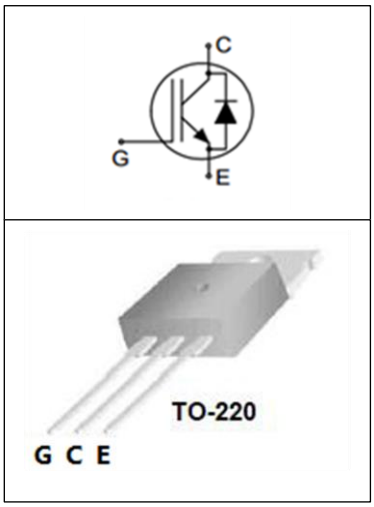
## *IGBT*

## Features




- 600V,20A
- $V_{CE(sat)(typ.)}$=1.85V@$V_{GE}$=15V,$I_C$=20A
- High speed switching
- Higher system efficiency
- Soft current turn-off waveforms
- Square RBSOA

## General Description

JIAEN trench IGBTs offer lower losses and higher energy efficiency for application such as IH (induction heating),UPS, general inverter and other soft switching applications.

## Absolute Maximum Ratings

| Symbol | Parameter | Value | Units |
|---|---|---|---|
| $V_{CES}$ | Collector-Emitter Voltage | 600 | V |
| $V_{GES}$ | Gate-Emitter Voltage | ± 30 | V |
| $I_C$ | Continuous Collector Current ( $T_C$=25℃) | 40 | A |
| | Continuous Collector Current ( $T_C$=100℃) | 20 | A |
| $I_{CM}$ | Pulsed Collector Current (Note 1) | 60 | A |
| $I_F$ | Diode Continuous Forward Current ( $T_C$=100℃) | 20 | A |
| $I_{FM}$ | Diode Maximum Forward Current (Note 1) | 60 | A |
| $t_{sc}$ | Short Circuit Withstand Time | 10 | us |
| $P_D$ | Maximum Power Dissipation ( $T_C$=25℃) | 135 | W |
| | Maximum Power Dissipation ( $T_C$=100℃) | 55 | W |
| $T_J$ | Operating Junction Temperature Range | -55 to +150 | ℃ |
| $T_{STG}$ | Storage Temperature Range | -55 to +150 | ℃ |

## Thermal Characteristics

| Symbol | Parameter | Max. | Units |
|---|---|---|---|
| $R_{th\ j\text{-}c}$ | Thermal Resistance, Junction to case for IGBT | 0.9 | ℃/ W |
| $R_{th\ j\text{-}c}$ | Thermal Resistance, Junction to case for Diode | 1.6 | ℃/ W |
| $R_{th\ j\text{-}a}$ | Thermal Resistance, Junction to Ambient | 62 | ℃/ W |

## Electrical Characteristics ($T_C$=25℃ unless otherwise noted )

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| $BV_{CES}$ | Collector-Emitter Breakdown Voltage | $V_{GE}$= 0V, $I_C$= 250uA | 600 | - | - | V |
| $I_{CES}$ | Collector-Emitter Leakage Current | $V_{CE}$= 600V, $V_{GE}$= 0V | - | - | 100 | uA |
| $I_{GES}$ | Gate Leakage Current, Forward | $V_{GE}$=30V, $V_{CE}$= 0V | - | - | 100 | nA |
| | Gate Leakage Current, Reverse | $V_{GE}$= -30V, $V_{CE}$= 0V | - | - | -100 | nA |
| $V_{GE(th)}$ | Gate Threshold Voltage | $V_{GE}$= $V_{CE}$, $I_C$= 250uA | 4.5 | - | 6.5 | V |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $V_{GE}$=15V, $I_C$= 15A | - | 1.85 | 2.3 | V |
| Qg | Total Gate Charge | $V_{CC}$=400V<br>$V_{GE}$=15V<br>$I_C$=20A | - | 62 | | nC |
| Qge | Gate-Emitter Charge | | - | 6 | | nC |
| Qgc | Gate-Collector Charge | | - | 33 | | nC |
| $t_{d(on)}$ | Turn-on Delay Time | $V_{CC}$=400V<br>$V_{GE}$=15V<br>$I_C$=20A<br>$R_G$=20Ω<br>Inductive Load<br>$T_C$=25 ℃ | - | 16 | - | ns |
| $t_r$ | Turn-on Rise Time | | - | 24 | - | ns |
| $t_{d(off)}$ | Turn-off Delay Time | | - | 122 | - | ns |
| $t_f$ | Turn-off Fall Time | | - | 35 | - | ns |
| Eon | Turn-on Switching Loss | | - | 0.43 | - | mJ |
| Eoff | Turn-off Switching Loss | | - | 0.29 | - | mJ |
| Ets | Total Switching Loss | | - | 0.72 | - | mJ |
| Cies | Input Capacitance | $V_{CE}$=25V<br>$V_{GE}$=0V<br>f = 1MHz | - | 920 | - | pF |
| Coes | Output Capacitance | | - | 150 | - | pF |
| Cres | Reverse Transfer Capacitance | | - | 54 | - | pF |

