



STB16PF06L

P-CHANNEL 60V - 0.11Ω - 16A D2PAK

STripFET™ MOSFET

Table 1: General Features

| TYPE | V _{DSS} | R _{DS(on)} | I _D | P _w |
|------------|------------------|---------------------|----------------|----------------|
| STB16PF06L | 60 V | < 0.125 Ω | 16 A | 70 W |

- TYPICAL R_{DS(on)} = 0.11 Ω
- LOW THRESHOLD DEVICE
- LOW GATE CHARGE

DESCRIPTION

This MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

APPLICATIONS

- MOTOR CONTROL
- DC-DC CONVERTERS

Table 2: Order Codes

| PART NUMBER | MARKING | PACKAGE | PACKAGING |
|--------------|----------|--------------------|-------------|
| STB16PF06LT4 | B16PF06L | D ² PAK | TAPE & REEL |

Figure 1: Package

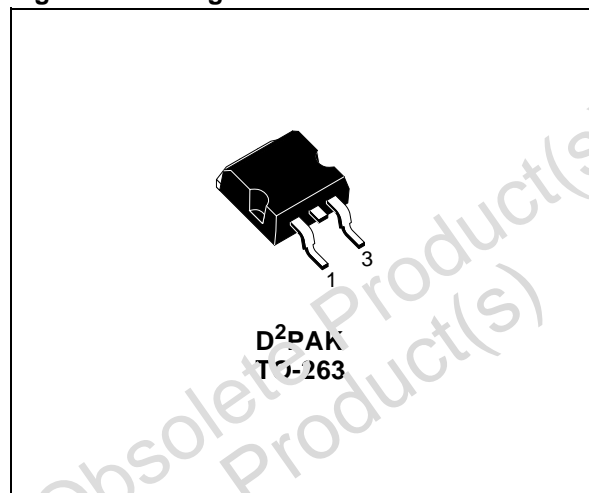


Figure 2: Internal Schematic Diagram

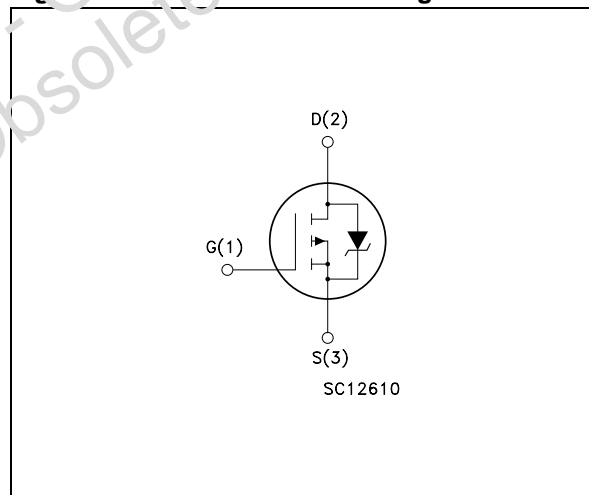


Table 3: Absolute Maximum ratings

| Symbol | Parameter | Value | Unit |
|--------------------|---|-------------|------|
| V_{DS} | Drain-source Voltage ($V_{GS} = 0$) | 60 | V |
| V_{DGR} | Drain-gate Voltage ($R_{GS} = 20 \text{ k}\Omega$) | 60 | V |
| V_{GS} | Gate-source Voltage | ± 16 | V |
| I_D | Drain Current (continuous) at $T_C = 25^\circ\text{C}$ | 16 | A |
| I_D | Drain Current (continuous) at $T_C = 100^\circ\text{C}$ | 11.4 | A |
| $I_{DM}(\bullet)$ | Drain Current (pulsed) | 64 | A |
| P_{TOT} | Total Dissipation at $T_C = 25^\circ\text{C}$ | 70 | W |
| | Derating Factor | 0.4 | W/°C |
| dv/dt (1) | Peak Diode Recovery voltage slope | 20 | V/ns |
| E_{AS} (2) | Single Pulse Avalanche Energy | 250 | mJ |
| T_j T_{stg} | Operating Junction Temperature Storage Temperature | - 55 to 175 | °C |

(●) Pulse width limited by safe operating area

(1) $I_{SD} \leq 16\text{A}$, $di/dt \leq 100\text{A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$, $T_j \leq T_{JMAX}$.

