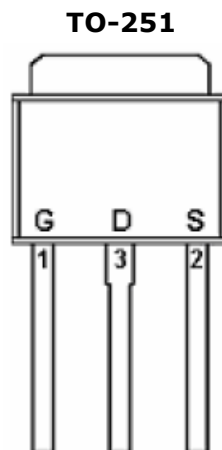
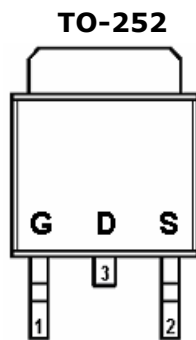
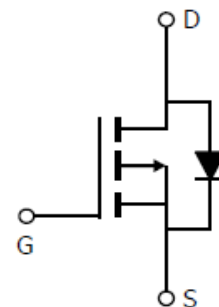


DESCRIPTION

STP413D is the P-Channel logic enhancement mode power field effect transistor which is produced using high cell density, DMOS trench technology. The STP413D has been designed specially to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low $R_{DS(ON)}$ and fast switching speed.

PIN CONFIGURATION (D-PAK)

FEATURE

- -40V/-12.0A, $R_{DS(ON)} = 36m\Omega$ (Typ.)
@ $V_{GS} = -10V$
- -40V/-8.0A, $R_{DS(ON)} = 52m\Omega$
@ $V_{GS} = -4.5V$
- Super high density cell design for extremely low $R_{DS(ON)}$
- Exceptional on-resistance and maximum DC current capability
- TO-252, TO-251 package design

PART MARKING


Y : Year Code
A : Perduce Code
Q : Process Code

STANSON TECHNOLOGY
120 Bentley Square, Mountain View, Ca 94040 USA
www.stansontech.com

**STP413D**

P Channel Enhancement Mode MOSFET

-12.0A

ABSOLUTE MAXIMUM RATINGS (Ta = 25°C Unless otherwise noted)

| Parameter | Symbol | Typical | Unit |
|--|--------|----------------|------|
| Drain-Source Voltage | VDSS | -40 | V |
| Gate-Source Voltage | VGSS | ±20 | V |
| Continuous Drain Current (TJ=150°C) | ID | -12.0 -10.0 | A |
| Pulsed Drain Current | IDM | -30 | A |
| Continuous Source Current (Diode Conduction) | IS | -12 | A |
| Power Dissipation | PD | 50 25 | W |
| Operation Junction Temperature | TJ | 150 | °C |
| Storage Temperature Range | TSTG | -55/150 | °C |
| Thermal Resistance-Junction to Ambient | RθJA | 60 | °C/W |



STP413D



P Channel Enhancement Mode MOSFET

-12.0A

ELECTRICAL CHARACTERISTICS (Ta = 25°C Unless otherwise noted)

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---------------------------------|---------------|--|------|------|-----------|------|
| Static | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}=0V, I_D=-250\mu A$ | -40 | | | V |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=-250\mu A$ | -1.0 | | -2.5 | V |
| Gate Leakage Current | I_{GSS} | $V_{DS}=0V, V_{GS}=\pm 20V$ | | | ± 100 | nA |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS}=-40V, V_{GS}=0V$ | | | -1 | uA |
| | | $V_{DS}=-40V, V_{GS}=0V$ $T_J=55^\circ C$ | | | -5 | |
| On-State Drain Current | $I_{D(on)}$ | $V_{DS} \geq -10V, V_{DS}=-5V$ | -30 | | | A |
| Drain-source On-Resistance | $R_{DS(on)}$ | $V_{GS}=-10V, I_D=-12A$ | | 36 | | mΩ |
| | | $V_{GS}=-4.5V, I_D=-8A$ | | 52 | | |
| Forward Transconductance | g_{fs} | $V_{DS}=-5V, I_D=-12A$ | | 23 | | S |
| Diode Forward Voltage | V_{SD} | $I_S=-1.0A, V_{GS}=0V$ | | | -1.0 | V |
| Dynamic | | | | | | |
| Total Gate Charge | Q_g | $V_{DS}=-10V, V_{DS}=-20V$ $I_D=-12A$ | | 16.5 | | nC |
| Gate-Source Charge | Q_{gs} | | | 3.8 | | |
| Gate-Drain Charge | Q_{gd} | | | 3.5 | | |
| Input Capacitance | C_{iss} | $V_{DS}=-20V, V_{GS}=0V$ $F=1MHz$ | | 900 | | pF |
| Output Capacitance | C_{oss} | | | 69 | | |
| Reverse Transfer Capacitance | C_{rss} | | | 115 | | |
| Turn-On Time | $t_{d(on)}$ | $V_{GS}=-10V, V_{DS}=-20V$ $R_L=1.6\Omega, R_{GEN}=3\Omega$ | | 6.9 | | nS |
| | t_r | | | 9 | | |
| Turn-Off Time | $t_{d(off)}$ | | | 44.8 | | |
| | t_f | | | 41.2 | | |

