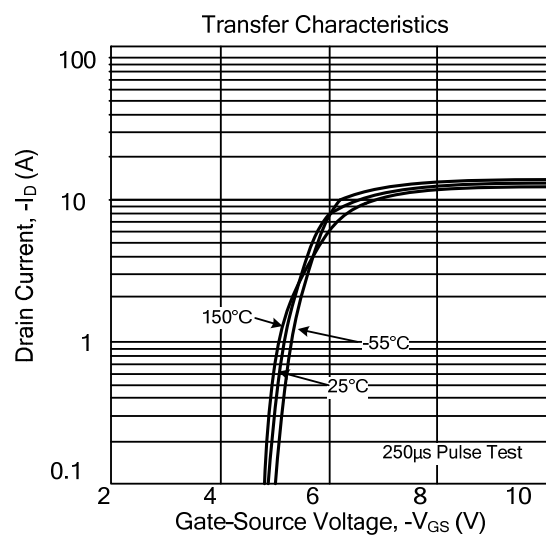
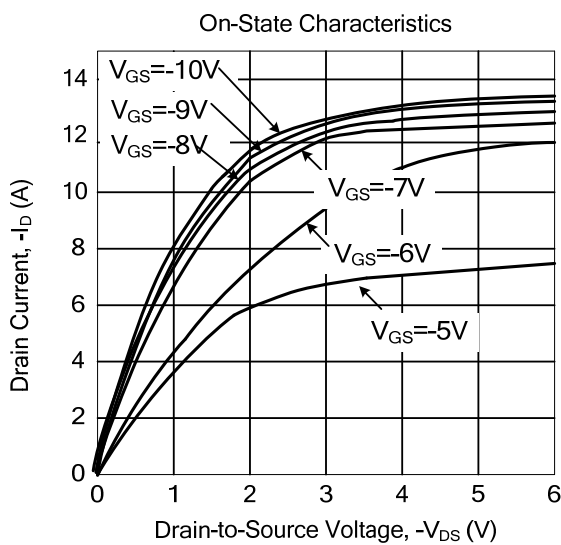
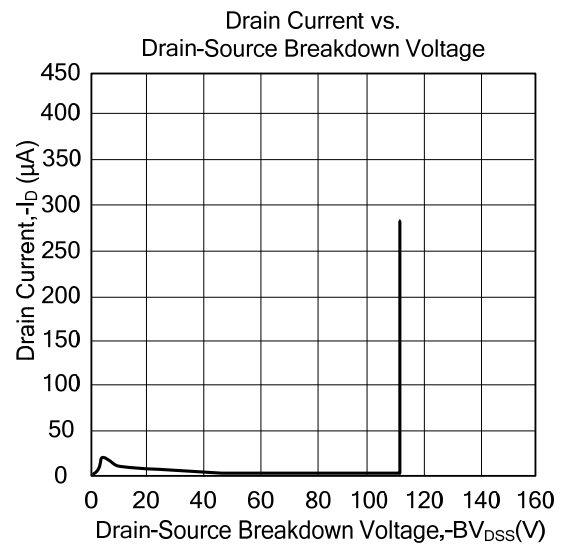
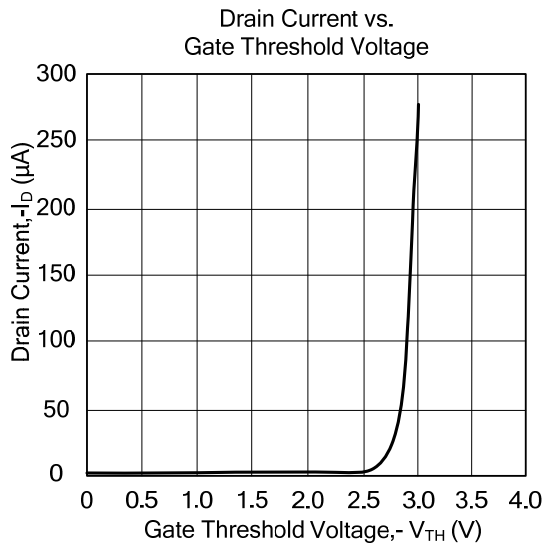
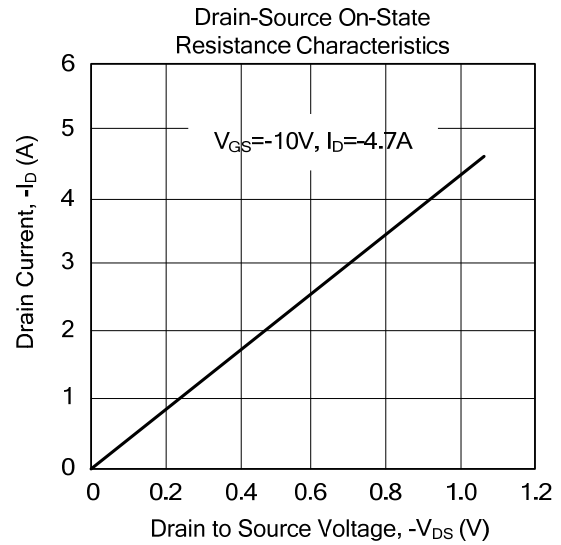
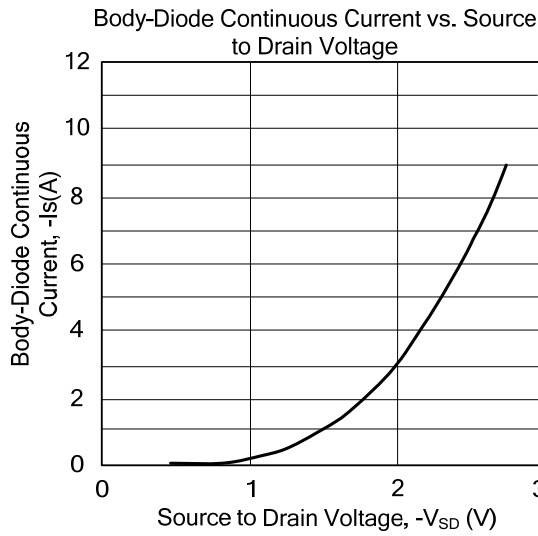


**Unclamped Inductive Switching Test Circuit**



**Unclamped Inductive Switching Waveforms**

## TYPICAL CHARACTERISTICS



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