(2) Starting $T_j = 25^\circ\text{C}$, $I_D = 8 \text{ A}$, $V_{DD} = 30 \text{ V}$

Note: For the P-CHANNEL MOSFET actual polarity of voltages and current has to be reverse

Table 4: Thermal Data

| | | | |
|-------------|--|------|------|
| Rthj-case | Thermal Resistance Junction-case Max | 2.14 | °C/W |
| Rthj-PCB(#) | Thermal Resistance Junction-PCB Max | 34 | °C/W |
| T_l | Maximum Lead Temperature For Soldering Purpose (1.6 mm from case, for 10sec) | 300 | °C |

(#) When Mounted on 1 inch² FR-4 board, 2 oz of Cu

ELECTRICAL CHARACTERISTICS ($T_{CASE} = 25^\circ\text{C}$ UNLESS OTHERWISE SPECIFIED)**Table 5: On/Off**

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------|--|---|------|---------------|----------------|--------------------------------|
| $V_{(BR)DSS}$ | Drain-source Breakdown Voltage | $I_D = 250\mu\text{A}$, $V_{GS} = 0$ | 60 | | | V |
| I_{DSS} | Zero Gate Voltage Drain Current ($V_{GS} = 0$) | $V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating}$, $T_C = 125^\circ\text{C}$ | | | 1 10 | μA μA |
| I_{GSS} | Gate-body Leakage Current ($V_{DS} = 0$) | $V_{GS} = \pm 16\text{V}$ | | | ± 100 | nA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}$, $I_D = 100\mu\text{A}$ | 1.5 | | | V |
| $R_{DS(on)}$ | Static Drain-source On Resistance | $V_{GS} = 10\text{V}$, $I_D = 8 \text{ A}$ $V_{GS} = 5\text{V}$, $I_D = 8 \text{ A}$ | | 0.11 0.130 | 0.125 0.165 | Ω Ω |

ELECTRICAL CHARACTERISTICS (CONTINUED)

Table 6: Dynamic

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|--|---|------|---------------------------|------|----------------------|
| g_{fs} | Forward Transconductance | $V_{DS} = 10\text{ V}, I_D = 3\text{ A}$ | | 7.2 | | S |
| C_{iss} C_{oss} C_{rss} | Input Capacitance Output Capacitance Reverse Transfer Capacitance | $V_{DS} = 25\text{ V}, f = 1\text{ MHz}, V_{GS} = 0$ | | 630 121 49 | | pF pF pF |
| $t_{d(on)}$ t_r $t_{d(off)}$ t_f | Turn-on Delay Time Rise Time Turn-off Delay Time Fall Time | $V_{DD} = 30\text{ V}, I_D = 8\text{ A}, R_G = 4.7\Omega$ $V_{GS} = 4.5\text{ V}$ (Resistive Load , Figure 1) | | 129 90 25.5 19.5 | | ns ns ns ns |
| Q_g Q_{gs} Q_{gd} | Total Gate Charge Gate-Source Charge Gate-Drain Charge | $V_{DD} = 48\text{ V}, I_D = 16\text{ A},$ $V_{GS} = 4.5\text{ V}$ (See test circuit, Figure 2) | | 11.4 5.2 4.7 | 15.5 | nC nC nC |

Table 7: Source Drain Diode

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-----------------------------------|--|---|------|---------------------|----------|---------------|
| I_{SD} $I_{SDM} (2)$ | Source-drain Current Source-drain Current (pulsed) | | | | 16 64 | A A |
| $V_{SD} (1)$ | Forward On Voltage | $I_{SD} = 8\text{ A}, V_{GS} = 0$ | | | 1.3 | V |
| t_{rr} Q_{rr} I_{RRM} | Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current | $I_{SD} = 16\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 20\text{ V}, T_j = 150^\circ\text{C}$ (see test circuit, Figure 3) | | 48.5 87.3 3.6 | | ns nC A |

Note: 1. Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %.