TYPICAL CHARACTERISTICS

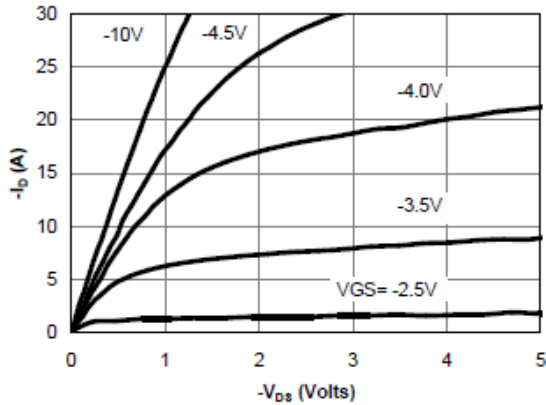


Figure 1: On-Region Characteristics

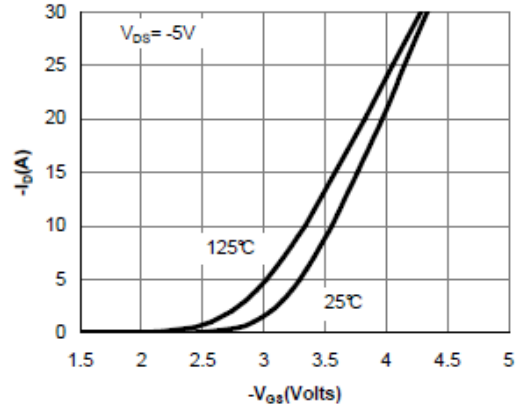


Figure 2: Transfer Characteristics

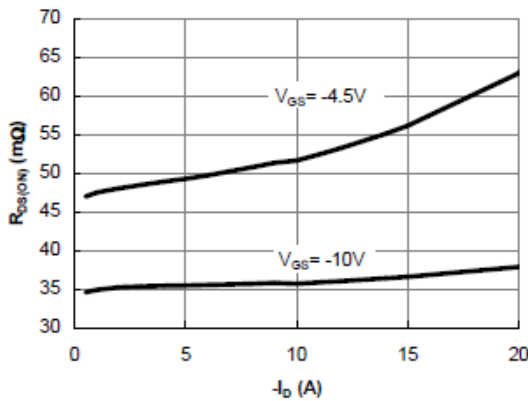


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

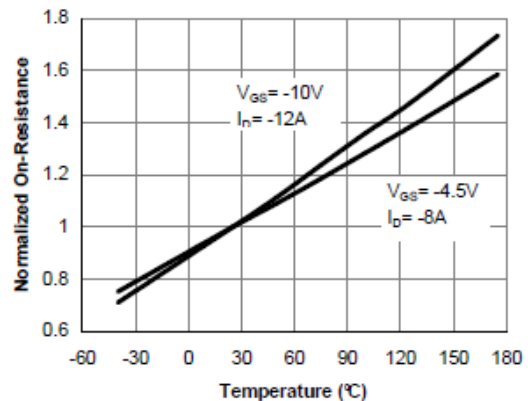


Figure 4: On-Resistance vs. Junction Temperature

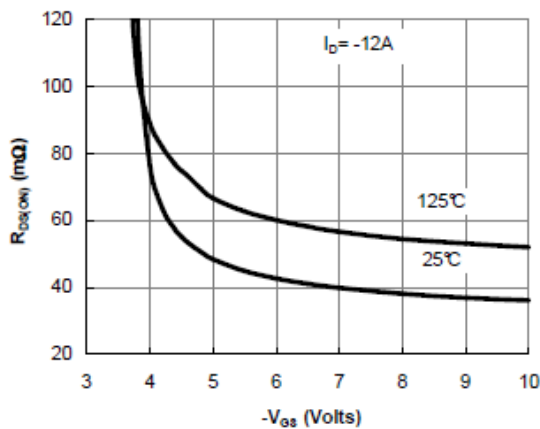


