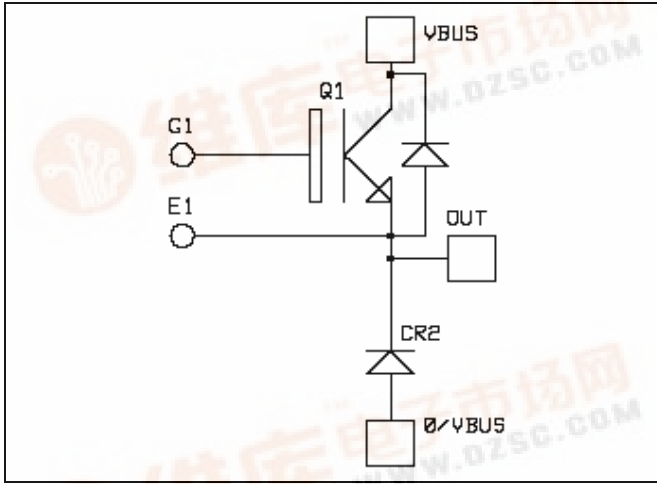


Buck chopper NPT IGBT Power Module

$V_{CES} = 600V$
 $I_C = 350A @ T_c = 80^\circ C$



Application

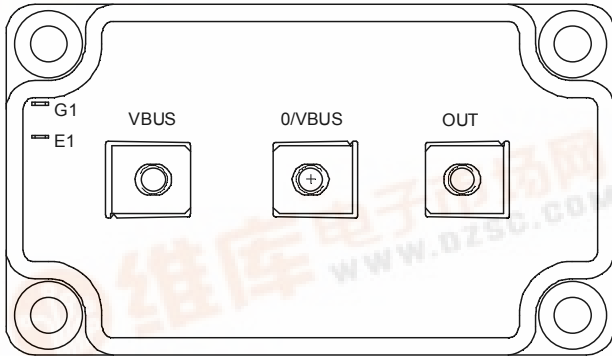
- AC and DC motor control
- Switched Mode Power Supplies

Features

- Non Punch Through (NPT) THUNDERBOLT IGBT®
 - Low voltage drop
 - Low tail current
 - Switching frequency up to 100 kHz
 - Soft recovery parallel diodes
 - Low diode VF
 - Low leakage current
 - Avalanche energy rated
 - RBSOA and SCSOA rated
- Kelvin emitter for easy drive
- Very low stray inductance
 - Symmetrical design
 - M5 power connectors
- High level of integration

Benefits

- Outstanding performance at high frequency operation
- 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



Absolute maximum ratings

| Symbol | Parameter | Max ratings | Unit |
|-----------|---------------------------------------|---------------------|--------------|
| V_{CES} | Collector - Emitter Breakdown Voltage | 600 | V |
| I_C | Continuous Collector Current | $T_c = 25^\circ C$ | 430 |
| | | $T_c = 80^\circ C$ | 350 |
| I_{CM} | Pulsed Collector Current | $T_c = 25^\circ C$ | 1225 |
| V_{GE} | Gate - Emitter Voltage | ± 20 | V |
| P_D | Maximum Power Dissipation | $T_c = 25^\circ C$ | 1562 |
| RBSOA | Reverse Bias Safe Operating Area | $T_j = 150^\circ C$ | 1225A @ 600V |

All ratings @ $T_j = 25^\circ\text{C}$ unless otherwise specified

Electrical Characteristics

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit |
|--------------|---------------------------------------|----------------------------------|---------------------------|-----|-----------|---------|
| BV_{CES} | Collector - Emitter Breakdown Voltage | $V_{GE} = 0V, I_C = 200\mu A$ | 600 | | | V |
| I_{CES} | Zero Gate Voltage Collector Current | $V_{GE} = 0V$ $V_{CE} = 600V$ | $T_j = 25^\circ\text{C}$ | | 200 | μA |
| | | | $T_j = 125^\circ\text{C}$ | | 4000 | |
| $V_{CE(on)}$ | Collector Emitter on Voltage | $V_{GE} = 15V$ $I_C = 360A$ | $T_j = 25^\circ\text{C}$ | 2.0 | 2.5 | V |
| | | | $T_j = 125^\circ\text{C}$ | 2.2 | | |
| $V_{GE(th)}$ | Gate Threshold Voltage | $V_{GE} = V_{CE}, I_C = 4mA$ | 3 | | 5 | V |
| I_{GES} | Gate - Emitter Leakage Current | $V_{GE} = \pm 20V, V_{CE} = 0V$ | | | ± 300 | nA |

