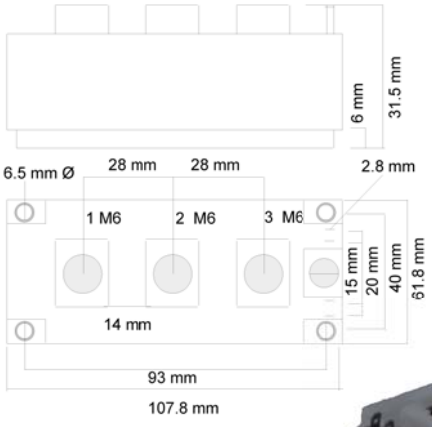
# IGBT

## Phase Leg Module

$V_{CES}$ = 1200 V
$I_{CM}$ = 300 A
$V_{CE(SAT)}$ = 2 V

### Features

- SPT chip (soft-punch-through)
- MOS input control
- Low $V_{CE(SAT)}$
- Positive temperature coefficient for easy paralleling
- High short-circuit current capability
- Low switching losses
- Isolation voltage 2500 V RMS

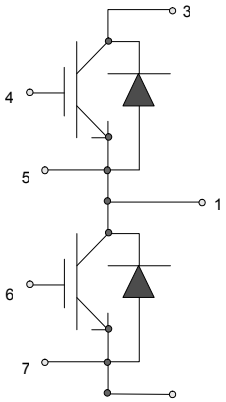



### Applications

- AC and DC motor control
- AC servo and robot devices
- Power supplies
- Welding inverters

**Maximum Ratings**

| Parameter | Symbol | Conditions | | Values | Units |
|---|---|---|---|---|---|
| **IGBT** | | | | | |
| Collector-Emitter Voltage | $V_{CES}$ | | | 1200 | V |
| DC-Collector Current | $I_{CM}$ | $T_c$=25ºC (85ºC) | | 450 (300) | A |
| Gate Emitter Peak Voltage | $V_{GES}$ | | | ±20 | V |
| Operating Temperature | $T_{vj}$ | | | -40 to +125 | ºC |
| Storage Temperature | $T_{stg}$ | | | -40 to +125 | ºC |
| Insulation Test Voltage | $V_{ISOL}$ | RMS, 1min, 50 Hz | | 2500 | V |
| **Free-wheeling diode** | | | | | |
| DC-Forward Current | $I_F$ | $T_c$=25ºC (85ºC) | | 450 (300) | A |
| Repetitive Peak Forward Current | $I_{FM}$ | | $t_P$= 1ms | 900 (600) | A |
| Forward Surge Current | $I_{FSM}$ | $t_P$= 10ms, Sin, $T_j$ = 150ºC | | 2200 | A |
| **Thermal Properties** | | | | | |
| Th. Resistance Junction to Case | $R_{thJC}$ | | | 0.06 | K/W |
| Th. Resistance Case to Heat Sink | $R_{thCS}$ | | | 0.03 | K/W |




| **Mechanical Properties** | | Values | | | |
|---|---|---|---|---|---|
| | | Min | Typ | Max | |
| Mounting Torque | $M_d$ | 3 | | 6 | Nm |
| Terminal Connection Torque | | 2.5 | | 5 | Nm |
| Weight | | | 324 | | g |
| Case Color | | | White | | |
| Dimensions | | | 107.5x62x31 | | mm |

**Characteristic Values**

| Parameter | Symbol | Conditions | Values Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **IGBT** | | | | | | |
| Gate Threshold Voltage | $V_{GE(th)}$ | $V_{GE}$= $V_{CE}$, $I_C$= 2mA, $T_j$= 25ºC | | 7.5 | | V |
| Collector-Emitter Cut-Off Current | $I_{CES,25}$ | $V_{GE}$= 0V, $V_{CE}$ = $V_{CES}$, $T_j$= 25ºC | | 0.5 | | mA |
| | $I_{CES,125}$ | $V_{GE}$= 0V, $V_{CE}$ = $V_{CES}$, $T_j$= 125ºC | | 1 | | mA |
| Gate-Leakage Current | $I_{GES}$ | $V_{GE}$= 0V, $V_{CE}$ = 20V, $T_j$= 25ºC | -400 | | 400 | nA |
| Collector-Emitter Threshold Voltage | $V_{CE(TO)}$ | $T_j$= 25ºC | | 1 | | V |
| Collector-Emitter Slope Resistance | $R_{CE,25}$ | $V_{GE}$= 15V, $T_j$= 25ºC | | 3 | | mΩ |
| | $R_{CE,125}$ | $V_{GE}$= 15V, $T_j$= 125ºC | | 4.5 | | mΩ |
| Collector-Emitter Saturation Voltage | $V_{CE(SAT)}$ | $I_C$= 300A, $V_{GE}$ = 15V, $T_j$= 25ºC | | 2 | | V |
| Input Capacitance | $C_{ies}$ | $V_{GE}$= 0V, $V_{CE}$ = 25V, f = 1MHz | | 26 | | nF |
| Output Capacitance | $C_{oes}$ | | | 3 | | nF |
| Reverse Transfer Capacitance | $C_{res}$ | | | 3 | | nF |
| Stray Module Inductance | $L_\sigma$ | | | 20 | | nH |
| Rise Time | $t_R$ | $V_{CC}$= 600V, $I_C$ = 300A, $T_j$= 125ºC $R_{gon}$ = $R_{goff}$ = 12Ω, $V_{GE}$= ±18V | | 260 | | ns |
| Fall Time | $t_F$ | | | 220 | | ns |
| Turn-On Energy Loss Per Pulse | $E_{on}$ | | | 10.8 | | mJ |
| Turn-Off Energy Loss Per Pulse | $E_{off}$ | | | 68 | | mJ |
| **Free-wheeling diode** | | | | | | |
| Forward Voltage | $V_F$ | $I_F$= 300A, $V_{GE}$ = 0V, $T_j$= 25ºC | | 1.9 | | V |
| Threshold Voltage at Diode | $V_{D(TO)}$ | $T_j$= 25ºC | | 0.7 | | V |
| Peak Reverse Recovery Current | $I_{RRM}$ | $I_F$=300A, $V_{GE}$=0V, -dI/dt=190 A/µs | | 43 | | A |
| Reverse Recovery Time | $t_{RR}$ | | | 1200 | | ns |

