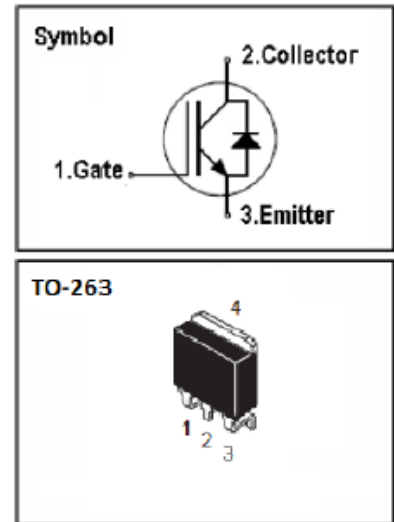


## IGBT

### 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	$\pm 20$	V
$I_C$	Continuous Collector Current ( $T_C=25^\circ C$ )	40	A
	Continuous Collector Current ( $T_C=100^\circ C$ )	20	A
$I_{CM}$	Pulsed Collector Current (Note 1)	60	A
$I_F$	Diode Continuous Forward Current ( $T_C=100^\circ C$ )	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 ( $T_C=25^\circ C$ )	135	W
	Maximum Power Dissipation ( $T_C=100^\circ C$ )	55	W
$T_J$	Operating Junction Temperature Range	-55 to +150	$^\circ C$
$T_{STG}$	Storage Temperature Range	-55 to +150	$^\circ C$

### Thermal Characteristics

Symbol	Parameter	Max.	Units
$R_{th\ j-c}$	Thermal Resistance, Junction to case for IGBT	0.9	$^\circ C/W$
$R_{th\ j-c}$	Thermal Resistance, Junction to case for Diode	1.6	$^\circ C/W$
$R_{th\ j-a}$	Thermal Resistance, Junction to Ambient	40	$^\circ C/W$

**Electrical Characteristics** ( $T_C=25^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$BV_{CES}$	Collector-Emitter Breakdown Voltage	$V_{GE}=0V, I_C=250\mu A$	600	-	-	V
$I_{CES}$	Collector-Emitter Leakage Current	$V_{CE}=600V, V_{GE}=0V$	-	-	100	$\mu A$
$I_{GES}$	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	$V_{GE}=V_{CE}, I_C=250\mu A$	4.5	-	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE}=15V, I_C=15A$	-	1.85	2.3	V
$Q_g$	Total Gate Charge	$V_{CC}=400V$ $V_{GE}=15V$ $I_C=20A$	-	62		nC
$Q_{ge}$	Gate-Emitter Charge		-	6		nC
$Q_{gc}$	Gate-Collector Charge		-	33		nC
$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=400V$ $V_{GE}=15V$ $I_C=20A$ $R_G=20\Omega$ Inductive Load $T_C=25^\circ\text{C}$	-	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
$E_{on}$	Turn-on Switching Loss		-	0.43	-	mJ
$E_{off}$	Turn-off Switching Loss		-	0.29	-	mJ
$E_{ts}$	Total Switching Loss		-	0.72	-	mJ
$C_{ies}$	Input Capacitance	$V_{CE}=25V$ $V_{GE}=0V$ $f=1\text{MHz}$	-	920	-	pF
$C_{oes}$	Output Capacitance		-	150	-	pF
$C_{res}$	Reverse Transfer Capacitance		-	54	-	pF

**Electrical Characteristics of Diode** ( $T_C=25^\circ\text{C}$  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	$V_{CE}=300V$ $I_F=20A$	-	90		ns
$I_{rr}$	Diode peak Reverse Recovery Current		-	19		A
$Q_{rr}$	Diode Reverse Recovery Charge	$dI_F/dt=500A/\mu s$	-	732		nC

