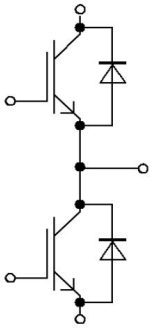
# 1200V 150A CoolFAST™ IGBT7 Power Module

## Electrical Features:

- 1200V 150A, $V_{CE(sat)}$ =1.7V@25°C
- High RBSOA Capability
- Trench/FS Technology
- Low Reverse-recovery Losses
- High SC Capability



Equivalent circuit

## Applications:

- Motor Drives
- Solar Applications
- UPS Systems
- Commercial Electric Vehicles
- Wind Turbines

## Mechanical Features:

- High Power and Thermal Cycling Capability
- Maximum Junction Temperature 175℃
- High Power Density
- PressFIT Contact Technology
- Isolated Base Plate

## Maximum Ratings and Characteristics

### Absolute Maximum Ratings at Tc= 25°C (unless otherwise specified)

| Items | Symbols | Values | Units | Remarks |
|---|---|---|---|---|
| Collector-Emitter voltage | $V_{CES}$ | 1200 | V | |
| Gate-Emitter voltage | $V_{GES}$ | ±30 | V | |
| DC Collector Current | $I_C$ | 150 | A | $T_C$= 100°C |
| Pulsed Collector Current | $I_{CP}$ | 300 | A | Note *1 |
| Diode Forward Current | $I_F$ | 150 | A | |
| Repetitive Peak Forward Current | $I_{FRM}$ | 300 | A | |
| Operating Junction Temperature | $T_{vj}$ | -40 ~ +150 | °C | |
| Storage Temperature | $T_{stg}$ | -40 ~ +125 | °C | |

Note *1 : Pulse width limited by $T_{vjmax}$.

## Electrical characteristics (unless otherwise specified)

### IGBT, Inverter

| Description | Symbols | Conditions | | Values | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | |
| Zero Gate Voltage Collector Current | $I_{CES}$ | $V_{CE}$= 1200V, $V_{GE}$= 0V<br>$T_{vj}$= 25°C | | | | 200 | μA |
| Gate-Emitter Leakage Current | $I_{GES}$ | $V_{CE}$= 0V, V= 20V, $T_{vj}$= 25°C | | | | ±300 | nA |
| Gate-Emitter Threshold Voltage | $V_{GE(th)}$ | $V_{CE}$= $V_{GE}$, $I_C$= 6mA | | 5.5 | 6.0 | 6.5 | V |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_{GE}$= 15V<br>$I_C$= 150A | $T_{vj}$= 25°C | | 1.7 | 2.2 | V |
| | | | $T_{vj}$= 125°C | | 2.1 | | |
| | | | $T_{vj}$= 150°C | | 2.2 | | |
| Input Capacitance | $C_{ies}$ | $V_{CE}$= 25V, $V_{GE}$= 0V<br>f= 1MHz | | | 40 | | nF |
| Reverse Transfer Capacitance | $C_{res}$ | | | | 0.19 | | nF |
| Gate Charge | $Q_G$ | $V_{CC}$= 600V, $V_{GE}$= 15V | | | 1450 | | nC |
| Turn-On Delay Time, Inductive load | $t_{d(on)}$ | $V_{CC}$= 600V<br>$I_C$= 150A<br>$V_{GE}$= 15V<br>$R_G$= 10Ω | $T_{vj}$= 25°C | | 0.13 | | μs |
| | | | $T_{vj}$= 125°C | | 0.15 | | |
| | | | $T_{vj}$= 150°C | | 0.16 | | |
| Rise Time, Inductive load | $t_r$ | | $T_{vj}$= 25°C | | 0.13 | | μs |
| | | | $T_{vj}$= 125°C | | 0.15 | | |
| | | | $T_{vj}$= 150°C | | 0.16 | | |
| Turn-Off Delay Time, Inductive load | $t_{d(off)}$ | | $T_{vj}$= 25°C | | 0.40 | | μs |
| | | | $T_{vj}$= 125°C | | 0.44 | | |
| | | | $T_{vj}$= 150°C | | 0.45 | | |
| Fall Time, Inductive load | $t_f$ | | $T_{vj}$= 25°C | | 0.14 | | μs |
| | | | $T_{vj}$= 125°C | | 0.23 | | |
| | | | $T_{vj}$= 150°C | | 0.25 | | |
| Turn-On Energy | $E_{on}$ | | $T_{vj}$= 25°C | | 7.5 | | mJ |
| | | | $T_{vj}$= 125°C | | 10.9 | | |
| | | | $T_{vj}$= 150°C | | 13.1 | | |
| Turn-Off Energy | $E_{off}$ | | $T_{vj}$= 25°C | | 8.9 | | mJ |
| | | | $T_{vj}$= 125°C | | 11.1 | | |
| | | | $T_{vj}$= 150°C | | 12.0 | | |

