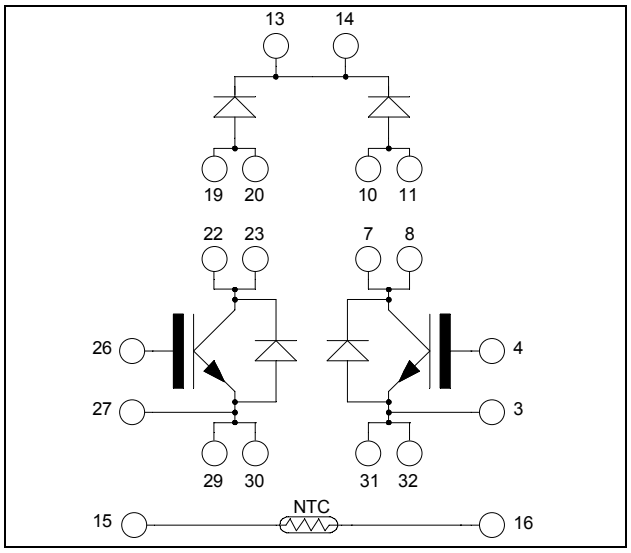
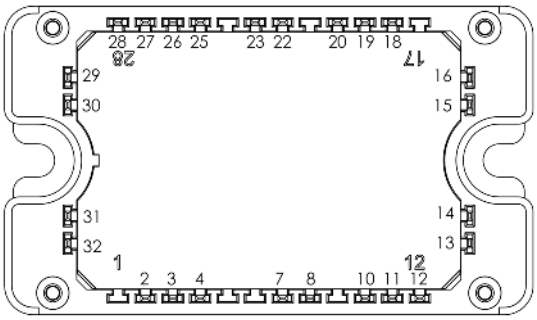
# APTGLQ50VDA65T3G

***Dual Boost Chopper***
***High speed Trench + Field Stop***
***IGBT4 Power Module***

$V_{CES}$ = 650V
$I_C$ = 50A @ Tc = 60°C




All multiple inputs and outputs must be shorted together
Example: 13/14 ; 29/30 ; 22/23 …

**Application**

- AC and DC motor control
- Switched Mode Power Supplies
- Power Factor Correction (PFC)
- Interleaved PFC

**Features**

- ***High speed Trench + Field Stop IGBT 4 Technology***
  - Low voltage drop
  - Low leakage current
  - Low switching losses
- Kelvin emitter for easy drive
- Very low stray inductance
- Internal thermistor for temperature monitoring

**Benefits**

- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Solderable terminals both for power and signal for easy PCB mounting
- Low profile
- Easy paralleling due to positive TC of VCEsat
- Each leg can be easily paralleled to achieve a single boost of twice the current capability
- 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 | 70 | A |
| | | $T_C$ = 60°C | 50 | |
| $I_{CM}$ | Pulsed Collector Current | $T_C$ = 25°C | 140 | |
| $V_{GE}$ | Gate – Emitter Voltage | | ±20 | V |
| $P_D$ | Power Dissipation | | 175 | W |