Dynamic Characteristics

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit |
|--------------|------------------------------|---|-----|------|-----|------|
| C_{ies} | Input Capacitance | $V_{GE} = 0V$ | | 17.2 | | nF |
| C_{oes} | Output Capacitance | $V_{CE} = 25V$ | | 1.88 | | |
| C_{res} | Reverse Transfer Capacitance | $f = 1MHz$ | | 1.6 | | |
| Q_g | Total gate Charge | $V_{GS} = 15V$ | | 1320 | | nC |
| Q_{ge} | Gate - Emitter Charge | $V_{Bus} = 300V$ | | 1160 | | |
| Q_{gc} | Gate - Collector Charge | $I_C = 360A$ | | 800 | | |
| $T_{d(on)}$ | Turn-on Delay Time | Inductive Switching (25°C) | | 26 | | ns |
| T_r | Rise Time | $V_{GE} = 15V$ | | 25 | | |
| $T_{d(off)}$ | Turn-off Delay Time | $V_{Bus} = 400V$ | | 150 | | |
| T_f | Fall Time | $I_C = 360A$ | | 30 | | |
| E_{on} | Turn-on Switching Energy ❶ | $R_G = 1.25\Omega$ | | 13.5 | | |
| E_{off} | Turn-off Switching Energy ❷ | | | 11.5 | | |
| $T_{d(on)}$ | Turn-on Delay Time | Inductive Switching (125°C) | | 26 | | ns |
| T_r | Rise Time | $V_{GE} = 15V$ | | 25 | | |
| $T_{d(off)}$ | Turn-off Delay Time | $V_{Bus} = 400V$ | | 170 | | |
| T_f | Fall Time | $I_C = 360A$ | | 40 | | |
| E_{on} | Turn-on Switching Energy ❶ | $R_G = 1.25\Omega$ | | 17.2 | | |
| E_{off} | Turn-off Switching Energy ❷ | | | 14 | | |

