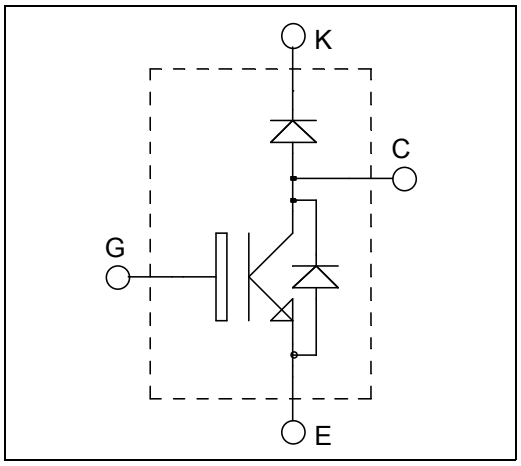
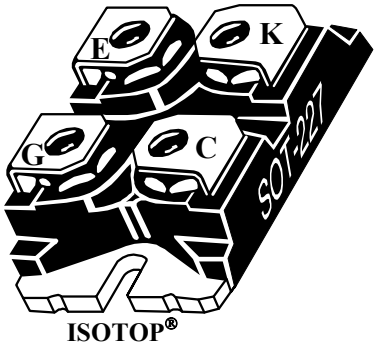
# APT50GLQ65JU2

***ISOTOP® Boost chopper***
***High speed Trench + Field Stop IGBT4***
***Power Module***

**$V_{CES}$ = 650V**
**$I_C$ = 50A @ Tc = 80°C**



ISOTOP®

**Application**

- AC and DC motor control
- Switched Mode Power Supplies
- Power Factor Correction
- Brake switch

**Features**

- ***High speed Trench + Field Stop IGBT 4***
  - Low voltage drop
  - Low leakage current
  - Low switching losses
- ISOTOP® Package (SOT-227)
- Very low stray inductance

**Benefits**

- Low conduction losses
- Stable temperature behavior
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Easy paralleling due to positive $T_C$ of $V_{CEsat}$
- RoHS Compliant

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

## Absolute maximum ratings

| *Symbol* | *Parameter* | | *Max ratings* | *Unit* |
|---|---|---|---|---|
| $V_{CES}$ | Collector - Emitter Voltage | | 650 | V |
| $I_C$ | Continuous Collector Current | $T_C$ = 25°C | 80 | A |
| | | $T_C$ = 80°C | 50 | |
| $I_{CM}$ | Pulsed Collector Current | $T_C$ = 25°C | 140 | |
| $V_{GE}$ | Gate – Emitter Voltage | | ±20 | V |
| $P_D$ | Power Dissipation | | 220 | W |

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

## Electrical Characteristics

| 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

| 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 | | | | | 0.68 | °C/W |

## Chopper diode ratings and characteristics

| 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 | | 50 | | A |
| $V_F$ | Diode Forward Voltage | $I_F$ = 50A<br>$V_{GE}$ = 0V | $T_j$ = 25°C | | 1.6 | 2 | V |
| | | | $T_j$ = 150°C | | 1.5 | | |
| $t_{rr}$ | Reverse Recovery Time | $I_F$ = 50A<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 | | 2.6 | | µC |
| | | | $T_j$ = 150°C | | 5.4 | | |
| $E_{rr}$ | Reverse Recovery Energy | | $T_j$ = 25°C | | 0.6 | | mJ |
| | | | $T_j$ = 150°C | | 1.2 | | |
| $R_{thJC}$ | Junction to Case Thermal Resistance | | | | | 1.14 | °C/W |

