



12P10

Power MOSFET

9.4A, 100V P-CHANNEL POWER MOSFET

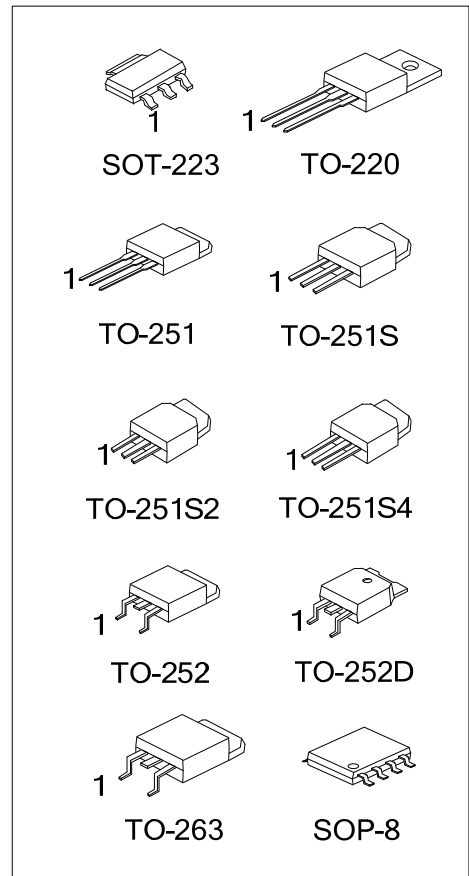
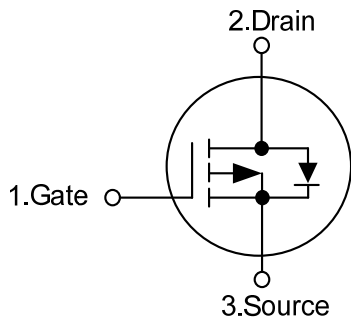
DESCRIPTION

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 (2) Package Type (3) Green Package</p> | <p>(1) R: Tape Reel, T: Tube (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 (3) G: Halogen Free and Lead Free, L: Lead Free</p> |
|--|---|

MARKING

| PACKAGE | MARKING |
|--|---|
| SOT-223 | <p>12P10G Data Code 1</p> |
| TO-220 TO-251 TO-251S TO-251S2 TO-251S4 TO-252 TO-252D TO-263 | <p>UTC 12P10 Lot Code Data Code 1</p> <p>L: Lead Free G: Halogen Free</p> |
| SOP-8 | <p>UTC 12P10G Date Code Lot Code 1</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} | ± 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. $I_{SD}\leq -11.5\text{A}$, $di/dt\leq 300\mu\text{A}/\text{s}$, $V_{DD}\leq BV_{DSS}$, Starting $T_J=25^{\circ}\text{C}$

