

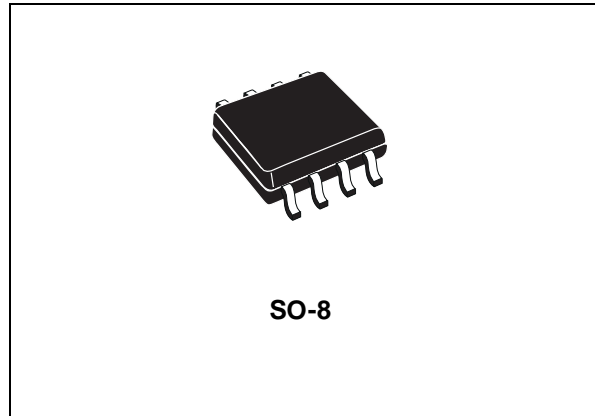


# STS6DNF30V

## DUAL N-CHANNEL 30V - 0.026Ω - 6A SO-8 2.5V-DRIVE STripFET™ II POWER MOSFET

| TYPE       | V <sub>DSS</sub> | R <sub>DS(on)</sub>                | I <sub>D</sub> |
|------------|------------------|------------------------------------|----------------|
| STS6DNF30V | 30 V             | <0.030Ω (@4.5V)<br><0.038Ω (@2.5V) | 6 A            |

- TYPICAL R<sub>DS(on)</sub> = 0.026Ω (@4.5V)
- TYPICAL R<sub>DS(on)</sub> = 0.030Ω (@2.5V)
- ULTRA LOW THRESHOLD GATE DRIVE (2.5V)
- STANDARD OUTLINE FOR EASY AUTOMATED SURFACE MOUNT ASSEMBLY

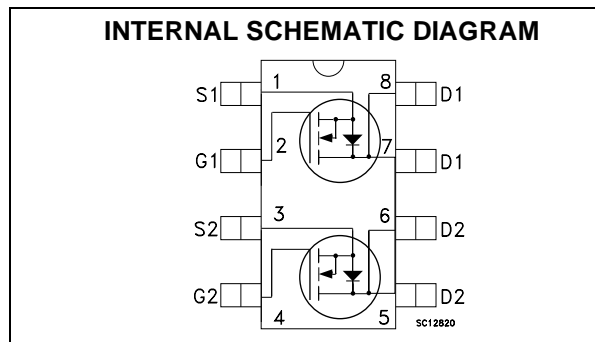


### DESCRIPTION

This Power 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

- BATTERY SAFETY UNIT IN NOMADIC EQUIPMENT
- DC-DC CONVERTERS
- POWER MANAGEMENT IN PORTABLE/DESKTOP PCs



### ABSOLUTE MAXIMUM RATINGS

| Symbol              | Parameter  | Value | Unit |
|---------------------|--|-------|------|
| V <sub>DS</sub>     | Drain-source Voltage (V <sub>GS</sub> = 0)                               | 30    | V    |
| V <sub>DGR</sub>    | Drain-gate Voltage (R <sub>GS</sub> = 20 kΩ)                             | 30    | V    |
| V <sub>GS</sub>     | Gate- source Voltage   | ±12   | V    |
| I <sub>D</sub>      | Drain Current (continuous) at T <sub>C</sub> = 25°C<br>Single Operation  | 6     | A    |
|                     | Drain Current (continuous) at T <sub>C</sub> = 100°C<br>Single Operation | 3.8   | A    |
| I <sub>DM</sub> (●) | Drain Current (pulsed)   | 24    | A    |
| P <sub>TOT</sub>    | Total Dissipation at T <sub>C</sub> = 25°C Dual Operation                | 2     | W    |
|                     | Total Dissipation at T <sub>C</sub> = 25°C Single Operation              | 1.6   | W    |

(●) Pulse width limited by safe operating area

## STS6DNF30V

### THERMAL DATA

|                  |  |            |              |
|------------------|--|------------|--------------|
| Rthj-amb         | Thermal Resistance Junction-ambient Max Single Operation<br>Thermal Resistance Junction-ambient Max Dual Operation | 78<br>62.5 | °C/W<br>°C/W |
| T <sub>j</sub>   | Max. Operating Junction Temperature  | 150        | °C           |
| T <sub>stg</sub> | Storage Temperature  | -65 to 150 | °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  | 30   |      |         | 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> = ±12V  |      |      | ±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                                     | 0.6  |                |                | V      |
| R <sub>DS(on)</sub> | Static Drain-source On Resistance | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 3 A<br>V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 3 A |      | 0.026<br>0.030 | 0.030<br>0.038 | Ω<br>Ω |