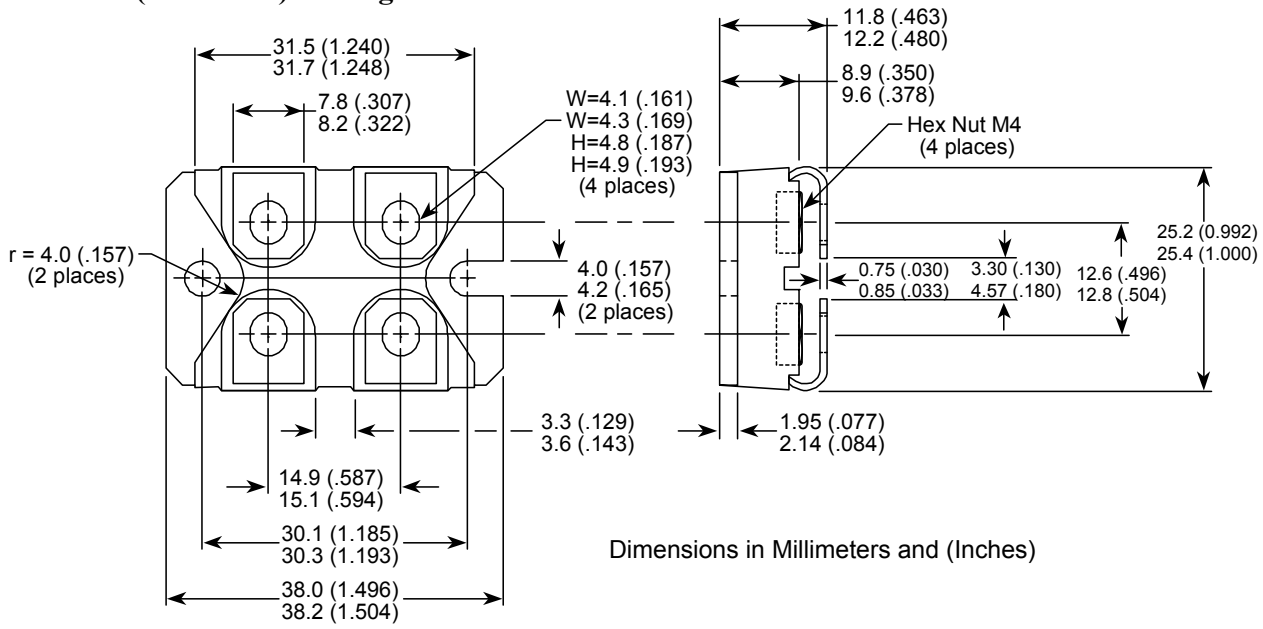
## IGBT parallel diode ratings and characteristics

| 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 = 60°C | | 20 | | A |
| $V_F$ | Diode Forward Voltage | $I_F$ = 20A<br>$V_{GE}$ = 0V | $T_j$ = 25°C | | 1.6 | 2 | V |
| | | | $T_j$ = 150°C | | 1.5 | | |
| $t_{rr}$ | Reverse Recovery Time | $I_F$ = 20A<br>$V_R$ = 300V<br>di/dt =1600A/µs | $T_j$ = 25°C | | 100 | | ns |
| | | | $T_j$ = 150°C | | 150 | | |
| $Q_{rr}$ | Reverse Recovery Charge | | $T_j$ = 25°C | | 1.1 | | µC |
| | | | $T_j$ = 150°C | | 2.3 | | |
| $E_{rr}$ | Reverse Recovery Energy | | $T_j$ = 25°C | | 0.23 | | mJ |
| | | | $T_j$ = 150°C | | 0.50 | | |
| $R_{thJC}$ | Junction to Case Thermal Resistance | | | | | 2.6 | °C/W |

## Thermal and package characteristics

| Symbol | Characteristic | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| $V_{ISOL}$ | RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz | 2500 | | | V |
| $T_J$,$T_{STG}$ | Storage Temperature Range | -55 | | 175 | °C |
| $T_{JOP}$ | Recommended junction temperature under switching conditions | -55 | | $T_J$max -25 | |
| $T_L$ | Max Lead Temp for Soldering:0.063" from case for 10 sec | | | 300 | |
| Torque | Mounting torque (Mounting = 8-32 or 4mm Machine and terminals = 4mm Machine) | | | 1.5 | N.m |
| Wt | Package Weight | | 29.2 | | g |

