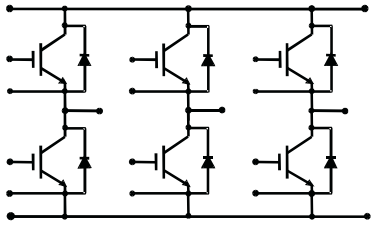
$V_{CE}$ = 1200 V
$I_C$ = 100 A



# IGBT Module LoPak3 SPT

# 5SNS 0100W120100

## PRELIMINARY

Doc. No. 5SYA1522-01 May. 01

- **Low-loss, rugged IGBT SPT chip-set**
- **EMC friendly diode with positive temp. coefficient of on-state**
- **Low profile compact baseless package**
- **Industry standard package**
- **UL File no. E63532**

## Maximum Rated Values

($T_{vj}$ = 25°C, unless specified otherwise)

| Parameter | Symbol | Conditions | Values | Unit |
|---|---|---|---|---|
| Collector-Emitter Voltage | $V_{CES}$ | $V_{GE}$ shorted | 1200 | V |
| DC Collector Current | $I_C$ | $T_{hs}$ = 70°C | 100 | A |
| Peak Collector Current | $I_{CM}$ | Pulse: tp=1ms, $T_{hs}$ = 70°C | 200 | A |
| Gate Emitter Voltage | $V_{GES}$ | | ±20 | V |
| Total Power Dissipation | Ptot | $T_{hs}$ = 25°C per switch | 450 | W |
| IGBT Switching SOA | SwSOA | $I_C$ = 200 A, $V_{CEM}$ = 1200 V, $V_{CC}$ ≤ 1000 V,<br>$V_{GE}$ = ±15 V, $T_{vj}$ =125°C<br>voltages measured on auxiliary terminals | | |
| IGBT Short Circuit SOA | SCSOA | $V_{CC}$ = 900 V, $V_{CEM}$ = 1200 V, $t_p$ = 10 µs,<br>$V_{GE}$ = ±15 V, $T_{vj}$ =125 °C | | |
| DC Forward Current | $I_F$ | | 100 | A |
| Peak Forward Current | $I_{FM}$ | Pulse: tp = 1ms, $T_{hs}$ = 70°C | 200 | A |

## Maximum Rated Values (cont.)

($T_{vj}$ = 25°C, unless specified otherwise)

| Parameter | Symbol | Conditions | | Values | Unit |
|---|---|---|---|---|---|
| Junction Temperature | $T_{vj}$ | | | - 40 ~ 150 | °C |
| Storage Temperature | $T_{tstg}/T_{cop}$ | | | - 40 ~ 125 | °C |
| Isolation Voltage | $V_{iso}$ | 1 min, f = 50Hz | | 2500 | V |
| Mounting | Base to Heatsink | (M5) Hole 5.5mm diameter | | 3 ~ 6 | Nm |
| | Main Terminals | Pin: 1.15*1.0 mm | | | |
| | PCB mounting | Pitch of pins : 3.81 mm | | | |
| | Gate, Emitter Aux. | Pin: 1.15*1.0 mm | | | |

## IGBT Characteristic Values

($T_{vj}$ = 25°C, unless specified otherwise)

| Parameter | Symbol | Conditions | | min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|---|
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$* | $I_C$ = 100 A, $V_{GE}$ = 15 V | $T_{vj}$ = 25 °C | | 2.00 | 2.35 | V |
| | | | $T_{vj}$ = 125 °C | | 2.20 | | V |
| Collector Cut-off Current | $I_{CES}$ | $V_{CE}$ = 1200 V, $V_{GE}$ = 0 V, $T_{vj}$ = 125 °C | | | | 8 | mA |
| Gate-Emitter leakage Current | $I_{GES}$ | $V_{CE}$ = 0 V, $V_{GE}$ = ±20 V, $T_{vj}$ = 125 °C | | | | ±500 | nA |
| Gate-Emitter Threshold Voltage | $V_{GE(TO)}$ | $I_C$ = 4 mA, $V_{CE}$ = $V_{GE}$ | | 4.5 | | 6.5 | V |
| Total Gate Charge | $Q_{ge}$ | $I_C$ = 100 A, $V_{CE}$ = 600 V, $V_{GE}$ = -15 to 15 V | | | 1000 | | nC |
| Input Capacitance | $C_{ies}$ | $V_{CE}$ = 25 V, $V_{GE}$ = 0 V, f = 1MHz | | | 9.0 | | nF |
| Output Capacitance | $C_{oes}$ | | | | 2.2 | | nF |
| Reverse Transfer Capacitance | $C_{res}$ | | | | 1.8 | | nF |
| Turn-On Delay Time | $t_{d(on)}$ | $I_C$ = 100 A, $V_{CC}$ = 600 V, $R_{gon}$ = 10 Ω, $T_{vj}$ = 125 °C, $V_{GE}$ = ±15 V | | | 0.08 | | µs |
| Rise Time | $t_r$ | | | | 0.06 | | µs |
| Turn-Off Delay Time | $t_{d(off)}$ | $I_C$ = 100 A, $V_{CC}$ = 600 V, $R_{goff}$ = 10 Ω, $T_{vj}$ = 125 °C, $V_{GE}$ = ±15 V | | | 0.5 | | µs |
| Fall Time | $t_f$ | | | | 0.09 | | µs |
| Turn-on Switching Energy | $E_{on}$ | $R_{gon}$ = 10 Ω | $I_C$ = 100 A, $T_{vj}$ = 125 °C, $V_{CC}$ = 600 V, $V_{GE}$ = ±15 V, inductive load, integrated up to: 3% $V_{CE}$ ($E_{on}$), 1% $I_C$ ($E_{off}$) | | 11.0 | | mJ |
| Turn-off Switching Energy | $E_{off}$ | $R_{goff}$ = 10 Ω | | | 9.5 | | mJ |
| Module stray Inductance Plus to Minus | $L_{s\ DC}$ | | | | | 25 | nH |
| Resistance terminal-chip | $R_{CC'+EE'}$ | | $T_{hs}$ = 25 °C | | 1.25 | | mΩ |
| | | | $T_{hs}$ = 125 °C | | 1.90 | | |