2. Pulse width limited by safe operating area.

Figure 3: Safe Operating Area

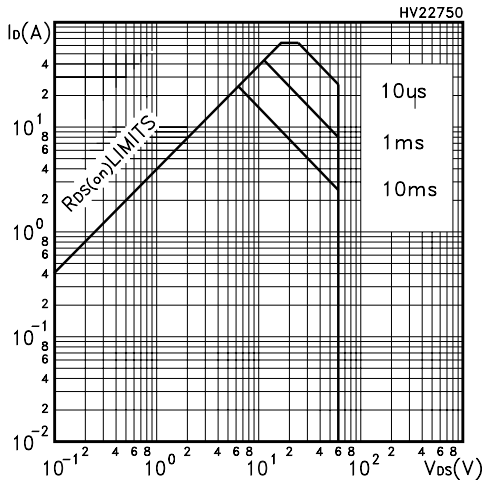


Figure 4: Output Characteristics

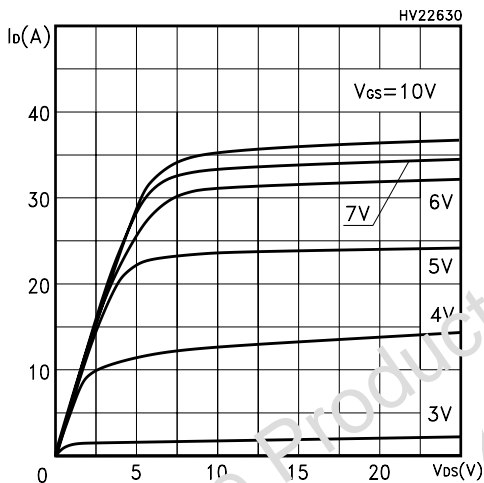


Figure 5: Transconductance

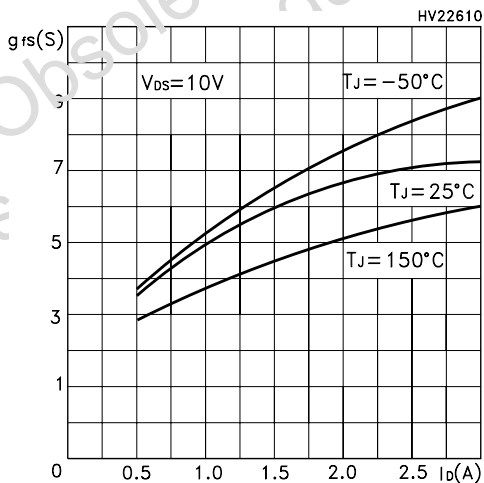


Figure 6: Thermal Impedance

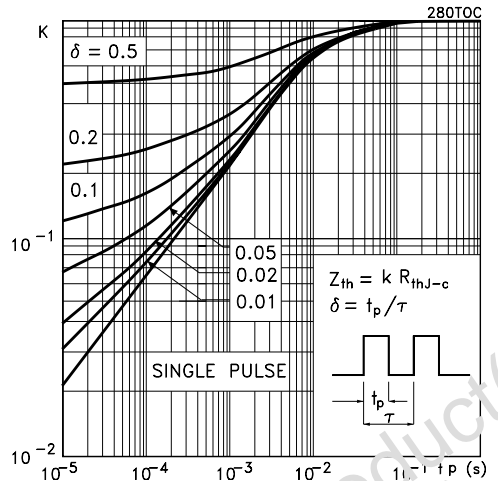


Figure 7: Transfer Characteristics