Figure 5: On-Resistance vs. Gate-Source Voltage

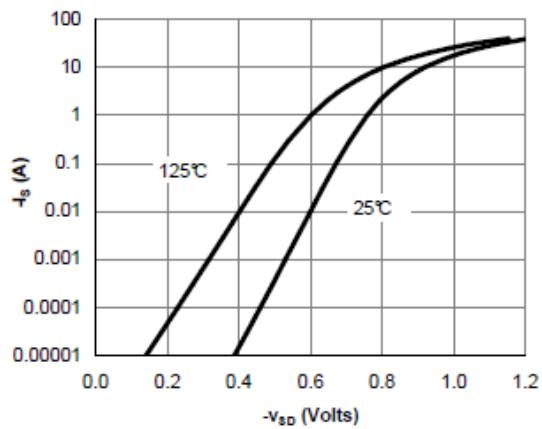


Figure 6: Body-Diode Characteristics

TYPICAL CHARACTERISTICS

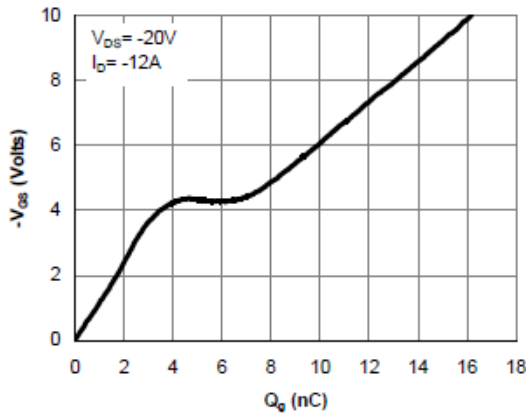


Figure 7: Gate-Charge Characteristics

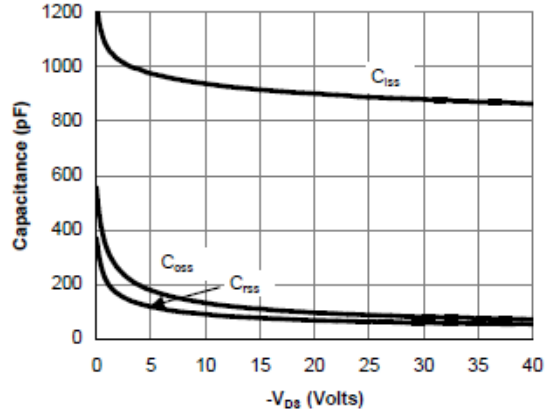


Figure 8: Capacitance Characteristics

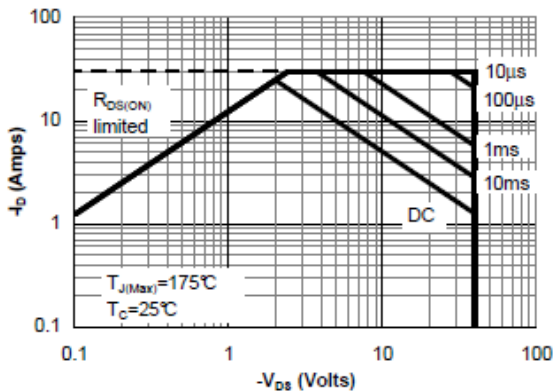