* Note 1: Collector emitter saturation voltage is given at die level.

## Diode Characteristic Values

($T_{vj}$ = 25°C, unless specified otherwise)

| Parameter | Symbol | Conditions | | min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|---|
| Forward Voltage | $V_F$* | $I_F$ = 100 A | $T_{vj}$ = 25 °C | | 2.00 | 2.40 | V |
| | | | $T_{vj}$ = 125 °C | | 2.00 | | |
| Reverse Recovery Current | $I_{rrm}$ | $I_F$ = 100 A, $R_{gon}$ = 10 Ω, $V_{CC}$ = 600 V, $V_{GE}$ = ±15 V, $T_{vj}$ = 125 °C | | | 120 | | A |
| Reverse Recovery Charge | $Q_{rr}$ | | | | 20 | | µC |
| Reverse Recovery Time | $t_{rr}$ | | | | 0.30 | | µs |
| Reverse Recovery Energy | $E_{rec}$ | $I_F$ = 100 A, $T_{vj}$ = 125 °C, $V_{CC}$ = 600V, $R_{gon}$ = 10 Ω, $V_{GE}$ = ±15 V, inductive load, fully integrated | | | 8.5 | | mJ |
| Resistance terminal-chip | $R_{CC'+EE'}$ | | $T_{hs}$ = 25 °C | | 1.25 | | mΩ |
| | | | $T_{hs}$ = 125 °C | | 1.90 | | |

* Note 2: Forward voltage is given at die level

## Thermal Characteristics

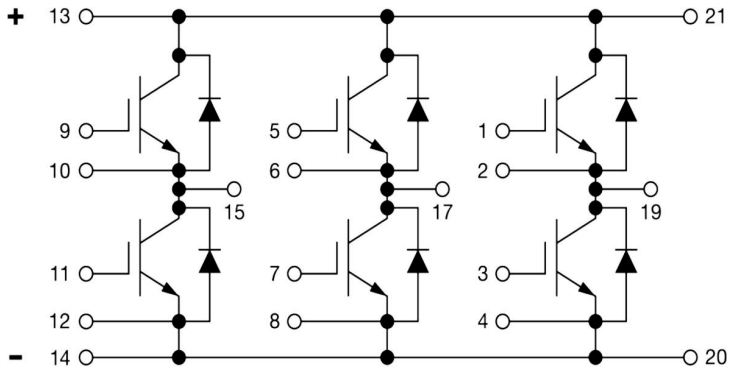
($T_j$ = 25°C, unless specified otherwise)

| Parameter | Symbol | Conditions | min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|
| IGBT Thermal Resistance Junction to Heatsink | $R_{th}$ j-h Igbt | Heatsink: flatness < +/- 20 µm, roughness < 6 µm without ridge Thermal grease: thickness: 30 µm < t < 50 µm | | | 0.280 | °C/W |
| Diode Thermal Resistance Junction to Heatsink | $R_{th}$ j-h Diode | | | | 0.560 | °C/W |
| Equivalent IGBT Thermal Resistance Junct. to Case | $R_{th}$ j-c Igbt | | | | 0.180 | °C/W |
| Equivalent Diode Thermal Resistance Junct. to Case | $R_{th}$ j-c Diode | | | | 0.360 | °C/W |