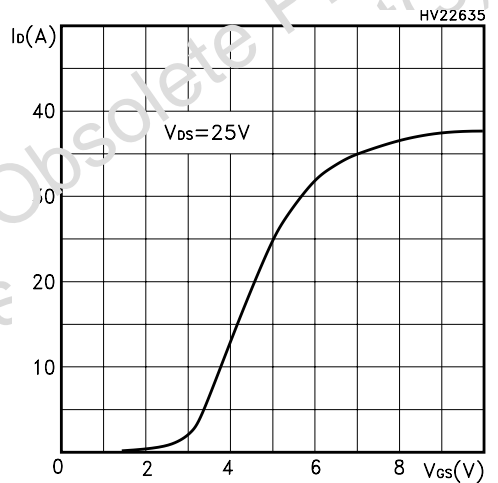


Figure 8: Static Drain-source On Resistance

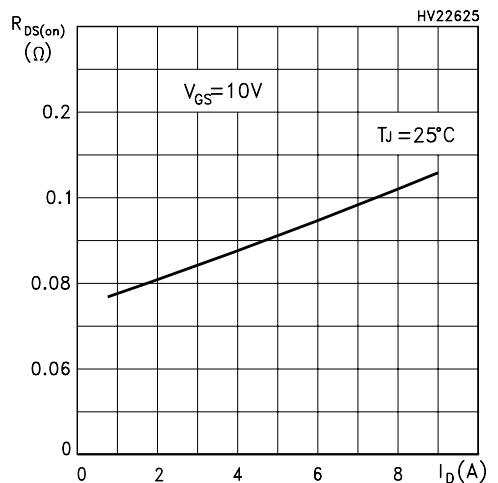


Figure 9: Gate Charge vs Gate-source Voltage

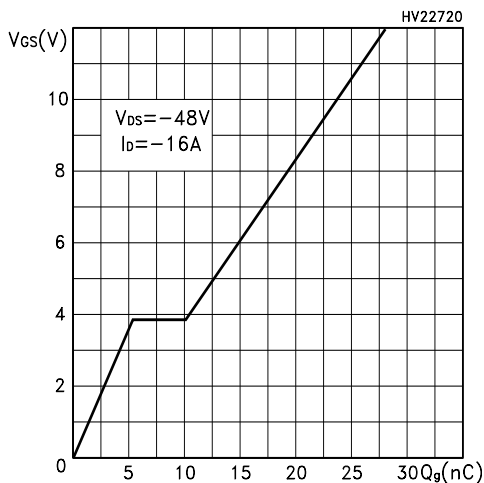


Figure 10: Normalized Gate Threshold Voltage vs Temperature

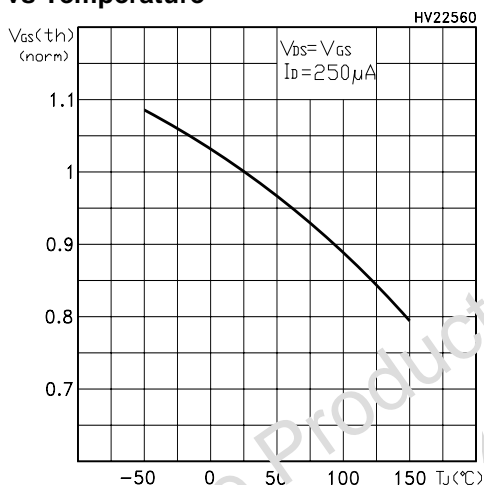


Figure 11: Dource-Drain Diode Forward Characteristics

