



STGW30NB60H

N-CHANNEL 30A - 600V TO-247
PowerMESH™ IGBT

| TYPE | V _{CES} | V _{CE(sat)} | I _C |
|-------------|------------------|----------------------|----------------|
| STGW30NB60H | 600 V | < 2.8 V | 30 A |

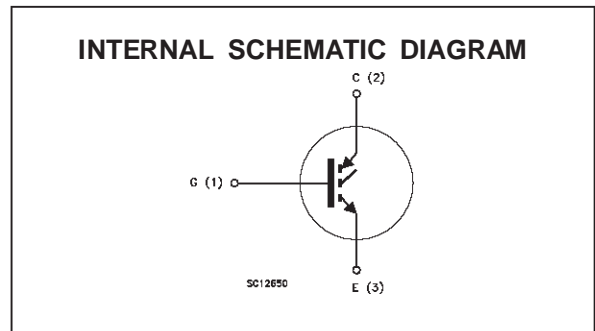
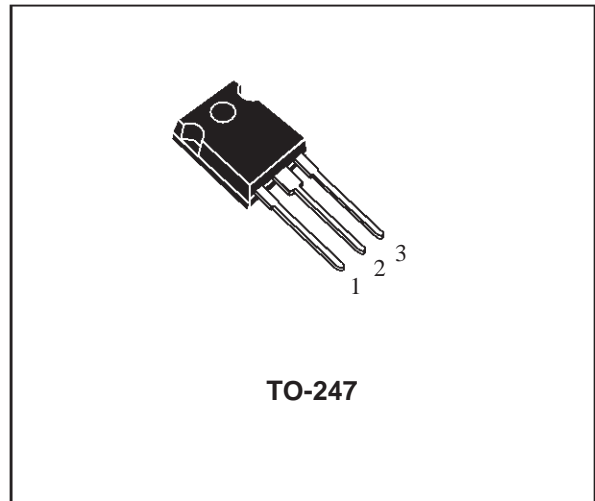
- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- LOW ON-VOLTAGE DROP (V_{CESAT})
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- VERY HIGH FREQUENCY OPERATION
- OFF LOSSES INCLUDE TAIL CURRENT

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 "H" identifies a family optimized to achieve very low switching times for high frequency applications (<120kHz).

APPLICATIONS

- HIGH FREQUENCY MOTOR CONTROLS
- WELDING EQUIPMENTS
- SMPS AND PFC IN BOTH HARD SWITCH AND RESONANT TOPOLOGIES



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|---------------------|---|------------|------|
| V _{CES} | Collector-Emitter Voltage (V _{GS} = 0) | 600 | V |
| V _{ECR} | Emitter-Collector Voltage | 20 | V |
| V _{GE} | Gate-Emitter Voltage | ± 20 | V |
| I _C | Collector Current (continuous) at T _c = 25 °C | 60 | A |
| I _C | Collector Current (continuous) at T _c = 100 °C | 30 | A |
| I _{CM} (•) | Collector Current (pulsed) | 240 | A |
| P _{tot} | Total Dissipation at T _c = 25 °C | 190 | W |
| | Derating Factor | 1.52 | W/°C |
| T _{stg} | Storage Temperature | -65 to 150 | °C |
| T _j | Max. Operating Junction Temperature | 150 | °C |

(•) Pulse width limited by safe operating area

STGW30NB60H

THERMAL DATA

| | | | | |
|----------------|-------------------------------------|-----|------|---------------|
| $R_{thj-case}$ | Thermal Resistance Junction-case | Max | 0.66 | $^{\circ}C/W$ |
| $R_{thj-amb}$ | Thermal Resistance Junction-ambient | Max | 30 | $^{\circ}C/W$ |
| R_{thc-h} | Thermal Resistance Case-heatsink | Typ | 0.1 | $^{\circ}C/W$ |

ELECTRICAL CHARACTERISTICS ($T_j = 25^{\circ}C$ unless otherwise specified)

