

IGBT

Features

- 1200V,15A
- $V_{CE(sat)(typ.)}=1.9V @V_{GE}=15V,I_C=15A$
- 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.

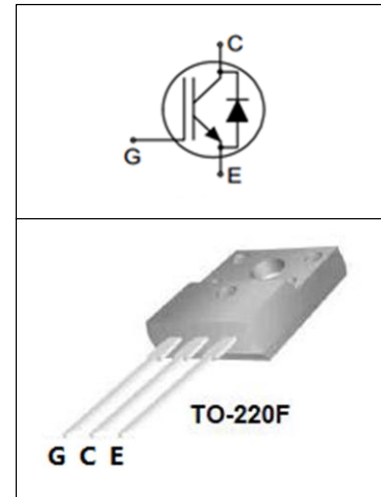
1)

Absolute Maximum Ratings

Symbol	Parameter	Value	Units
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	± 30	V
I_C	Continuous Collector Current ($T_C=25^\circ C$) ^{1) 2)}	14	A
	Continuous Collector Current ($T_C=100^\circ C$) ^{1) 2)}	7	A
I_{CM}	Pulsed Collector Current ¹⁾	45	A
I_F	Diode Continuous Forward Current ($T_C=100^\circ C$)	7	A
I_{FM}	Diode Maximum Forward Current ¹⁾	45	A
t_{sc}	Short Circuit Withstand Time	10	us
P_D	Maximum Power Dissipation ($T_C=25^\circ C$)	32	W
	Maximum Power Dissipation ($T_C=100^\circ C$)	13	W
T_J	Operating Junction Temperature Range	-40 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	3.8	$^\circ C/W$
$R_{th j-c}$	Thermal Resistance, Junction to case for Diode	4.2	$^\circ C/W$
$R_{th j-a}$	Thermal Resistance, Junction to Ambient	65	$^\circ C/W$



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	$V_{GE}=0V, I_C=250\mu A$	1200	-	-	V
I_{CES}	Collector-Emitter Leakage Current	$V_{CE}=1200V, V_{GE}=0V$	-	-	100	μA
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	$V_{GE}=15V, I_C=15A$	-	1.9	2.4	V
Q_g	Total Gate Charge	$V_{CC}=600V$ $V_{GE}=15V$ $I_C=15A$	-	120	-	nC
Q_{ge}	Gate-Emitter Charge		-	50	-	nC
Q_{gc}	Gate-Collector Charge		-	15	-	nC
$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V$ $V_{GE}=15V$ $I_C=15A$ $R_G=10\Omega$ Inductive Load $T_C=25^\circ\text{C}$	-	20	-	ns
t_r	Turn-on Rise Time		-	30	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	150	-	ns
t_f	Turn-off Fall Time		-	95	-	ns
E_{on}	Turn-on Switching Loss		-	2.8	-	mJ
E_{off}	Turn-off Switching Loss		-	0.6	-	mJ
E_{ts}	Total Switching Loss		-	3.4	-	mJ
C_{ies}	Input Capacitance	$V_{CE}=25V$ $V_{GE}=0V$ $f=1\text{MHz}$	-	2300	-	pF
C_{oes}	Output Capacitance		-	95	-	pF
C_{res}	Reverse Transfer Capacitance		-	45	-	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	$I_F=15A$	-	1.9	2.6	V
t_{rr}	Diode Reverse Recovery Time	$V_{CE}=600V$ $I_F=15A$ $dI_F/dt=200A/\mu s$	-	230	-	ns
I_{rr}	Diode peak Reverse Recovery Current		-	27	-	A
Q_{rr}	Diode Reverse Recovery Charge		-	1260	-	nC

note:

- 1) Repetitive Rating: Pulse width limited by maximum junction temperature.
- 2) Limited by thermal resistance.