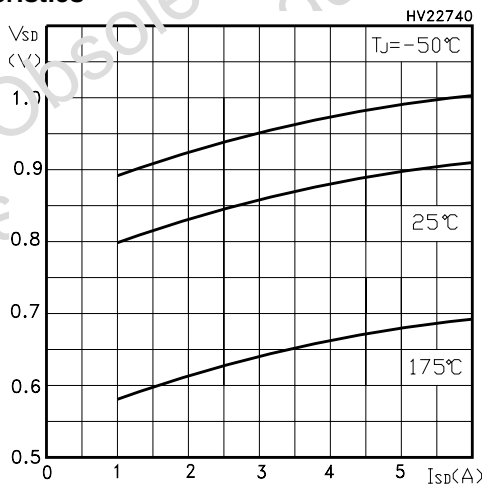


Figure 12: Capacitance Variations

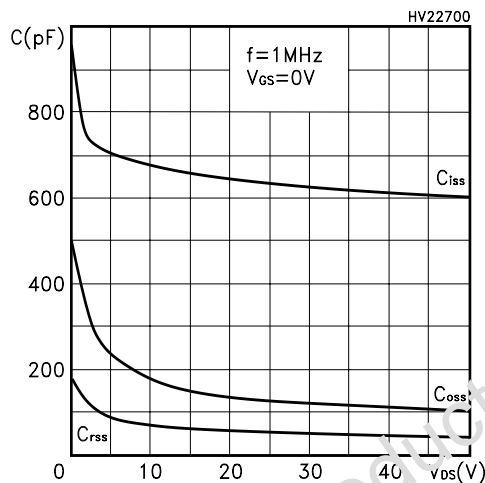


Figure 13: Normalized On Resistance vs Temperature

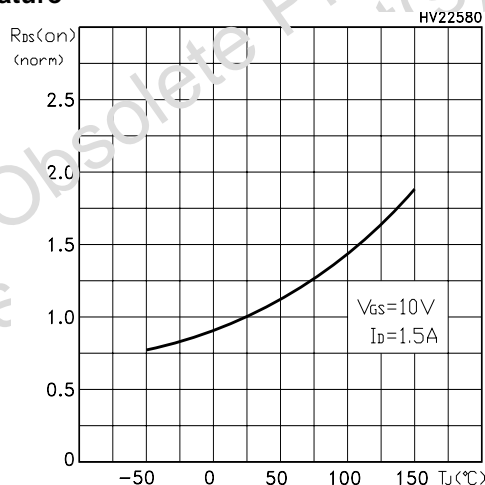


Figure 14: Normalized Breakdown Voltage vs Temperature

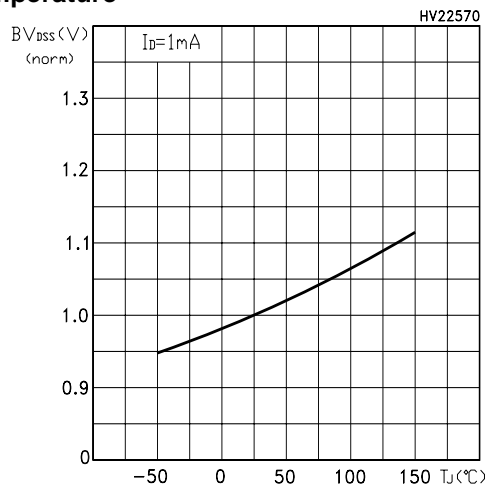


Figure 15: Unclamped Inductive Load Test Circuit

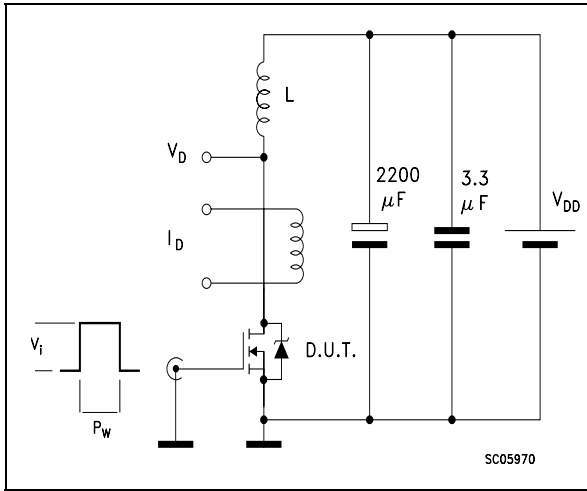