## Diode, Inverter

| Description | Symbols | Conditions | | Values | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | |
| Forward Voltage | $V_F$ | $I_F$= 150A, $V_{GE}$= 0V | $T_{vj}$= 25°C | | 2.04 | 2.7 | V |
| | | | $T_{vj}$= 125°C | | 1.62 | | |
| | | | $T_{vj}$= 150°C | | 1.56 | | |
| Recovery Charge | $Q_r$ | $I_F$= 150A,$V_R$= 600V<br>-$di_F/dt$= 1700A/us<br>$V_{GE}$= -15V | $T_{vj}$= 25°C | | 10.63 | | µC |
| | | | $T_{vj}$= 125°C | | 15.99 | | |
| | | | $T_{vj}$= 150°C | | 19.33 | | |
| Reverse Recovery Energy | $E_{rec}$ | $I_F$= 150A, $V_R$= 600V<br>-$di_F/dt$=1700A/us<br>$V_{GE}$= -15V | $T_{vj}$= 25°C | | 5.45 | | mJ |
| | | | $T_{vj}$= 125°C | | 5.76 | | |
| | | | $T_{vj}$= 150°C | | 6.89 | | |

## Thermal resistance

| Items | Symbols | Values | | | Unit |
|---|---|---|---|---|---|
| | | Min | Typ | Max | |
| Thermal Resistance, Per IGBT Junction to Case | $R_{th(j-c)}$ | | | 0.2 | K/W |
| Thermal Resistance, Per Diodes Junction to Case | $R_{th(j-c)}$ | | | 0.3 | |

## Module

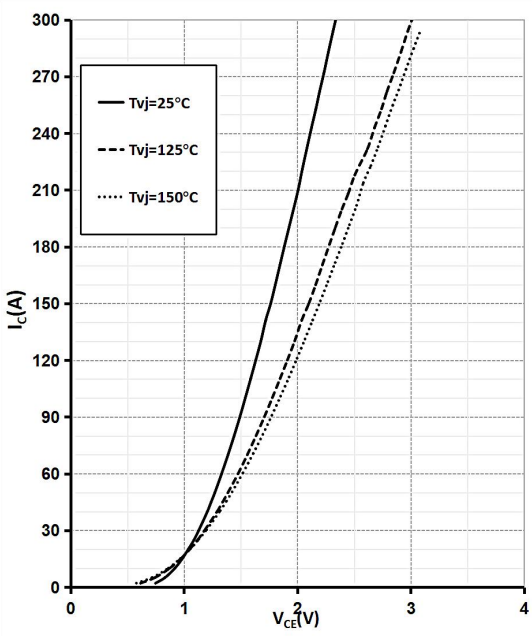
| Description | Symbols | Conditions | Values | Unit |
|---|---|---|---|---|
| Isolation Test Voltage | $V_{ISOL}$ | RMS, f =50Hz, t= 1min | 4.0 | KV |
| Material of Module Base plat | | | Cu | |
| Internal Isolation | | | $Al_2O_3$ | |
| Creepage Distance | $d_{Creep}$ | Terminal to terminal | 20.1 | mm |
| Clearance | $d_{Clear}$ | Terminal to terminal | 9.5 | mm |
| Comparative Tracking Index | CTI | | 200 | |

| Description | Symbols | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| Stray Inductance Module | $L_{sCE}$ | | | 29.2 | | nH |
| Module Lead Resistance，Terminals-Chip | $R_{CC'+EE'}$ | $T_C$= 25°C，Per switch | | 0.66 | | mΩ |
| Mounting Torque for Module Mounting | M | Screw M5 | 3.0 | | 5.0 | Nm |
| Weight | G | | | 156 | | g |