## Electrical Characteristics of Diode ($T_C$=25℃ unless otherwise noted)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| $V_F$ | Diode Forward Voltage | $I_F$=20A | - | 1.5 | 2.3 | V |
| $t_{rr}$ | Diode Reverse Recovery Time | $V_{CE}$ = 300V<br>$I_F$= 20A<br>dIF/dt = 500A/us | - | 90 | | ns |
| $I_{rr}$ | Diode peak Reverse Recovery Current | | - | 19 | | A |
| $Q_{rr}$ | Diode Reverse Recovery Charge | | - | 732 | | nC |

**Notes：**

1. Repetitive Rating: Pulse width limited by maximum junction temperature

## Typical Performance Characteristics

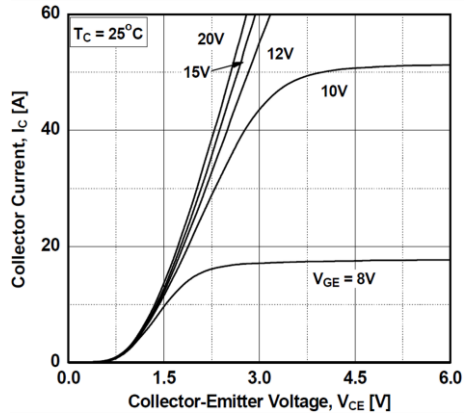



Fig 1. Output characteristics

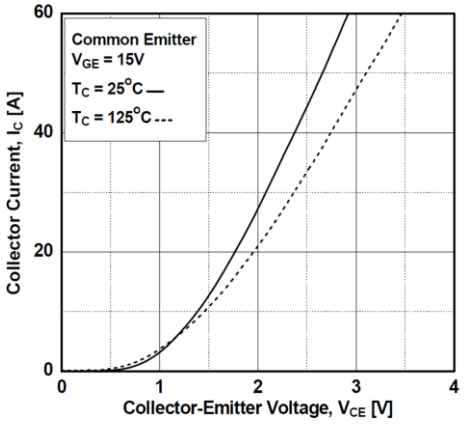