■ THERMAL DATA

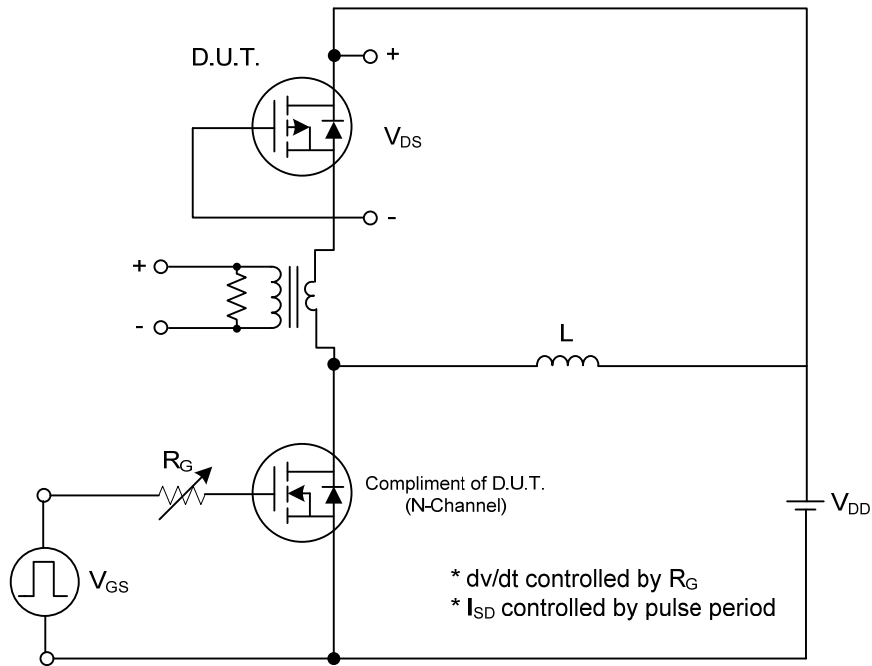
| PARAMETER | | SYMBOL | RATINGS | UNIT |
|---------------------|---|---------------|---------------|-----------------------------|
| Junction to Ambient | TO-220/TO-263 | θ_{JA} | 62.5 | $^{\circ}\text{C}/\text{W}$ |
| | TO-251/TO-251S TO-251S2/TO-251S4 TO-252/TO-252D | | 110 | $^{\circ}\text{C}/\text{W}$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

■ ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise specified)

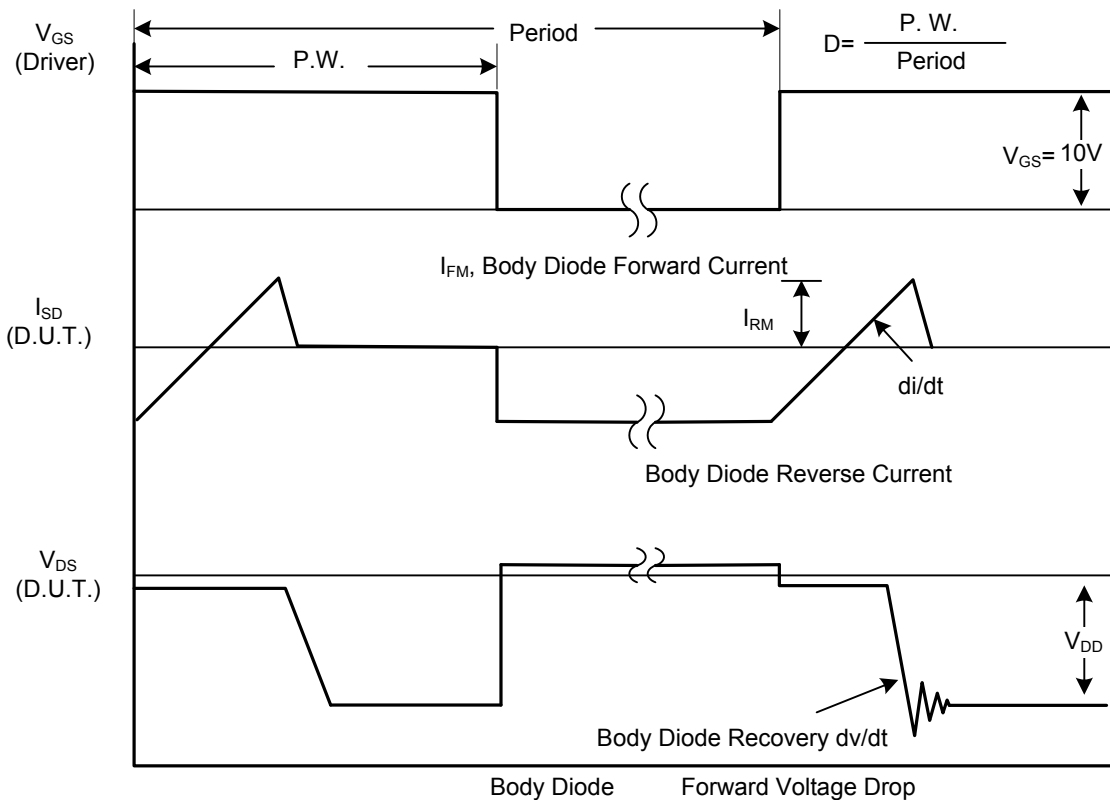
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|--|---------------------|---|------|------|-------|------|
| OFF CHARACTERISTICS | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | V _{GS} =0 V, I _D =-250μA | -100 | | | V |
| Drain-Source Leakage Current | I _{DSS} | V _{DS}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

