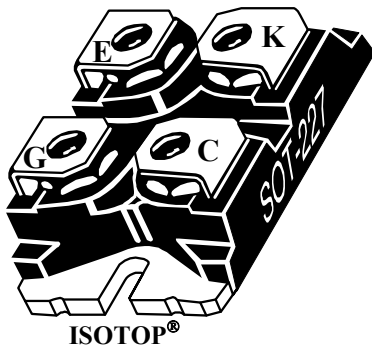
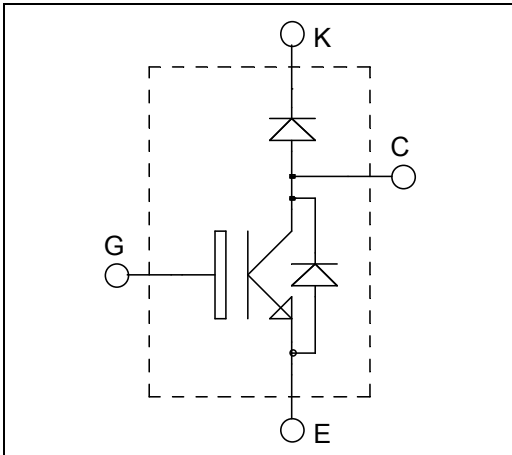


**ISOTOP® Boost chopper  
High speed Trench + Field Stop IGBT4  
Power Module**

**$V_{CES} = 650V$   
 $I_C = 100A^* @ T_c = 80^\circ C$**



### 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 @  $T_j = 25^\circ C$  unless otherwise specified**

### Absolute maximum ratings

| Symbol    | Parameter                    | Max ratings        | Unit |
|-----------|------------------------------|--------------------|------|
| $V_{CES}$ | Collector - Emitter Voltage  | 650                | V    |
| $I_C$     | Continuous Collector Current | $T_C = 25^\circ C$ | 165* |
|           |                              | $T_C = 80^\circ C$ | 100* |
| $I_{CM}$  | Pulsed Collector Current     | 270                | A    |
| $V_{GE}$  | Gate - Emitter Voltage       | $\pm 20$           | V    |
| $P_D$     | Power Dissipation            | 430                | W    |

\* Specification of IGBT device but output current must be limited due to size of output pins.

 **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 <sub>CEs</sub>     | Zero Gate Voltage Collector Current  | V <sub>GE</sub> = 0V, V <sub>CE</sub> = 650V                |     |                               | 50  | μA   |
| V <sub>CE(sat)</sub> | Collector Emitter Saturation Voltage | V <sub>GE</sub> = 15V<br>I <sub>C</sub> = 100A              | 1.4 | T <sub>j</sub> = 25°C<br>1.85 | 2.3 | V    |
|                      |                                      | T <sub>j</sub> = 150°C<br>2.2                               |     |                               |     |      |
| V <sub>GE(th)</sub>  | Gate Threshold Voltage               | V <sub>GE</sub> = V <sub>CE</sub> , I <sub>C</sub> = 1.6 mA | 4.2 | 5.1                           | 5.6 | V    |
| I <sub>GES</sub>     | Gate – Emitter Leakage Current       | V <sub>GE</sub> = 20V, V <sub>CE</sub> = 0V                 |     |                               | 150 | nA   |

