



## STD25NF10

### N-CHANNEL 100V - 0.041Ω - 25A DPAK LOW GATE CHARGE STripFET™ POWER MOSFET

| TYPE      | V <sub>DSS</sub> | R <sub>DS(on)</sub> | I <sub>D</sub> |
|-----------|------------------|---------------------|----------------|
| STD25NF10 | 100 V            | < 0.048 Ω           | 25 A           |

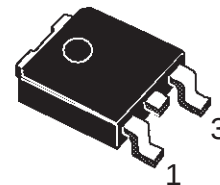
- TYPICAL R<sub>DS(on)</sub> = 0.041Ω
- EXCEPTIONAL dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- APPLICATION ORIENTED CHARACTERIZATION

#### DESCRIPTION

This Power Mosfet series realized with STMicroelectronics unique STripFET process has specifically been designed to minimize input capacitance and gate charge. It is therefore suitable as primary switch in advanced high-efficiency isolated DC-DC converters for Telecom and Computer application. It is also intended for any application with low gate charge drive requirements.

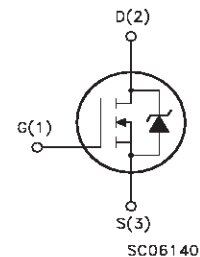
#### APPLICATIONS

- HIGH-EFFICIENCY DC-DC CONVERTERS
- UPS AND MOTOR CONTROL



DPAK

#### INTERNAL SCHEMATIC DIAGRAM



#### ABSOLUTE MAXIMUM RATINGS

| Symbol              | Parameter                                            | Value      | Unit |
|---------------------|------------------------------------------------------|------------|------|
| V <sub>DS</sub>     | Drain-source Voltage (V <sub>GS</sub> = 0)           | 100        | V    |
| V <sub>DGR</sub>    | Drain-gate Voltage (R <sub>GS</sub> = 20 kΩ)         | 100        | V    |
| V <sub>GS</sub>     | Gate- source Voltage                                 | ± 20       | V    |
| I <sub>D</sub>      | Drain Current (continuous) at T <sub>C</sub> = 25°C  | 25         | A    |
| I <sub>D</sub>      | Drain Current (continuous) at T <sub>C</sub> = 100°C | 16         | A    |
| I <sub>DM</sub> (●) | Drain Current (pulsed)                               | 100        | A    |
| P <sub>TOT</sub>    | Total Dissipation at T <sub>C</sub> = 25°C           | 55         | W    |
|                     | Derating Factor                                      | 0.37       | W/°C |
| dv/dt (1)           | Peak Diode Recovery voltage slope                    | 9          | V/ns |
| E <sub>AS</sub> (2) | Single Pulse Avalanche Energy                        | 200        | mJ   |
| T <sub>stg</sub>    | Storage Temperature                                  | -65 to 175 | °C   |
| T <sub>j</sub>      | Max. Operating Junction Temperature                  | 175        | °C   |

(●) Pulse width limited by safe operating area

(1) I<sub>SD</sub> ≤ 25A, di/dt ≤ 300A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>, T<sub>j</sub> ≤ T<sub>JMAX</sub>.  
(2) Starting T<sub>j</sub> = 25°C, I<sub>D</sub> = 40A, V<sub>DD</sub> = 50V

## STD25NF10

### THERMAL DATA

|                |                                                |      |      |
|----------------|------------------------------------------------|------|------|
| Rthj-case      | Thermal Resistance Junction-case Max           | 2.7  | °C/W |
| Rthj-amb       | Thermal Resistance Junction-ambient Max        | 62.5 | °C/W |
| T <sub>I</sub> | Maximum Lead Temperature For Soldering Purpose | 300  | °C   |

### ELECTRICAL CHARACTERISTICS (TCASE = 25 °C UNLESS OTHERWISE SPECIFIED)

OFF

| Symbol               | Parameter                                             | Test Conditions                                                                       | Min. | Typ. | Max.    | Unit     |
|----------------------|-------------------------------------------------------|---------------------------------------------------------------------------------------|------|------|---------|----------|
| V <sub>(BR)DSS</sub> | Drain-source Breakdown Voltage                        | I <sub>D</sub> = 250 µA, V <sub>GS</sub> = 0                                          | 100  |      |         | V        |
| I <sub>DSS</sub>     | Zero Gate Voltage Drain Current (V <sub>GS</sub> = 0) | V <sub>DS</sub> = Max Rating<br>V <sub>DS</sub> = Max Rating, T <sub>C</sub> = 125 °C |      |      | 1<br>10 | µA<br>µA |
| I <sub>GSS</sub>     | Gate-body Leakage Current (V <sub>DS</sub> = 0)       | V <sub>GS</sub> = ±20V                                                                |      |      | ±100    | nA       |

