



STGD3NB60SD

N-CHANNEL 3A - 600V - DPAK

PowerMESH™ IGBT

| TYPE | V _{CES} | V _{CE(sat)} | I _C |
|-------------|------------------|----------------------|----------------|
| STGD3NB60SD | 600 V | < 1.5 V | 3 A |

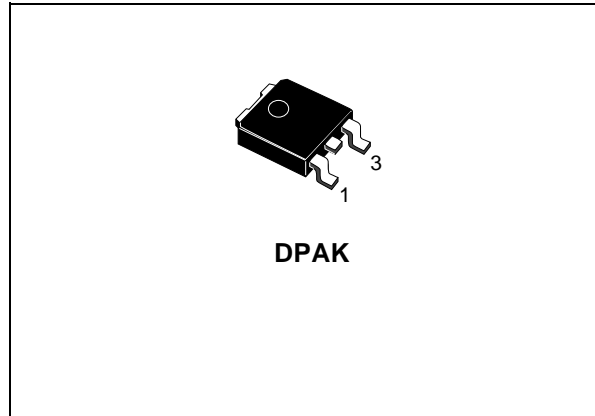
- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- VERY LOW ON-VOLTAGE DROP (V_{cesat})
- HIGH CURRENT CAPABILITY
- INTEGRATED WHEELING DIODE
- OFF LOSSES INCLUDE TAIL CURRENT

DESCRIPTION

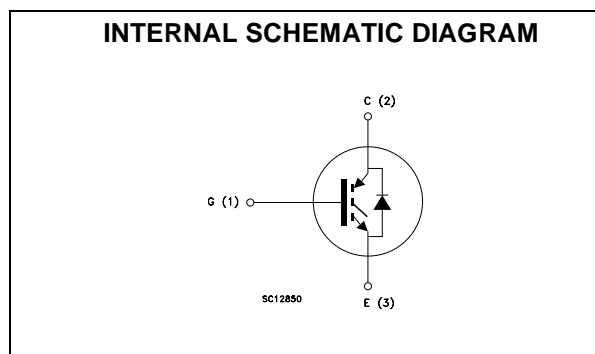
Using the latest high voltage technology based on a patented strip layout, STMicroelectronics has designed an advanced family of IGBTs, the PowerMESH™ IGBTs, with outstanding performances. The suffix "S" identifies a family optimized to achieve minimum on-voltage drop for low frequency applications (<1kHz).

APPLICATIONS

- MOTOR CONTROL
- GAS DISCHARGE LAMP
- STATIC RELAYS



DPAK



ORDERING INFORMATION

| SALES TYPE | MARKING | PACKAGE | PACKAGING |
|---------------|-----------|---------|-------------|
| STGD3NB60SDT4 | GD3NB60SD | DPAK | TAPE & REEL |

STGD3NB60SD

ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|--------------|---|-------------|------|
| V_{CES} | Collector-Emitter Voltage ($V_{GS} = 0$) | 600 | V |
| V_{GE} | Gate-Emitter Voltage | ± 20 | V |
| I_C | Collector Current (continuous) at $T_C = 25^\circ\text{C}$ | 6 | A |
| I_C | Collector Current (continuous) at $T_C = 100^\circ\text{C}$ | 3 | A |
| $I_{CM} (*)$ | Collector Current (pulsed) | 25 | A |
| P_{TOT} | Total Dissipation at $T_C = 25^\circ\text{C}$ | 48 | W |
| | Derating Factor | 0.32 | W/°C |
| T_{stg} | Storage Temperature | - 65 to 175 | °C |
| T_j | Max. Operating Junction Temperature | 175 | °C |

(*) Pulse width limited by safe operating area

THERMAL DATA

| | | | |
|-----------|---|-------|------|
| Rthj-case | Thermal Resistance Junction-case Max | 3.125 | °C/W |
| Rthj-amb | Thermal Resistance Junction-ambient Max | 100 | °C/W |

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

OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------|---|---|------|------|-----------|--------------------------------|
| $V_{BR(CES)}$ | Collectro-Emitter Breakdown Voltage | $I_C = 250 \mu\text{A}$, $V_{GE} = 0$ | 600 | | | V |
| I_{CES} | Collector cut-off ($V_{GE} = 0$) | $V_{CE} = \text{Max Rating}$, $T_C = 25^\circ\text{C}$ $V_{CE} = \text{Max Rating}$, $T_C = 125^\circ\text{C}$ | | | 10 100 | μA μA |
| I_{GES} | Gate-Emitter Leakage Current ($V_{CE} = 0$) | $V_{GE} = \pm 20\text{V}$, $V_{CE} = 0$ | | | ± 100 | nA |