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

## 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 | | | | 50 | µA |
| $V_{CE(sat)}$ | Collector Emitter Saturation Voltage | $V_{GE}$ =15V<br>$I_C$ = 50A | $T_j$ = 25°C | 1.4 | 1.85 | 2.3 | V |
| | | | $T_j$ = 150°C | | 2.2 | | |
| $V_{GE(th)}$ | Gate Threshold Voltage | $V_{GE}$ = $V_{CE}$ , $I_C$ = 0.8 mA | | 4.2 | 5.1 | 5.6 | V |
| $I_{GES}$ | Gate – Emitter Leakage Current | $V_{GE}$ = 20V, $V_{CE}$ = 0V | | | | 150 | 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 | | | 3100 | | pF |
| $C_{oes}$ | Output Capacitance | | | | 116 | | |
| $C_{res}$ | Reverse Transfer Capacitance | | | | 90 | | |
| $Q_G$ | Gate charge | $V_{GE}$ = 15V, $I_C$ = 50A<br>$V_{CE}$ = 480V | | | 315 | | nC |
| $T_{d(on)}$ | Turn-on Delay Time | Inductive Switching (25°C)<br>$V_{GE}$ = ±15V<br>$V_{Bus}$ = 400V<br>$I_C$ = 50A<br>$R_G$ = 7Ω | | | 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>$V_{Bus}$ = 400V<br>$I_C$ = 50A<br>$R_G$ = 7Ω | | | 19 | | ns |
| $T_r$ | Rise Time | | | | 29 | | |
| $T_{d(off)}$ | Turn-off Delay Time | | | | 227 | | |
| $T_f$ | Fall Time | | | | 22 | | |
| $E_{on}$ | Turn on Energy | $V_{GE}$ = ±15V<br>$V_{Bus}$ = 400V<br>$I_C$ = 50A<br>$R_G$ = 7Ω | $T_j$ = 150°C | | 1.2 | | mJ |
| $E_{off}$ | Turn off Energy | | $T_j$ = 150°C | | 1 | | |
| $I_{sc}$ | Short Circuit data | $V_{GE}$ ≤15V ; $V_{Bus}$ = 400V<br>$t_p$ ≤5µs ; $T_j$ = 150°C | | | 350 | | A |
| $R_{thJC}$ | Junction to Case Thermal Resistance | | | | | 0.85 | °C/W |

## Chopper Diode ratings and characteristics (per diode)

| Symbol | Characteristic | Test Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{RRM}$ | Peak Repetitive Reverse Voltage | | | | | 650 | V |
| $I_{RM}$ | Reverse Leakage Current | $V_R$ = 650V | | | | 50 | µA |
| $I_F$ | DC Forward Current | | Tc = 25°C | | 75 | | A |
| $V_F$ | Diode Forward Voltage | $I_F$ = 75A<br>$V_{GE}$ = 0V | $T_j$ = 25°C | | 1.6 | 2 | V |
| | | | $T_j$ = 150°C | | 1.5 | | |
| $t_{rr}$ | Reverse Recovery Time | $I_F$ = 75A<br>$V_R$ = 300V<br>di/dt =2000A/µs | $T_j$ = 25°C | | 100 | | ns |
| | | | $T_j$ = 150°C | | 150 | | |
| $Q_{rr}$ | Reverse Recovery Charge | | $T_j$ = 25°C | | 3.6 | | µC |
| | | | $T_j$ = 150°C | | 7.6 | | |
| $E_{rr}$ | Reverse Recovery Energy | | $T_j$ = 25°C | | 0.85 | | mJ |
| | | | $T_j$ = 150°C | | 1.80 | | |
| $R_{thJC}$ | Junction to Case Thermal Resistance | | | | | 0.98 | °C/W |

## IGBT parallel diode ratings and characteristics (per diode)

| Symbol | Characteristic | Test Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{RRM}$ | Peak Repetitive Reverse Voltage | | | | | 650 | V |
| $I_{RM}$ | Reverse Leakage Current | $V_R$ = 650V | | | | 50 | µA |
| $I_F$ | DC Forward Current | | Tc = 25°C | | 30 | | A |
| $V_F$ | Diode Forward Voltage | $I_F$ = 30A<br>$V_{GE}$ = 0V | $T_j$ = 25°C | | 1.6 | 2 | V |
| | | | $T_j$ = 150°C | | 1.5 | | |
| $t_{rr}$ | Reverse Recovery Time | $I_F$ = 30A<br>$V_R$ = 300V<br>di/dt =1800A/µs | $T_j$ = 25°C | | 100 | | ns |
| | | | $T_j$ = 150°C | | 150 | | |
| $Q_{rr}$ | Reverse Recovery Charge | | $T_j$ = 25°C | | 1.5 | | µC |
| | | | $T_j$ = 150°C | | 3.1 | | |
| $E_{rr}$ | Reverse Recovery Energy | | $T_j$ = 25°C | | 0.34 | | mJ |
| | | | $T_j$ = 150°C | | 0.75 | | |
| $R_{thJC}$ | Junction to Case Thermal Resistance | | | | | 2.45 | °C/W |

## Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

| Symbol | Characteristic | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $R_{25}$ | Resistance @ 25°C | | | 50 | | kΩ |
| $\Delta R_{25}/R_{25}$ | | | | 5 | | % |
| $B_{25/85}$ | $T_{25}$ = 298.15 K | | | 3952 | | K |
| ΔB/B | | $T_C$=100°C | | 4 | | % |

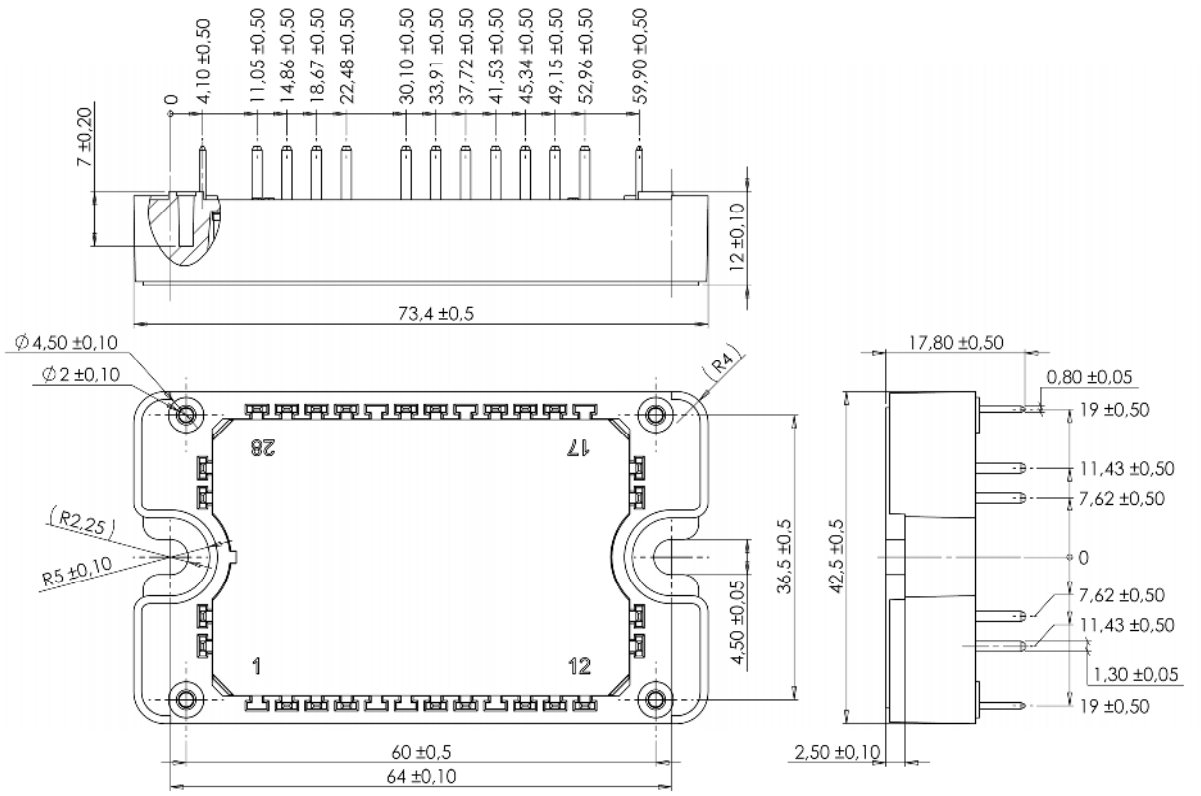
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature
$R_T$: Thermistor value at T

## 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 | 125 | |
| Torque | Mounting torque | To heatsink | M4 | 2 | 3 | N.m |
| Wt | Package Weight | | | | 110 | g |