## Dynamic Characteristics

| Symbol              | Characteristic                      | Test Conditions                                                                                                                    | Min | Typ  | Max  | Unit |
|---------------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-----|------|------|------|
| C <sub>ies</sub>    | Input Capacitance                   | V <sub>GE</sub> = 0V<br>V <sub>CE</sub> = 25V<br>f = 1MHz                                                                          |     | 6100 |      | pF   |
| C <sub>oes</sub>    | Output Capacitance                  |                                                                                                                                    |     | 232  |      |      |
| C <sub>res</sub>    | Reverse Transfer Capacitance        |                                                                                                                                    |     | 180  |      |      |
| Q <sub>G</sub>      | Gate charge                         | V <sub>GE</sub> = 15V, I <sub>C</sub> = 100A<br>V <sub>CE</sub> = 480V                                                             |     | 630  |      | nC   |
| T <sub>d(on)</sub>  | Turn-on Delay Time                  | Inductive Switching (25°C)<br>V <sub>GE</sub> = ±15V<br>V <sub>Bus</sub> = 400V<br>I <sub>C</sub> = 100A<br>R <sub>G</sub> = 3.6Ω  |     | 19   |      | ns   |
| T <sub>r</sub>      | Rise Time                           |                                                                                                                                    |     | 33   |      |      |
| T <sub>d(off)</sub> | Turn-off Delay Time                 |                                                                                                                                    |     | 197  |      |      |
| T <sub>f</sub>      | Fall Time                           |                                                                                                                                    |     | 21   |      |      |
| T <sub>d(on)</sub>  | Turn-on Delay Time                  | Inductive Switching (150°C)<br>V <sub>GE</sub> = ±15V<br>V <sub>Bus</sub> = 400V<br>I <sub>C</sub> = 100A<br>R <sub>G</sub> = 3.6Ω |     | 19   |      | ns   |
| T <sub>r</sub>      | Rise Time                           |                                                                                                                                    |     | 29   |      |      |
| T <sub>d(off)</sub> | Turn-off Delay Time                 |                                                                                                                                    |     | 227  |      |      |
| T <sub>f</sub>      | Fall Time                           |                                                                                                                                    |     | 22   |      |      |
| E <sub>on</sub>     | Turn on Energy                      | V <sub>GE</sub> = ±15V<br>V <sub>Bus</sub> = 400V<br>I <sub>C</sub> = 100A                                                         |     | 2.4  |      | mJ   |
| E <sub>off</sub>    | Turn off Energy                     | R <sub>G</sub> = 3.6Ω                                                                                                              |     | 2    |      |      |
| R <sub>G</sub>      | Integrated gate resistor            |                                                                                                                                    |     | 2    |      | Ω    |
| I <sub>sc</sub>     | Short Circuit data                  | V <sub>GE</sub> ≤ 15V ; V <sub>Bus</sub> = 400V<br>t <sub>p</sub> ≤ 5μs ; T <sub>j</sub> = 150°C                                   |     | 700  |      | A    |
| R <sub>thJC</sub>   | Junction to Case Thermal Resistance |                                                                                                                                    |     |      | 0.35 | °C/W |

## Chopper diode ratings and characteristics

| Symbol            | Characteristic                      | Test Conditions                                                   | Min | Typ                           | Max                           | Unit |    |
|-------------------|-------------------------------------|-------------------------------------------------------------------|-----|-------------------------------|-------------------------------|------|----|
| V <sub>RRM</sub>  | Peak Repetitive Reverse Voltage     |                                                                   |     |                               | 650                           | V    |    |
| I <sub>RM</sub>   | Reverse Leakage Current             | V <sub>R</sub> = 650V                                             |     |                               | 50                            | μA   |    |
| I <sub>F</sub>    | DC Forward Current                  | T <sub>c</sub> = 60°C                                             |     | 50                            |                               | A    |    |
| V <sub>F</sub>    | Diode Forward Voltage               | I <sub>F</sub> = 50A<br>V <sub>GE</sub> = 0V                      |     | T <sub>j</sub> = 25°C<br>1.6  | 2                             | V    |    |
|                   |                                     |                                                                   |     | T <sub>j</sub> = 150°C<br>1.5 |                               |      |    |
| t <sub>rr</sub>   | Reverse Recovery Time               | I <sub>F</sub> = 50A<br>V <sub>R</sub> = 300V<br>di/dt = 1800A/μs |     | T <sub>j</sub> = 25°C<br>100  |                               | ns   |    |
|                   |                                     |                                                                   |     |                               | T <sub>j</sub> = 150°C<br>150 |      |    |
| Q <sub>rr</sub>   | Reverse Recovery Charge             |                                                                   |     |                               | T <sub>j</sub> = 25°C<br>2.6  |      | μC |
|                   |                                     |                                                                   |     |                               | T <sub>j</sub> = 150°C<br>5.4 |      |    |
| E <sub>rr</sub>   | Reverse Recovery Energy             |                                                                   |     | T <sub>j</sub> = 25°C<br>0.6  |                               | mJ   |    |
|                   |                                     |                                                                   |     | T <sub>j</sub> = 150°C<br>1.2 |                               |      |    |
| R <sub>thJC</sub> | Junction to Case Thermal Resistance |                                                                   |     |                               | 1.14                          | °C/W |    |