ON (1)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------|--------------------------------------|---|------|-----------------|------|-------------|
| $V_{GE(th)}$ | Gate Threshold Voltage | $V_{CE} = V_{GE}$, $I_C = 250\mu\text{A}$ | 2.5 | | 4.5 | V |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $V_{GE} = 15\text{V}$, $I_C = 1.5 \text{ A}$ $V_{GE} = 15\text{V}$, $I_C = 3 \text{ A}$ $V_{GE} = 15\text{V}$, $I_C = 7 \text{ A}$, $T_J = 125^\circ\text{C}$ | | 1 1.2 1.1 | 1.5 | V V V |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------------------------|---|---|------|------------------|------|----------------|
| g_{fs} | Forward Transconductance | $V_{CE} = 10 \text{ V}$, $I_C = 3 \text{ A}$ | 1.7 | 2.5 | | S |
| C_{ies} | Input Capacitance | $V_{CE} = 25\text{V}$, $f = 1 \text{ MHz}$, $V_{GE} = 0$ | | 255 | | pF |
| C_{oes} | Output Capacitance | | | 30 | | pF |
| C_{res} | Reverse Transfer Capacitance | | | 5.6 | | pF |
| Q_G Q_{GE} Q_{GC} | Total Gate Charge Gate-Emitter Charge Gate-Collector Charge | $V_{CE} = 480 \text{ V}$, $I_C = 3 \text{ A}$, $V_{GE} = 15\text{V}$ | | 18 5.4 5.5 | 23 | nC nC nC |
| I_{CL} | Latching Current | $V_{clamp} = 380 \text{ V}$, $T_j = 25^\circ\text{C}$ $R_G = 1\text{K}\Omega$ | 15 | | | A |

ELECTRICAL CHARACTERISTICS (CONTINUED)
SWITCHING ON

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------------------------|---|---|------|------------|------|---|
| $t_{d(on)}$ t_r | Turn-on Delay Time Rise Time | $V_{CC} = 480\text{ V}$, $I_C = 3\text{ A}$ $R_G = 1\text{ K}\Omega$, $V_{GE} = 15\text{ V}$ | | 125 150 | | μs μs |
| $(di/dt)_{on}$ E_{on} | Turn-on Current Slope Turn-on Switching Losses | $V_{CC} = 480\text{ V}$, $I_C = 3\text{ A}$, $R_G = 1\text{ K}\Omega$ $V_{GE} = 15\text{ V}$, $T_j = 125^\circ\text{C}$ | | 50 1100 | | $\text{A}/\mu\text{s}$ μJ |

SWITCHING OFF

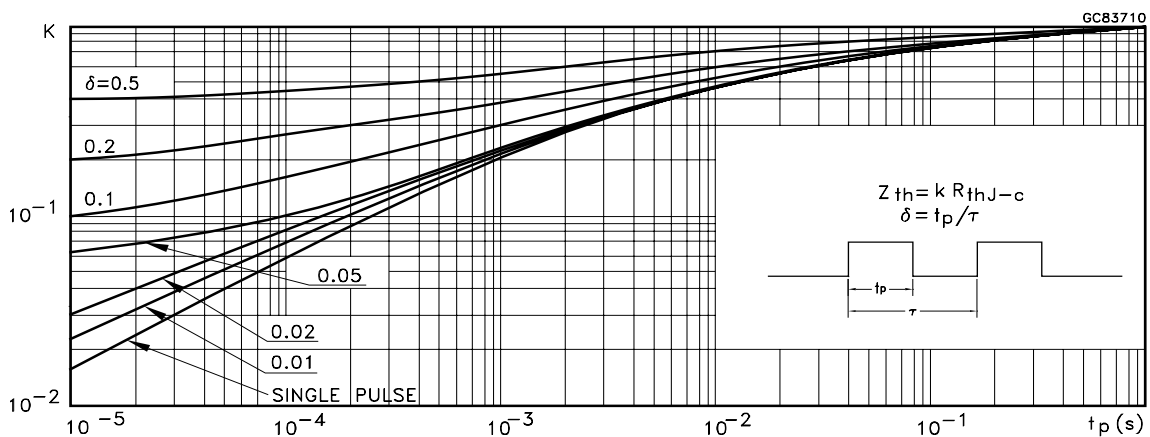
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--|--|---|------|-----------------------------------|------|---|
| t_c $t_r(V_{off})$ $t_{d(on)}$ t_f $E_{off(**)}$ | Cross-over Time Off Voltage Rise Time Delay Time Fall Time Turn-off Switching Loss | $V_{CC} = 480\text{ V}$, $I_C = 3\text{ A}$, $R_{GE} = 1\text{ K}\Omega$, $V_{GE} = 15\text{ V}$ | | 1.8 1.0 3.4 0.72 1.15 | | μs μs μs μs mJ |
| t_c $t_r(V_{off})$ $t_{d(on)}$ t_f $E_{off(**)}$ | Cross-over Time Off Voltage Rise Time Delay Time Fall Time Turn-off Switching Loss | $V_{CC} = 480\text{ V}$, $I_C = 3\text{ A}$, $R_{GE} = 1\text{ K}\Omega$, $V_{GE} = 15\text{ V}$, $T_j = 125^\circ\text{C}$ | | 2.8 1.45 3.6 1.2 1.8 | | μs μs μs μs mJ |