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

■ TEST CIRCUITS AND WAVEFORMS

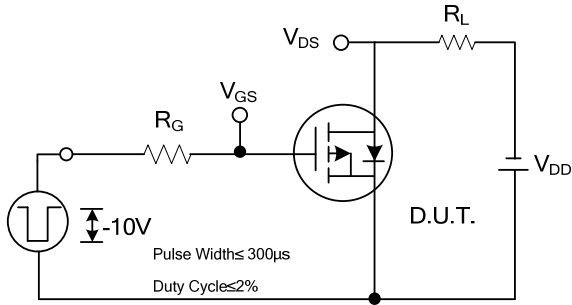


Peak Diode Recovery dv/dt Test Circuit

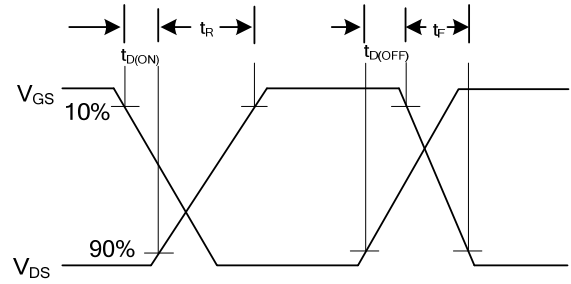


Peak Diode Recovery dv/dt Waveforms

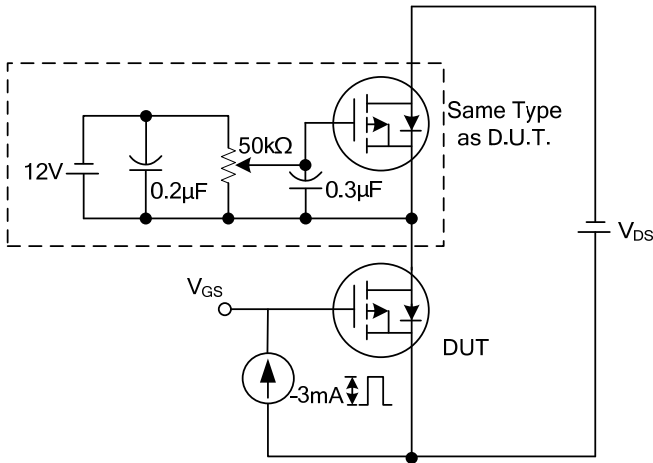
TEST CIRCUITS AND WAVEFORMS (Cont.)



