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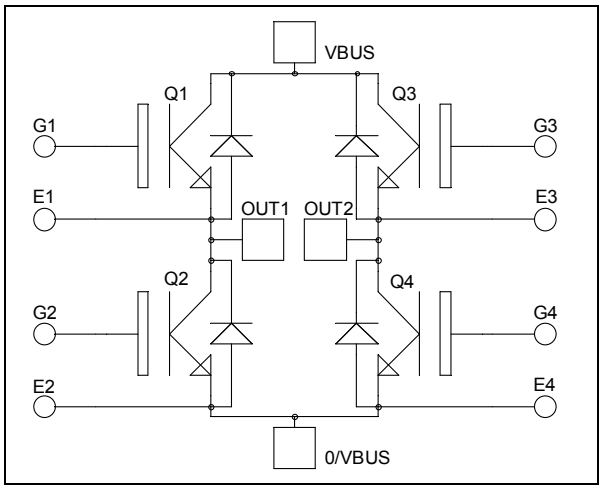
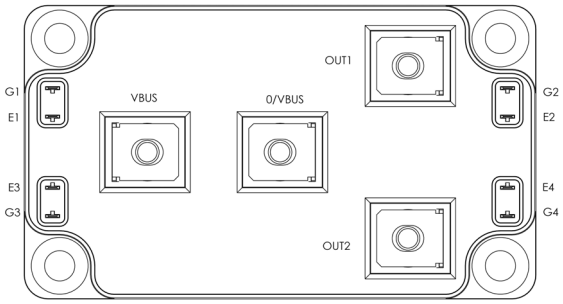
# APTGLQ300H65G

***Full bridge***
***High speed Trench + Field Stop IGBT4***
***Power module***

$V_{CES}$ = 650V
$I_C$ = 300A @ Tc = 60°C




**Application**

- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

**Features**

- High speed Trench + Field Stop IGBT 4 Technology
  - Low voltage drop
  - Low leakage current
  - Low switching losses
  - Soft recovery parallel diodes
  - Low diode VF
  - RBSOA and SCSOA rated
- Kelvin source for easy drive
- Very low stray inductance
- M5 power connectors
- High level of integration

**Benefits**

- Stable temperature behavior
- Very rugged
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Easy paralleling due to positive TC of VCEsat
- Low profile
- RoHS Compliant

**All ratings @ $T_j$ = 25°C unless otherwise specified**

**Absolute maximum ratings** (per IGBT)

| *Symbol* | *Parameter* | | *Max ratings* | *Unit* |
|---|---|---|---|---|
| $V_{CES}$ | Collector - Emitter Voltage | | 650 | V |
| $I_C$ | Continuous Collector Current | $T_C$ = 25°C | 385 | A |
| | | $T_C$ = 60°C | 300 | |
| $I_{CM}$ | Pulsed Collector Current | $T_C$ = 25°C | 750 | |
| $V_{GE}$ | Gate – Emitter Voltage | | ±20 | V |
| $P_D$ | Maximum Power Dissipation | $T_C$ = 25°C | 1000 | W |
| RBSOA | Reverse Bias Safe Operating Area | $T_j$ = 125°C | 600A @ 600V | |

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.
See application note APT0502 on www.microsemi.com

## Electrical Characteristics (per IGBT)

| Symbol | Characteristic | Test Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $I_{CES}$ | Zero Gate Voltage Collector Current | $V_{GE}$ = 0V, $V_{CE}$ = 650V | | | | 300 | µA |
| $V_{CE(sat)}$ | Collector Emitter saturation Voltage | $V_{GE}$ = 15V<br>$I_C$ = 300A | $T_j$ = 25°C | | 1.85 | 2.3 | V |
| | | | $T_j$ = 150°C | | 2.2 | | |
| $V_{GE(th)}$ | Gate Threshold Voltage | $V_{GE}$ = $V_{CE}$ , $I_C$ = 1.6 mA | | 4.2 | 5.1 | 5.6 | V |
| $I_{GES}$ | Gate – Emitter Leakage Current | $V_{GE}$ = 20V, $V_{CE}$ = 0V | | | | 500 | nA |