COLLECTOR-EMITTER DIODE

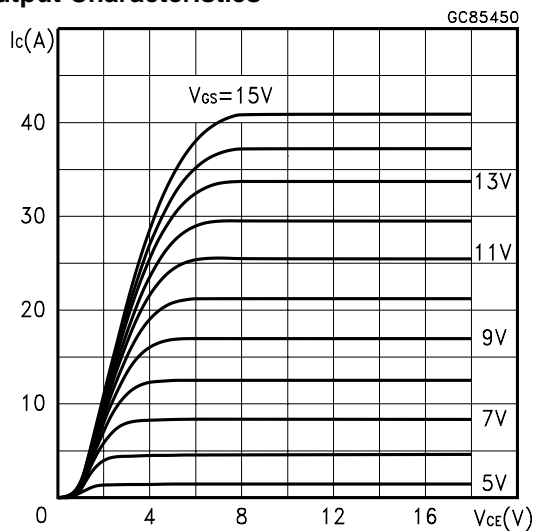
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-----------------------------------|--|---|------|---------------------|---------|---------------|
| I_f I_{fm} | Forward Current Forward Current pulsed | | | | 3 25 | A A |
| V_f | Forward On-Voltage | $I_f = 3\text{ A}$ $I_f = 1\text{ A}$ | | 1.55 1.15 | 1.9 | V V |
| t_{rr} Q_{rr} I_{rrm} | Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current | $I_f = 3\text{ A}$, $V_R = 200\text{ V}$, $T_j = 125^\circ\text{C}$, $di/dt = 100\text{ A}/\mu\text{s}$ | | 1700 4500 9.5 | | ns nC A |

Note: 1. Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %.
2. Pulse width limited by max. junction temperature.
(**) Losses also include the Tail (Jedec Standardization)