Fig 2. Typical Saturation Voltage Characteristics

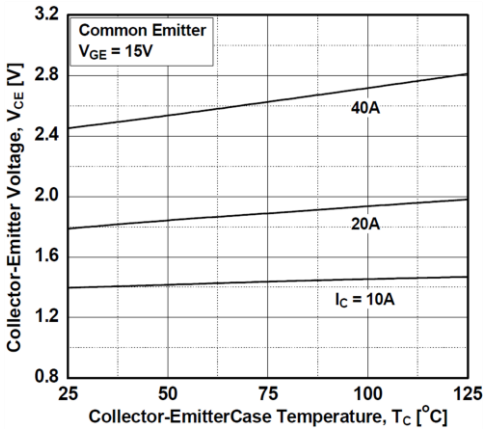



Figure 3. Saturation Voltage vs. Case Temperature

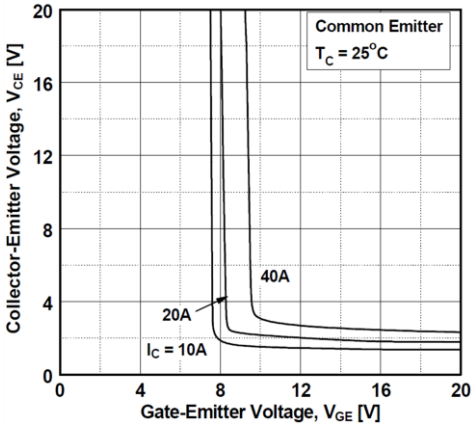



Figure 4. Saturation Voltage vs. VGE

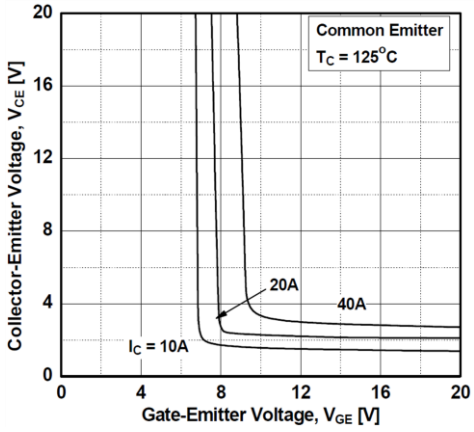



Figure 5. Saturation Voltage vs. VGE

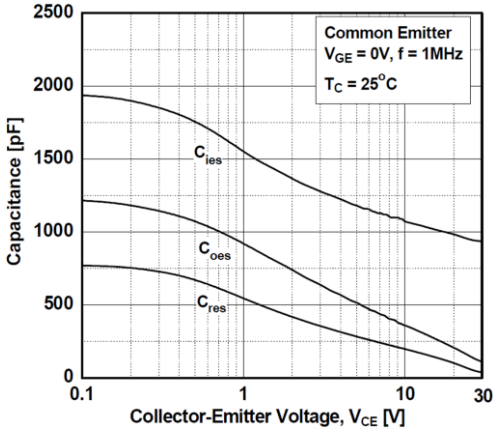



Figure 6. Capacitance Characteristics

## Typical Performance Characteristics

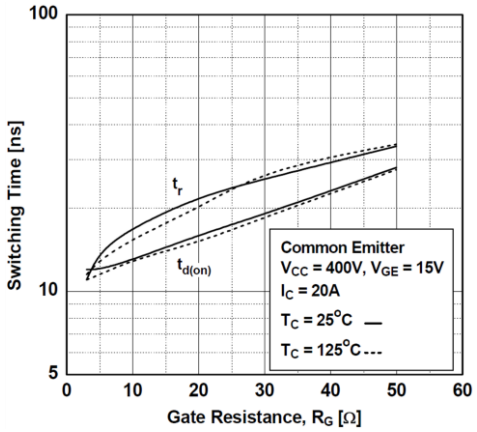



Figure 7. Turn-On Characteristics vs. Gate Resistance

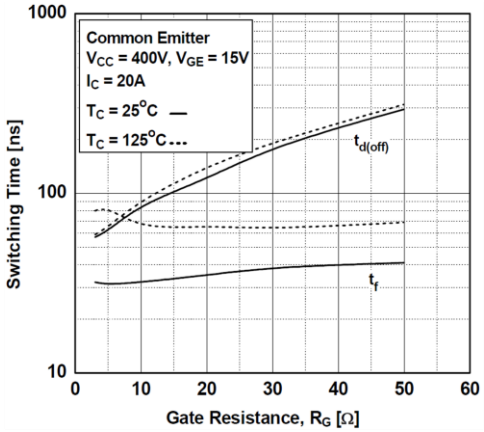



Figure 8. Turn-Off Characteristics vs. Gate Resistance

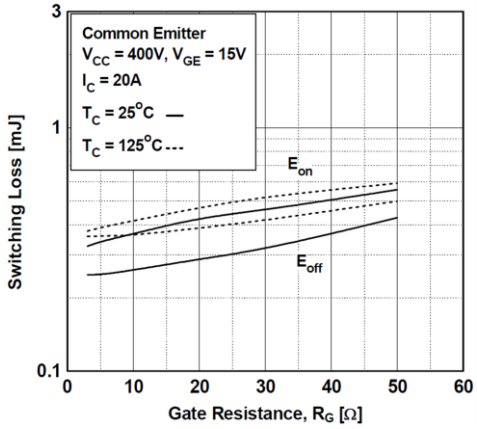



Figure 9. Switching Loss vs. Gate Resistance