OFF

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

ON (*)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------|--------------------------------------|---|------|------------|------|--------|
| $V_{GE(th)}$ | Gate Threshold Voltage | $V_{CE} = V_{GE}$ $I_C = 250 \mu A$ | 3 | | 5 | V |
| $V_{CE(SAT)}$ | Collector-Emitter Saturation Voltage | $V_{GE} = 15 V$ $I_C = 30 A$ $V_{GE} = 15 V$ $I_C = 30 A$ $T_j = 125^{\circ}C$ | | 2.2 1.8 | 2.8 | V V |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------------------------------|---|---|------|-------------------|------|----------------|
| g_{fs} | Forward Transconductance | $V_{CE} = 25 V$ $I_C = 30 A$ | | 20 | | S |
| C_{ies} C_{oes} C_{res} | Input Capacitance Output Capacitance Reverse Transfer Capacitance | $V_{CE} = 25 V$ $f = 1 \text{ MHz}$ $V_{GE} = 0$ | | 2300 250 60 | | pF pF pF |
| Q_G Q_{GE} Q_{GC} | Total Gate Charge Gate-Emitter Charge Gate-Collector Charge | $V_{CE} = 480 V$ $I_C = 30 A$ $V_{GE} = 15 V$ | | 150 15 72 | | nC nC nC |
| I_{CL} | Latching Current | $V_{clamp} = 480 V$ $R_G = 10 \Omega$ $T_j = 150^{\circ}C$ | 120 | | | A |

SWITCHING ON

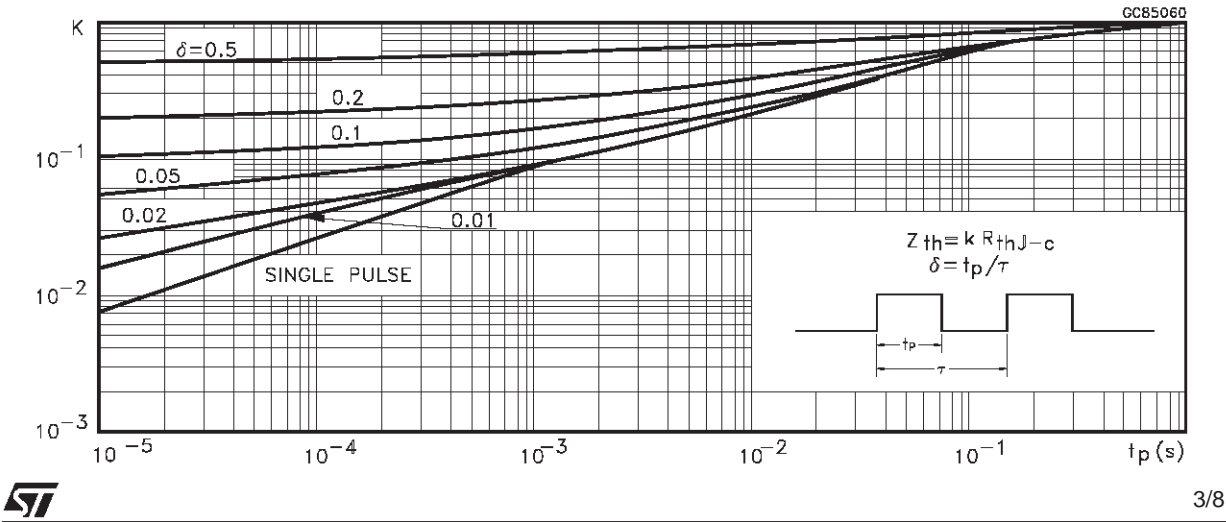
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------------------|--------------------------|--|------|----------|------|------------|
| $t_{d(on)}$ t_r | Delay Time Rise Time | $V_{CC} = 480 V$ $I_C = 30 A$ $V_{GE} = 15 V$ $R_G = 10 \Omega$ | | 15 75 | | ns ns |
| $(di/dt)_{on}$ | Turn-on Current Slope | $V_{CC} = 480 V$ $I_C = 30 A$ $R_G = 10 \Omega$ $V_{GE} = 15 V$ | | 760 | | A/ μs |
| E_{on} | Turn-on Switching Losses | $T_j = 125^{\circ}C$ | | 850 | | μJ |