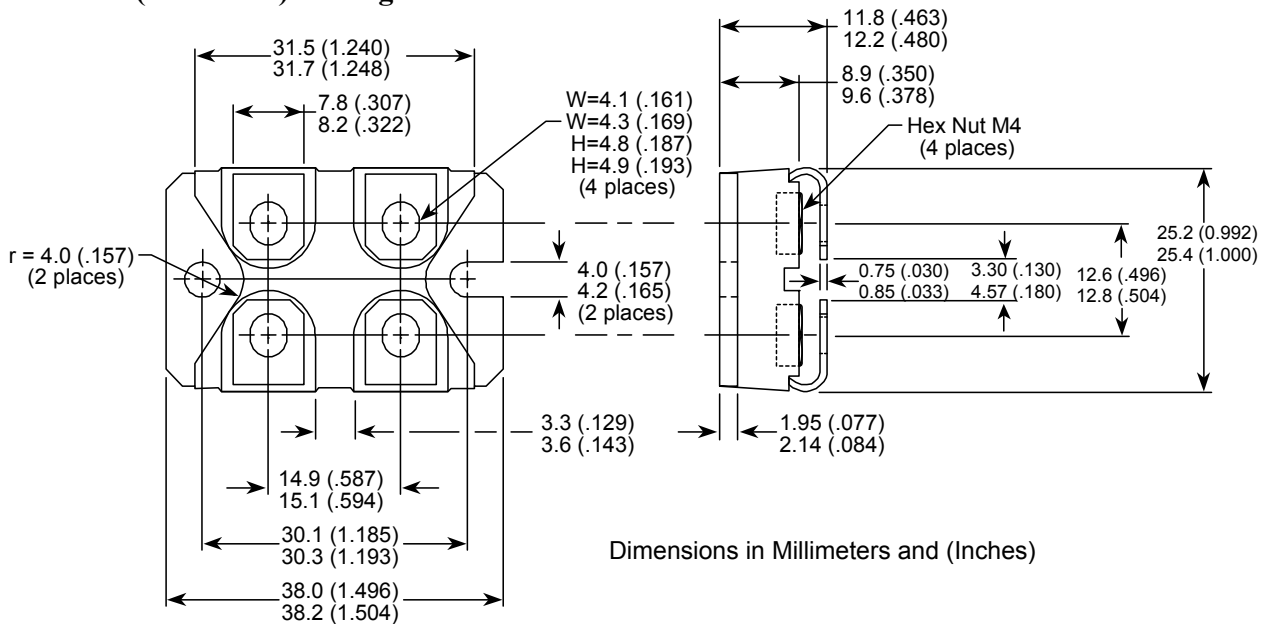
## IGBT parallel diode ratings and characteristics

| Symbol            | Characteristic                      | Test Conditions                                                   | Min                    | Typ  | Max | Unit |
|-------------------|-------------------------------------|-------------------------------------------------------------------|------------------------|------|-----|------|
| V <sub>RRM</sub>  | Peak Repetitive Reverse Voltage     |                                                                   |                        |      | 650 | V    |
| I <sub>RM</sub>   | Reverse Leakage Current             | V <sub>R</sub> = 650V                                             |                        |      | 50  | μA   |
| I <sub>F</sub>    | DC Forward Current                  | T <sub>c</sub> = 60°C                                             |                        | 20   |     | A    |
| V <sub>F</sub>    | Diode Forward Voltage               | I <sub>F</sub> = 20A<br>V <sub>GE</sub> = 0V                      | T <sub>j</sub> = 25°C  | 1.6  | 2   | V    |
|                   |                                     |                                                                   | T <sub>j</sub> = 150°C | 1.5  |     |      |
| t <sub>rr</sub>   | Reverse Recovery Time               | I <sub>F</sub> = 20A<br>V <sub>R</sub> = 300V<br>di/dt = 1600A/μs | T <sub>j</sub> = 25°C  | 100  |     | ns   |
|                   |                                     |                                                                   | T <sub>j</sub> = 150°C | 150  |     |      |
| Q <sub>rr</sub>   | Reverse Recovery Charge             | I <sub>F</sub> = 20A<br>V <sub>R</sub> = 300V<br>di/dt = 1600A/μs | T <sub>j</sub> = 25°C  | 1.1  |     | μC   |
|                   |                                     |                                                                   | T <sub>j</sub> = 150°C | 2.3  |     |      |
| E <sub>rr</sub>   | Reverse Recovery Energy             | I <sub>F</sub> = 20A<br>V <sub>R</sub> = 300V<br>di/dt = 1600A/μs | T <sub>j</sub> = 25°C  | 0.23 |     | mJ   |
|                   |                                     |                                                                   | T <sub>j</sub> = 150°C | 0.50 |     |      |
| R <sub>thJC</sub> | Junction to Case Thermal Resistance |                                                                   |                        |      | 2.6 | °C/W |