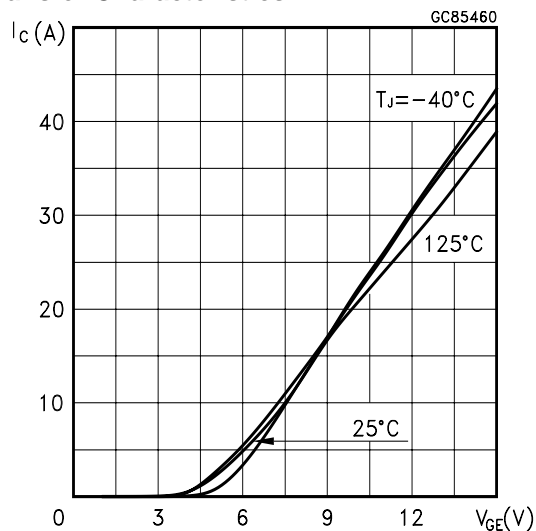
Thermal Impedance



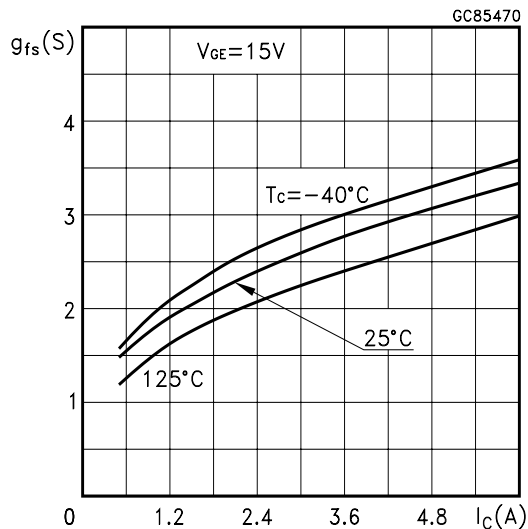
Output Characteristics



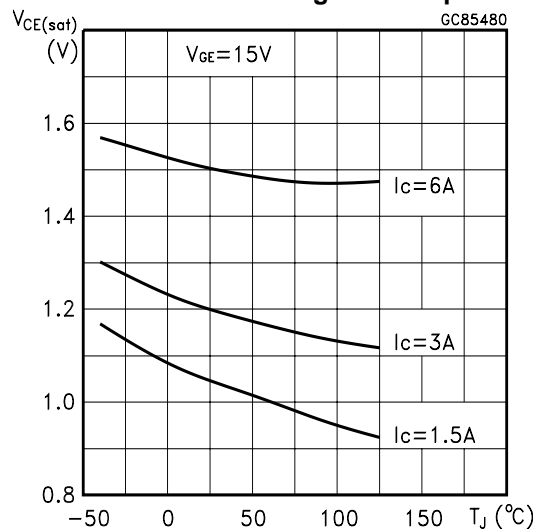
Transfer Characteristics



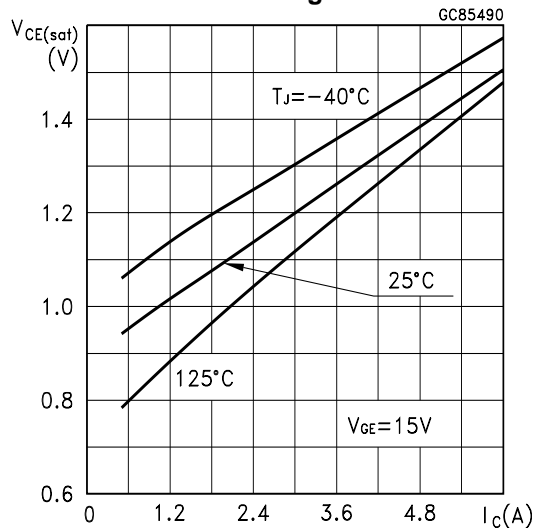
Transconductance



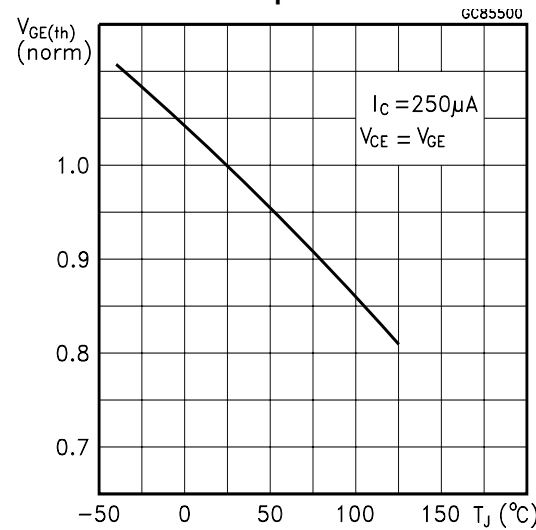
Collector-Emitter On Voltage vs Temperature



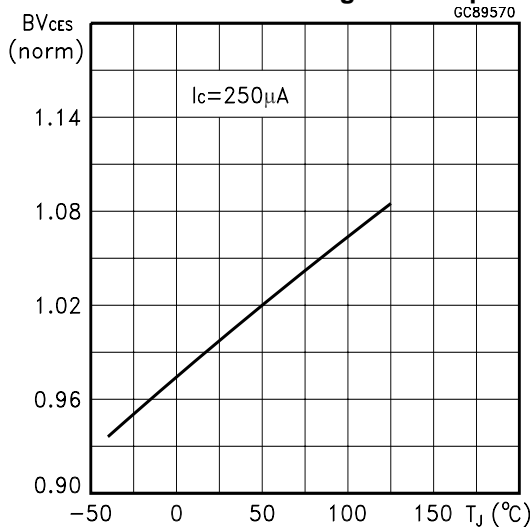
Collector-Emitter On Voltage vs Collector Current