ELECTRICAL CHARACTERISTICS (continued)
SWITCHING OFF

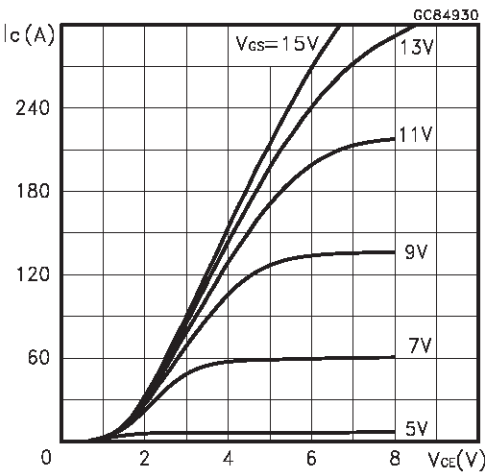
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------------|-------------------------|--|------|------|------|------|
| t_c | Cross-Over Time | $V_{CC} = 480\text{ V}$ $R_{GE} = 10\text{ }\Omega$ $I_C = 30\text{ A}$ $V_{GE} = 15\text{ V}$ | | 150 | | ns |
| $t_r(v_{off})$ | Off Voltage Rise Time | | | 40 | | ns |
| $t_d(off)$ | Delay Time | | | 210 | | ns |
| t_f | Fall Time | | | 90 | | ns |
| $E_{off(**)}$ | Turn-off Switching Loss | | | 1.10 | | mJ |
| E_{ts} | Total Switching Loss | | | 1.8 | | mJ |
| t_c | Cross-Over Time | $V_{CC} = 480\text{ V}$ $R_{GE} = 10\text{ }\Omega$ $T_j = 125\text{ }^\circ\text{C}$ $I_C = 30\text{ A}$ $V_{GE} = 15\text{ V}$ | | 250 | | ns |
| $t_r(v_{off})$ | Off Voltage Rise Time | | | 70 | | ns |
| $t_d(off)$ | Delay Time | | | 250 | | ns |
| t_f | Fall Time | | | 160 | | ns |
| $E_{off(**)}$ | Turn-off Switching Loss | | | 1.6 | | mJ |
| E_{ts} | Total Switching Loss | | | 2.45 | | mJ |

(●) Pulse width limited by max. junction temperature
(*) Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %
(**) Losses Include Also The Tail (Jedec Standardization)