ON (1)

| Symbol              | Parameter                         | Test Conditions                                                                          | Min. | Typ.  | Max.  | Unit |
|---------------------|-----------------------------------|------------------------------------------------------------------------------------------|------|-------|-------|------|
| V <sub>GS(th)</sub> | Gate Threshold Voltage            | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250µA                               | 2    | 3     | 4     | V    |
| R <sub>DS(on)</sub> | Static Drain-source On Resistance | V <sub>GS</sub> = 10V, I <sub>D</sub> = 12.5 A                                           |      | 0.041 | 0.048 | Ω    |
| I <sub>D(on)</sub>  | On State Drain Current            | V <sub>DS</sub> > I <sub>D(on)</sub> × R <sub>DS(on)</sub> max,<br>V <sub>GS</sub> = 10V | 25   |       |       | A    |

### DYNAMIC

| Symbol              | Parameter                    | Test Conditions                                                                            | Min. | Typ. | Max. | Unit |
|---------------------|------------------------------|--------------------------------------------------------------------------------------------|------|------|------|------|
| g <sub>fs</sub> (1) | Forward Transconductance     | V <sub>DS</sub> > I <sub>D(on)</sub> × R <sub>DS(on)</sub> max,<br>I <sub>D</sub> = 12.5 A |      | 20   |      | S    |
| C <sub>iss</sub>    | Input Capacitance            | V <sub>DS</sub> = 25V, f = 1 MHz, V <sub>GS</sub> = 0                                      |      | 1550 |      | pF   |
| C <sub>oss</sub>    | Output Capacitance           |                                                                                            |      | 220  |      | pF   |
| C <sub>rss</sub>    | Reverse Transfer Capacitance |                                                                                            |      | 94   |      | pF   |

## ELECTRICAL CHARACTERISTICS (CONTINUED)

## SWITCHING ON

| Symbol      | Parameter          | Test Conditions                                                                                 | Min. | Typ. | Max. | Unit |
|-------------|--------------------|-------------------------------------------------------------------------------------------------|------|------|------|------|
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DD} = 50V, I_D = 12.5 A$<br>$R_G = 4.7\Omega, V_{GS} = 10V$<br>(see test circuit, Figure 3) |      | 17   |      | ns   |
| $t_r$       | Rise Time          |                                                                                                 |      | 67   |      | ns   |
| $Q_g$       | Total Gate Charge  | $V_{DD} = 80V, I_D = 25A, V_{GS} = 10V$                                                         |      | 55   |      | nC   |
| $Q_{gs}$    | Gate-Source Charge |                                                                                                 |      | 12   |      | nC   |
| $Q_{gd}$    | Gate-Drain Charge  |                                                                                                 |      | 19   |      | nC   |

## SWITCHING OFF

| Symbol       | Parameter             | Test Conditions                                                                                  | Min. | Typ. | Max. | Unit |
|--------------|-----------------------|--------------------------------------------------------------------------------------------------|------|------|------|------|
| $t_{d(off)}$ | Turn-off-Delay Time   | $V_{DD} = 50V, I_D = 12.5 A$<br>$R_G = 4.7\Omega, V_{GS} = 10V$<br>(see test circuit, Figure 3)  |      | 58   |      | ns   |
| $t_f$        | Fall Time             |                                                                                                  |      | 14   |      | ns   |
| $t_{d(off)}$ | Off-voltage Rise Time | $V_{clamp} = 80V, I_D = 25 A$<br>$R_G = 4.7\Omega, V_{GS} = 10V$<br>(see test circuit, Figure 5) |      | 52   |      | ns   |
| $t_f$        | Fall Time             |                                                                                                  |      | 20   |      | ns   |
| $t_c$        | Cross-over Time       |                                                                                                  |      | 35   |      | ns   |