## Dynamic Characteristics (per IGBT)

| Symbol | Characteristic | Test Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $C_{ies}$ | Input Capacitance | $V_{GE}$ = 0V<br>$V_{CE}$ = 25V<br>f = 1MHz | | | 18.3 | | nF |
| $C_{oes}$ | Output Capacitance | | | | 0.65 | | |
| $C_{res}$ | Reverse Transfer Capacitance | | | | 0.54 | | |
| $Q_G$ | Gate charge | $V_{GE}$ = 15V ; $V_{CE}$ = 480V<br>$I_C$ = 300A | | | 1750 | | nC |
| $T_{d(on)}$ | Turn-on Delay Time | Inductive Switching (25°C)<br>$V_{GE}$ = ±15V<br>$V_{CE}$ = 400V<br>$I_C$ = 300A<br>$R_G$ = 1.2Ω | | | 19 | | ns |
| $T_r$ | Rise Time | | | | 33 | | |
| $T_{d(off)}$ | Turn-off Delay Time | | | | 197 | | |
| $T_f$ | Fall Time | | | | 21 | | |
| $T_{d(on)}$ | Turn-on Delay Time | Inductive Switching (150°C)<br>$V_{GE}$ = ±15V<br>$V_{CE}$ = 400V<br>$I_C$ = 300A<br>$R_G$ = 1.2Ω | | | 19 | | ns |
| $T_r$ | Rise Time | | | | 29 | | |
| $T_{d(off)}$ | Turn-off Delay Time | | | | 227 | | |
| $T_f$ | Fall Time | | | | 22 | | |
| $E_{on}$ | Turn-on Switching Energy | $V_{GE}$ = ±15V<br>$V_{CE}$ = 400V<br>$I_C$ = 300A<br>$R_G$ = 1.2Ω | $T_J$ = 25°C | | 6 | | mJ |
| | | | $T_J$ = 150°C | | 7.4 | | |
| $E_{off}$ | Turn-off Switching Energy | | $T_J$ = 25°C | | 5.6 | | mJ |
| | | | $T_J$ = 150°C | | 6 | | |
| $I_{sc}$ | Short Circuit data | $V_{GE}$ ≤15V ; $V_{Bus}$ = 600V<br>$t_p$ ≤10µs ; $T_j$ = 150°C | | | 1950 | | A |
| $R_{thJC}$ | Junction to Case Thermal Resistance | | | | | 0.15 | °C/W |