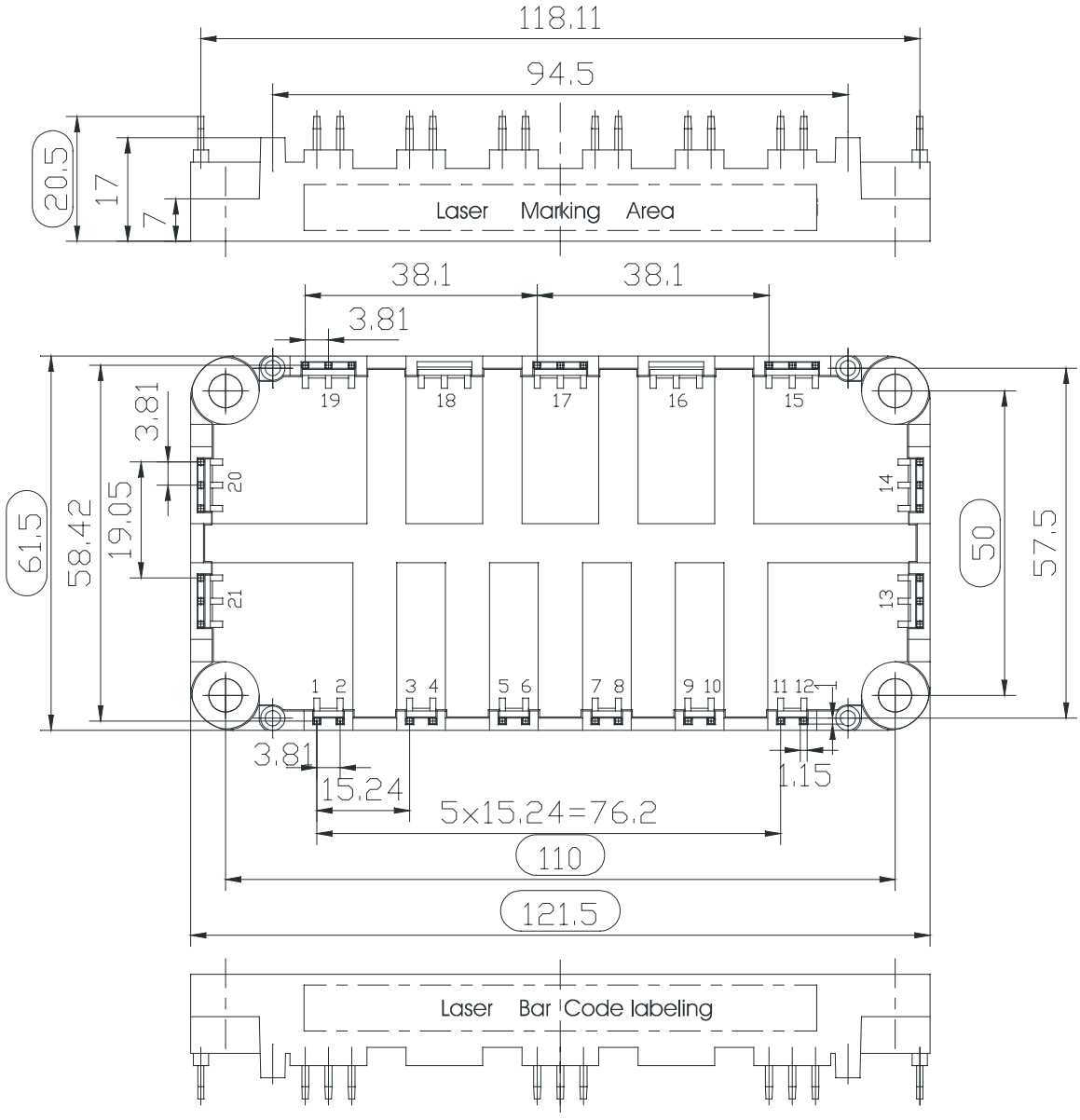
## Mechanical Properties

| Parameter | Symbol | Conditions | | min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|---|
| Dimensions | L* W* H | Typical , see outline drawing | | 121.5 * 61.5 * 20.5 | | | mm |
| Clearance Distance | $D_C$ | acc. IEC 664-1 and prEN50124-1:1995 | Term. to base: | 8.5 | | | mm |
| | | | Term. to term: | 9.5 | | | mm |
| Surface Creepage Distance | $D_{SC}$ | acc. IEC 664-1 and prEN50124-1:1995 | Term. to base: | 12.5 | | | mm |
| | | | Term. to term: | 15.5 | | | mm |
| Weight | | | | | 215 | | gr |