## SOT-227 (ISOTOP®) Package Outline




Dimensions in Millimeters and (Inches)

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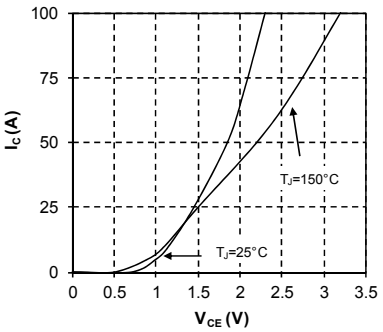
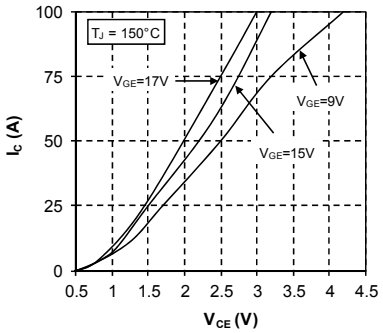
## IGBT & Chopper diode Typical Performance Curves

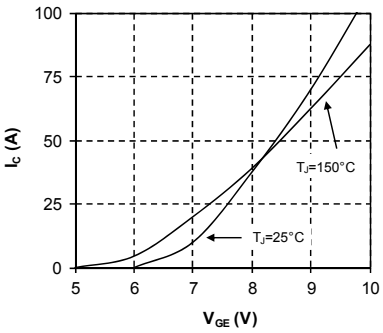
Output Characteristics ($V_{GE}$=15V)