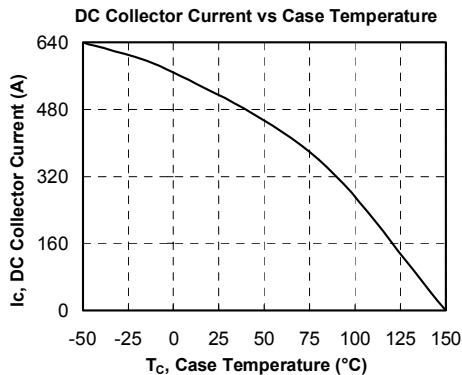
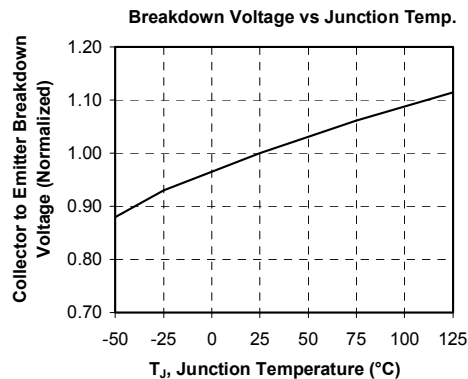
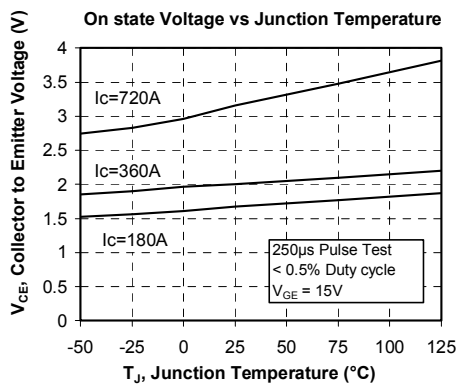
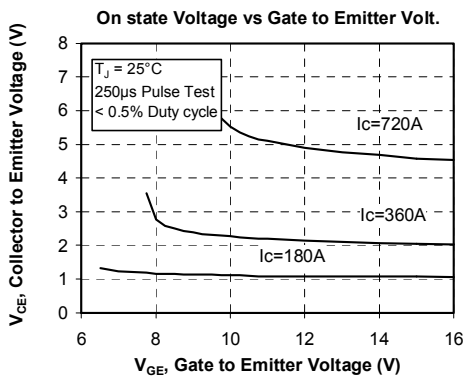
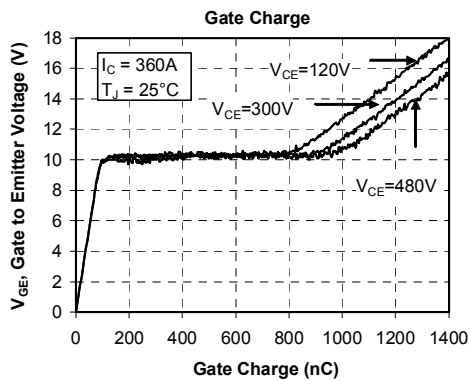
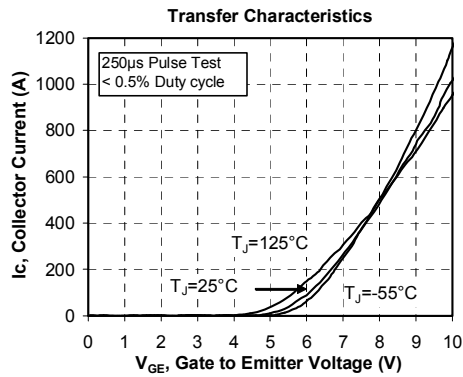
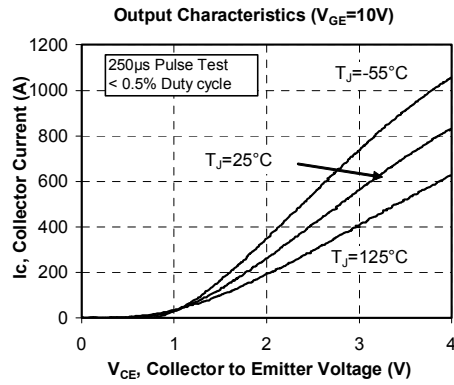
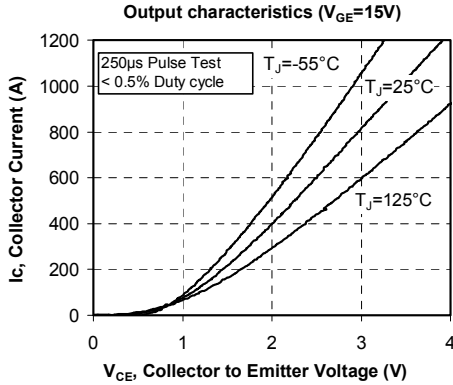
Reverse diode ratings and characteristics

