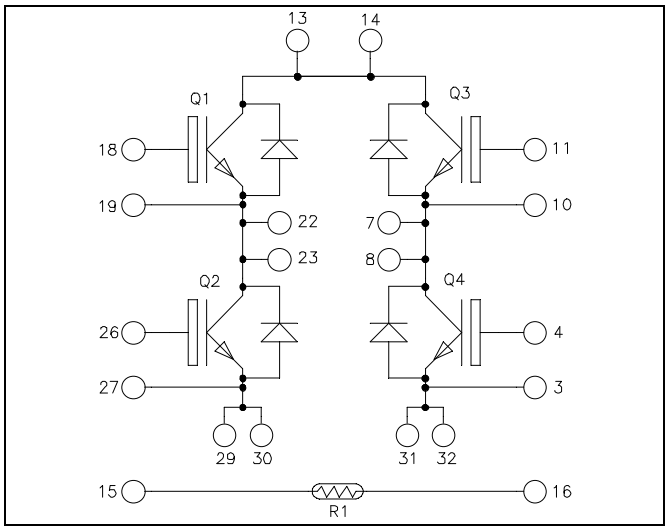
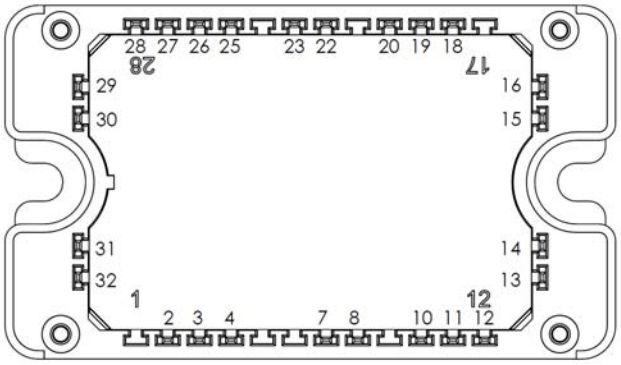
# APTGT75H60T3G

## *Full - Bridge*
## *Trench + Field Stop IGBT3*
## *Power Module*

**$V_{CES}$ = 600V**
**$I_C$ = 75A @ Tc = 80°C**




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

**Application**

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

**Features**

- **Trench + Field Stop IGBT3**
  - Low voltage drop
  - Low tail current
  - Switching frequency up to 20 kHz
  - Low leakage current
  - RBSOA and SCSOA rated
- Kelvin emitter for easy drive
- Very low stray inductance
- High level of integration
- Internal thermistor for temperature monitoring

**Benefits**

- Stable temperature behavior
- Very rugged
- Solderable terminals for easy PCB mounting
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Easy paralleling due to positive TC of VCEsat
- Low profile
- Each leg can be easily paralleled to achieve a phase leg 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 | | 600 | V |
| $I_C$ | Continuous Collector Current | $T_C$ = 25°C | 100 | A |
| | | $T_C$ = 80°C | 75 | |
| $I_{CM}$ | Pulsed Collector Current | $T_C$ = 25°C | 140 | |
| $V_{GE}$ | Gate – Emitter Voltage | | ±20 | V |
| $P_D$ | Power Dissipation | $T_C$ = 25°C | 250 | W |
| RBSOA | Reverse Bias Safe Operating Area | $T_J$ = 150°C | 150A @ 550V | |