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)max</sub> ,<br>I <sub>D</sub> = 3 A |      | 15   |      | S    |
| C <sub>iss</sub>    | Input Capacitance            | V <sub>DS</sub> = 25 V, f = 1 MHz, V <sub>GS</sub> = 0                                  |      | 800  |      | pF   |
| C <sub>oss</sub>    | Output Capacitance           |   |      | 180  |      | pF   |
| C <sub>rss</sub>    | Reverse Transfer Capacitance |   |      | 32   |      | pF   |

**ELECTRICAL CHARACTERISTICS (CONTINUED)**

**SWITCHING ON**

| Symbol      | Parameter          | Test Conditions  | Min. | Typ. | Max. | Unit |
|-------------|--------------------|--|------|------|------|------|
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DD} = 15\text{ V}, I_D = 3\text{ A}$                                 |      | 20   |      | ns   |
| $t_r$       | Rise Time          | $R_G = 4.7\Omega, V_{GS} = 2.5\text{ V}$<br>(see test circuit, Figure 3) |      | 25   |      | ns   |
| $Q_g$       | Total Gate Charge  | $V_{DD} = 15\text{ V}, I_D = 6\text{ A},$                                |      | 6.8  | 9.5  | nC   |
| $Q_{gs}$    | Gate-Source Charge | $V_{GS} = 2.5\text{ V}$  |      | 2    |      | nC   |
| $Q_{gd}$    | Gate-Drain Charge  |  |      | 3.4  |      | nC   |

**SWITCHING OFF**

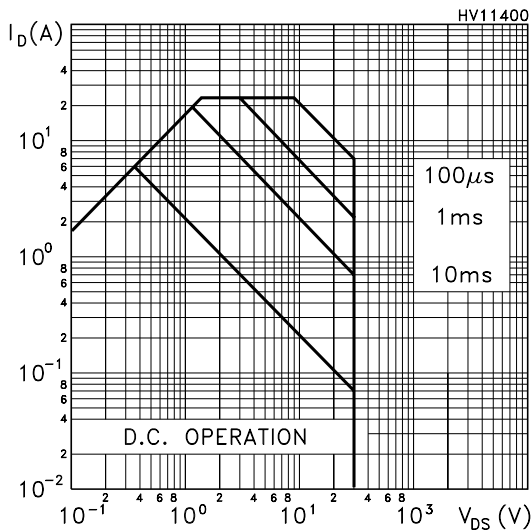
| Symbol       | Parameter           | Test Conditions  | Min. | Typ. | Max. | Unit |
|--------------|---------------------|--|------|------|------|------|
| $t_{d(off)}$ | Turn-off-Delay Time | $V_{DD} = 10\text{ V}, I_D = 3\text{ A},$                                |      | 32   |      | ns   |
| $t_f$        | Fall Time           | $R_G = 4.7\Omega, V_{GS} = 2.5\text{ V}$<br>(see test circuit, Figure 3) |      | 13   |      | ns   |

**SOURCE DRAIN DIODE**

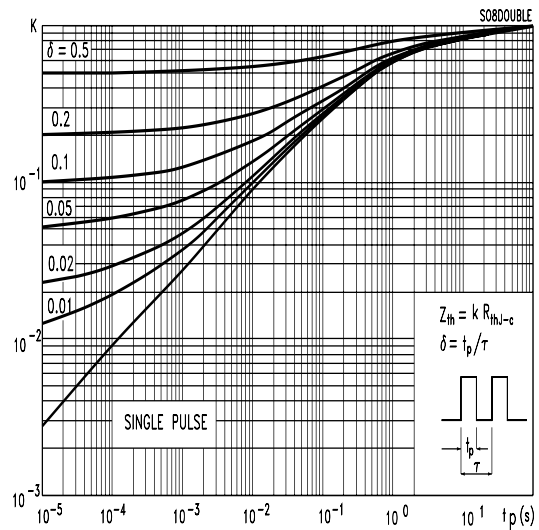
| Symbol       | Parameter                     | Test Conditions  | Min. | Typ. | Max. | Unit |
|--------------|-------------------------------|--|------|------|------|------|
| $I_{SD}$     | Source-drain Current          |  |      |      | 6    | A    |
| $I_{SDM(2)}$ | Source-drain Current (pulsed) |  |      |      | 24   | A    |
| $V_{SD(1)}$  | Forward On Voltage            | $I_{SD} = 6\text{ A}, V_{GS} = 0$                        |      |      | 1.2  | V    |
| $t_{rr}$     | Reverse Recovery Time         | $I_{SD} = 6\text{ A}, di/dt = 100\text{ A}/\mu\text{s},$ |      | 25   |      | ns   |
| $Q_{rr}$     | Reverse Recovery Charge       | $V_{DD} = 15\text{ V}, T_j = 150^\circ\text{C}$          |      | 21   |      | nC   |
| $I_{RRM}$    | Reverse Recovery Current      | (see test circuit, Figure 5)                             |      | 1.7  |      | A    |