Typical Performance Characteristics

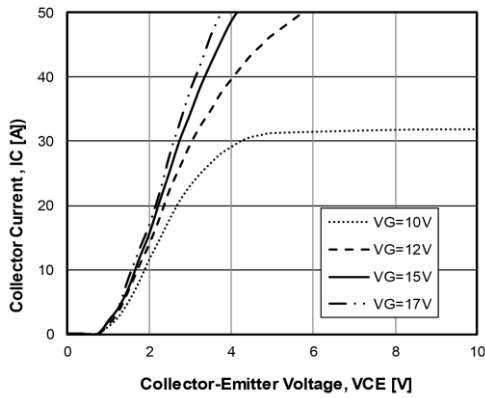


Fig 1. Output characteristics

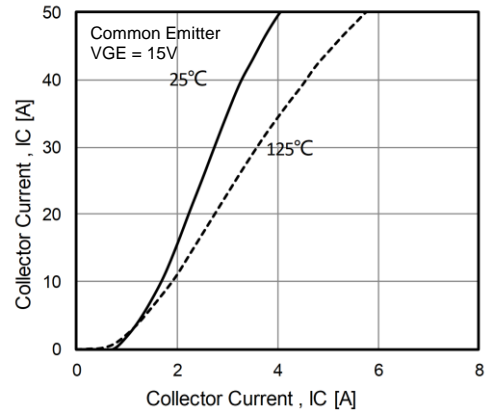


Fig 2. Typical Saturation Voltage Characteristics

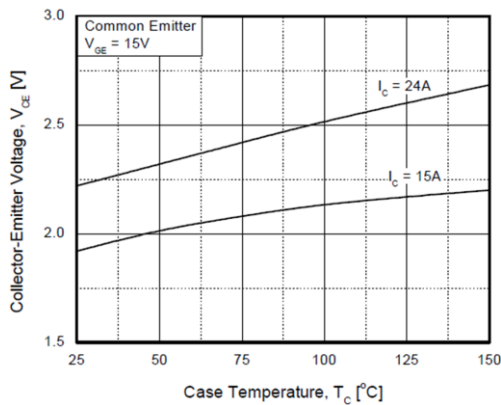


Figure 3. Saturation Voltage vs. Case Temperature at Variant Current Level

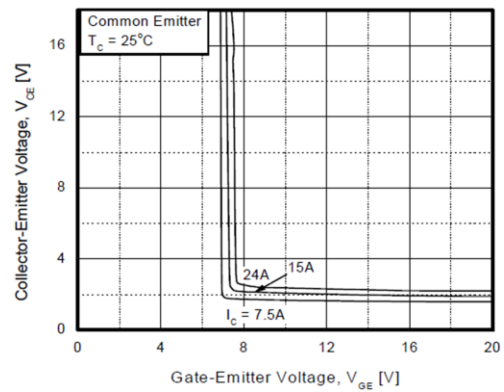


Figure 4. Saturation Voltage vs. V_{GE}

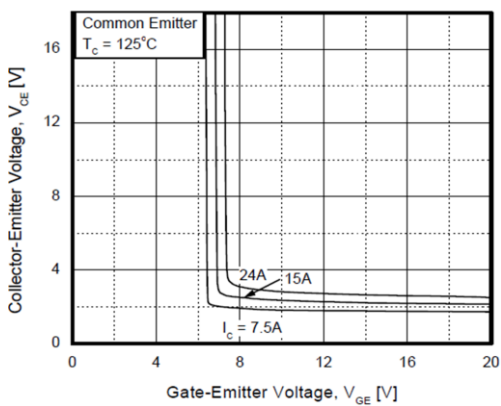


Figure 5. Saturation Voltage vs. V_{GE}

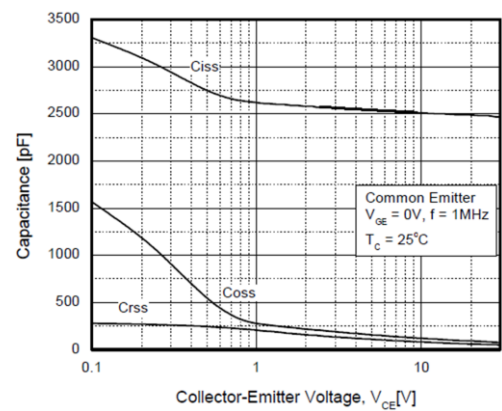