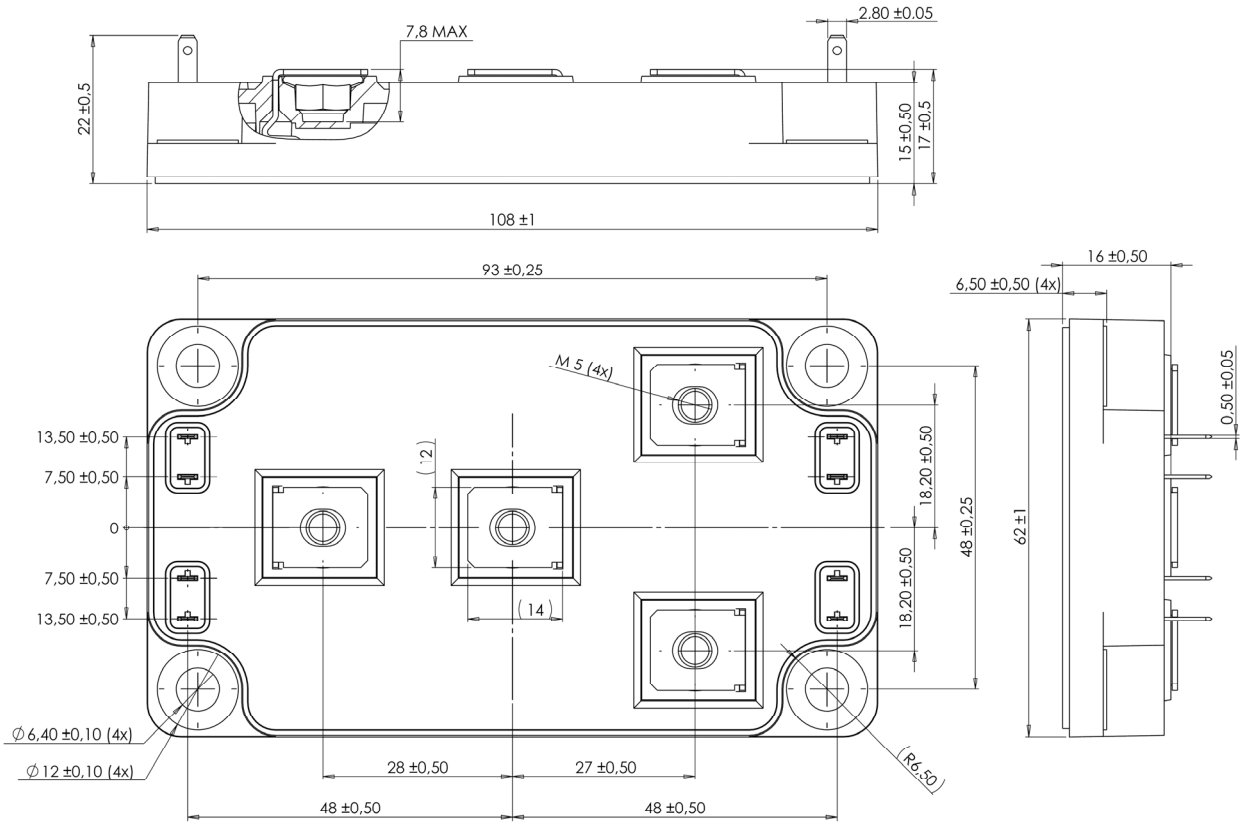
## Diode ratings and characteristics (per diode)

| Symbol | Characteristic | Test Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{RRM}$ | Repetitive Reverse Voltage | | | | | 650 | V |
| $I_{RM}$ | Reverse Leakage Current | $V_R$ = 650V | | | | 150 | µA |
| $I_F$ | DC Forward Current | | $T_C$ = 25°C | | 300 | | A |
| $V_F$ | Diode Forward Voltage | $I_F$ = 300A<br>$V_{GE}$ = 0V | $T_j$ = 25°C | | 1.6 | 2 | V |
| | | | $T_j$ = 150°C | | 1.5 | | |
| $t_{rr}$ | Reverse Recovery Time | $I_F$ = 300A<br>$V_R$ = 400V<br>di/dt = 3800A/µs | $T_j$ = 25°C | | 125 | | ns |
| | | | $T_j$ = 150°C | | 220 | | |
| $Q_{rr}$ | Reverse Recovery Charge | | $T_j$ = 25°C | | 14.1 | | µC |
| | | | $T_j$ = 150°C | | 29.7 | | |
| $E_r$ | Reverse Recovery Energy | | $T_j$ = 25°C | | 3.3 | | mJ |
| | | | $T_j$ = 150°C | | 7.2 | | |
| $R_{thJC}$ | Junction to Case Thermal Resistance | | | | | 0.26 | °C/W |