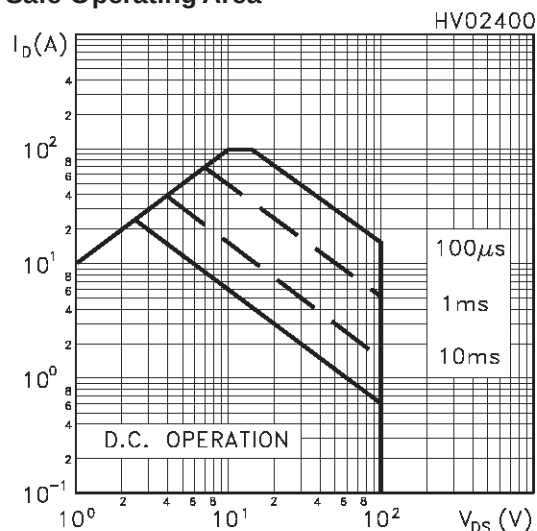
## SOURCE DRAIN DIODE

| Symbol       | Parameter                     | Test Conditions                                                                                          | Min. | Typ. | Max. | Unit |
|--------------|-------------------------------|----------------------------------------------------------------------------------------------------------|------|------|------|------|
| $I_{SD}$     | Source-drain Current          |                                                                                                          |      |      | 25   | A    |
| $I_{SDM(1)}$ | Source-drain Current (pulsed) |                                                                                                          |      |      | 100  | A    |
| $V_{SD(2)}$  | Forward On Voltage            | $I_{SD} = 25 A, V_{GS} = 0$                                                                              |      |      | 1.5  | V    |
| $t_{rr}$     | Reverse Recovery Time         | $I_{SD} = 25 A, di/dt = 100A/\mu s$<br>$V_{DD} = 50V, T_J = 150^\circ C$<br>(see test circuit, Figure 5) |      | 160  |      | ns   |
| $Q_{rr}$     | Reverse Recovery Charge       |                                                                                                          |      | 720  |      | nC   |
| $I_{RRM}$    | Reverse Recovery Current      |                                                                                                          |      | 9    |      | A    |

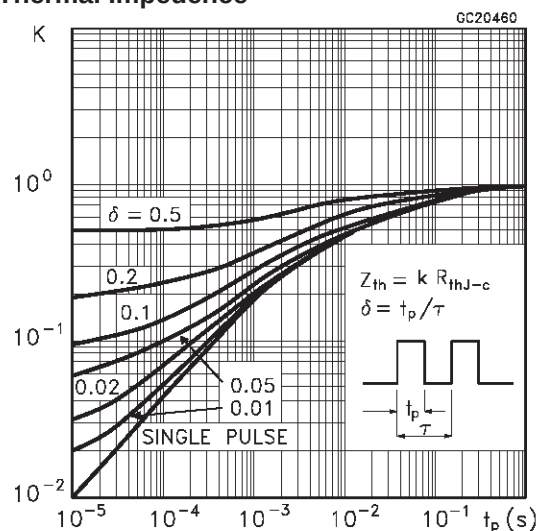
Note: 1. Pulsed: Pulse duration = 300  $\mu s$ , duty cycle 1.5 %.