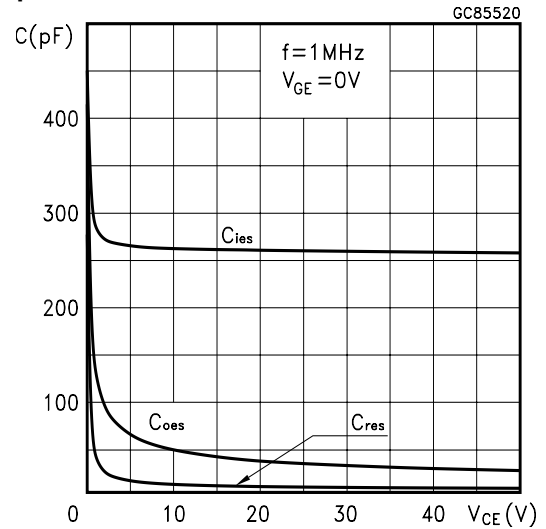
Gate Threshold vs Temperature



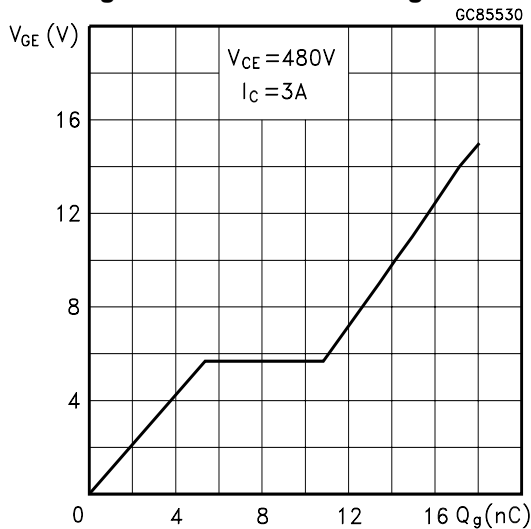
Normalized Breakdown Voltage vs Temperature