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

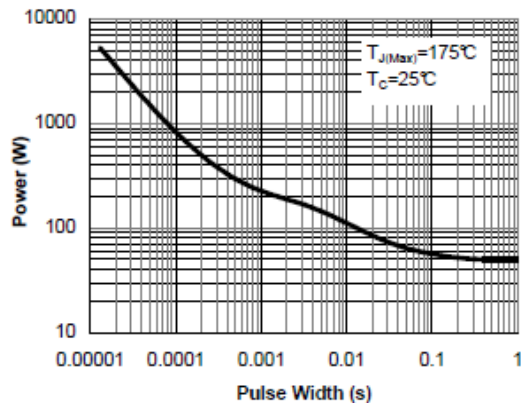


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

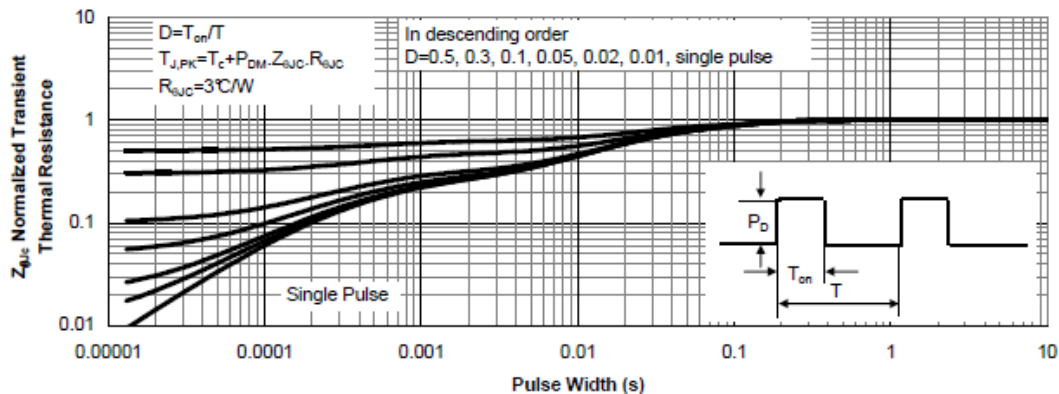


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL CHARACTERISTICS

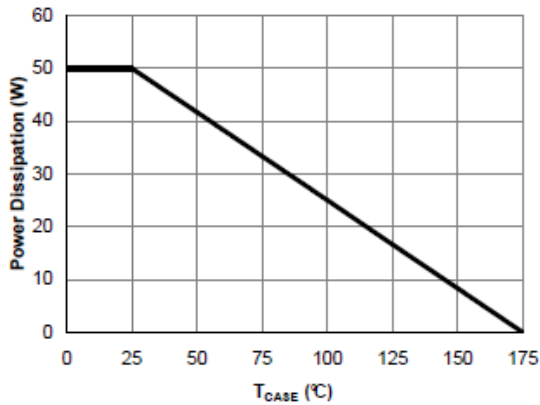


Figure 12: Power De-rating (Note B)

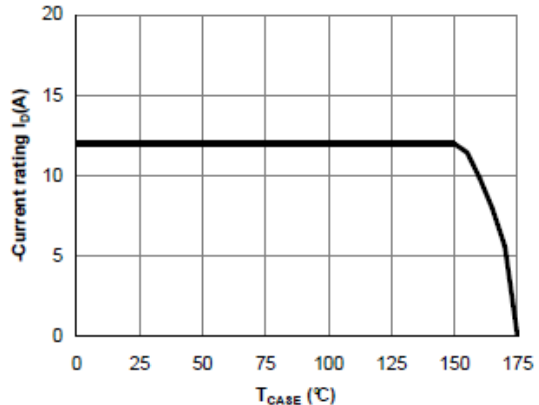


Figure 13: Current De-rating (Note B)