## Thermal and package characteristics

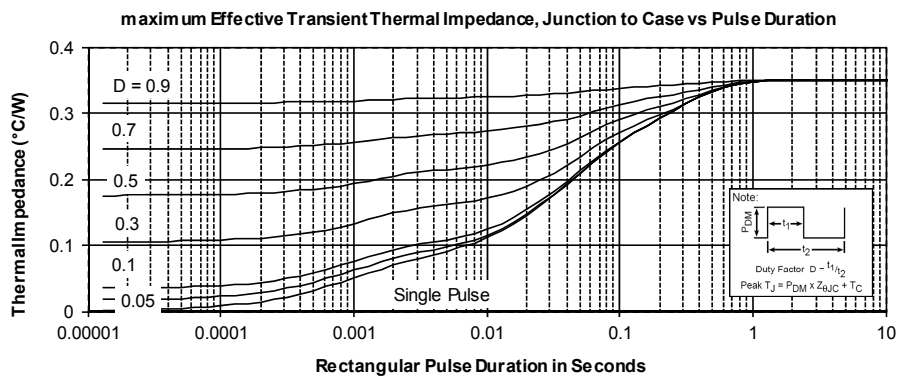
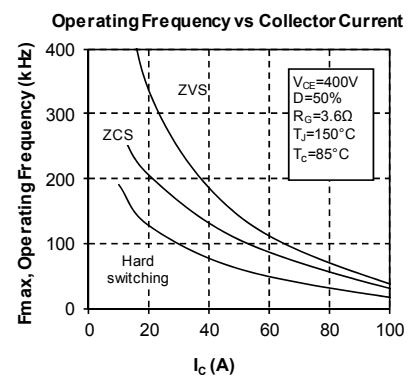
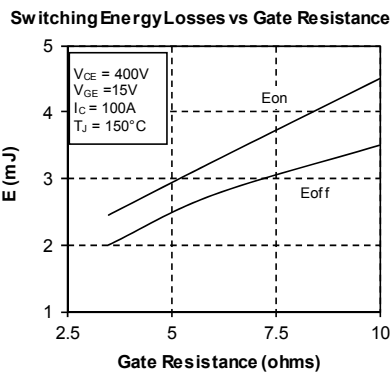
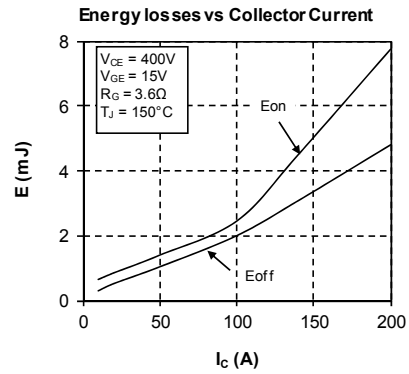
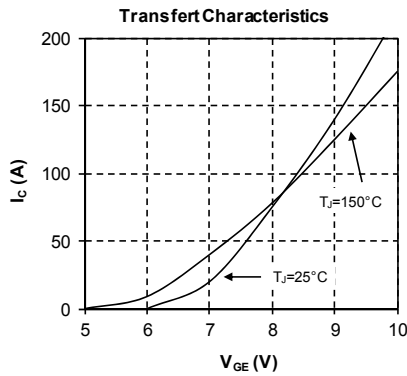
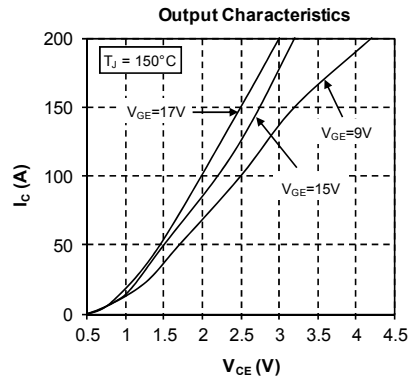
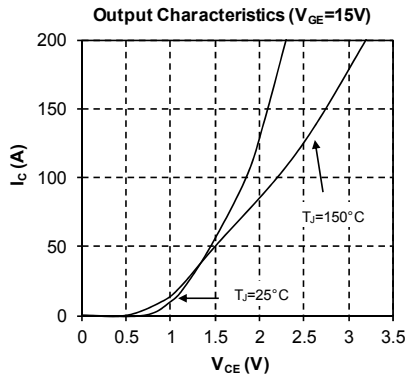
| Symbol                            | Characteristic                                                               | Min  | Typ  | Max                      | Unit |
|-----------------------------------|------------------------------------------------------------------------------|------|------|--------------------------|------|
| V <sub>ISOL</sub>                 | RMS Isolation Voltage, any terminal to case t = 1 min, 50/60Hz               | 2500 |      |                          | V    |
| T <sub>J</sub> , T <sub>STG</sub> | Storage Temperature Range                                                    | -55  |      | 175                      | °C   |
| T <sub>JOP</sub>                  | Recommended junction temperature under switching conditions                  | -55  |      | T <sub>Jmax</sub><br>-25 |      |
| T <sub>L</sub>                    | 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