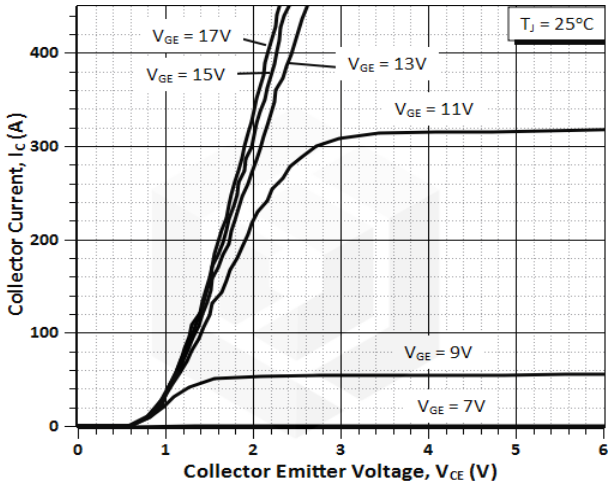



**Figure 1: Typical Output Characteristics at 25 ºC**

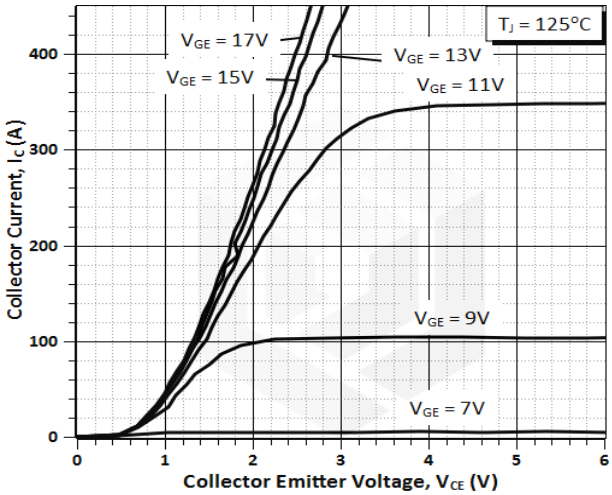



**Figure 2: Typical Output Characteristics at 125 ºC**

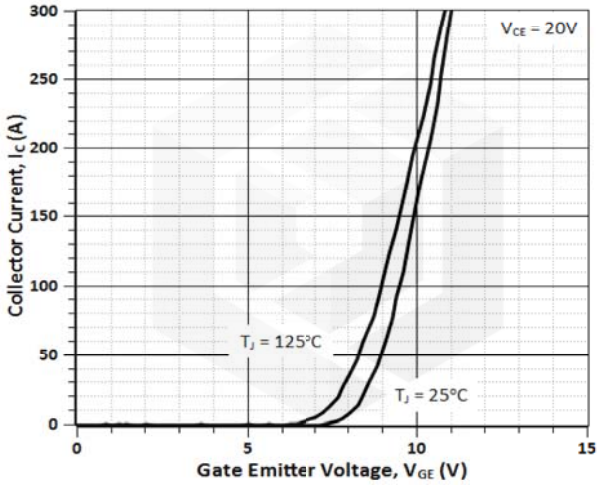



Figure 3: Typical Transfer Characteristics

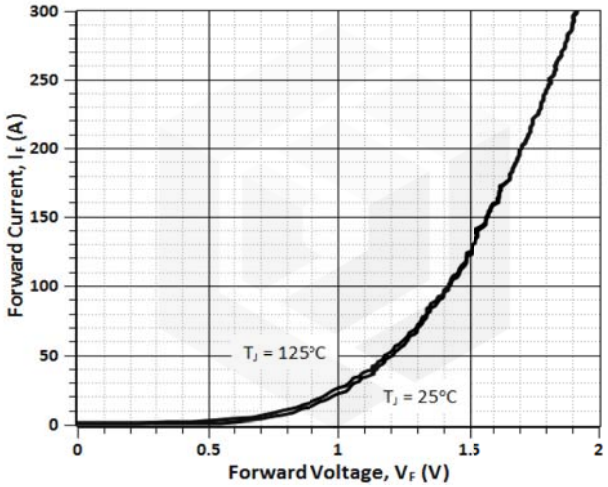



Figure 4: Typical FWD Forward Characteristics

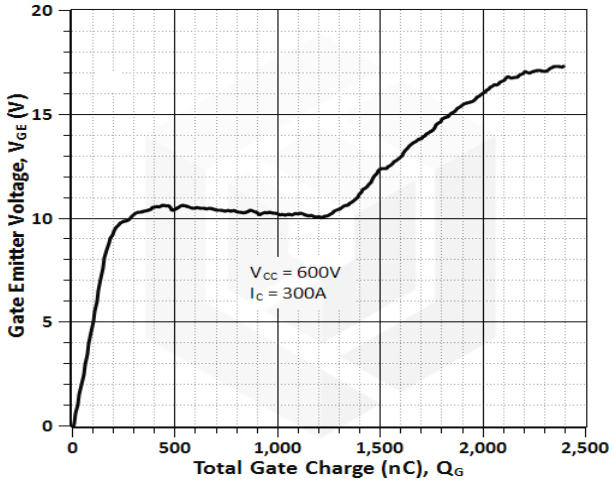



Figure 5: Typical Turn On Gate Charge