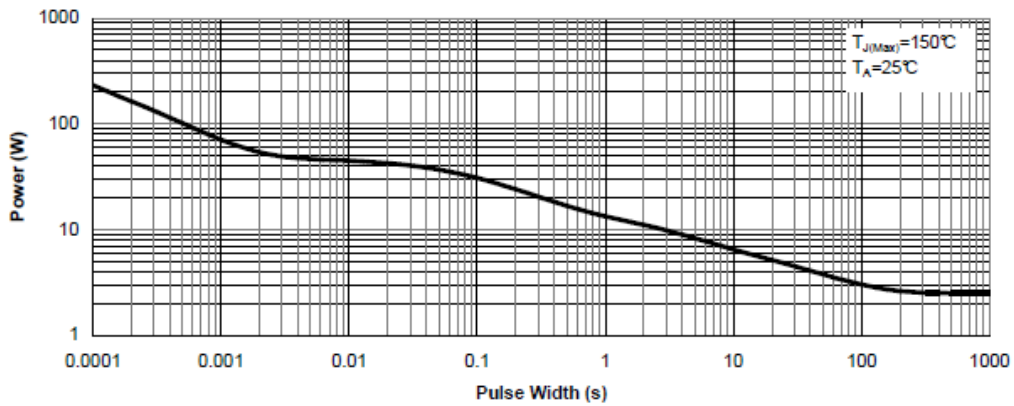


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note G)

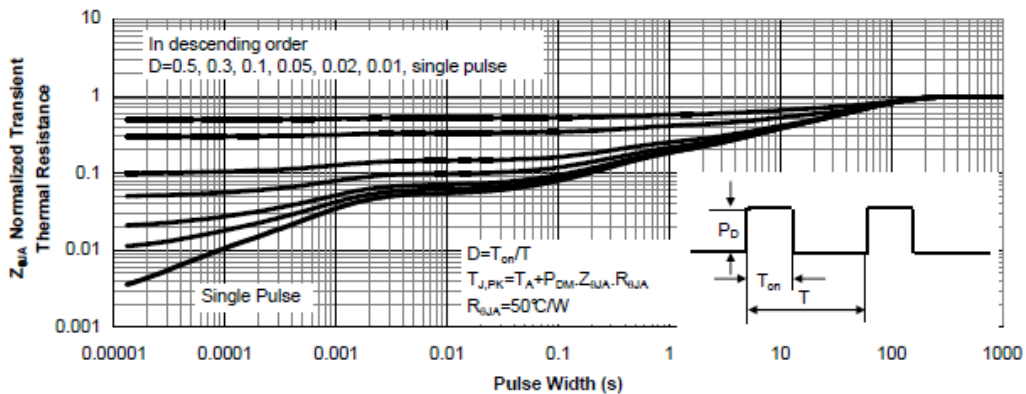
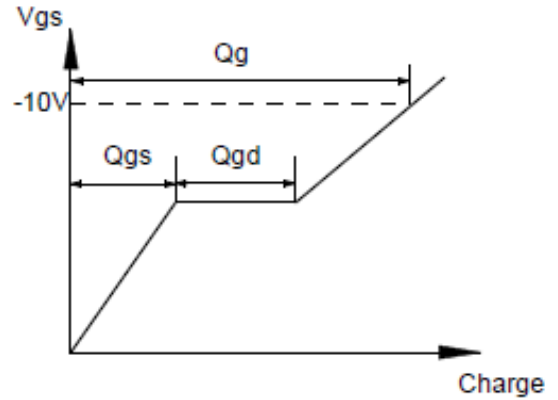
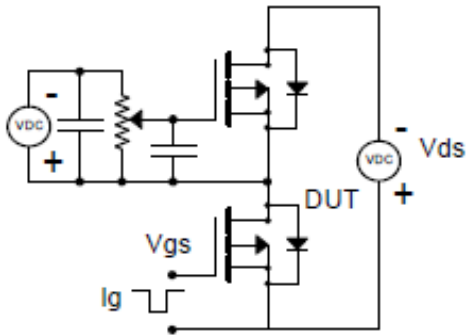
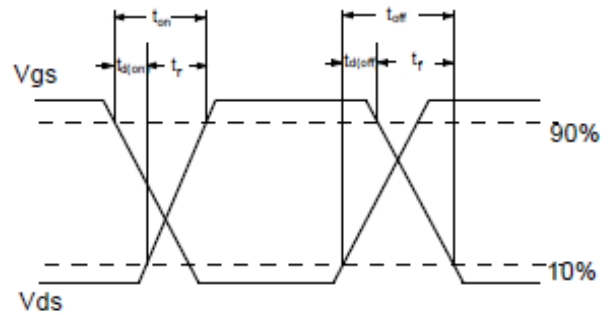
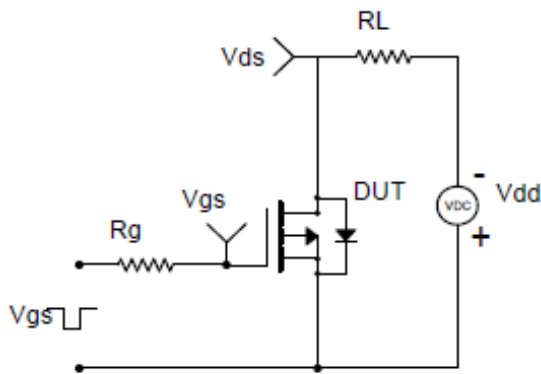