## Electrical configuration




## Outline drawing



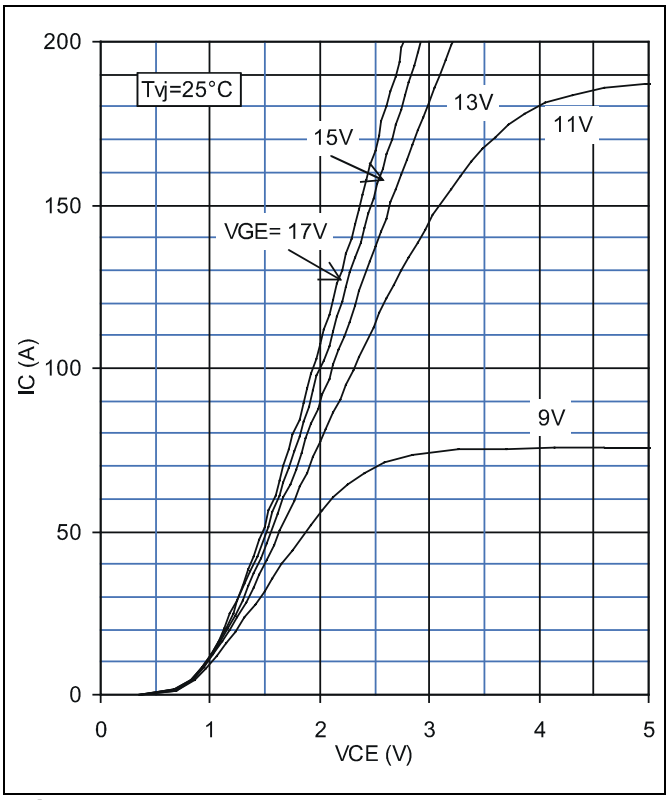



**Fig. 1** Typ. Output Characteristics at Tvj=25°C

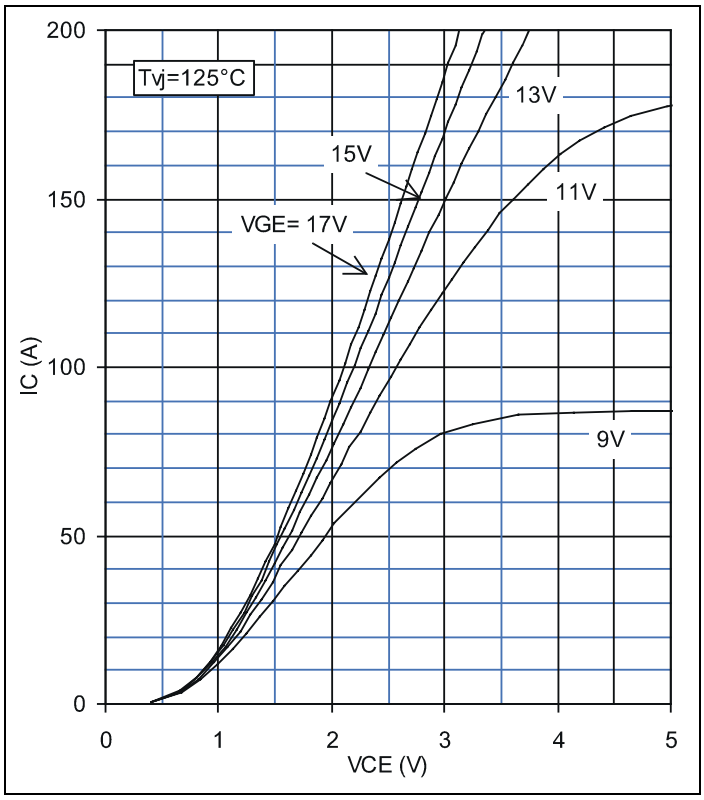



**Fig. 2** Typ. Output Characteristics at Tvj=125°C

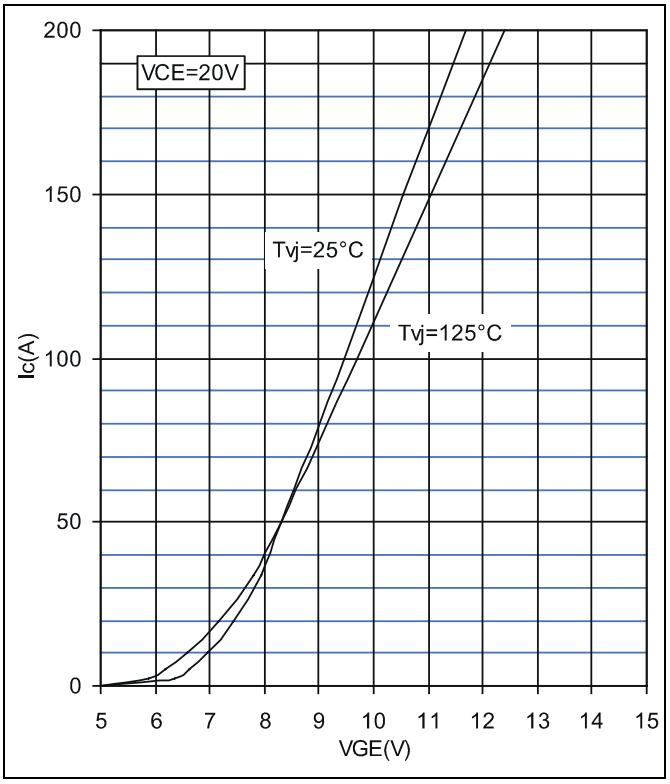