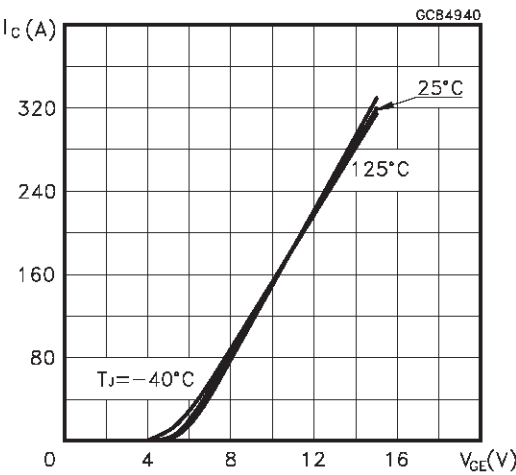
Thermal Impedance



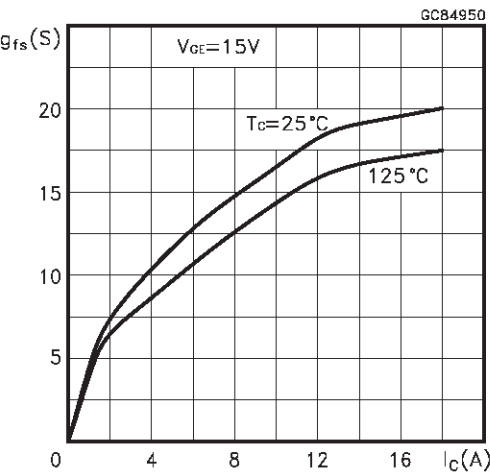
Output Characteristics



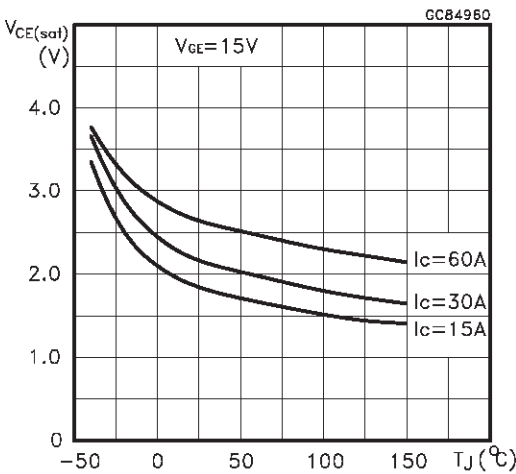
Transfer Characteristics



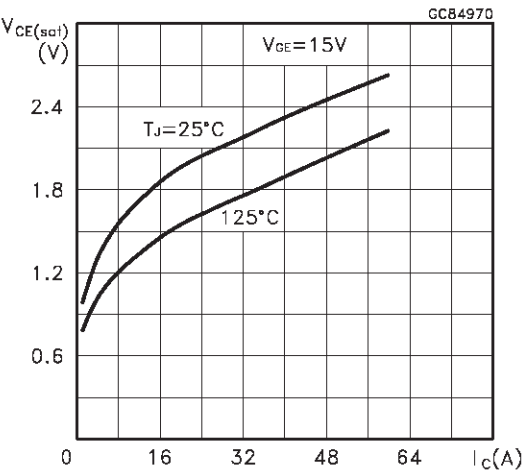
Transconductance



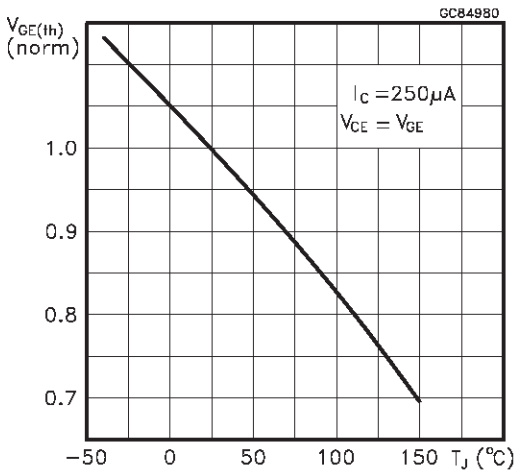
Collector-Emitter On Voltage vs Temperature



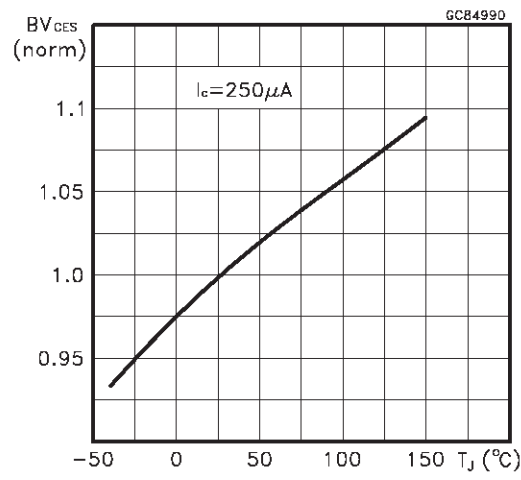
Collector-Emitter On Voltage vs Collector Current