Figure 15: Normalized Maximum Transient Thermal Impedance (Note G)

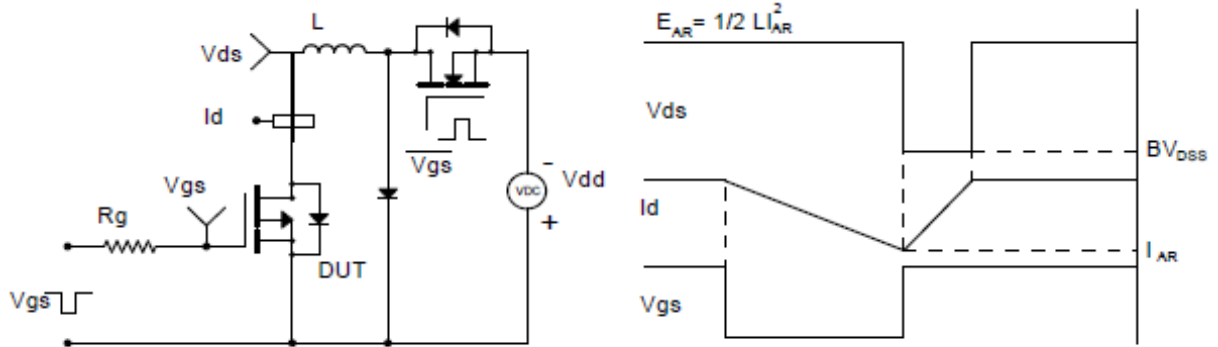
GATE CHARGE TEST CIRCUIT & WAVEFORM



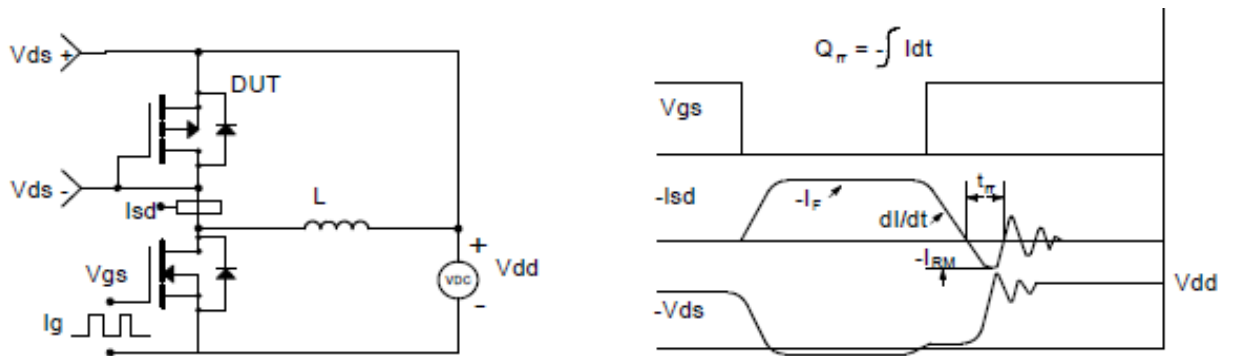
RESISTIVE SWITCHING TEST CIRCUIT & WAVEFORMS