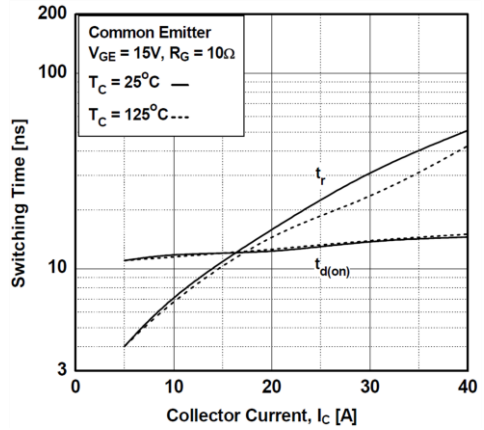



Figure 10. Turn-On Characteristics vs. Collector Current

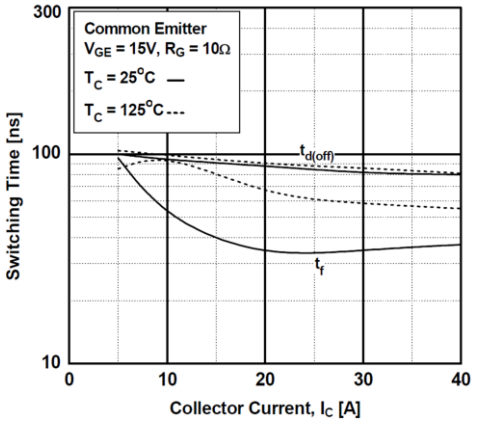



Figure 11. Turn-Off Characteristics vs. Collector Current

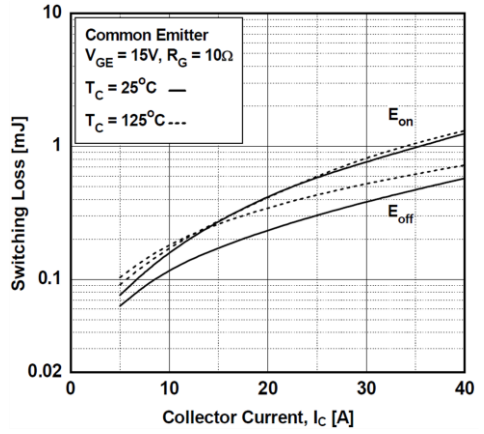



Figure 12. Switching Loss vs. Collector Current

## Typical Performance Characteristics

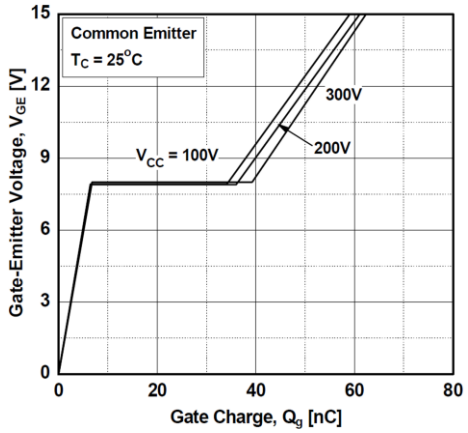



Figure 13. Gate Charge Characteristics

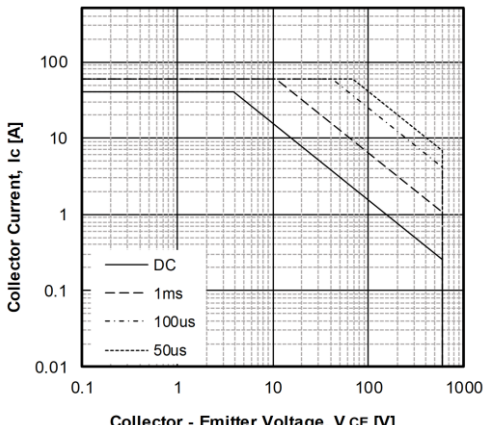



Figure 14. SOA Characteristics

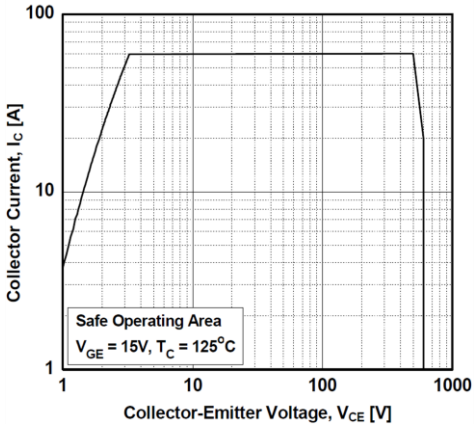



Figure 15. Turn-Off SOA

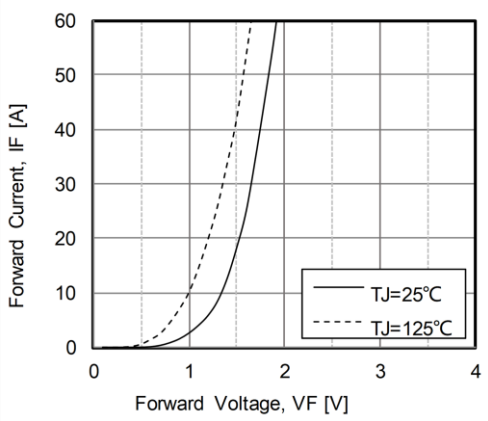



Figure 16. Forward Characteristics

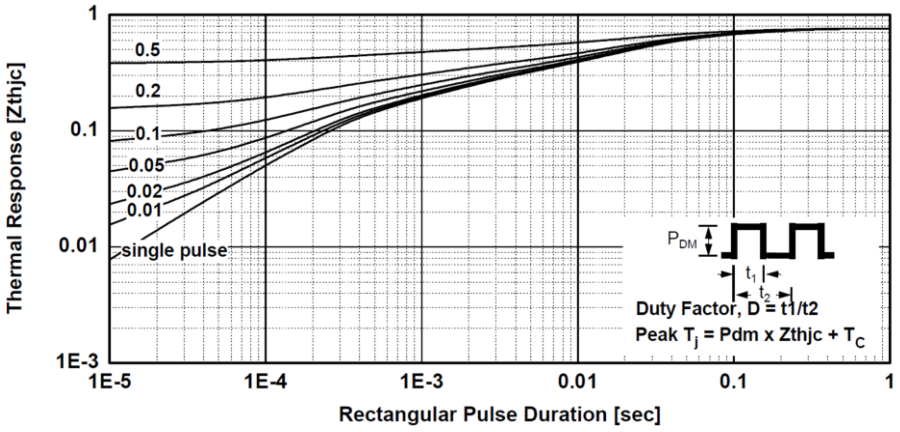