Note: 1. Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %.  
2. Pulse width limited by safe operating area.

**Safe Operating Area**

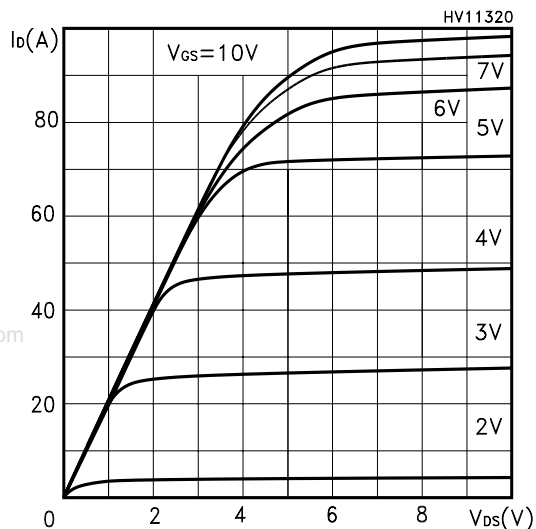


**Thermal Impedance**

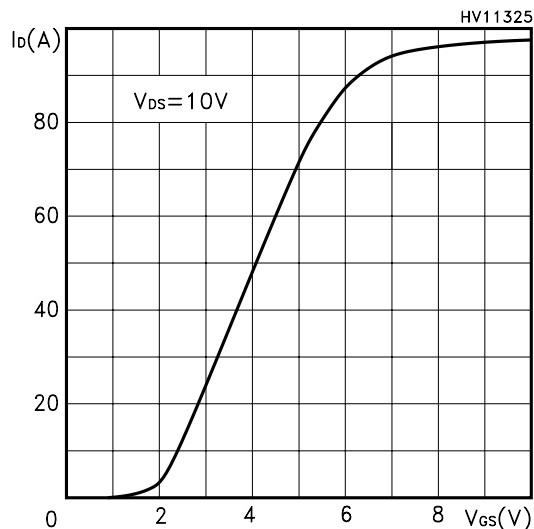


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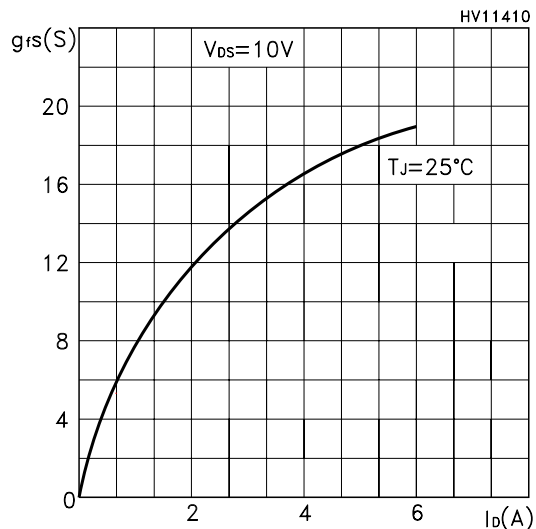
## Output Characteristics