**Fig. 3** Typ. Transfer Characteristics

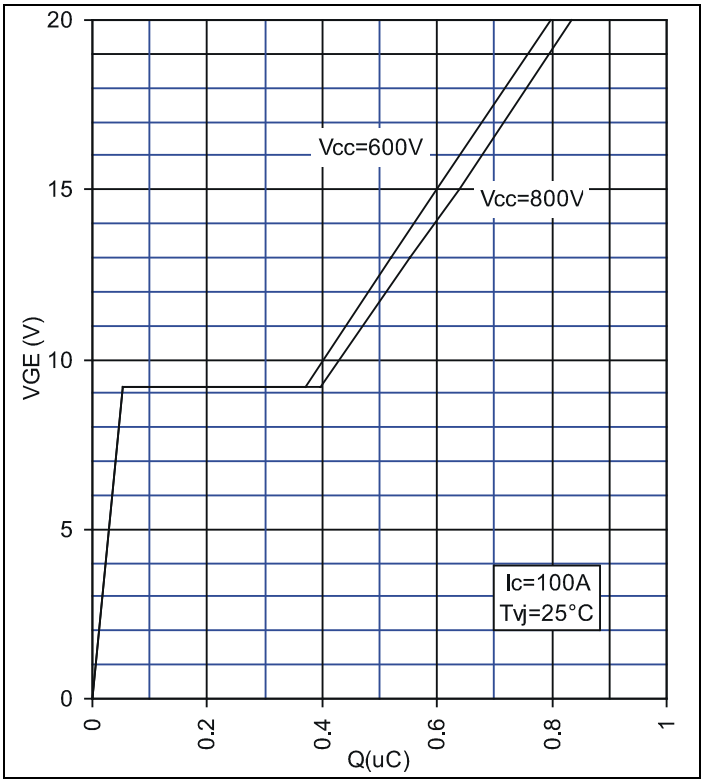



**Fig. 4** Typ. Gate charge Characteristics

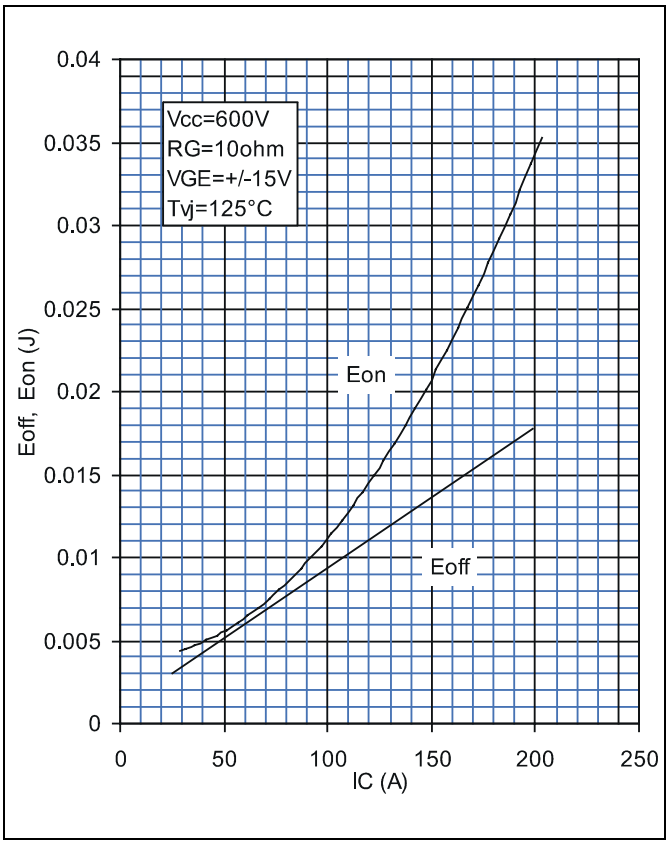



**Fig. 5** Typ. Switching Energies per pulse vs on-state current

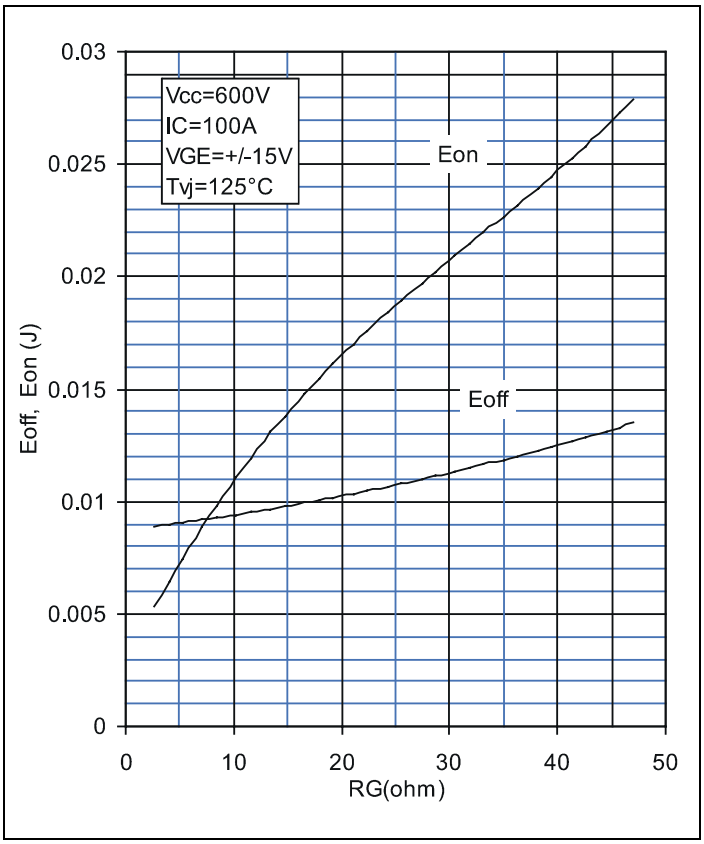