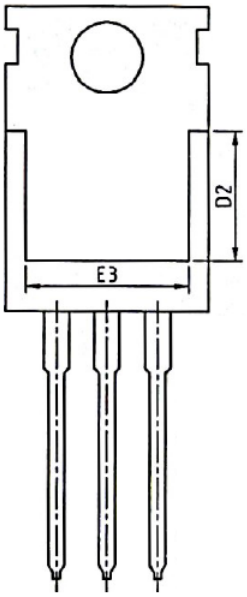
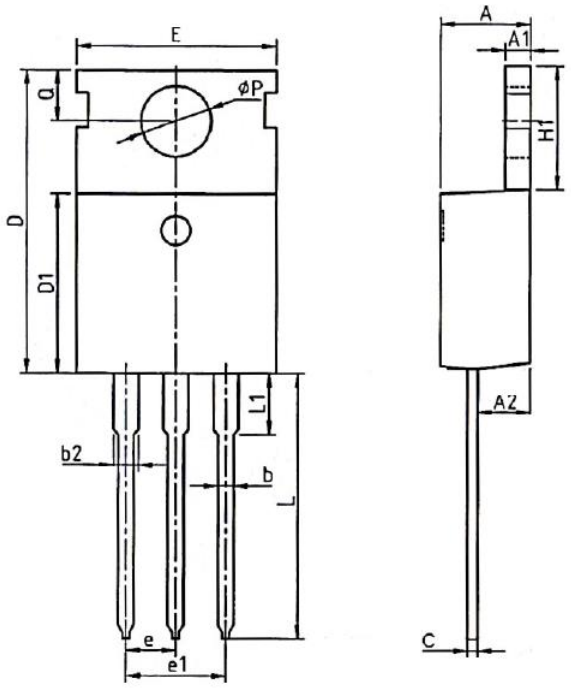



Figure 17. Transient Thermal Impedance of IGBT

## Package




| SYMBOL | MIN | NOM | MAX |
|---|---|---|---|
| A | 4.37 | 4.57 | 4.7 |
| A1 | 1.25 | 1.3 | 1.4 |
| A2 | 2.2 | 2.4 | 2.6 |
| b | 0.7 | 0.8 | 0.95 |
| b2 | 1.17 | 1.27 | 1.47 |
| c | 0.45 | 0.5 | 0.6 |
| D | 15.1 | 15.6 | 16.1 |
| D1 | 8.8 | 9.1 | 9.4 |
| D2 | 5.5 | - | - |
| E | 9.7 | 10 | 10.3 |
| E3 | 7 | - | - |
| e | 2.54 BSC | | |
| e1 | 5.08 BSC | | |
| H1 | 6.25 | 6.5 | 6.85 |
| L | 12.75 | 13.5 | 13.8 |
| L1 | - | 3.1 | 3.4 |
| ΦP | 3.4 | 3.6 | 3.8 |
| Q | 2.6 | 2.8 | 3 |



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