Figure 6. Capacitance Characteristics

Typical Performance Characteristics

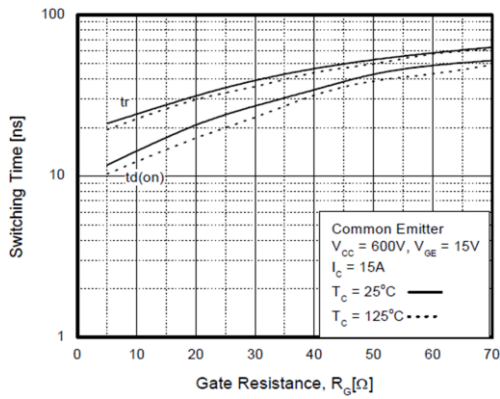


Figure 7. Turn-On Characteristics vs. Gate Resistance

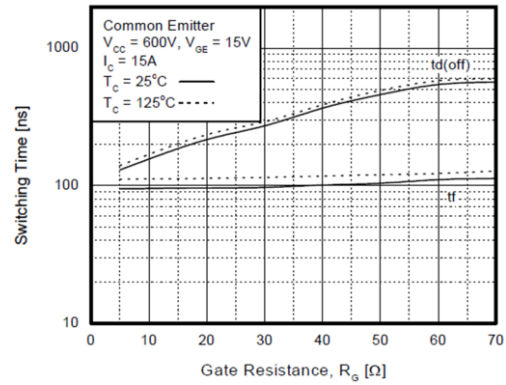


Figure 8. Turn-Off Characteristics vs. Gate Resistance

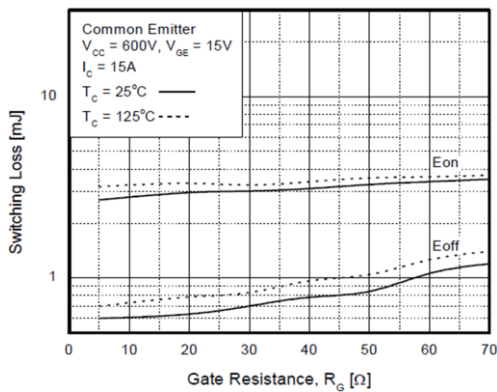


Figure 9. Switching Loss vs. Gate Resistance

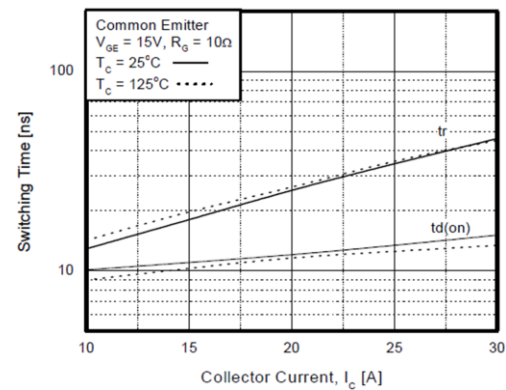


Figure 10. Turn-On Characteristics vs. Collector Current

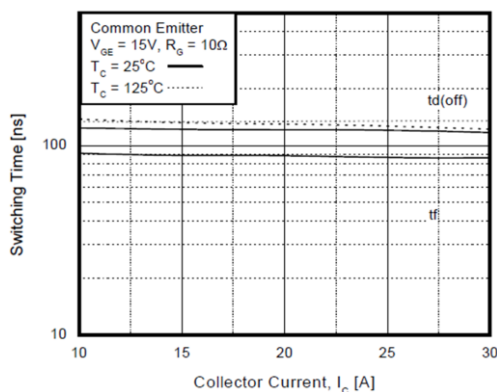


Figure 11. Turn-Off Characteristics vs. Collector Current