## Thermal and package characteristics

| *Symbol* | *Characteristic* | | | *Min* | *Max* | *Unit* |
|---|---|---|---|---|---|---|
| $V_{ISOL}$ | RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz | | | 4000 | | V |
| $T_J$ | Operating junction temperature range | | | -40 | 175 | °C |
| $T_{JOP}$ | Recommended junction temperature under switching conditions | | | -40 | $T_J$max -25 | |
| $T_{STG}$ | Storage Temperature Range | | | -40 | 125 | |
| $T_C$ | Operating Case Temperature | | | -40 | 100 | |
| Torque | Mounting torque | To Heatsink | M6 | 3 | 5 | N.m |
| | | For teminals | M5 | 2 | 3.5 | |
| Wt | Package Weight | | | | 300 | g |

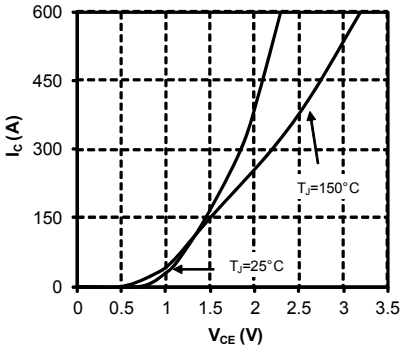
## Package outline (dimensions in mm)



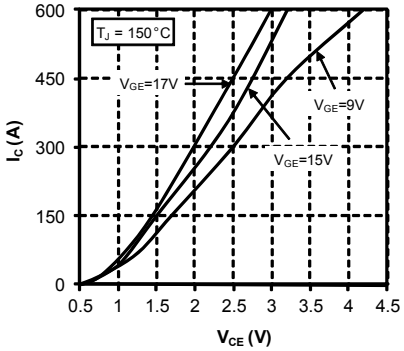

See application note APT0601 - Mounting Instructions for SP6 Power Modules on www.microsemi.com

## Typical Performance Curve

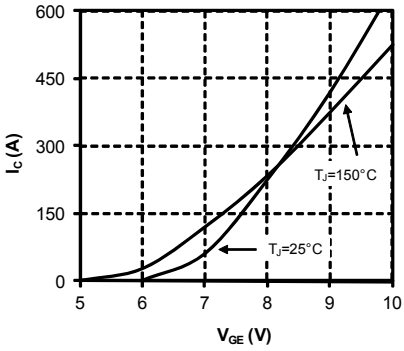
Output Characteristics ($V_{GE}$=15V)