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, $V_{CE}$ = 600V | | | | 250 | µA |
| $V_{CE(sat)}$ | Collector Emitter Saturation Voltage | $V_{GE}$ =15V<br>$I_C$ = 75A | $T_j$ = 25°C | | 1.5 | 1.9 | V |
| | | | $T_j$ = 150°C | | 1.7 | | |
| $V_{GE(th)}$ | Gate Threshold Voltage | $V_{GE}$ = $V_{CE}$, $I_C$ = 600µA | | 5.0 | 5.8 | 6.5 | V |
| $I_{GES}$ | Gate – Emitter Leakage Current | $V_{GE}$ = 20V, $V_{CE}$ = 0V | | | | 600 | 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 | | | 4620 | | pF |
| $C_{oes}$ | Output Capacitance | | | | 300 | | |
| $C_{res}$ | Reverse Transfer Capacitance | | | | 140 | | |
| $T_{d(on)}$ | Turn-on Delay Time | Inductive Switching (25°C)<br>$V_{GE}$ = ±15V<br>$V_{Bus}$ = 300V<br>$I_C$ = 75A<br>$R_G$ = 4.7Ω | | | 110 | | ns |
| $T_r$ | Rise Time | | | | 45 | | |
| $T_{d(off)}$ | Turn-off Delay Time | | | | 200 | | |
| $T_f$ | Fall Time | | | | 40 | | |
| $T_{d(on)}$ | Turn-on Delay Time | Inductive Switching (150°C)<br>$V_{GE}$ = ±15V<br>$V_{Bus}$ = 300V<br>$I_C$ = 75A<br>$R_G$ = 4.7Ω | | | 120 | | ns |
| $T_r$ | Rise Time | | | | 50 | | |
| $T_{d(off)}$ | Turn-off Delay Time | | | | 250 | | |
| $T_f$ | Fall Time | | | | 60 | | |
| $E_{on}$ | Turn-on Switching Energy | $V_{GE}$ = ±15V<br>$V_{Bus}$ = 300V<br>$I_C$ = 75A<br>$R_G$ = 4.7Ω | $T_j$ = 25°C | | 0.35 | | mJ |
| | | | $T_j$ = 150°C | | 0.6 | | |
| $E_{off}$ | Turn-off Switching Energy | | $T_j$ = 25°C | | 2.2 | | mJ |
| | | | $T_j$ = 150°C | | 2.6 | | |
| $R_{thJC}$ | Junction to Case Thermal Resistance | | | | | 0.6 | °C/W |

## Reverse diode ratings and characteristics (per diode)

| Symbol | Characteristic | Test Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{RRM}$ | Peak Repetitive Reverse Voltage | | | | | 600 | V |
| $I_{RM}$ | Reverse Leakage Current | $V_R$=600V | | | | 250 | µA |
| $I_F$ | DC Forward current | | Tc = 40°C | | 75 | | A |
| $V_F$ | Diode Forward Voltage | $I_F$ = 75A<br>$V_{GE}$ = 0V | $T_j$ = 25°C | | 1.6 | 2 | |
| | | | $T_j$ = 150°C | | 1.5 | | V |
| $t_{rr}$ | 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 | | |
| $E_r$ | Reverse Recovery Energy | | $T_j$ = 25°C | | 0.85 | | mJ |
| | | | $T_j$ = 150°C | | 1.8 | | |
| $R_{thJC}$ | Junction to Case Thermal Resistance | | | | | 0.98 | °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 |
| $\Delta B/B$ | | $T_C$=100°C | | 4 | | % |

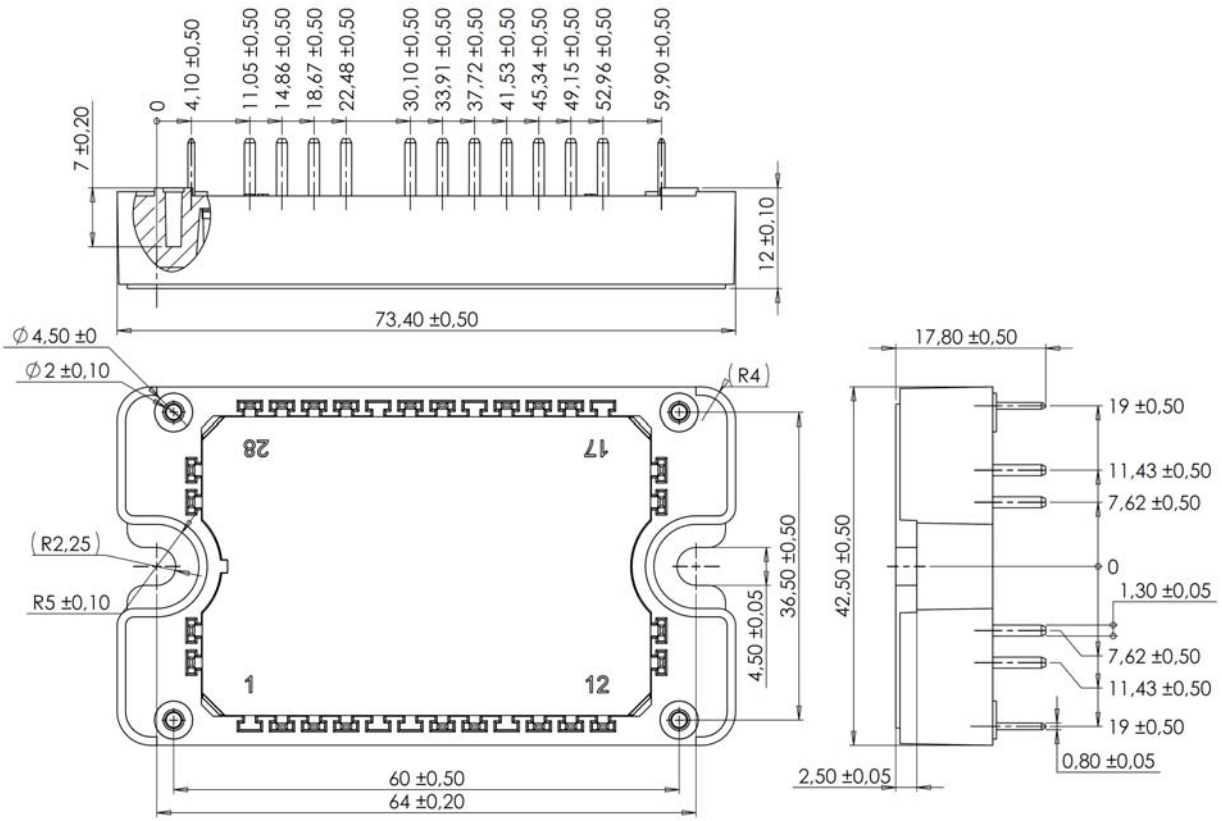
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