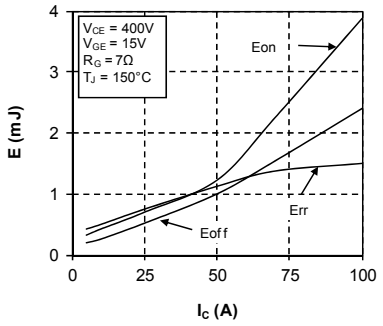

Output Characteristics



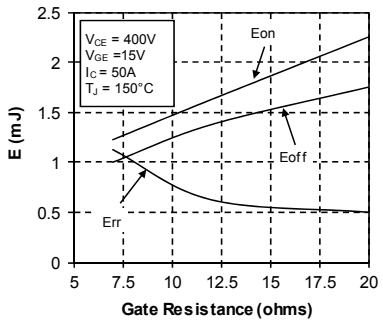

Transfert Characteristics



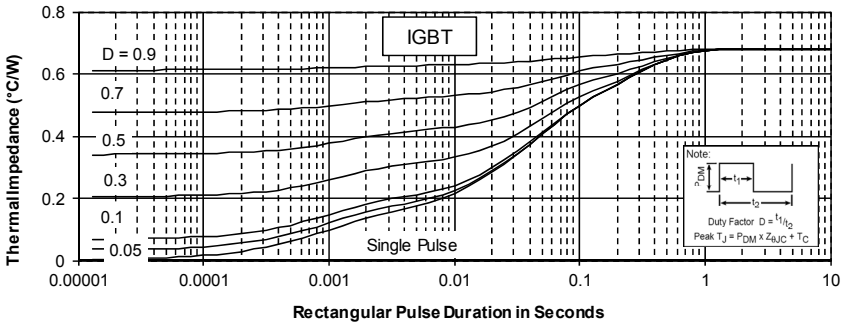

Energy losses vs Collector Current

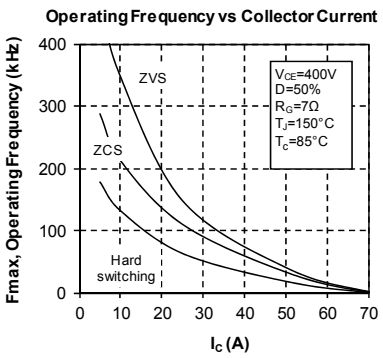


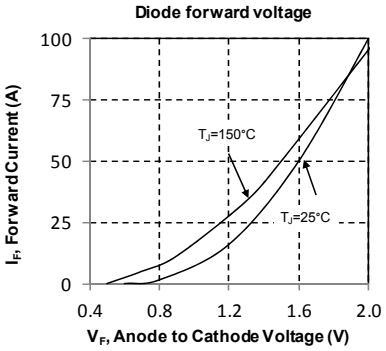

Switching Energy Losses vs Gate Resistance

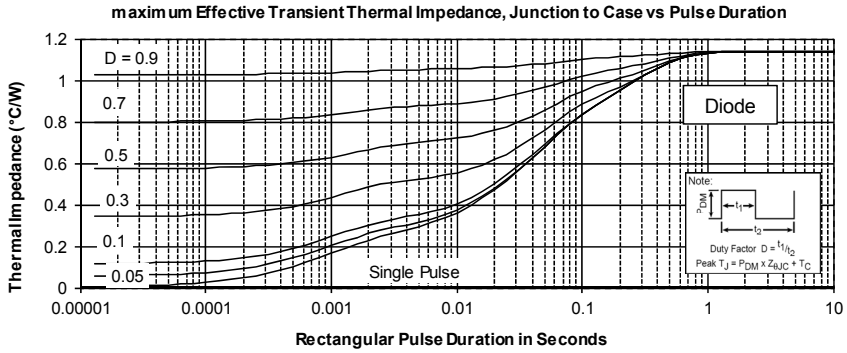



maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration

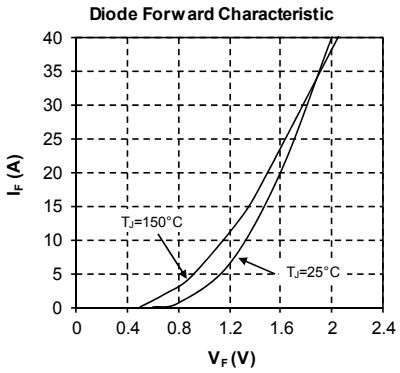


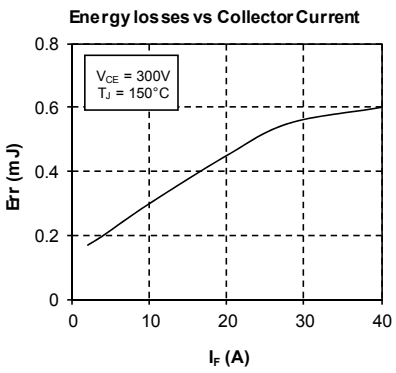


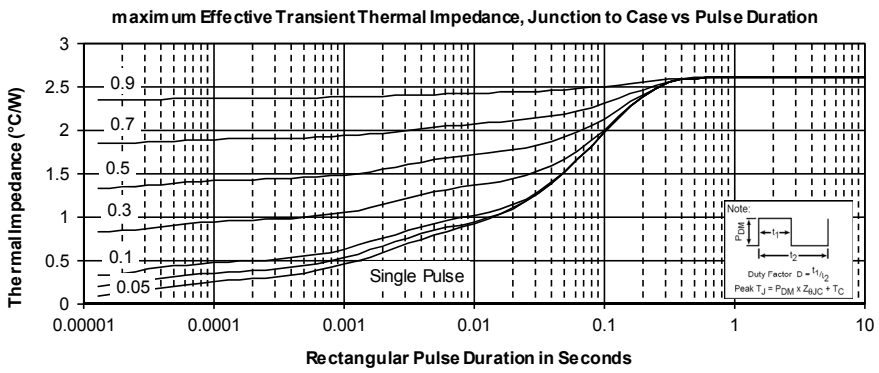




## IGBT parallel diode Typical Performance Curves



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