Figure 16: Switching Times Test Circuit For Resistive Load

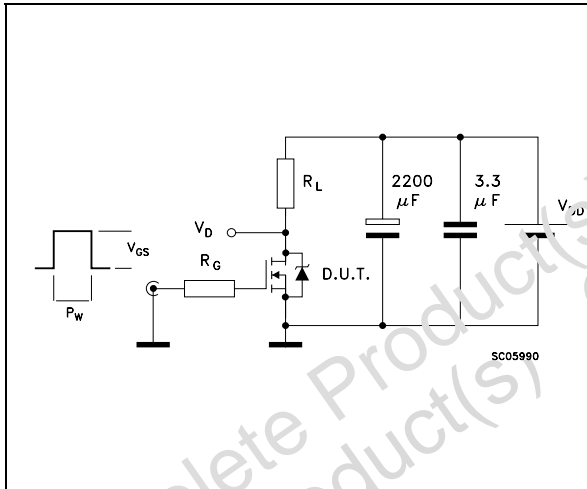


Figure 17: Test Circuit For Inductive Load Switching and Diode Recovery Times

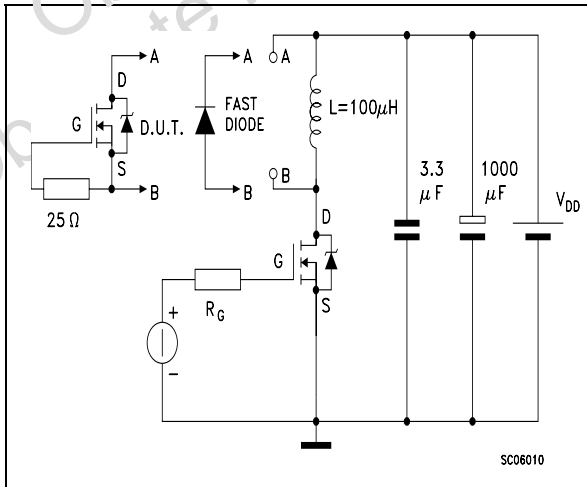


Figure 18: Unclamped Inductive Waferform

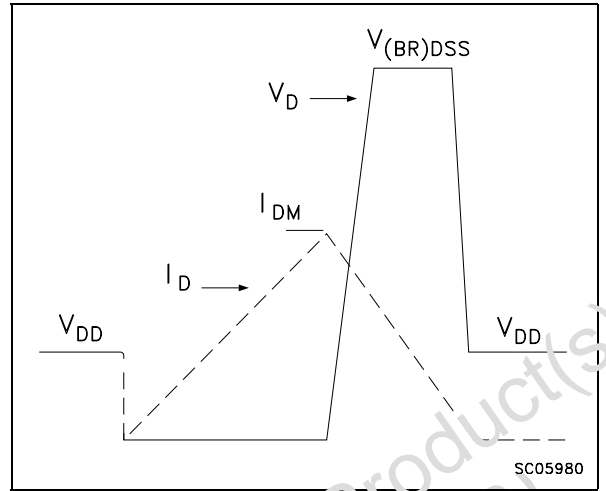
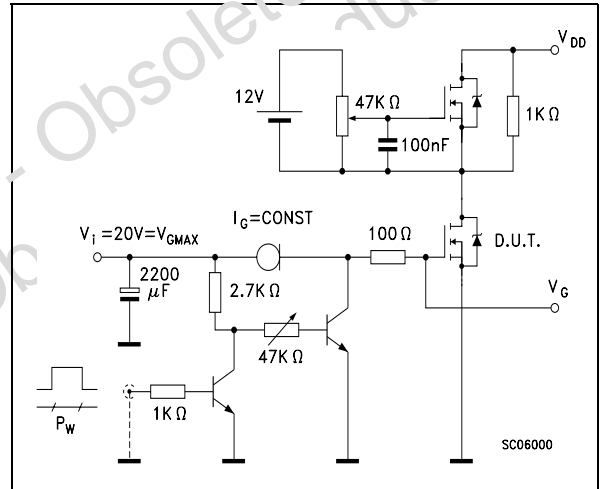
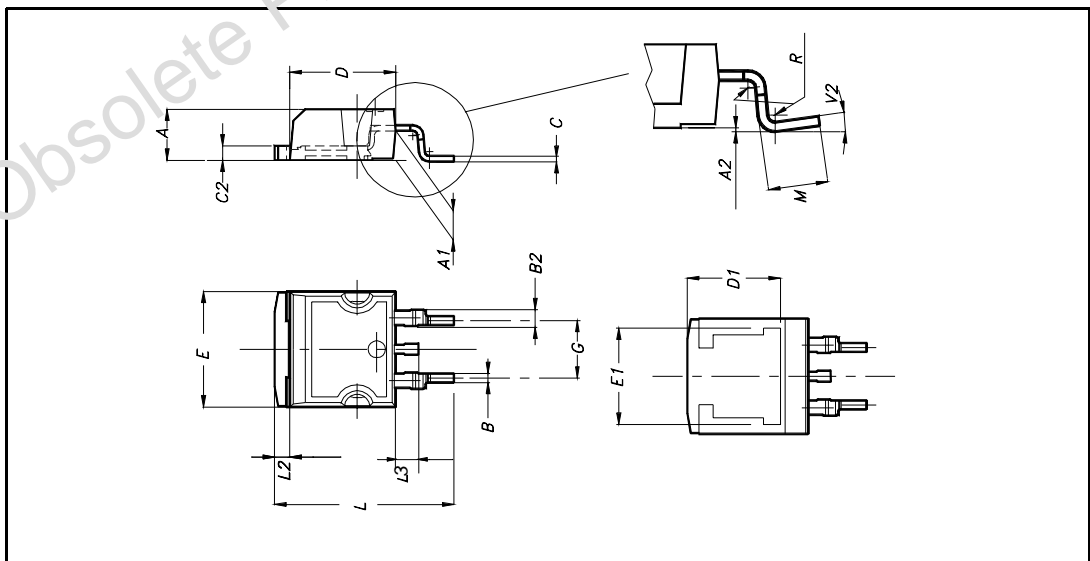