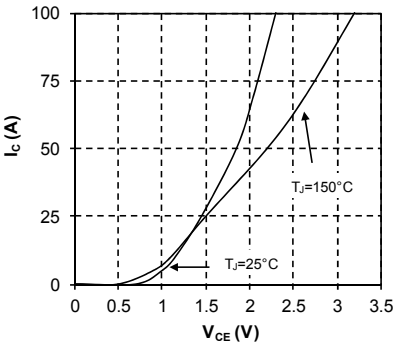
**Package outline** (dimensions in mm)



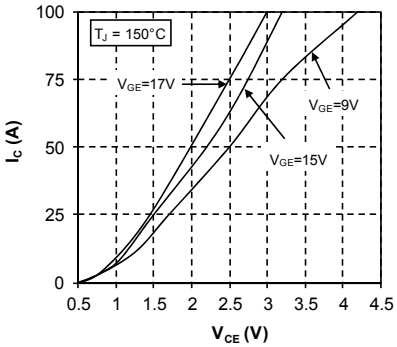

See application note 1906 - Mounting Instructions for SP3F Power Modules on www.microsemi.com

## Typical IGBT Performance Curve

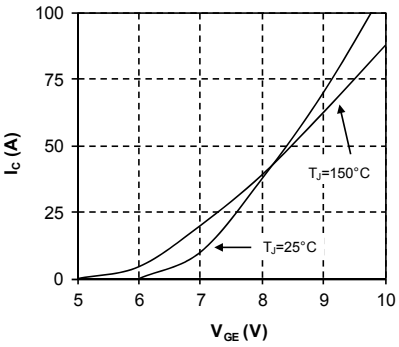
Output Characteristics ($V_{GE}$=15V)