2. Pulse width limited by safe operating area.

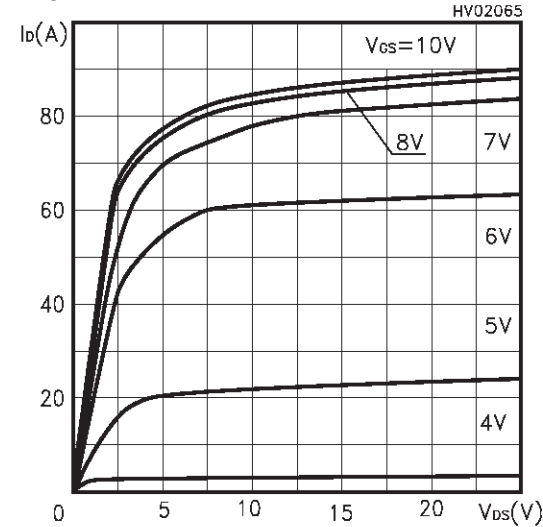
## Safe Operating Area



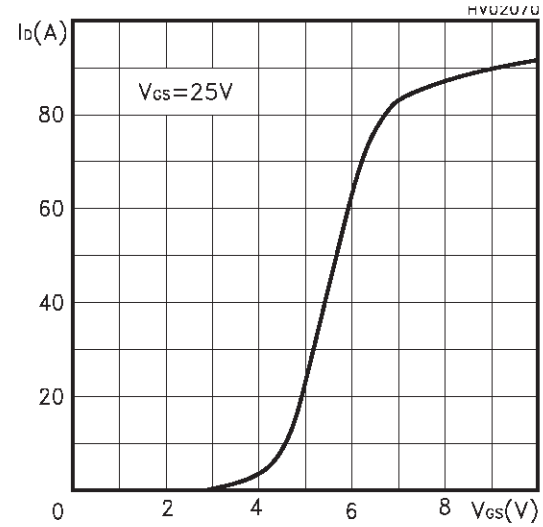
## Thermal Impedance



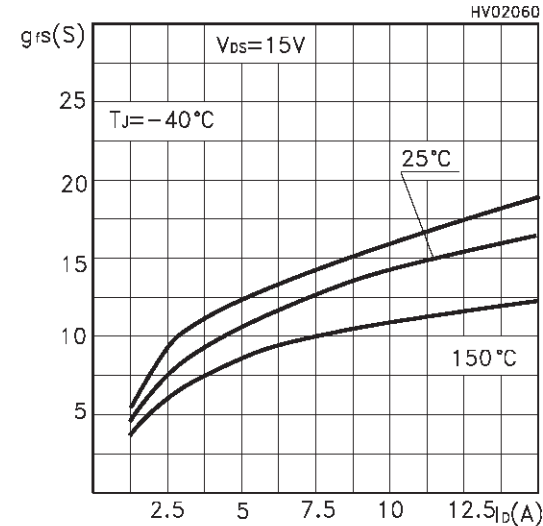
Output Characteristics



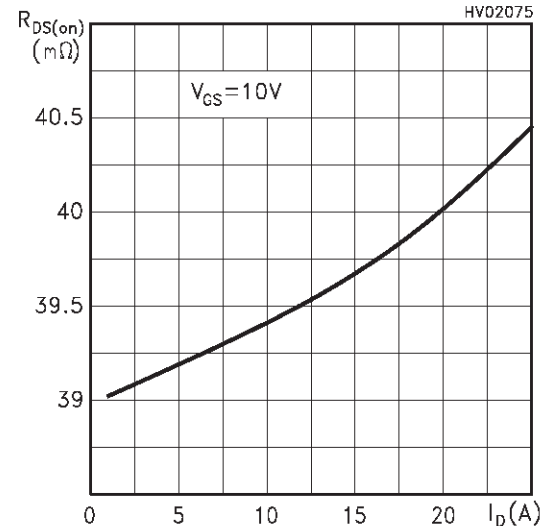
Transfer Characteristics



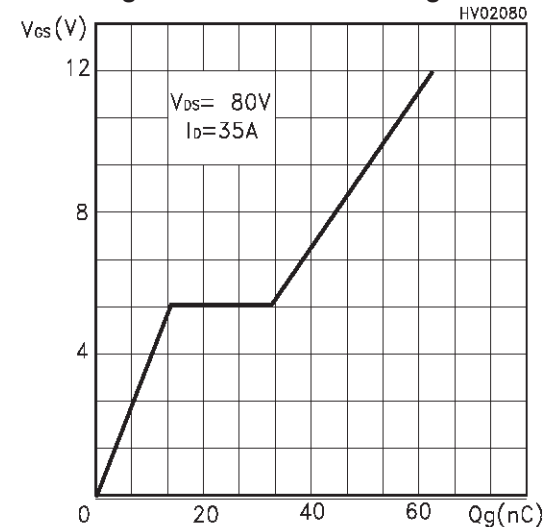