**Notes:**

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

**Typical Performance Characteristics**

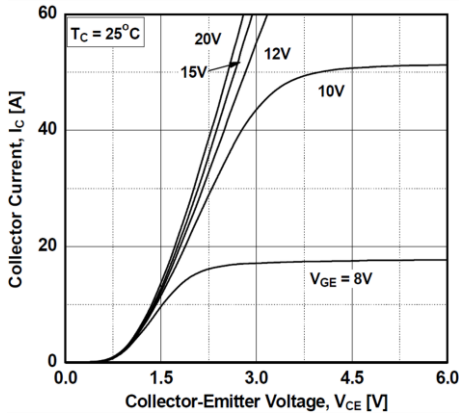


Fig 1. Output characteristics

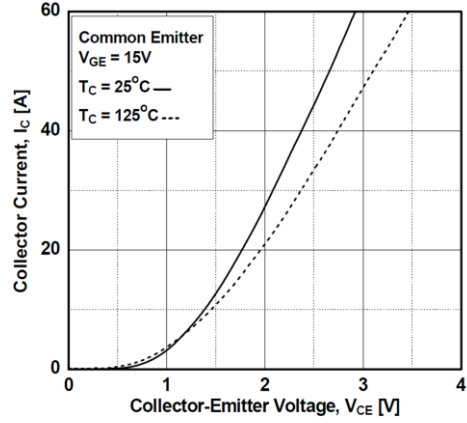


Fig 2. Typical Saturation Voltage Characteristics

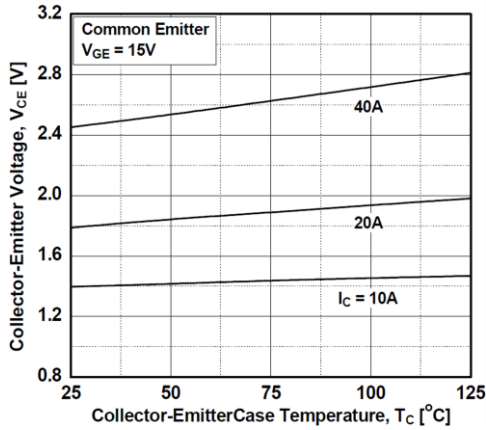


Figure 3. Saturation Voltage vs. Case Temperature

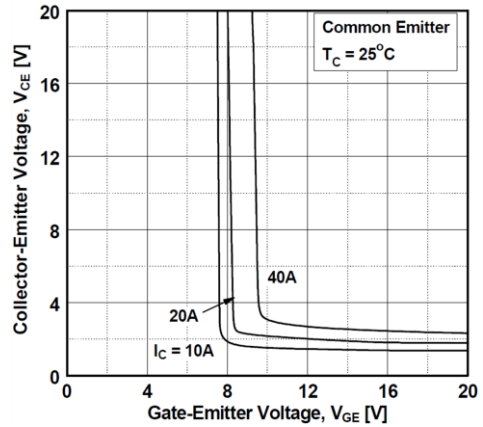


Figure 4. Saturation Voltage vs.  $V_{GE}$

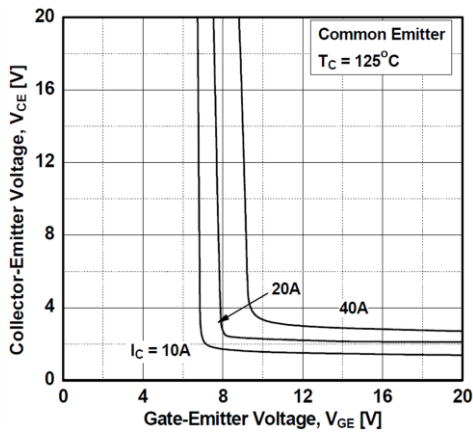


Figure 5. Saturation Voltage vs.  $V_{GE}$

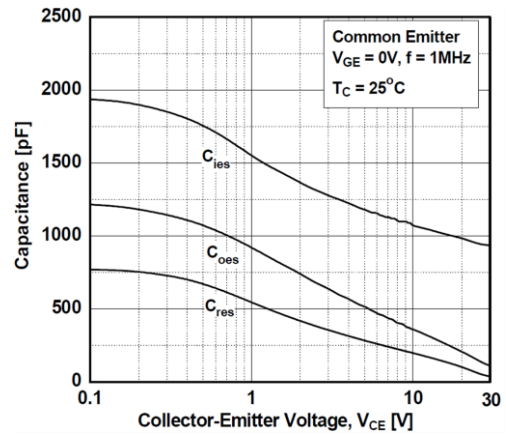