**Fig. 6** Typ. Switching Energies per pulse vs gate resistor

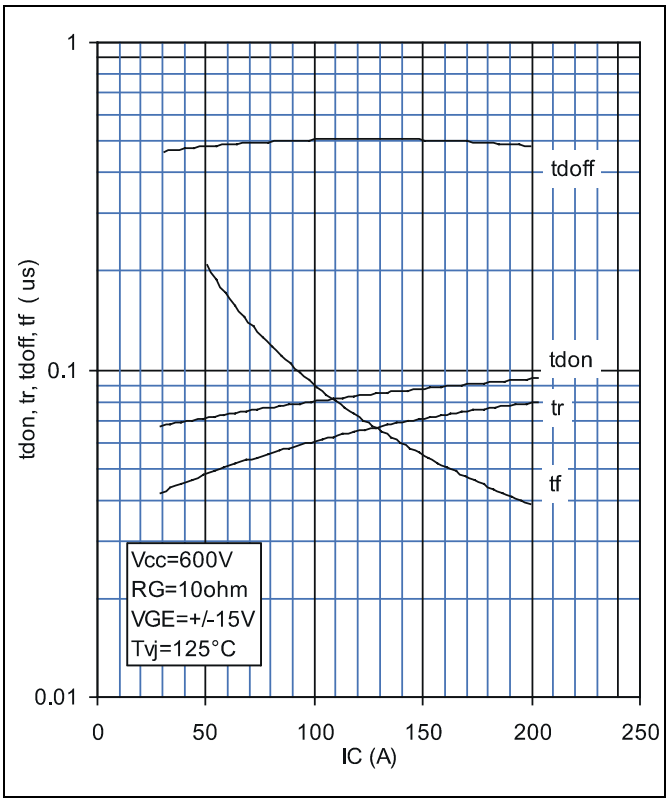



**Fig. 7** Typ. Switching times vs on-state current

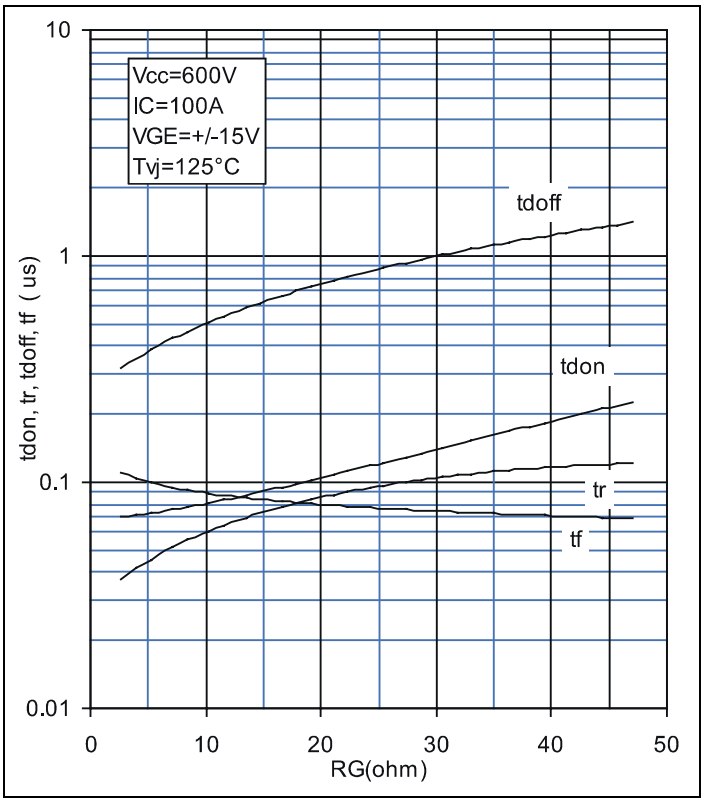



**Fig. 8** Typ. Switching times vs gate resistor

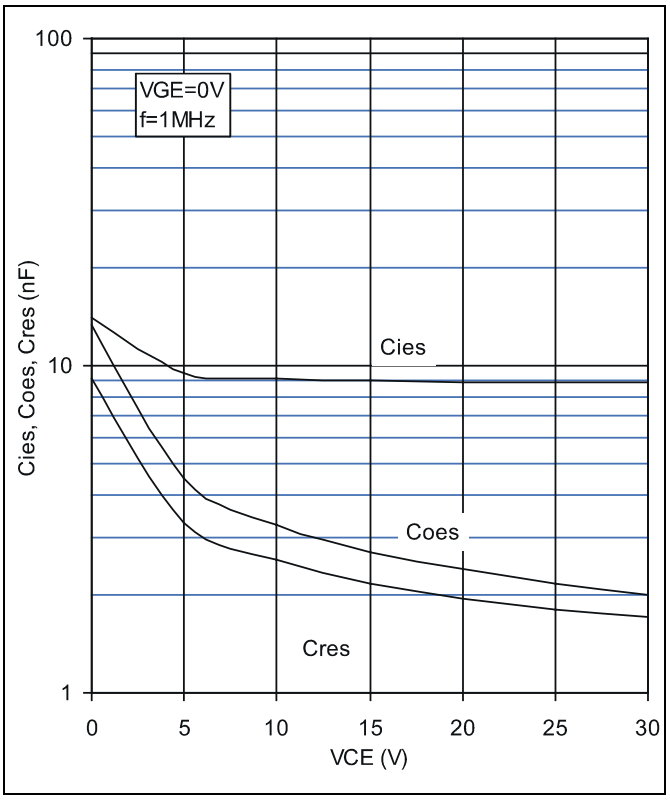