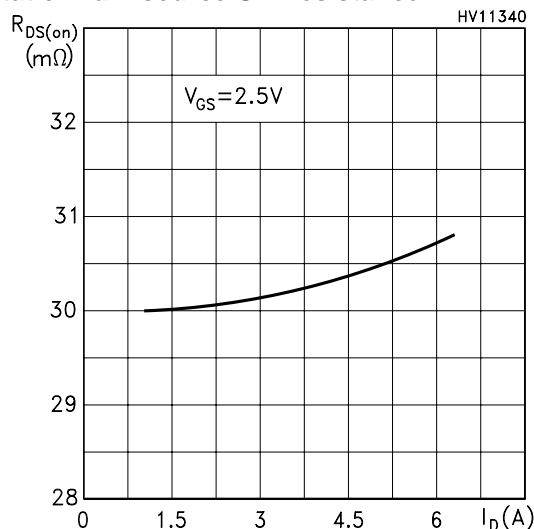
## Transfer Characteristics



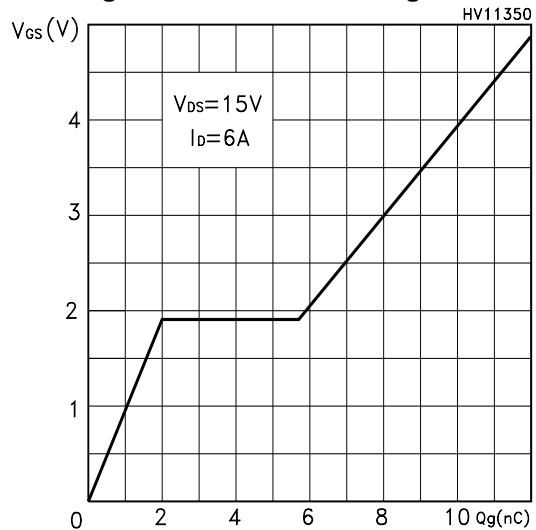
## Transconductance



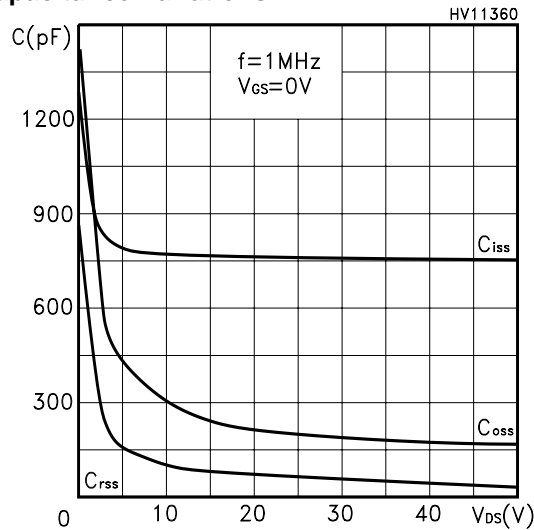
## Static Drain-source On Resistance



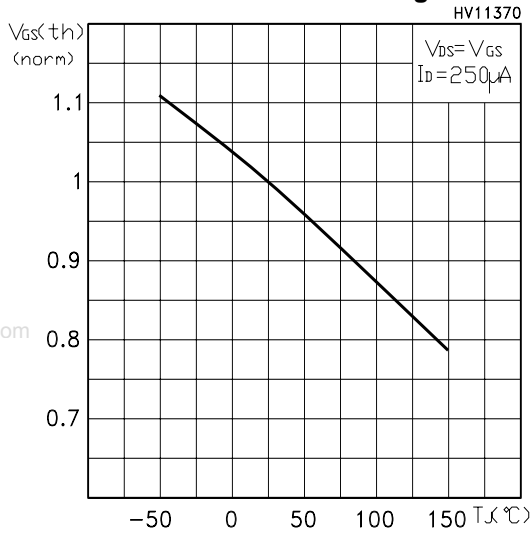
## Gate Charge vs Gate-source Voltage



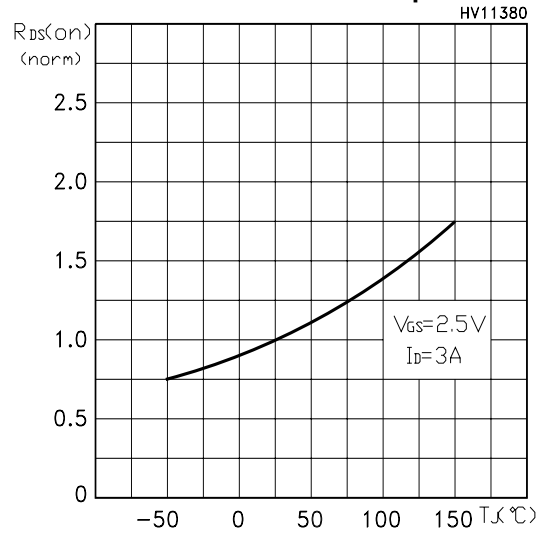
## Capacitance Variations



Normalized Gate Threshold Voltage vs Temp.