Figure 19: Gate Charge Test Circuit

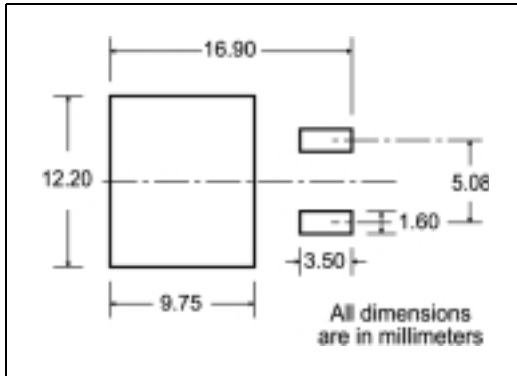


D²PAK MECHANICAL DATA

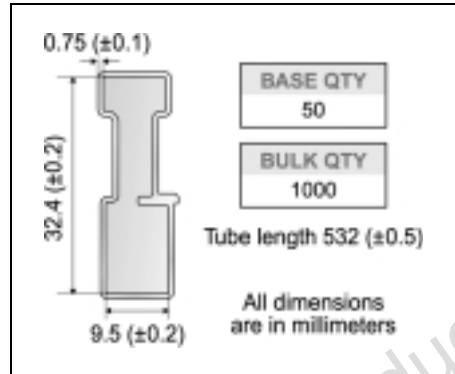
| DIM. | mm. | | | inch | | |
|------|------|-----|-------|-------|-------|-------|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | 4.4 | | 4.6 | 0.173 | | 0.181 |
| A1 | 2.49 | | 2.69 | 0.098 | | 0.106 |
| A2 | 0.03 | | 0.23 | 0.001 | | 0.009 |
| B | 0.7 | | 0.93 | 0.027 | | 0.036 |
| B2 | 1.14 | | 1.7 | 0.044 | | 0.067 |
| C | 0.45 | | 0.6 | 0.017 | | 0.023 |
| C2 | 1.23 | | 1.36 | 0.048 | | 0.053 |
| D | 8.95 | | 9.35 | 0.352 | | 0.368 |
| D1 | | 8 | | | 0.315 | |
| E | 10 | | 10.4 | 0.393 | | |
| E1 | | 8.5 | | | 0.334 | |
| G | 4.88 | | 5.28 | 0.192 | | 0.208 |
| L | 15 | | 15.85 | 0.590 | | 0.625 |
| L2 | 1.27 | | 1.4 | 0.050 | | 0.055 |
| L3 | 1.4 | | 1.75 | 0.055 | | 0.068 |
| M | 2.4 | | 3.2 | 0.094 | | 0.126 |
| R | | 0.4 | | | 0.015 | |
| V2 | 0° | | 4° | | | |



D²PAK FOOTPRINT



TUBE SHIPMENT (no suffix)*



TAPE AND REEL SHIPMENT (suffix "T4")*

TAPE MECHANICAL DATA

| DIM. | mm | | inch | |
|------|------|------|--------|--------|
| | MIN. | MAX. | MIN. | MAX. |
| A0 | 10.5 | 10.7 | 0.413 | 0.421 |
| P0 | 15.7 | 15.9 | 0.618 | 0.626 |
| D | 1.5 | 1.6 | 0.059 | 0.063 |
| D1 | 1.59 | 1.61 | 0.062 | 0.063 |
| E | 1.65 | 1.85 | 0.065 | 0.073 |
| F | 11.4 | 11.6 | 0.449 | 0.456 |
| K0 | 4.8 | 5.0 | 0.189 | 0.197 |
| P0 | 3.9 | 4.1 | 0.153 | 0.161 |
| P1 | 11.9 | 12.1 | 0.468 | 0.476 |
| P2 | 1.9 | 2.1 | 0.075 | 0.082 |
| R | 50 | | 1.574 | |
| T | 0.25 | 0.35 | 0.0098 | 0.0137 |
| W | 23.7 | 24.3 | 0.933 | 0.956 |

REEL MECHANICAL DATA

| DIM. | mm | | inch | |
|------|------|------|-------|--------|
| | MIN. | MAX. | MIN. | MAX. |
| A | | 330 | | 12.992 |
| B | 1.5 | | 0.059 | |
| C | 12.8 | 13.2 | 0.504 | 0.520 |
| D | 20.2 | | 0.795 | |
| G | 24.4 | 26.4 | 0.960 | 1.039 |
| N | 100 | | 3.937 | |
| T | | 30.4 | | 1.197 |

| BASE QTY | BULK QTY |
|----------|----------|
| 1000 | 1000 |

* on sales type

Table 8: Revision History

| Date | Revision | Description of Changes |
|-------------|----------|------------------------|
| 13/Sep/2004 | 1 | First Release. |

Obsolete Product(s) - Obsolete Product(s)
Obsolete Product(s) - Obsolete Product(s)

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