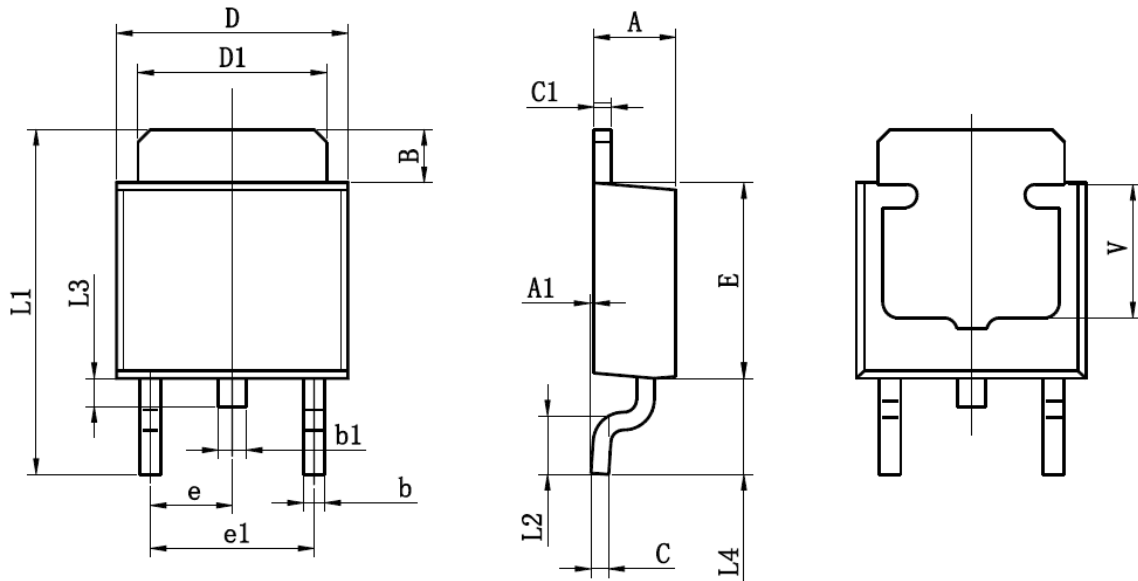


UNCLAMPED INDUCTIVE SWITCHING (UIS) TEST CIRCUIT & WAVEFORMS

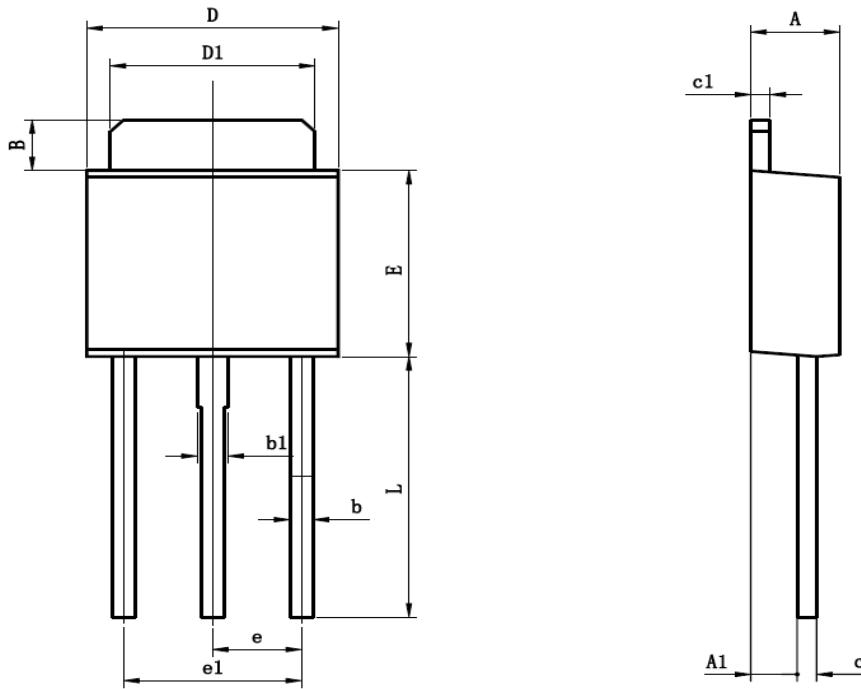


DIODE RECOVERY TEST CIRCUIT & WAVEFORMS



TO-252-2L PACKAGE OUTLINE SOP-8P


| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 2.200 | 2.400 | 0.087 | 0.094 |
| A1 | 0.000 | 0.127 | 0.000 | 0.005 |
| B | 1.350 | 1.650 | 0.053 | 0.065 |
| b | 0.500 | 0.700 | 0.020 | 0.028 |
| b1 | 0.700 | 0.900 | 0.028 | 0.035 |
| c | 0.430 | 0.580 | 0.017 | 0.023 |
| c1 | 0.430 | 0.580 | 0.017 | 0.023 |
| D | 6.350 | 6.650 | 0.250 | 0.262 |
| D1 | 5.200 | 5.400 | 0.205 | 0.213 |
| E | 5.400 | 5.700 | 0.213 | 0.224 |
| e | 2.300TYP | | 0.091TYP | |
| e1 | 4.500 | 4.700 | 0.177 | 0.185 |