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 |

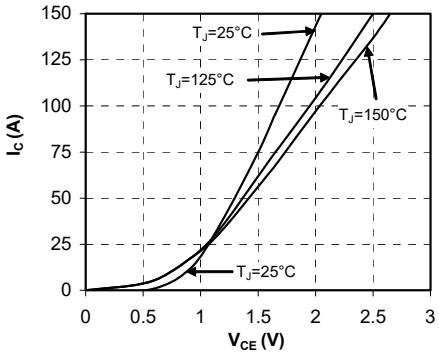
## Package outline (dimensions in mm)



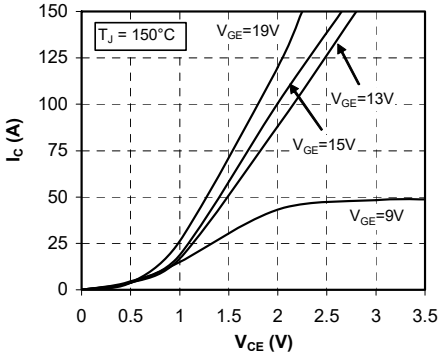

See application note 1906 - Mounting Instructions for SP3F Power Modules on www.microsemi.com

## Typical Performance Curve

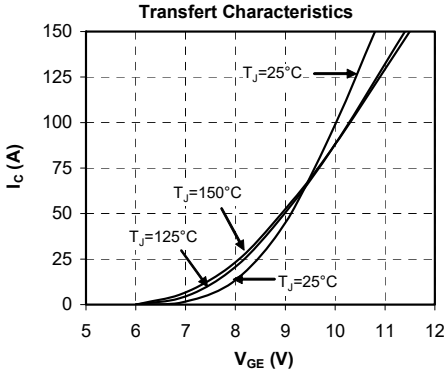
Output Characteristics ($V_{GE}$=15V)