**Output characteristic (typical), IGBT, Inverter**

$I_C = f(V_{CE})$

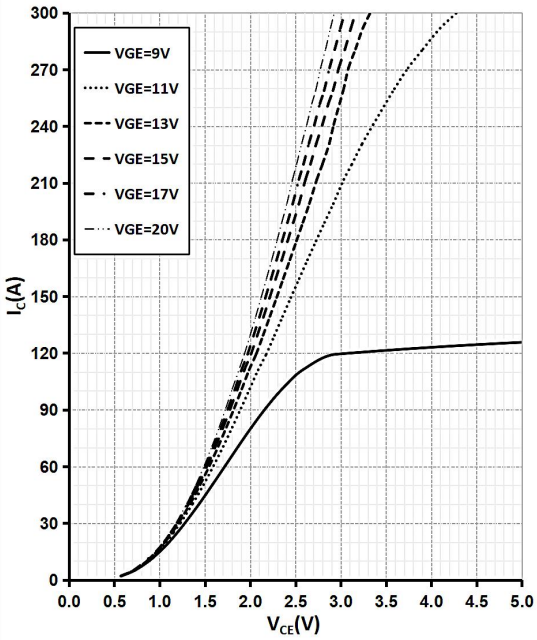
$V_{GE}$= 15V




**Output characteristic (typical), IGBT, Inverter**

$I_C = f(V_{CE})$

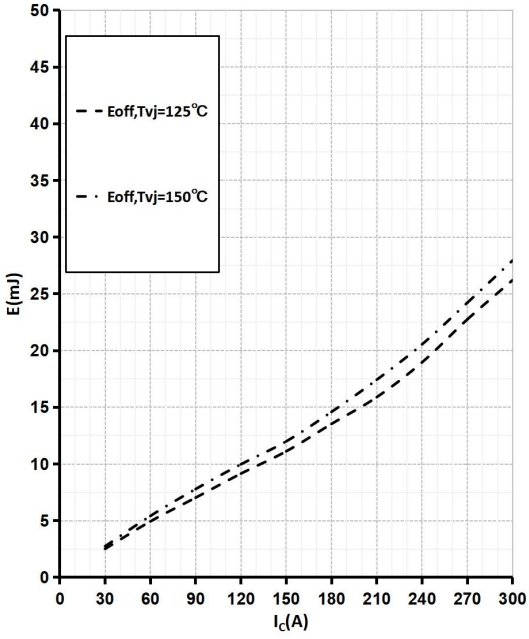
$T_{vj}$= 150°C




**Switching losses (typical), IGBT, Inverter**

$E = f(I_C)$

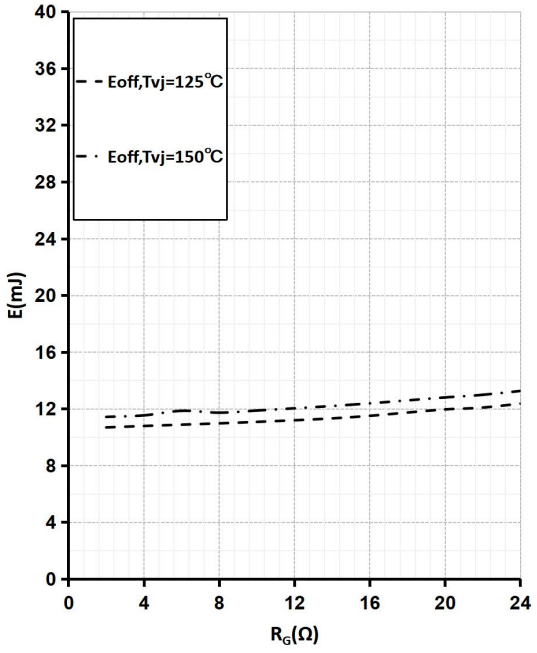
$R_{Goff}$= 10Ω, $R_{Gon}$=10Ω, $V_{GE}$= ±15V, $V_{CC}$= 600V