| L1 | 9.500 | 9.900 | 0.374 | 0.390 |
| L2 | 1.400 | 1.780 | 0.055 | 0.070 |
| L3 | 0.650 | 0.950 | 0.026 | 0.037 |
| L4 | 2.550 | 2.900 | 0.100 | 0.114 |
| V | 3.80REF | | 0.150REF | |

TO-251 PACKAGE OUTLINE SOP-8P


| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 2.200 | 2.400 | 0.087 | 0.094 |
| A1 | 1.020 | 1.270 | 0.040 | 0.050 |
| B | 1.350 | 1.650 | 0.053 | 0.065 |
| b | 0.500 | 0.700 | 0.020 | 0.028 |
| b1 | 0.700 | 0.900 | 0.028 | 0.035 |
| c | 0.430 | 0.580 | 0.017 | 0.023 |
| c1 | 0.430 | 0.580 | 0.017 | 0.023 |
| D | 6.350 | 6.650 | 0.250 | 0.262 |
| D1 | 5.200 | 5.400 | 0.205 | 0.213 |
| E | 5.400 | 5.700 | 0.213 | 0.224 |
| e | 2.300TYP | | 0.091TYP | |
| e1 | 4.500 | 4.700 | 0.177 | 0.185 |
| L | 7.500 | 7.900 | 0.295 | 0.311 |