Figure 6. Capacitance Characteristics

**Typical Performance Characteristics**

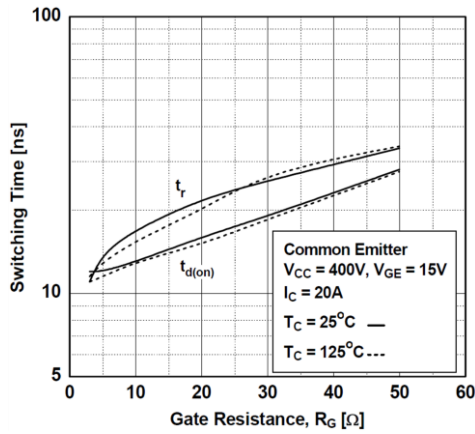


Figure 7. Turn-On Characteristics vs. Gate Resistance

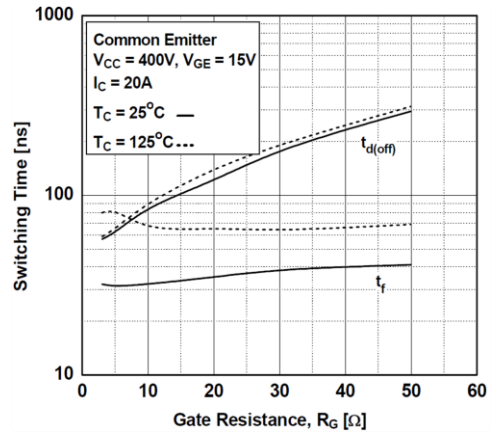


Figure 8. Turn-Off Characteristics vs. Gate Resistance

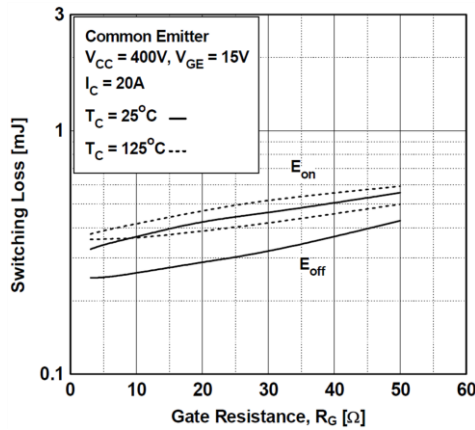


Figure 9. Switching Loss vs. Gate Resistance

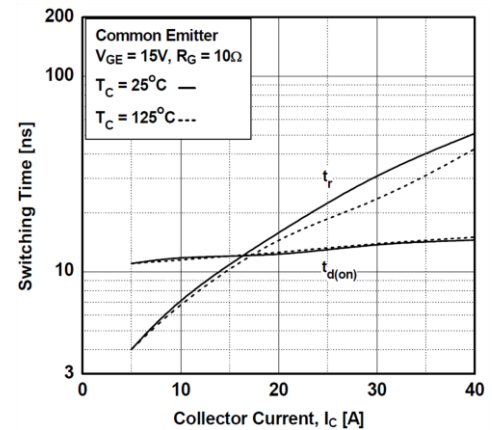


Figure 10. Turn-On Characteristics vs. Collector Current

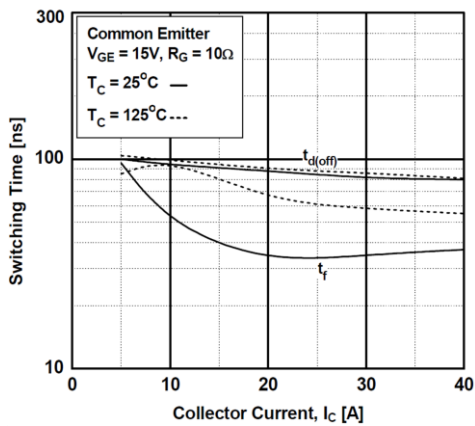


Figure 11. Turn-Off Characteristics vs. Collector Current