**Fig. 9** Typ. Capacitances vs collector-emitter Voltage

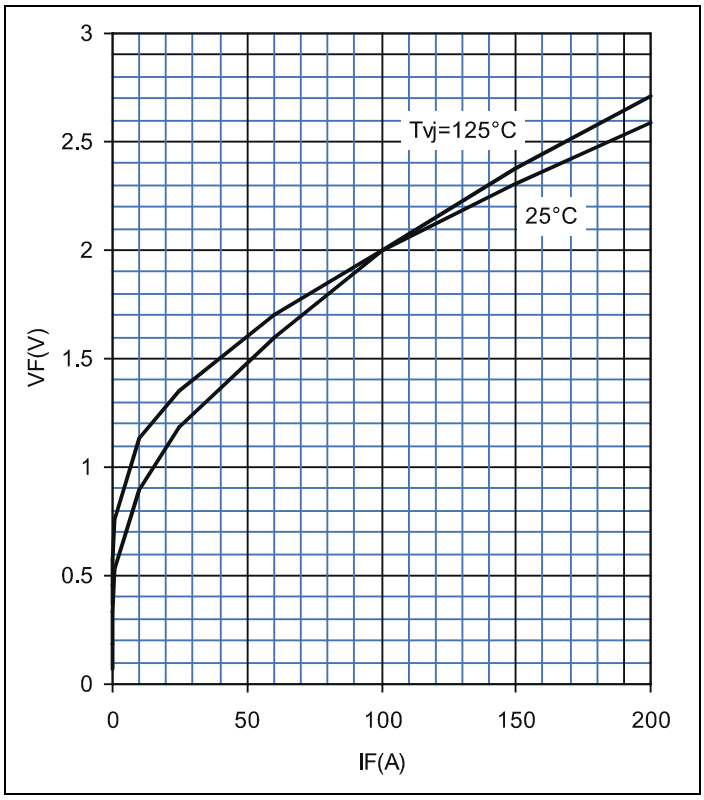



**Fig. 10** Typ. Diode forward Characteristics

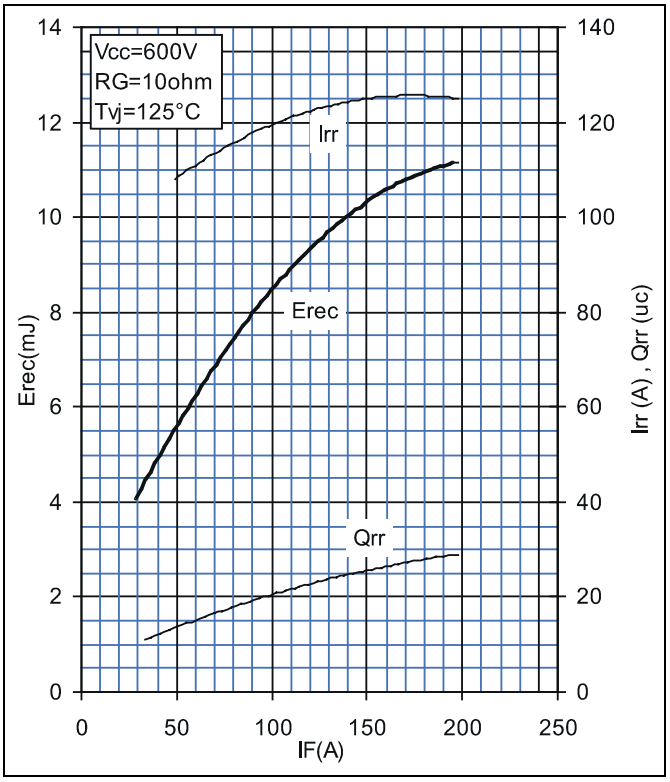



**Fig. 11** Typ. Reverse Recovery Characteristics