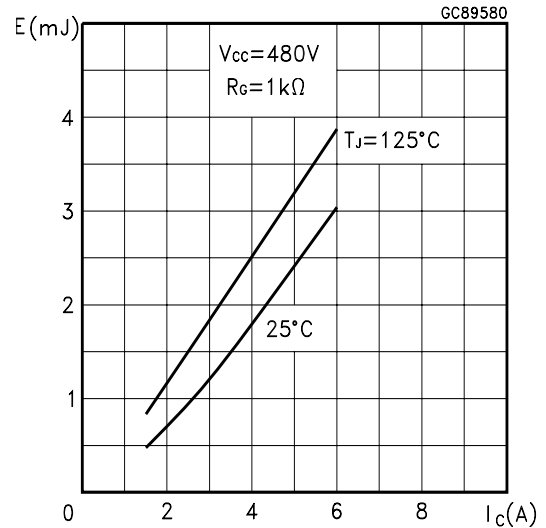
Capacitance Variations



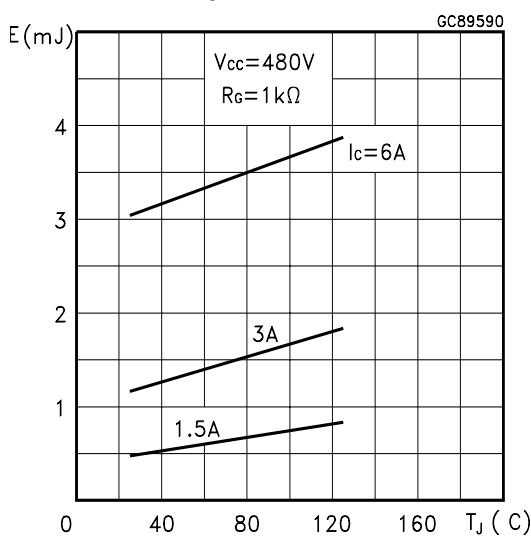
Gate Charge vs Gate-Emitter Voltage



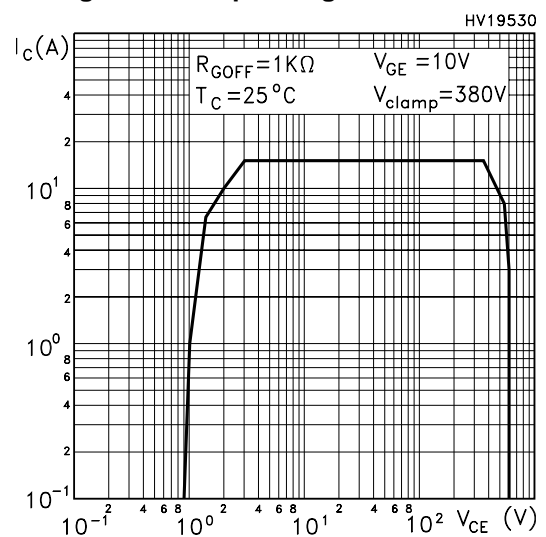
Off Losses vs Collector Current



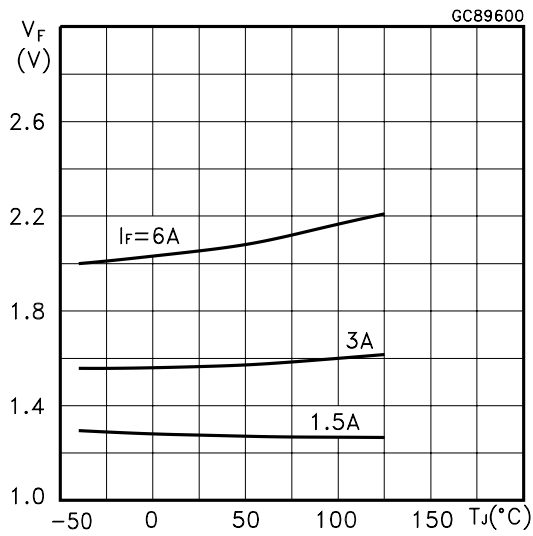
Off Losses vs Temperature



Switching Off Safe Operating Area