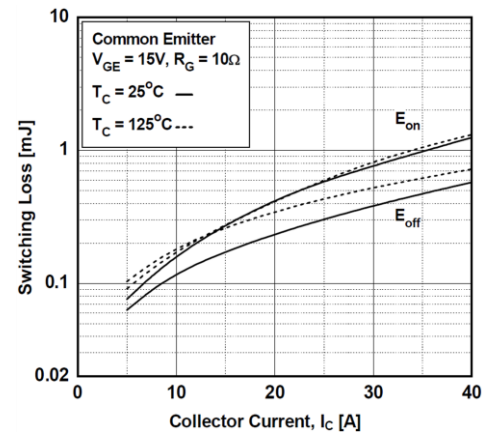


Figure 12. Switching Loss vs. Collector Current

**Typical Performance Characteristics**

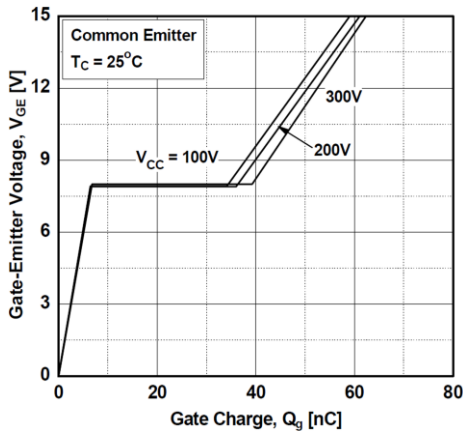


Figure 13. Gate Charge Characteristics

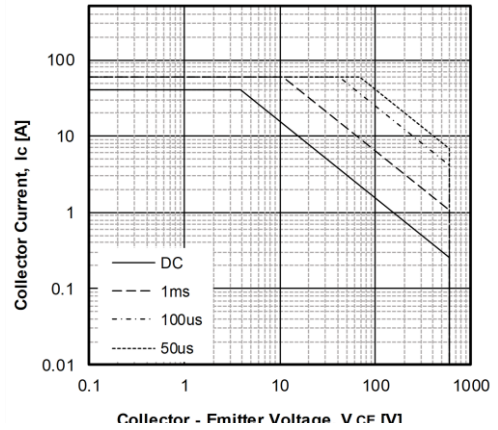


Figure 14. SOA Characteristics

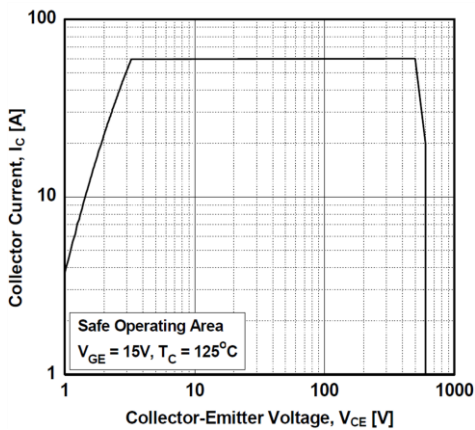


Figure 15. Turn-Off SOA

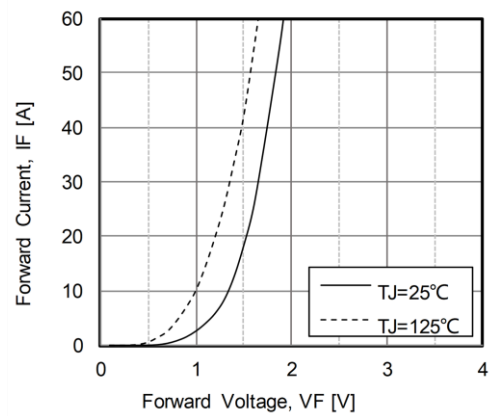


Figure 16. Forward Characteristics

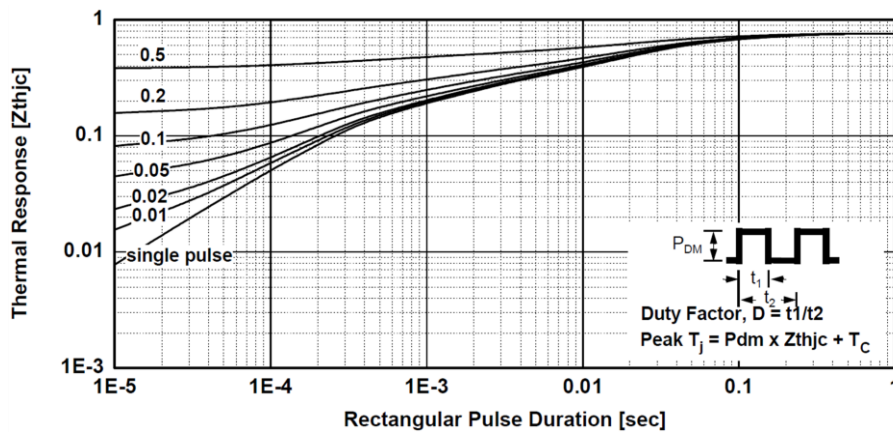
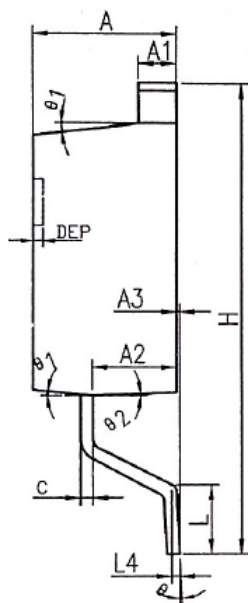
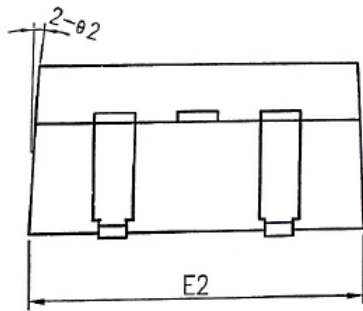