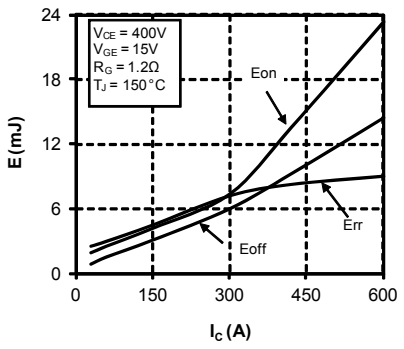

Output Characteristics



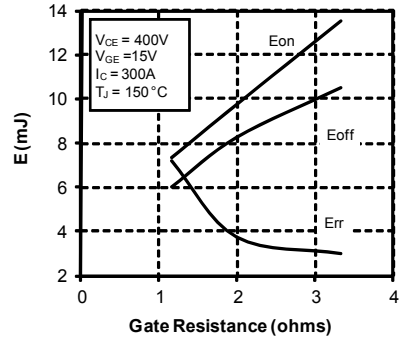

Transfert Characteristics



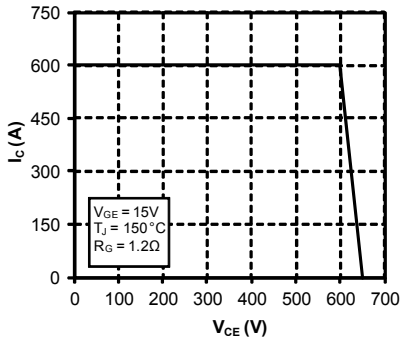

Energy losses vs Collector Current



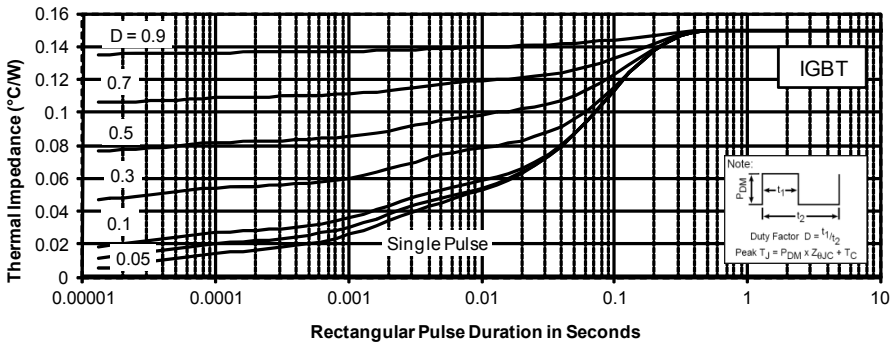

Switching Energy Losses vs Gate Resistance



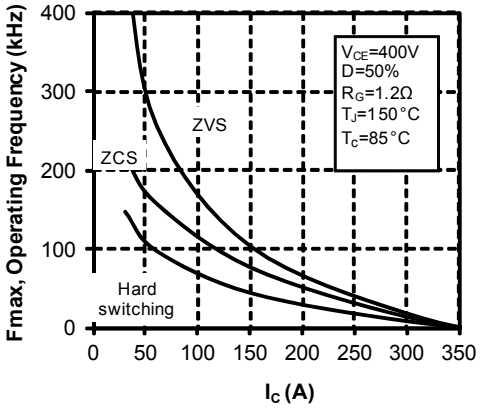

Reverse Bias Safe Operating Area



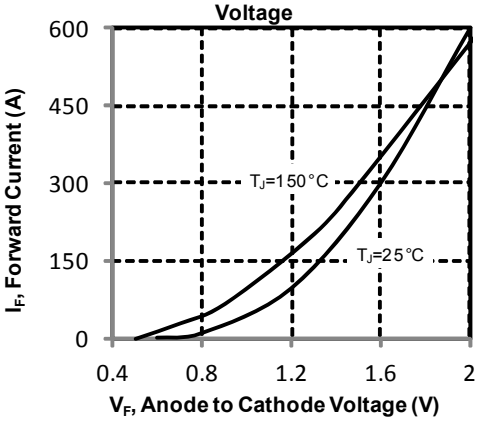

maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration



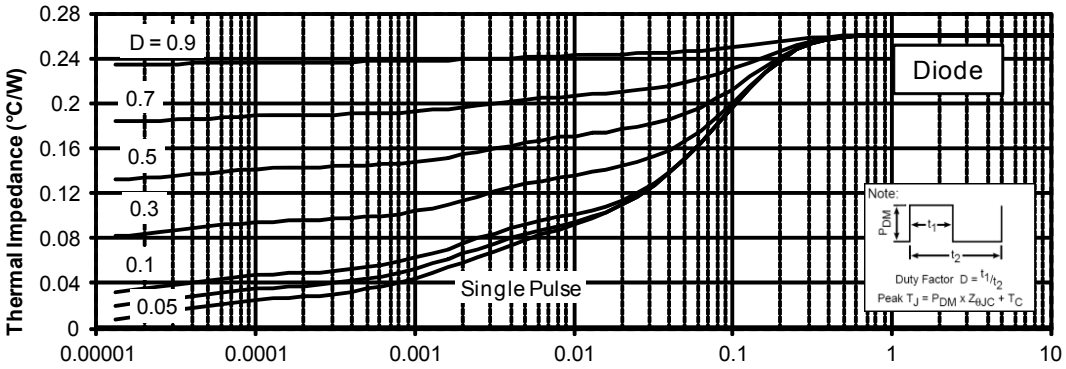
**Operating Frequency vs Collector Current**




**Forward Current vs Forward Voltage**




**maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration**



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