Diode Forward Voltage vs Tj



Diode Forward Voltage

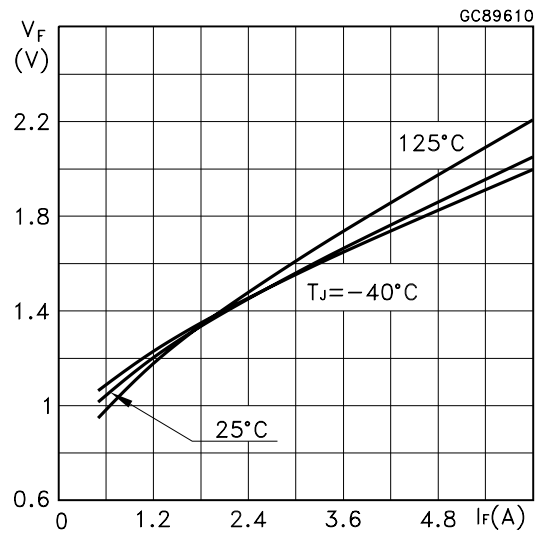


Fig. 1: Gate Charge test Circuit

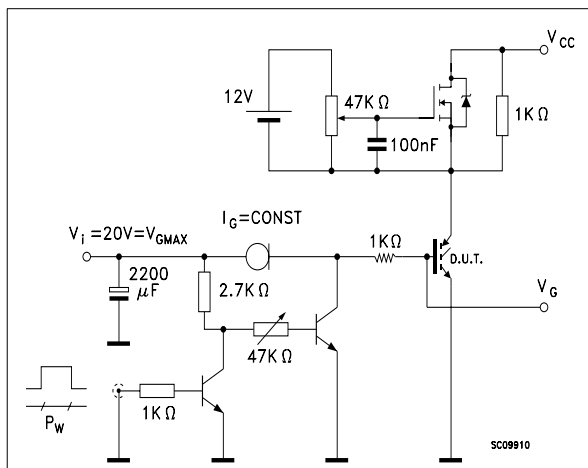
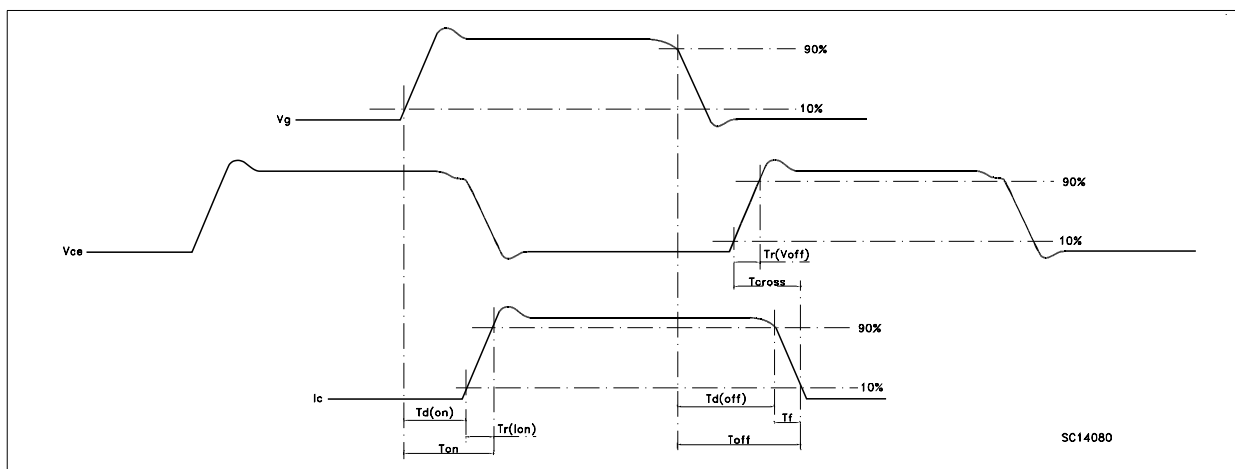
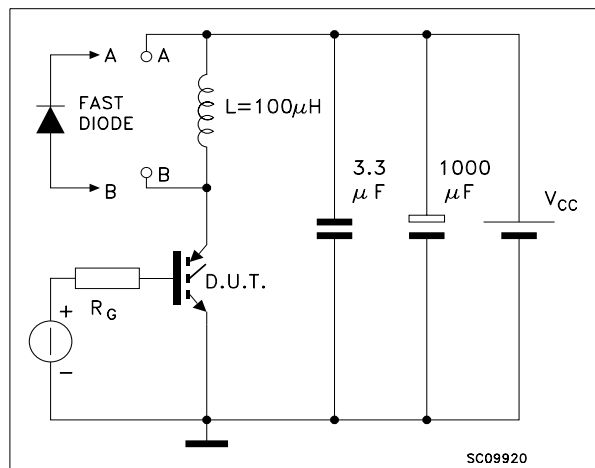
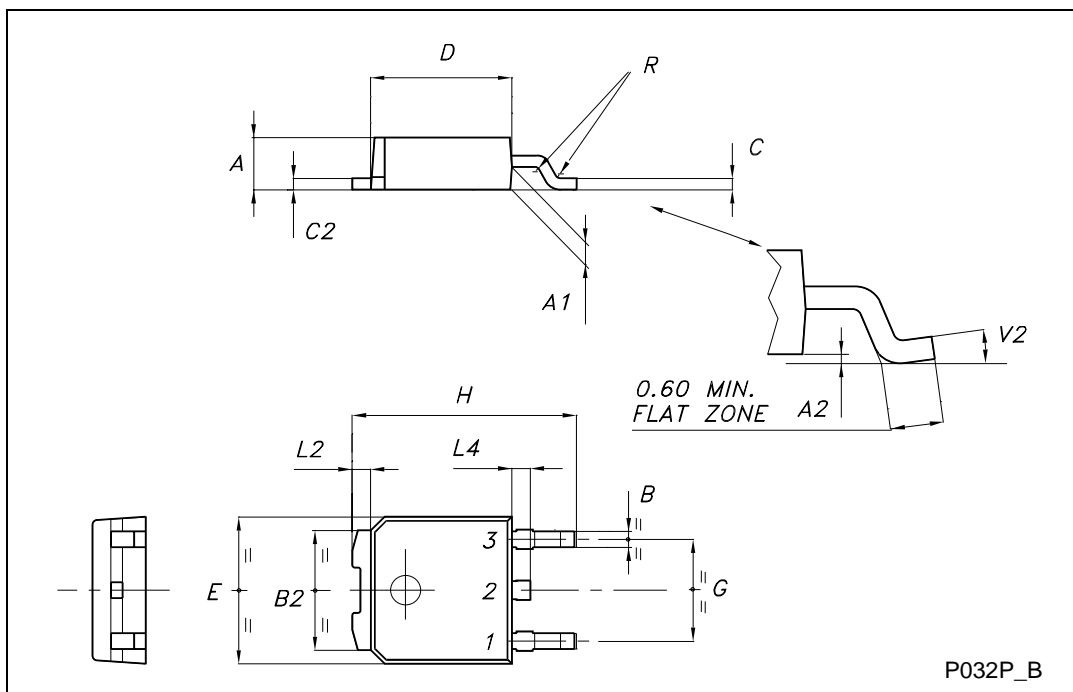