vs forward current

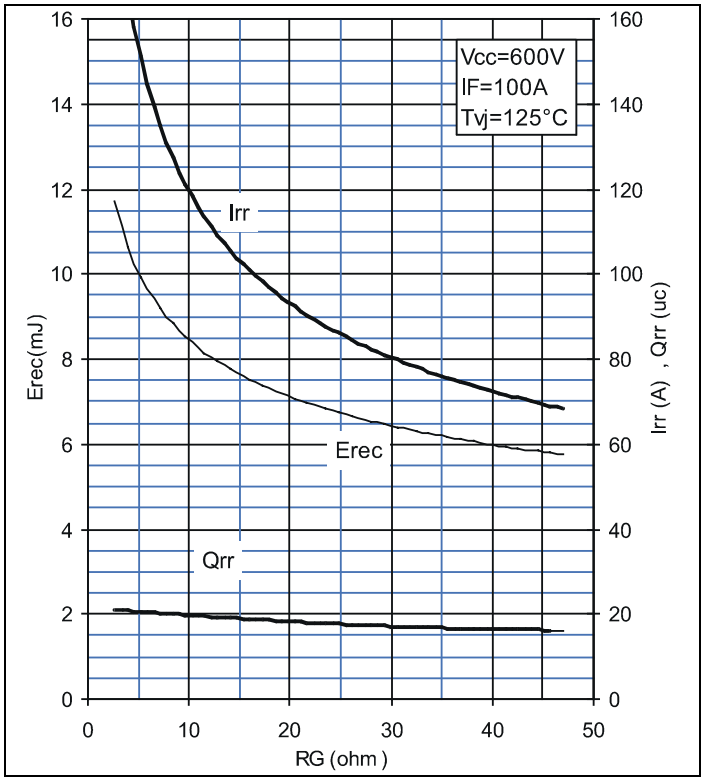



**Fig. 12** Typ. Reverse Recovery Characteristics vs gate resistor

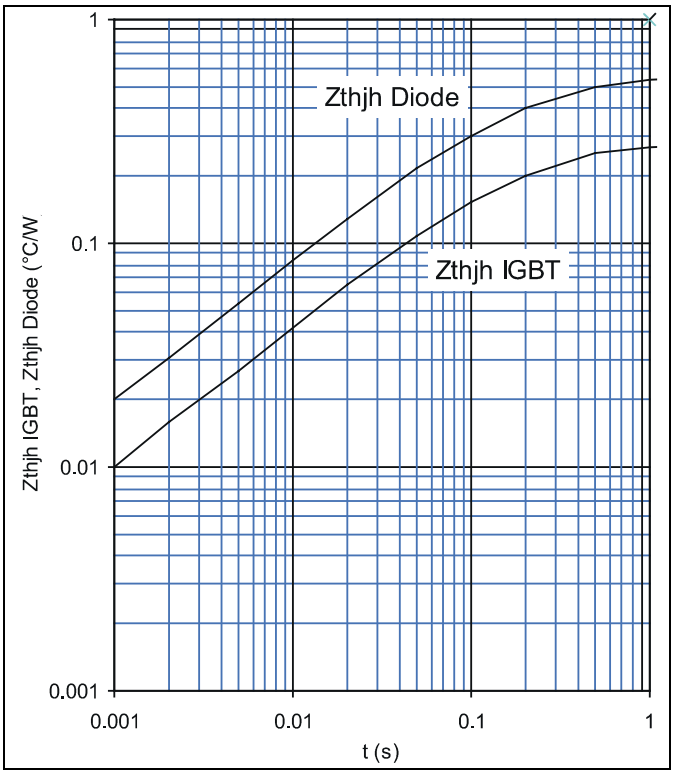



**Fig. 13** Typ. Thermal impedance vs time



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