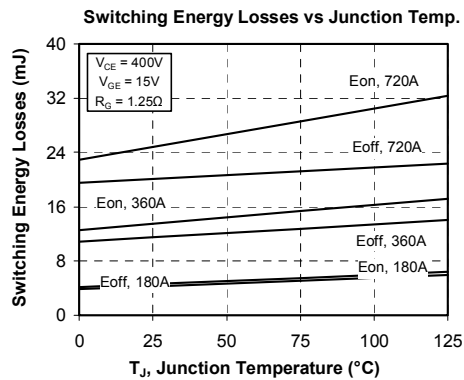
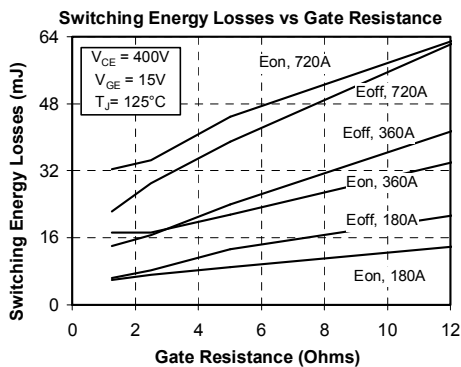
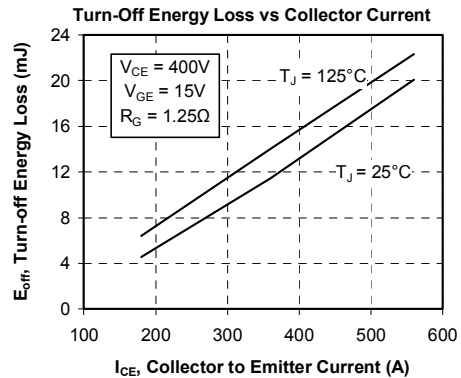
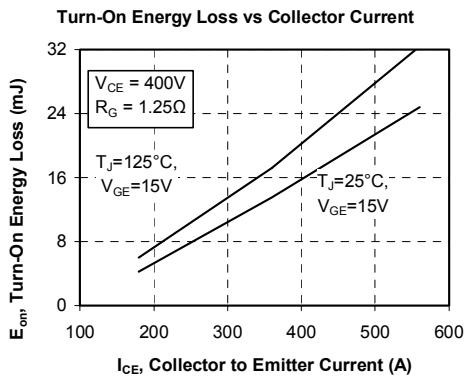
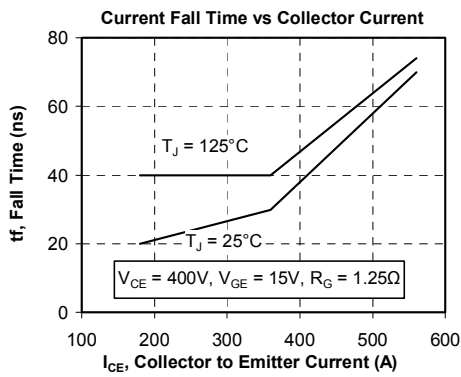
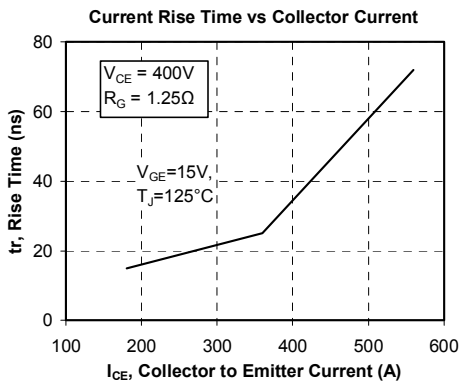
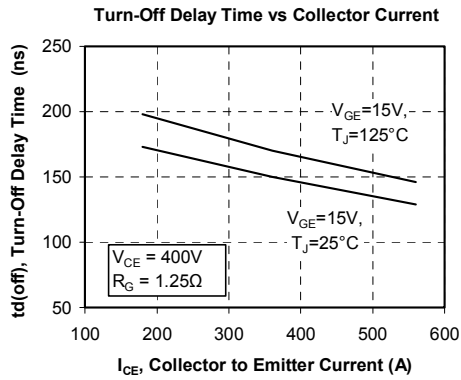
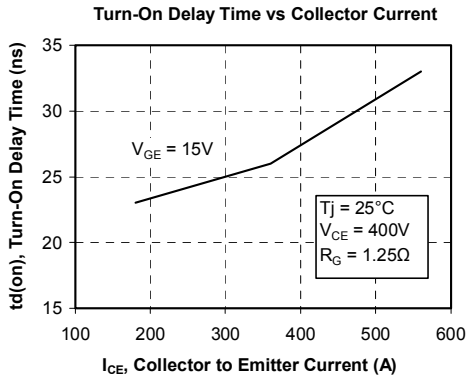
| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit |
|-------------|---------------------------------|---|---------------------------|------|-----|------|
| $I_{F(AV)}$ | Maximum Average Forward Current | 50% duty cycle $T_c = 80^\circ\text{C}$ | | 400 | | A |
| V_F | Diode Forward Voltage | $I_F = 400A$ | | 1.6 | 1.8 | V |
| | | $I_F = 800A$ | | 1.9 | | |
| | | $I_F = 400A$ $T_j = 125^\circ\text{C}$ | | 1.4 | | |
| t_{rr} | Reverse Recovery Time | $I_F = 400A$ $V_R = 4400V$ $di/dt = 800A/\mu s$ | $T_j = 25^\circ\text{C}$ | 180 | | ns |
| | | | $T_j = 125^\circ\text{C}$ | 220 | | |
| Q_{rr} | Reverse Recovery Charge | $I_F = 400A$ $V_R = 400V$ $di/dt = 800A/\mu s$ | $T_j = 25^\circ\text{C}$ | 1560 | | nC |
| | | | $T_j = 125^\circ\text{C}$ | 5800 | | |