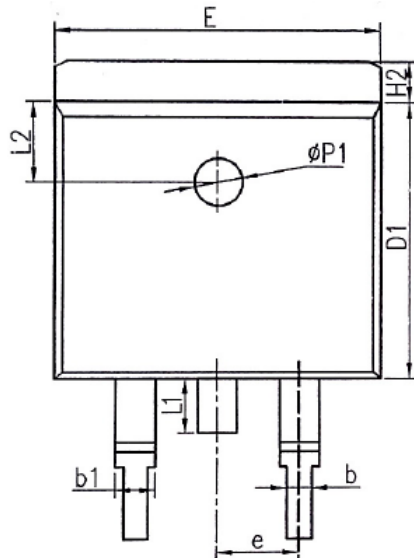


Figure 17. Transient Thermal Impedance of IGBT

**Package**



SYMBOL	MM		
	MIN	NOM	MAX
A	4.40	4.57	4.70
A1	1.22	1.27	1.32
A2	2.59	2.69	2.79
A3	0.00	0.10	0.20
b	0.77	0.813	0.90
b1	1.20	1.27	1.36
c	0.34	0.381	0.47
D1	8.60	8.70	8.80
E	10.00	10.16	10.26
E2	10.00	10.10	10.20
e	2.54 BSC		
H	14.70	15.10	15.50
H2	1.17	1.27	1.40
L	2.00	2.30	2.60
L1	1.45	1.55	1.70
L2	2.5 REF		
L4	0.25 BSC		
$\theta$	0°	5°	8°
$\theta_1$	5°	7°	9°
$\theta_2$	1°	3°	5°
$\Phi P1$	1.40	1.50	1.60
DEP	0.05	0.10	0.20

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