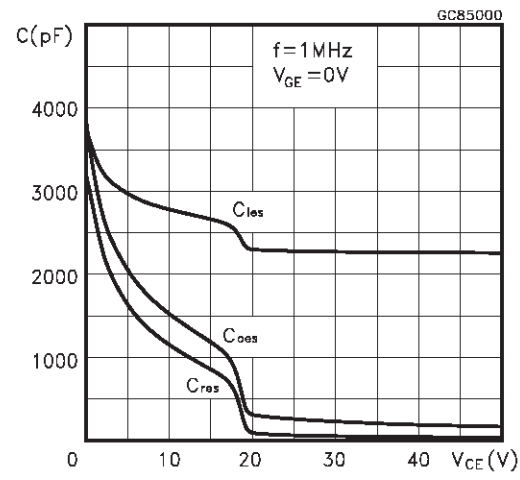
Gate Threshold vs Temperature



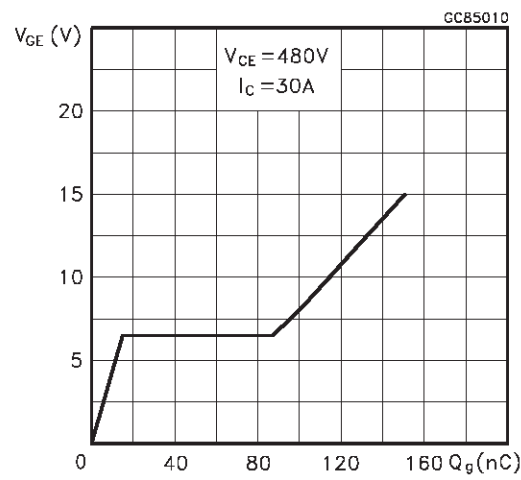
Normalized Breakdown Voltage vs Temperature



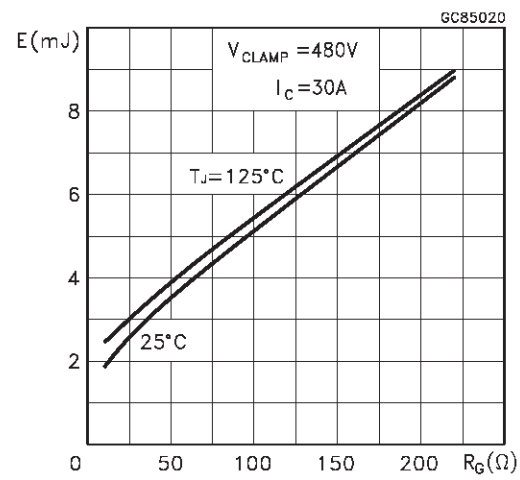
Capacitance Variations



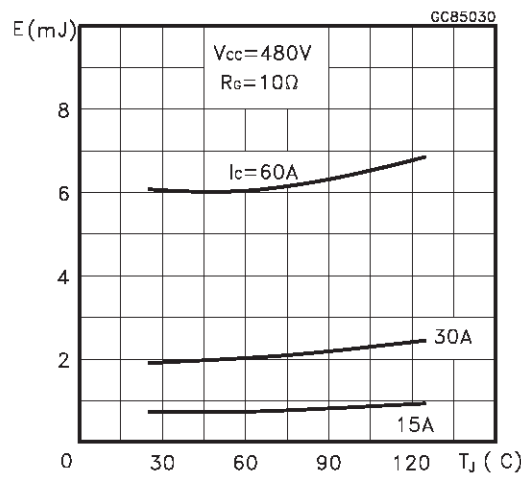
Gate Charge vs Gate-Emitter Voltage



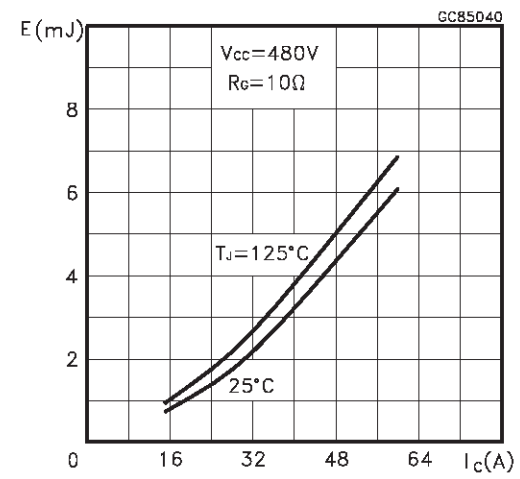
Total Switching Losses vs Gate Resistance