Transconductance



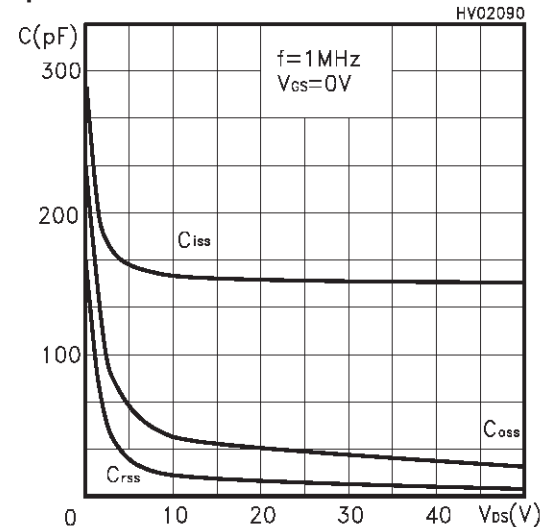
Static Drain-source On Resistance



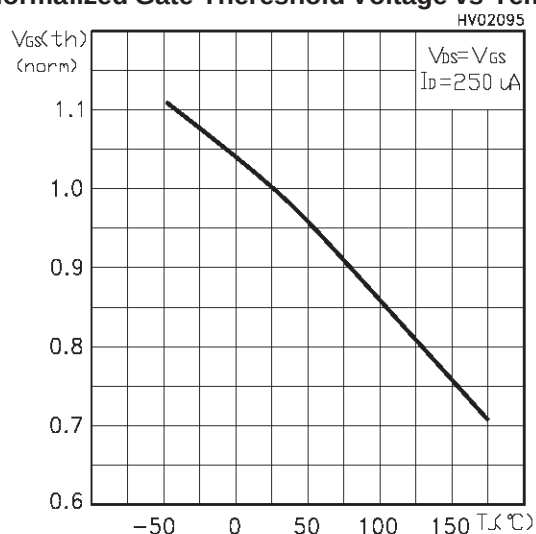
Gate Charge vs Gate-source Voltage



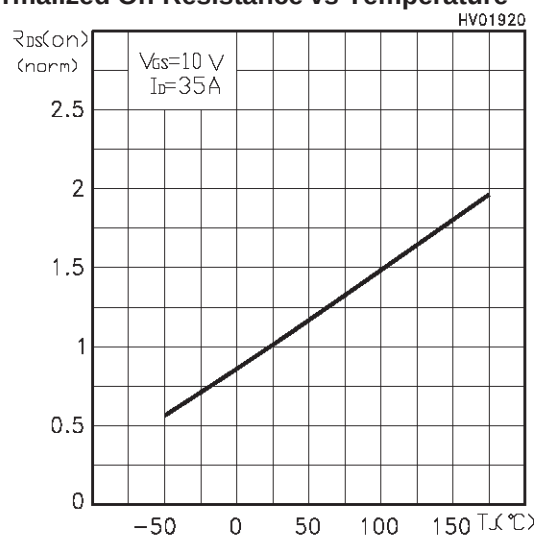
Capacitance Variations



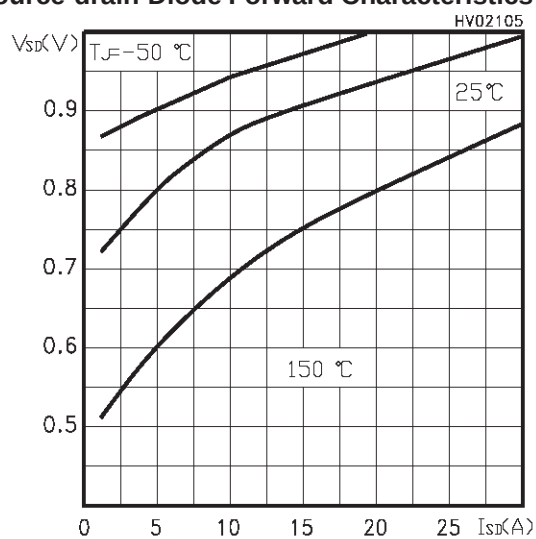
Normalized Gate Threshold Voltage vs Temp.