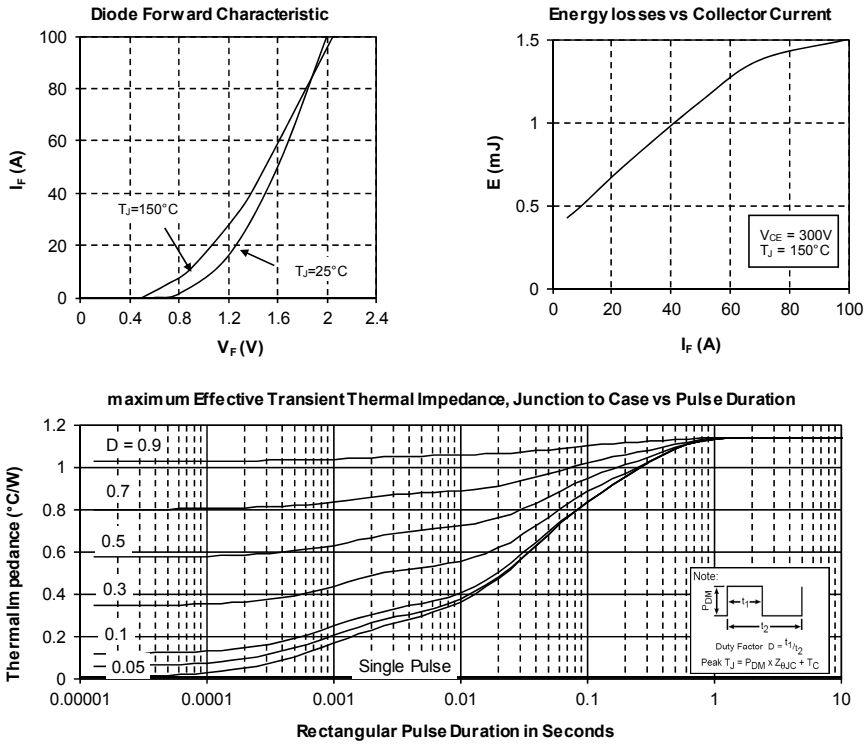


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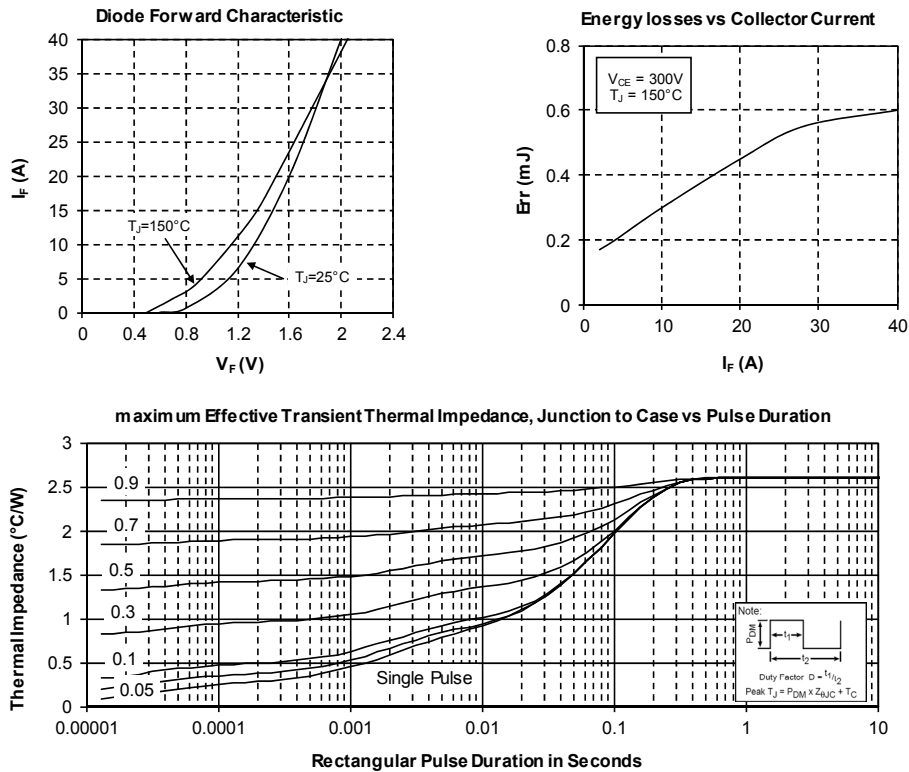
## IGBT Typical Performance Curves



## Chopper diode Typical Performance Curves



## IGBT parallel diode Typical Performance Curves



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