Total Switching Losses vs Temperature



Total Switching Losses vs Collector Current



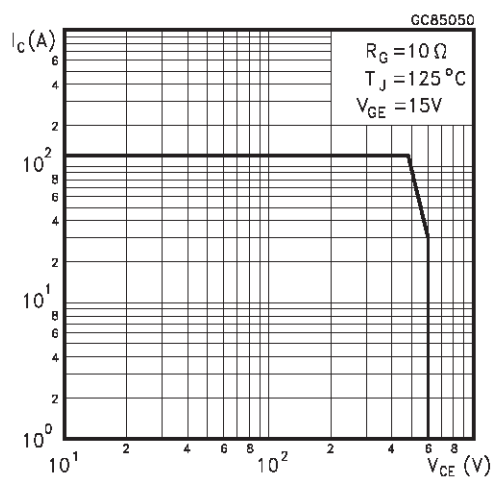


Fig. 1: Gate Charge test Circuit

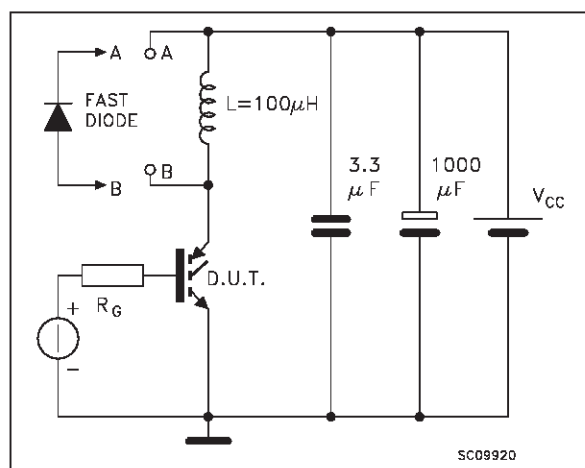
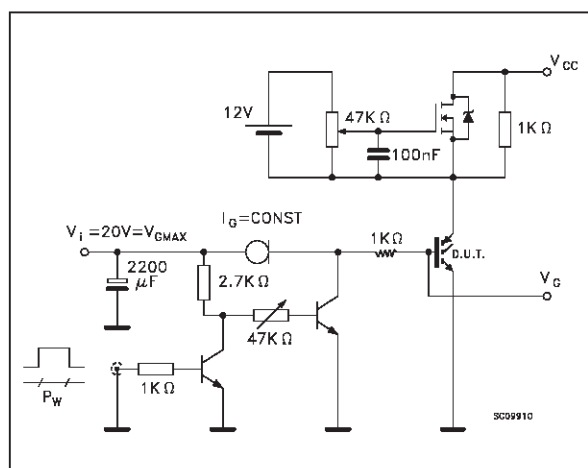
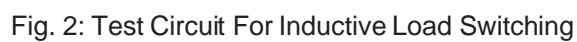
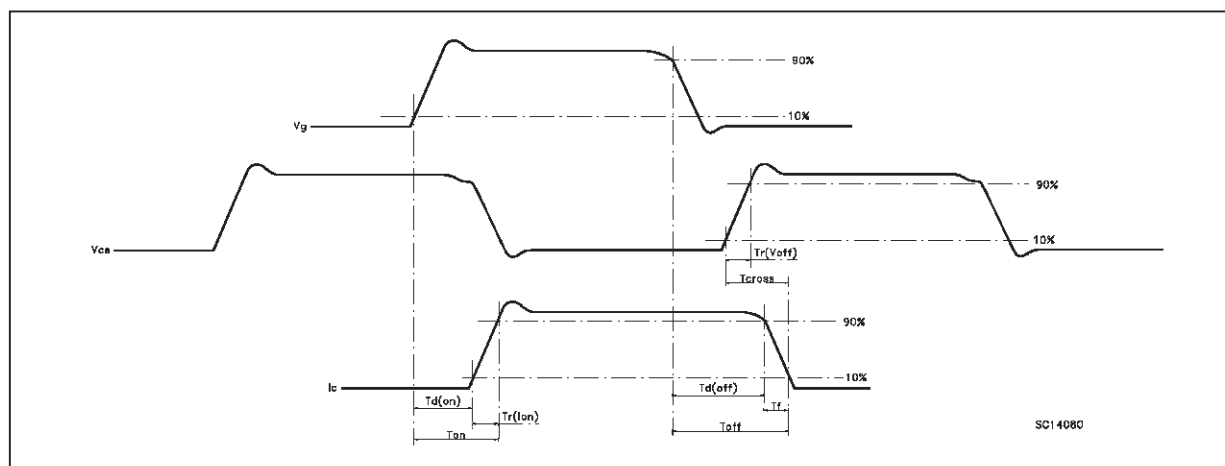
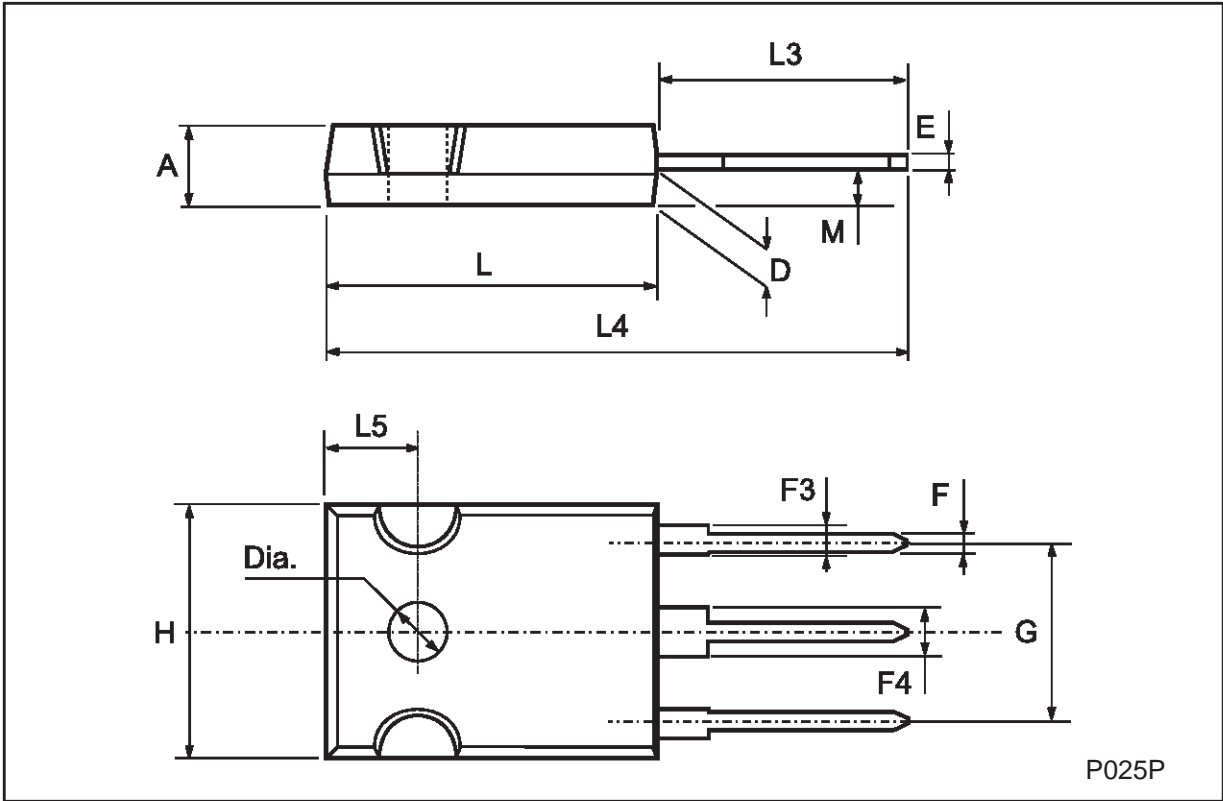


Fig. 3 Switching Waveforms



TO-247 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|------|------|------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.7 | | 5.3 | 0.185 | | 0.209 |
| D | 2.2 | | 2.6 | 0.087 | | 0.102 |
| E | 0.4 | | 0.8 | 0.016 | | 0.031 |
| F | 1 | | 1.4 | 0.039 | | 0.055 |
| F3 | 2 | | 2.4 | 0.079 | | 0.094 |
| F4 | 3 | | 3.4 | 0.118 | | 0.134 |
| G | | 10.9 | | | 0.429 | |
| H | 15.3 | | 15.9 | 0.602 | | 0.626 |
| L | 19.7 | | 20.3 | 0.776 | | 0.779 |
| L3 | 14.2 | | 14.8 | 0.559 | | 0.582 |
| L4 | | 34.6 | | | 1.362 | |
| L5 | | 5.5 | | | 0.217 | |
| M | 2 | | 3 | 0.079 | | 0.118 |



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