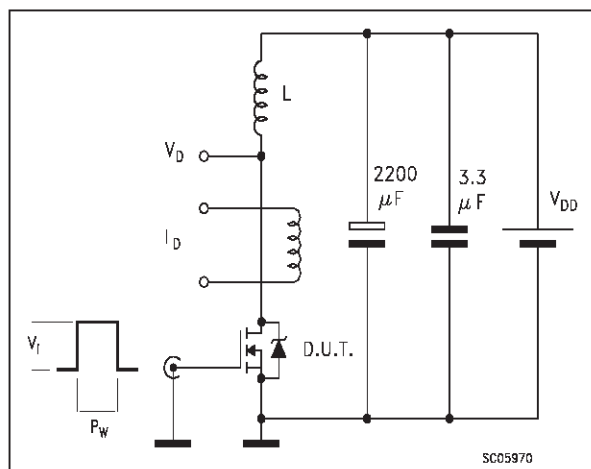
Normalized On Resistance vs Temperature



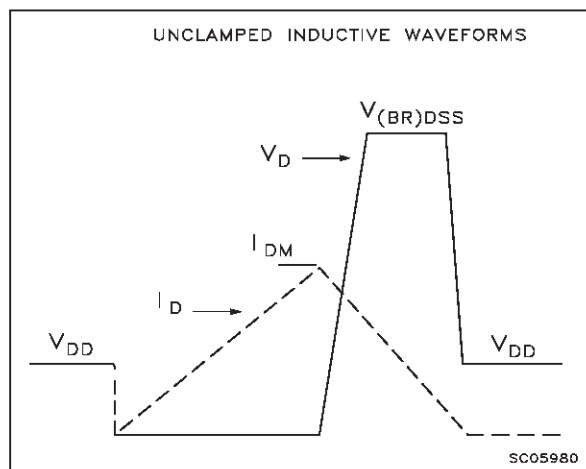
Source-drain Diode Forward Characteristics



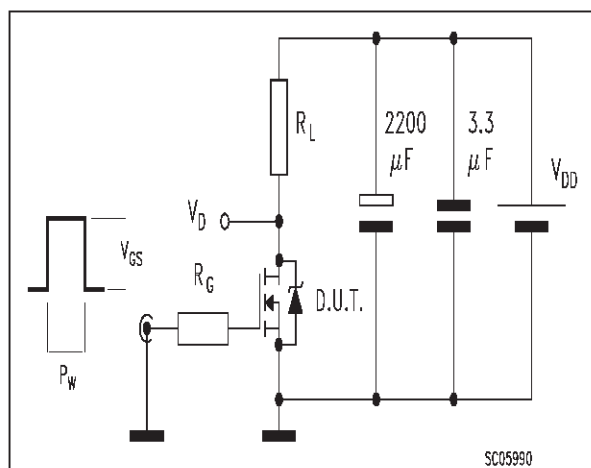
**Fig. 1: Unclamped Inductive Load Test Circuit**



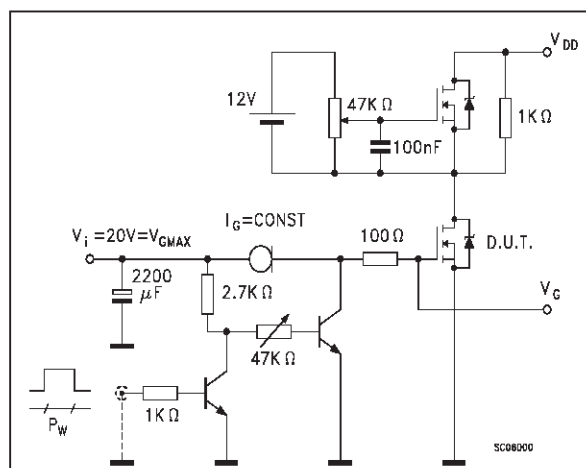
**Fig. 2: Unclamped Inductive Waveform**



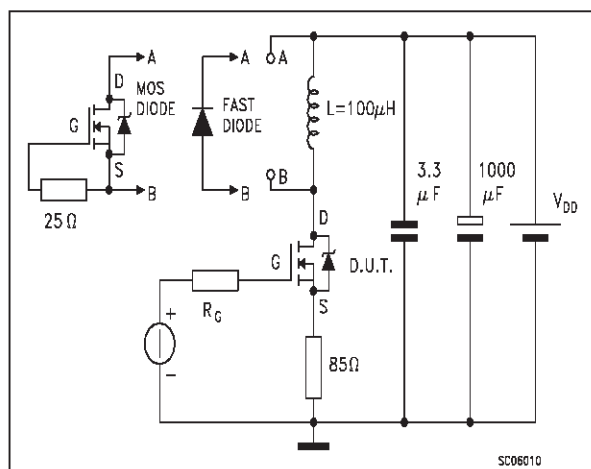
**Fig. 3: Switching Times Test Circuit For Resistive Load**