**Switching losses (typical), IGBT, Inverter**

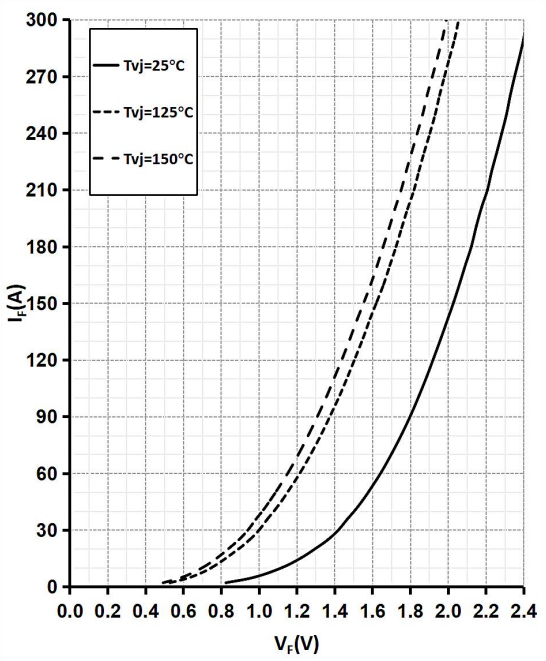
$E = f(R_G)$

$V_{GE}$= 15V, $I_C$= 150A, $V_{CC}$= 600V



**Forward characteristic (typical), Diode, Inverter**

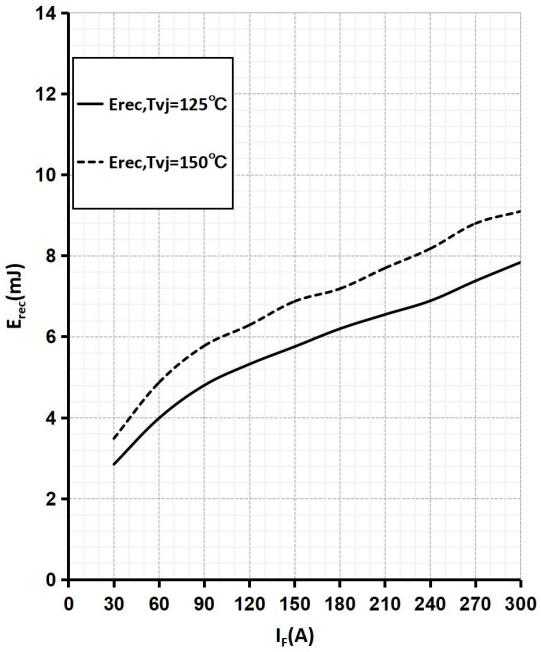
$I_F = f(V_f)$




**Switching losses (typical), Diode, Inverter**

$E_{rec} = f(I_F)$

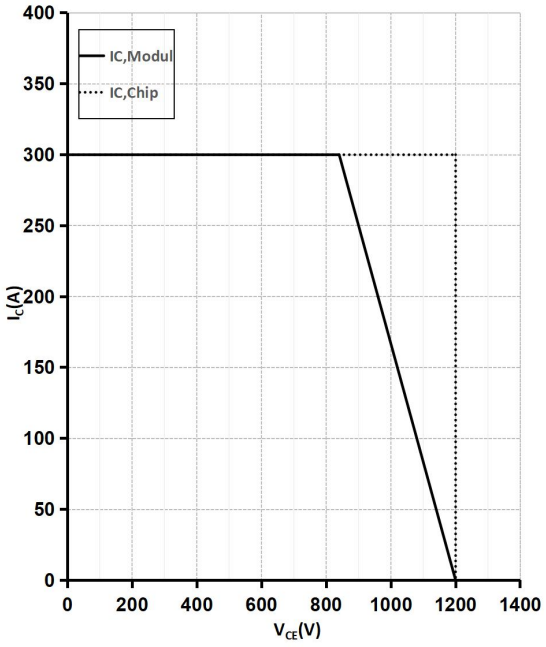
$R_{Gon}$= 10Ω, $V_{CC}$= 600V




**Reverse bias safe operating area (RBSOA), IGBT, Inverter**

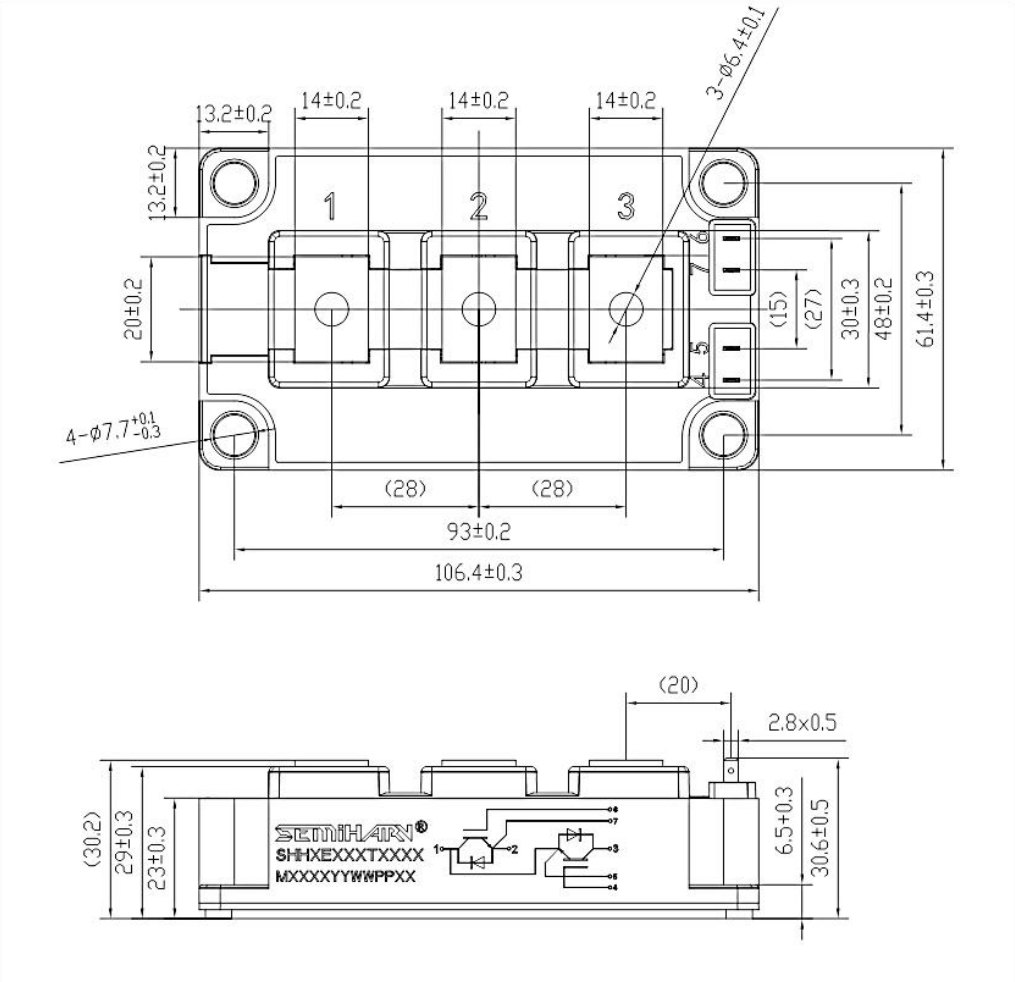
$I_C = f(V_{CE})$

$R_{Goff}$= 10Ω, $V_{GE}$= ±15V, $T_{vj}$= 150°C

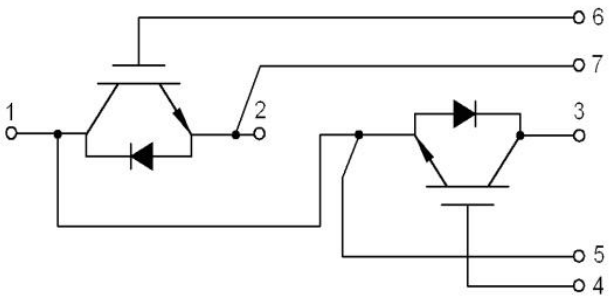


## Package Dimension

Dimensions in Millimeters




Internal Circuit



## Revision History

| Revision | Date | Subjects (major changes since last revision) |
|---|---|---|
| 0.1 | 2023-04-10 | Preliminary version |
| 1.0 | 2023-11-23 | MP version |

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