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

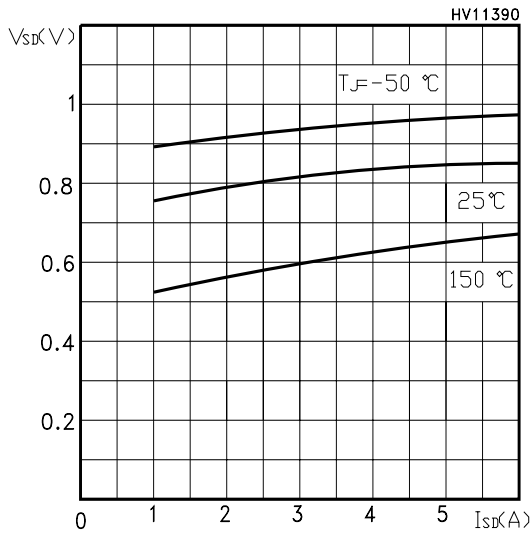


Fig. 1: Unclamped Inductive Load Test Circuit

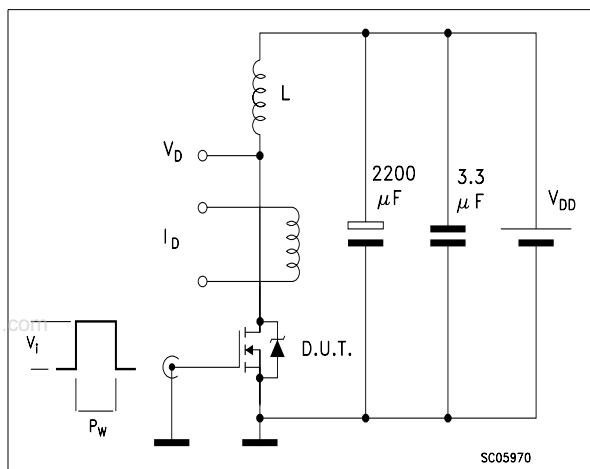


Fig. 2: Unclamped Inductive Waveform

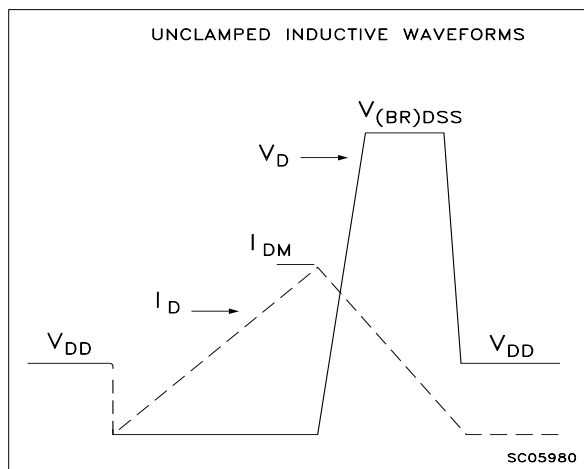


Fig. 3: Switching Times Test Circuit For Resistive Load

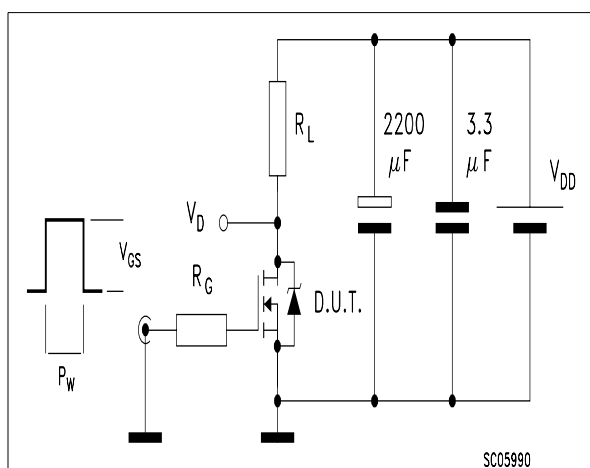


Fig. 4: Gate Charge test Circuit

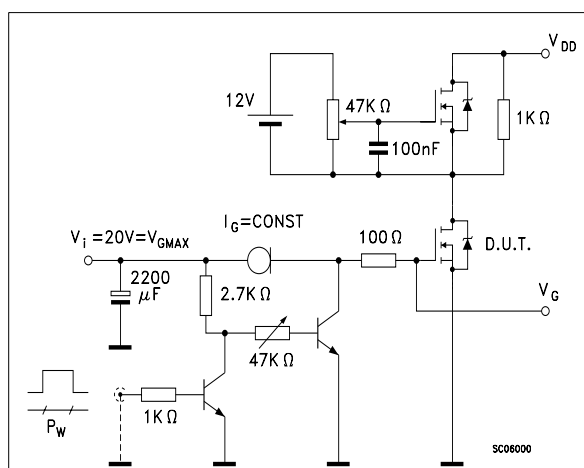
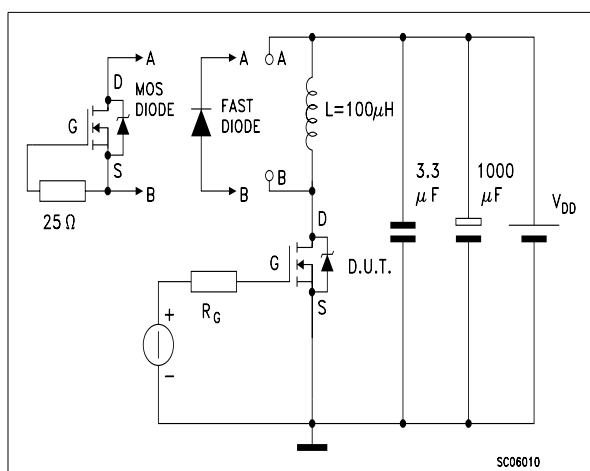
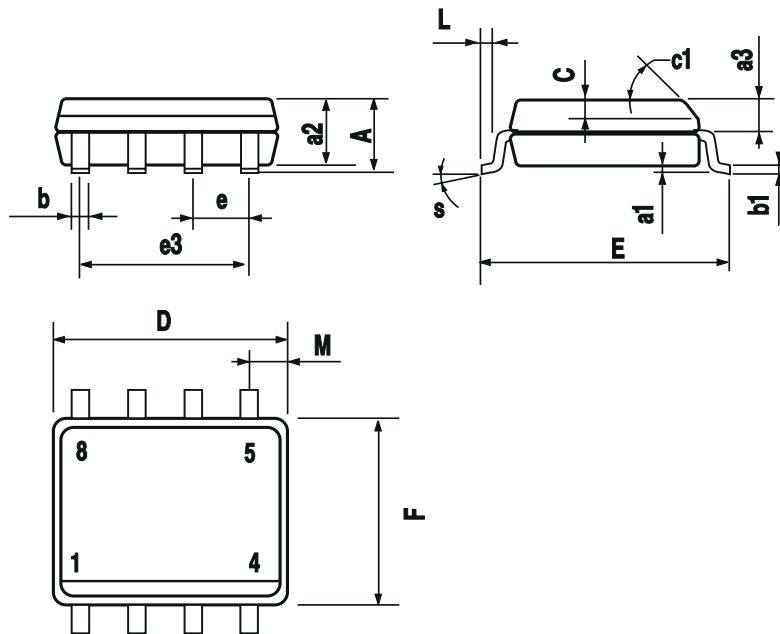


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



SO-8 MECHANICAL DATA

| DIM. | mm        |      |      | inch  |       |       |
|------|-----------|------|------|-------|-------|-------|
|      | MIN.      | TYP. | MAX. | MIN.  | TYP.  | MAX.  |
| A    |           |      | 1.75 |       |       | 0.068 |
| a1   | 0.1       |      | 0.25 | 0.003 |       | 0.009 |
| a2   |           |      | 1.65 |       |       | 0.064 |
| a3   | 0.65      |      | 0.85 | 0.025 |       | 0.033 |
| b    | 0.35      |      | 0.48 | 0.013 |       | 0.018 |
| b1   | 0.19      |      | 0.25 | 0.007 |       | 0.010 |
| C    | 0.25      |      | 0.5  | 0.010 |       | 0.019 |
| c1   | 45 (typ.) |      |      |       |       |       |
| D    | 4.8       |      | 5.0  | 0.188 |       | 0.196 |
| E    | 5.8       |      | 6.2  | 0.228 |       | 0.244 |
| e    |           | 1.27 |      |       | 0.050 |       |
| e3   |           | 3.81 |      |       | 0.150 |       |
| F    | 3.8       |      | 4.0  | 0.14  |       | 0.157 |
| L    | 0.4       |      | 1.27 | 0.015 |       | 0.050 |
| M    |           |      | 0.6  |       |       | 0.023 |
| S    | 8 (max.)  |      |      |       |       |       |



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