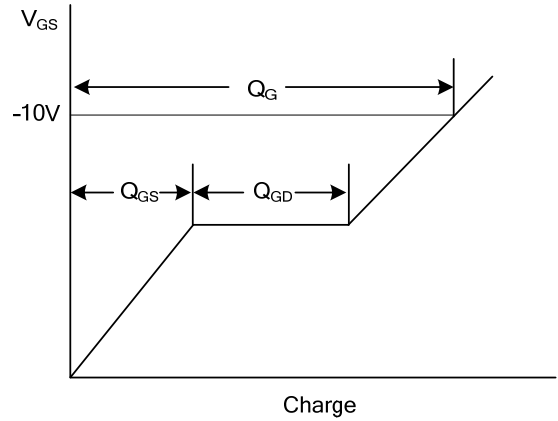
Switching Test Circuit



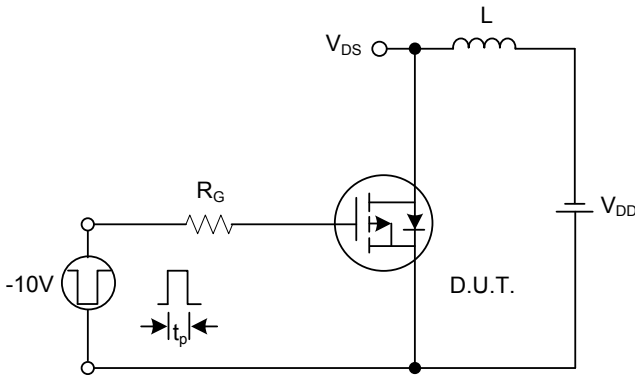
Switching Waveforms



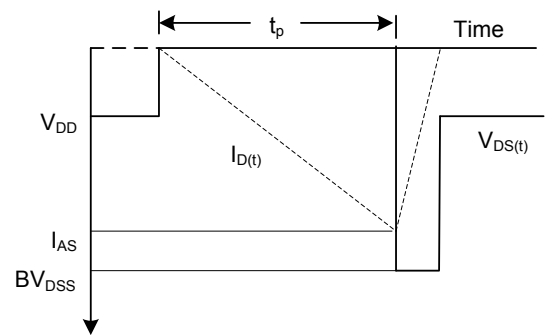
Gate Charge Test Circuit



Gate Charge Waveform

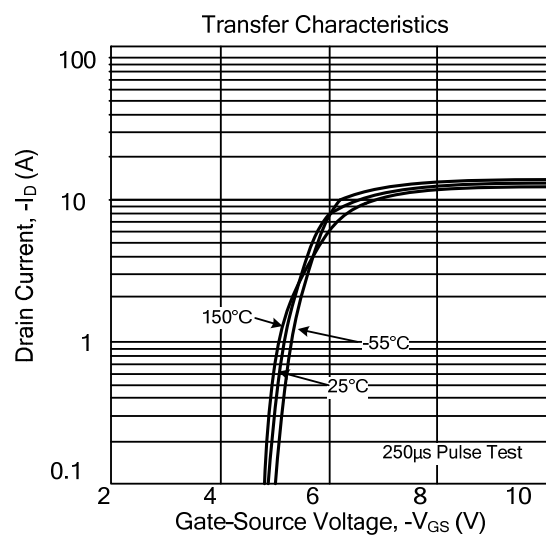
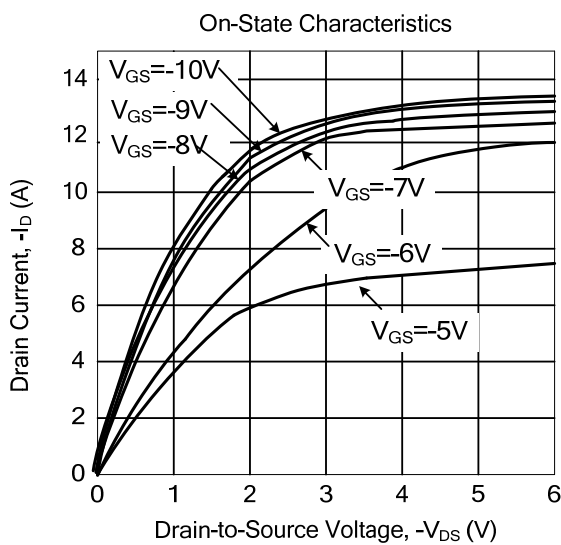