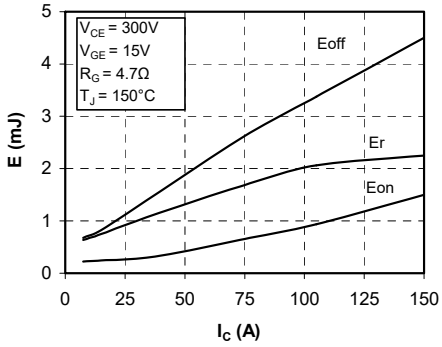

Output Characteristics



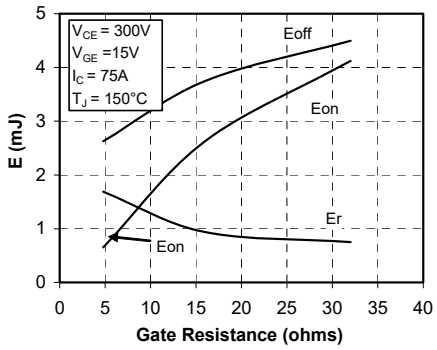

Transfert Characteristics



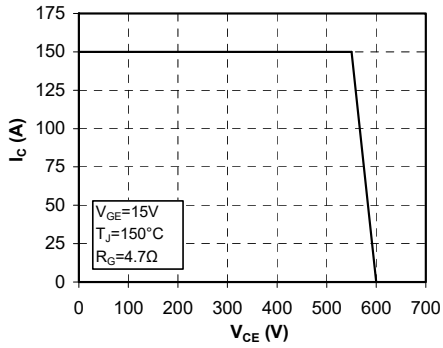

Energy losses vs Collector Current



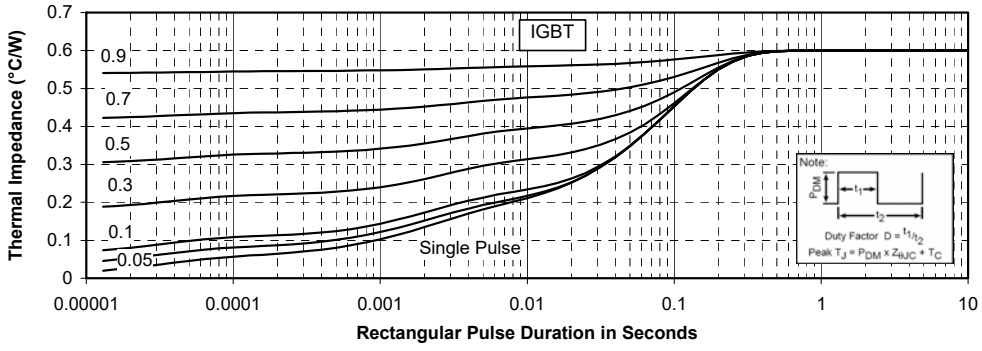

Switching Energy Losses vs Gate Resistance



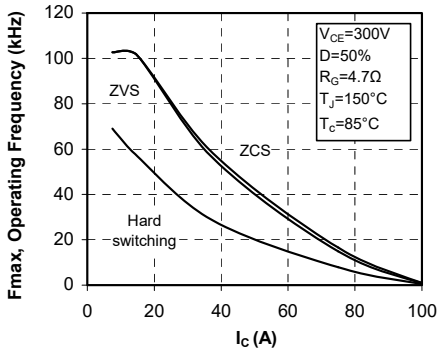

Reverse Bias Safe Operating Area



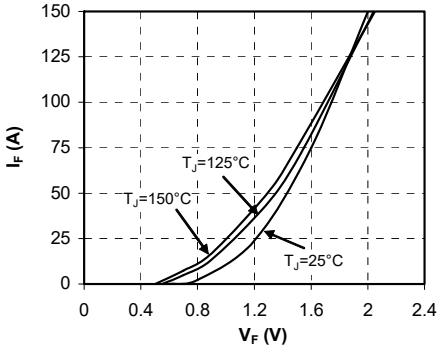

maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration



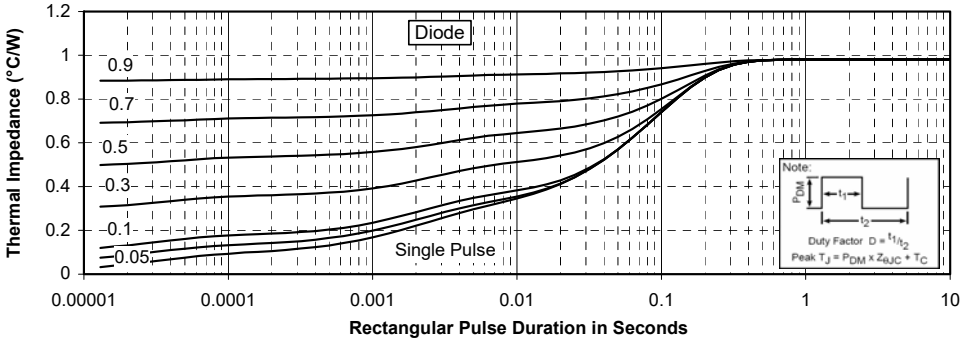
**Operating Frequency vs Collector Current**




**Forward Characteristic of diode**




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



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