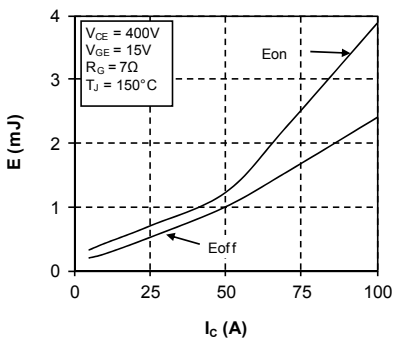

Output Characteristics



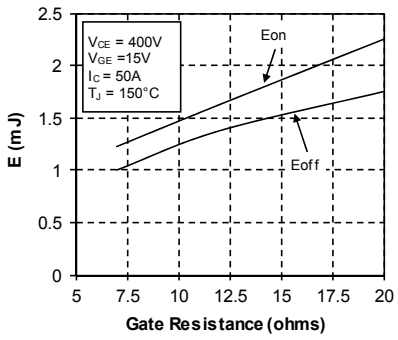

Transfert Characteristics



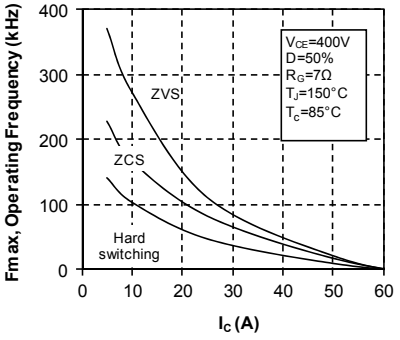

Energy losses vs Collector Current



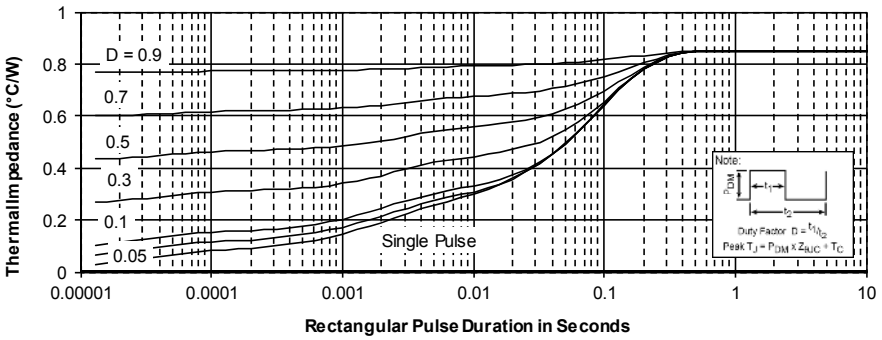

Switching Energy Losses vs Gate Resistance



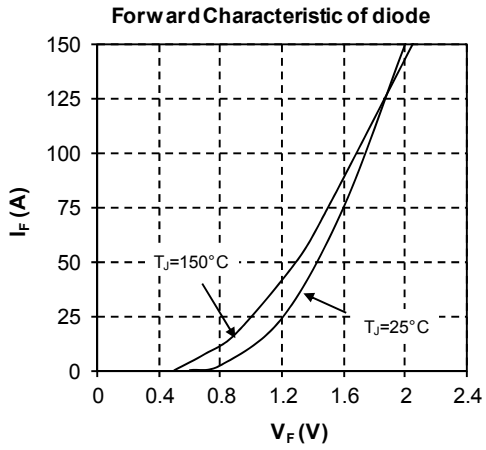

Operating Frequency vs Collector Current

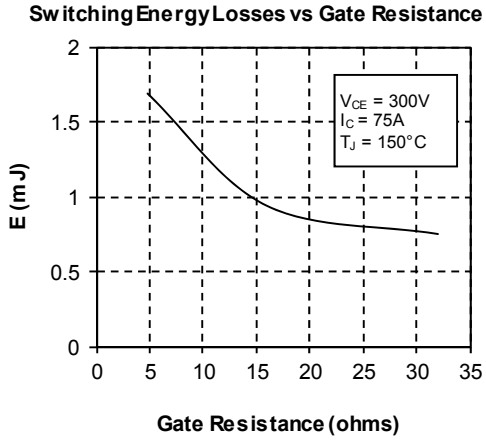


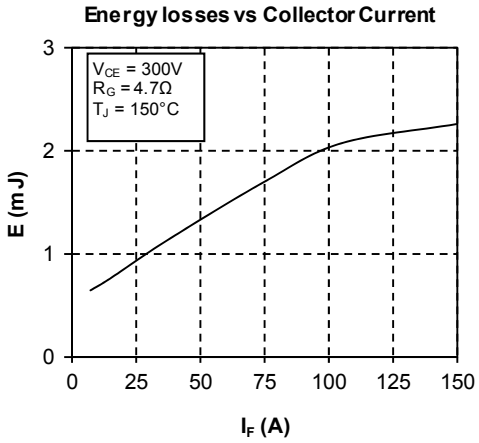

maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration

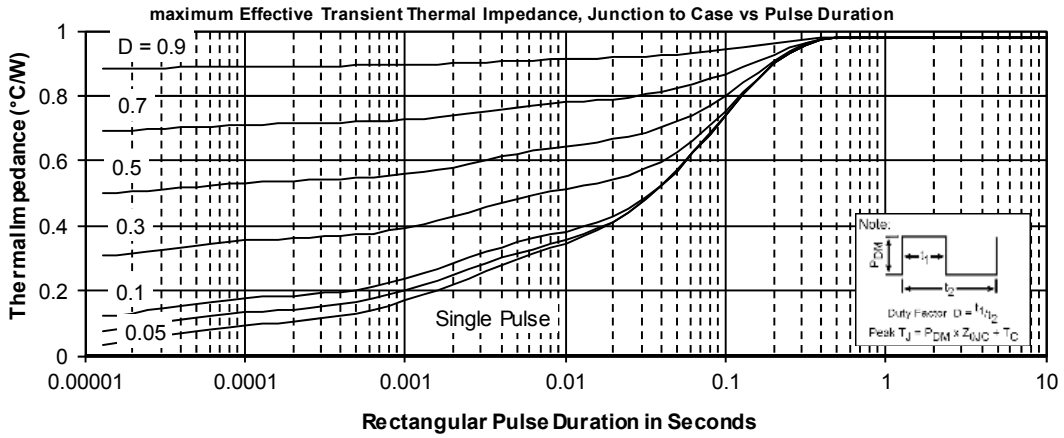


## Typical Boost chopper diode Performance Curve



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