Fig. 2: Test Circuit For Inductive Load Switching

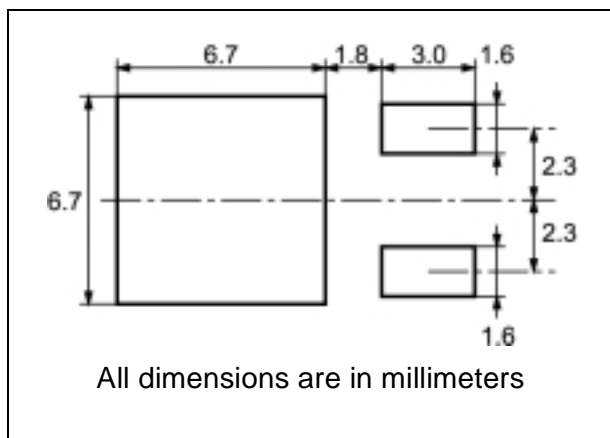


TO-252 (DPAK) MECHANICAL DATA

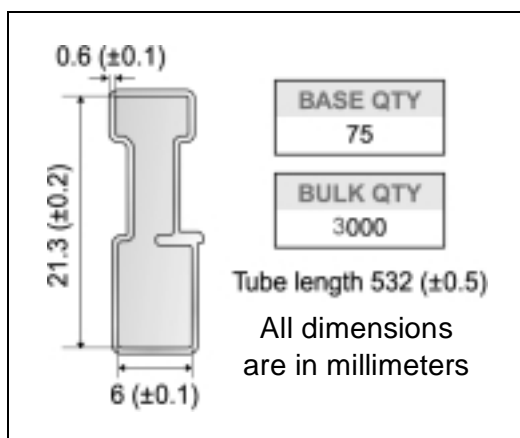
| DIM. | mm | | | inch | | |
|------|------|------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 2.20 | | 2.40 | 0.087 | | 0.094 |
| A1 | 0.90 | | 1.10 | 0.035 | | 0.043 |
| A2 | 0.03 | | 0.23 | 0.001 | | 0.009 |
| B | 0.64 | | 0.90 | 0.025 | | 0.035 |
| B2 | 5.20 | | 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° |



DPAK FOOTPRINT



TUBE SHIPMENT (no suffix)*



TAPE AND REEL SHIPMENT (suffix "T4")*

40 mm min. Access hole at slot location
Full radius
Tape slot in core for tape start 2.5mm min. width
G measured at hub

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 | 16.4 | 18.4 | 0.645 | 0.724 |
| N | 50 | | 1.968 | |
| T | | 22.4 | | 0.881 |

| BASE QTY | BULK QTY |
|----------|----------|
| 2500 | 2500 |

TAPE MECHANICAL DATA

| DIM. | mm | | inch | |
|------|------|------|-------|-------|
| | MIN. | MAX. | MIN. | MAX. |
| A0 | 6.8 | 7 | 0.267 | 0.275 |
| B0 | 10.4 | 10.6 | 0.409 | 0.417 |
| B1 | | 12.1 | | 0.476 |
| D | 1.5 | 1.6 | 0.059 | 0.063 |
| D1 | 1.5 | | 0.059 | |
| E | 1.65 | 1.85 | 0.065 | 0.073 |
| F | 7.4 | 7.6 | 0.291 | 0.299 |
| K0 | 2.55 | 2.75 | 0.100 | 0.108 |
| P0 | 3.9 | 4.1 | 0.153 | 0.161 |
| P1 | 7.9 | 8.1 | 0.311 | 0.319 |
| P2 | 1.9 | 2.1 | 0.075 | 0.082 |
| R | 40 | | 1.574 | |
| W | 15.7 | 16.3 | 0.618 | 0.641 |

10 pitches cumulative tolerance on tape +/- 0.2 mm
TOP COVER TAPE
Center line of cavity
User Direction of Feed
FEED DIRECTION
Bending radius
For machine net only including draft and radii concentric around fillet

* on sales type

Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

The ST logo is a registered trademark of STMicroelectronics
All other names are the property of their respective owners

© 2004 STMicroelectronics - All Rights Reserved
STMicroelectronics GROUP OF COMPANIES

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan -
Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States.

<http://www.st.com>