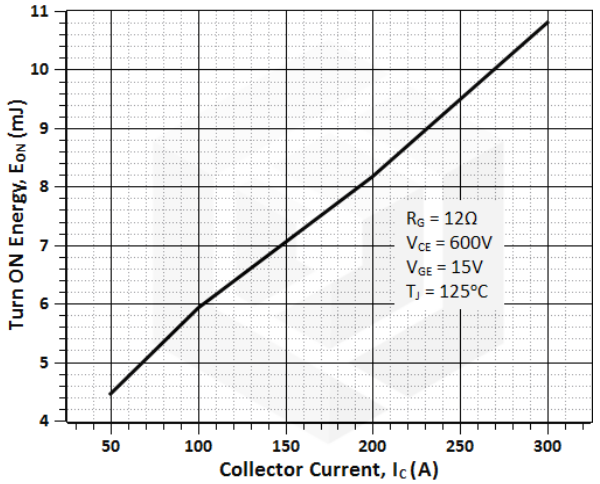



Figure 6: Typical Turn On Energy vs Collector Current

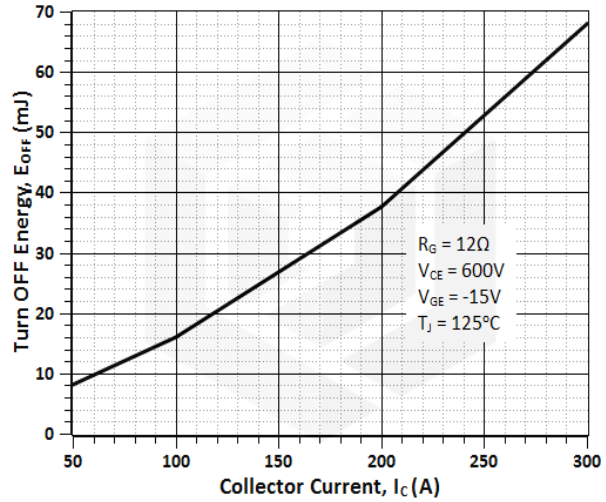



Figure 7: Typical Turn Off Energy vs Collector Current

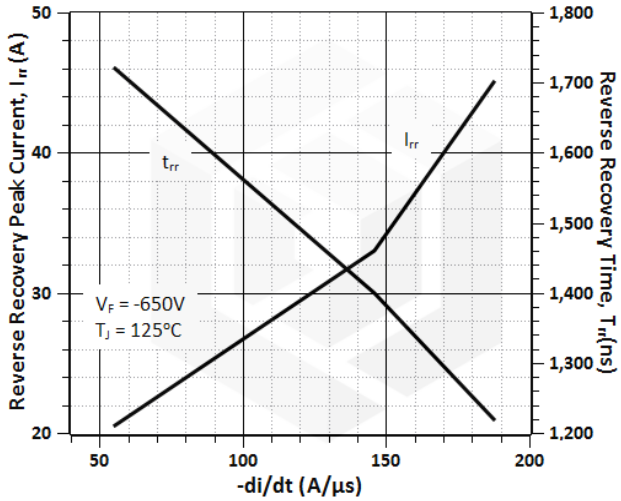



Figure 8: Typical FWD Turn Off Characteristics

| Revision History | | |
|---|---|---|
| **Date** | **Rev.** | **Notes** |
| 2010-10-08 | 0 | Created |
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