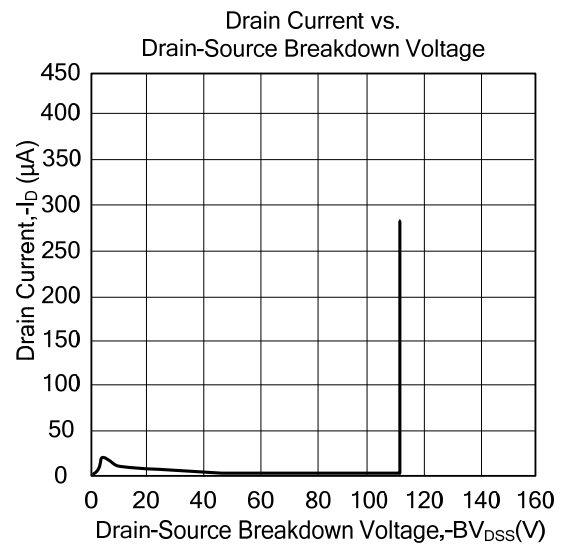
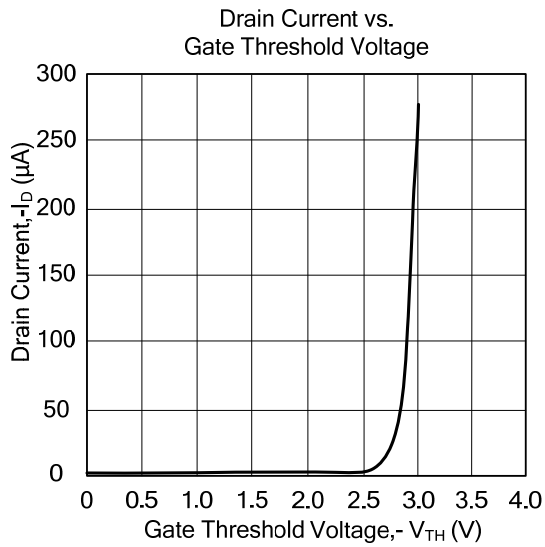
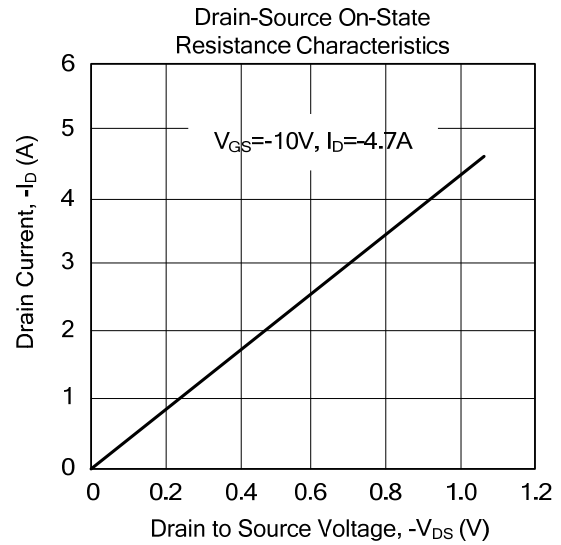
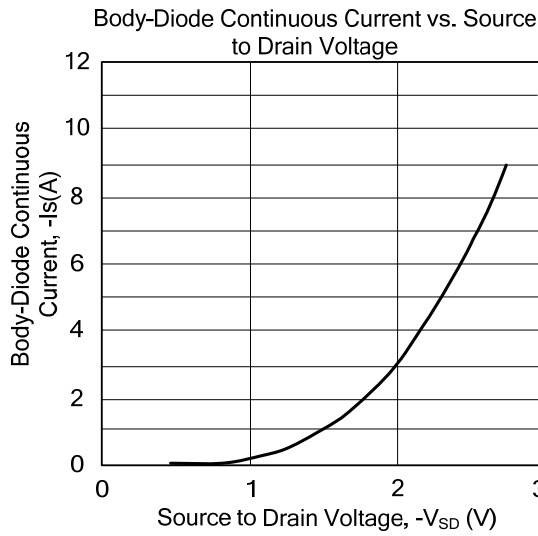


Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

TYPICAL CHARACTERISTICS



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