**Fig. 4: Gate Charge test Circuit**

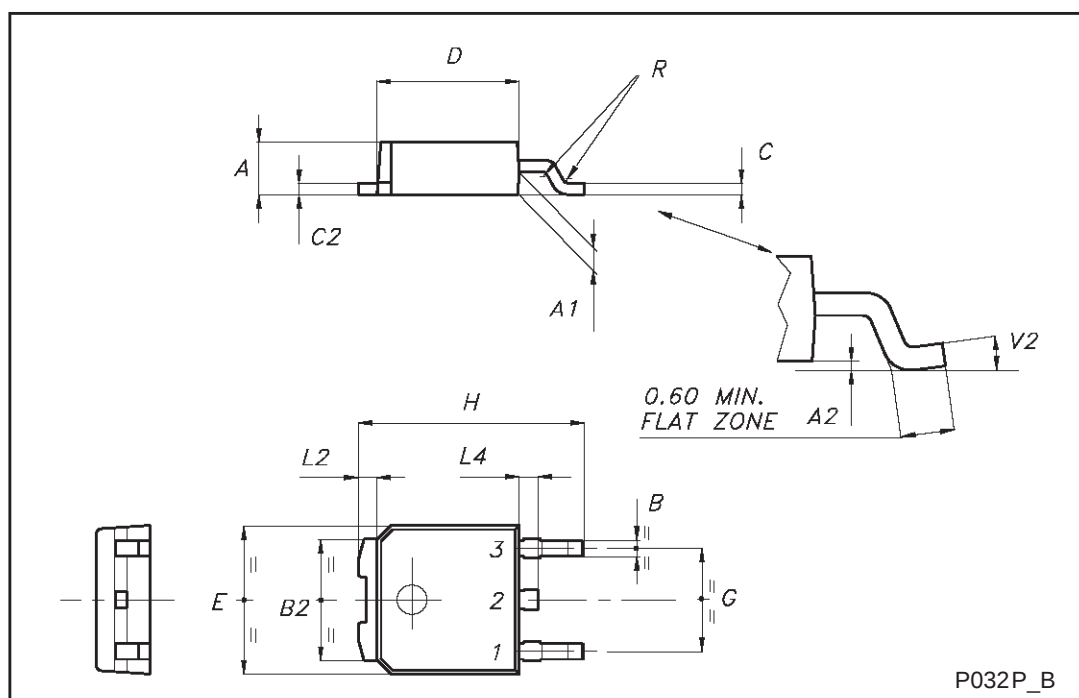


**Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times**



## TO-252 (DPAK) MECHANICAL DATA

| DIM. | mm   |      |       | inch  |       |       |
|------|------|------|-------|-------|-------|-------|
|      | MIN. | TYP. | MAX.  | MIN.  | TYP.  | MAX.  |
| A    | 2.20 |      | 2.40  | 0.087 |       | 0.094 |
| A1   | 0.90 |      | 1.10  | 0.035 |       | 0.043 |
| A2   | 0.03 |      | 0.23  | 0.001 |       | 0.009 |
| B    | 0.64 |      | 0.90  | 0.025 |       | 0.035 |
| B2   | 5.20 |      | 5.40  | 0.204 |       | 0.213 |
| C    | 0.45 |      | 0.60  | 0.018 |       | 0.024 |
| C2   | 0.48 |      | 0.60  | 0.019 |       | 0.024 |
| D    | 6.00 |      | 6.20  | 0.236 |       | 0.244 |
| E    | 6.40 |      | 6.60  | 0.252 |       | 0.260 |
| G    | 4.40 |      | 4.60  | 0.173 |       | 0.181 |
| H    | 9.35 |      | 10.10 | 0.368 |       | 0.398 |
| L2   |      | 0.8  |       |       | 0.031 |       |
| L4   | 0.60 |      | 1.00  | 0.024 |       | 0.039 |
| V2   | 0°   |      | 8°    | 0°    |       | 0°    |



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