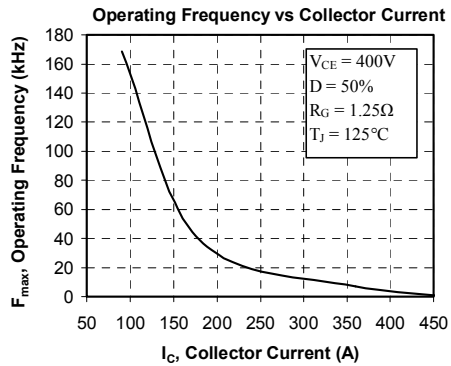
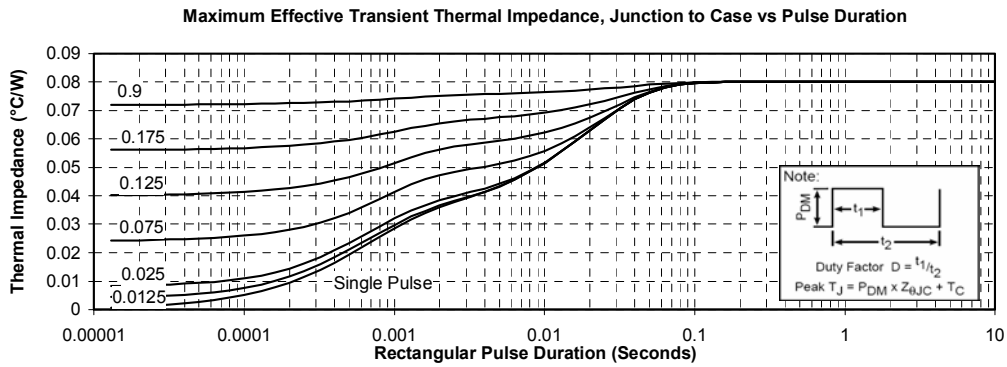
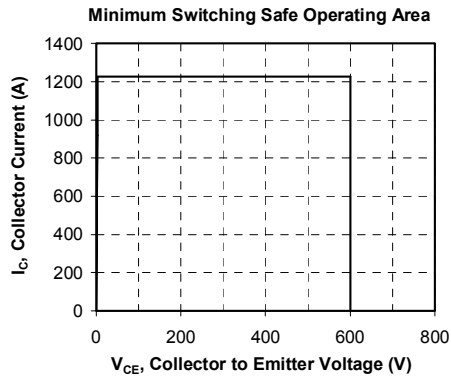
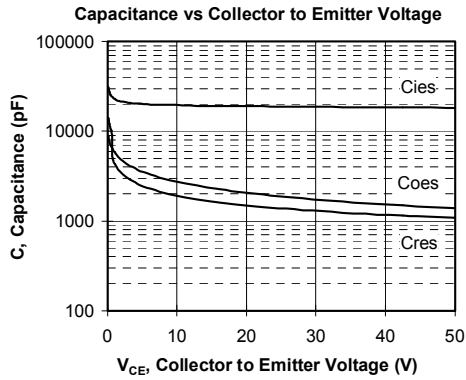
❶ E_{on} includes diode reverse recovery

❷ In accordance with JEDEC standard JESD24-1

Typical Performance Curve







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