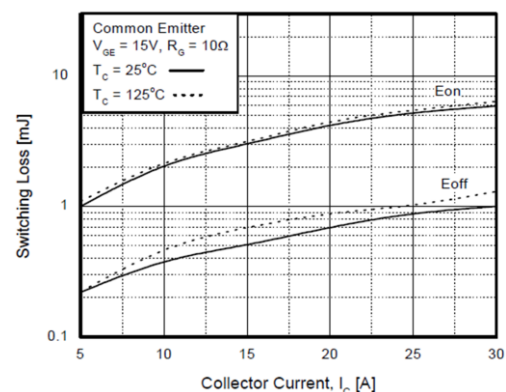


Figure 12. Switching Loss vs. Collector Current

Typical Performance Characteristics

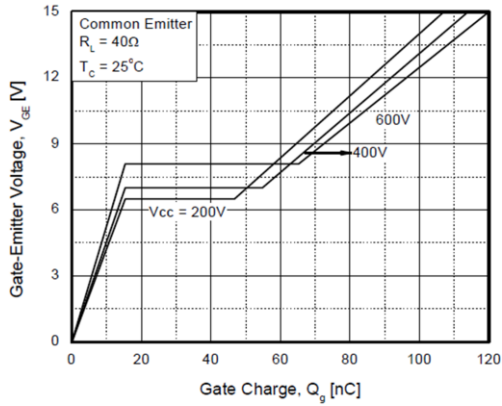


Figure 13. Gate Charge Characteristics

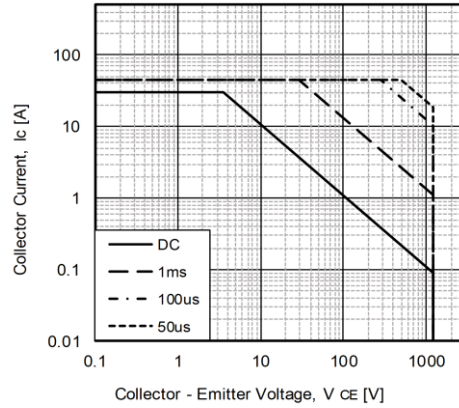


Figure 14. SOA Characteristics ³⁾

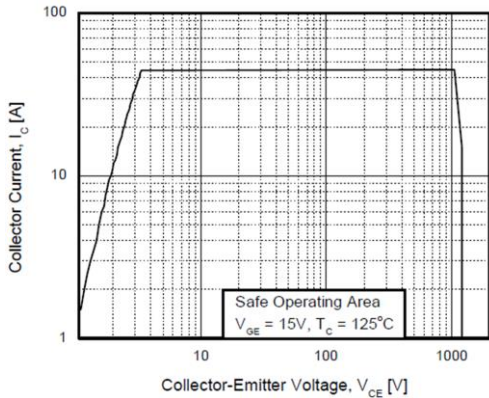


Figure 15. Turn-Off SOA ³⁾

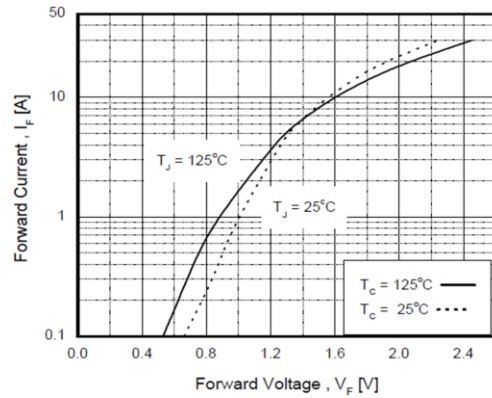


Figure 16. Forward Characteristics

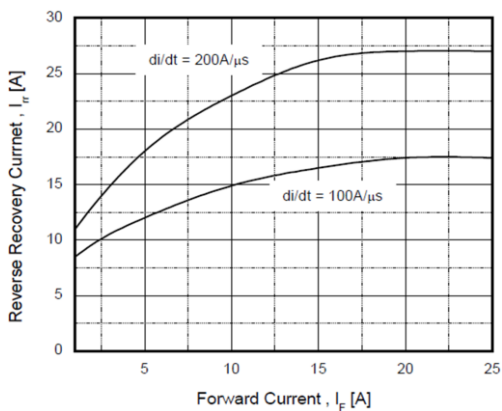


Figure 17. Reverse Recovery Current

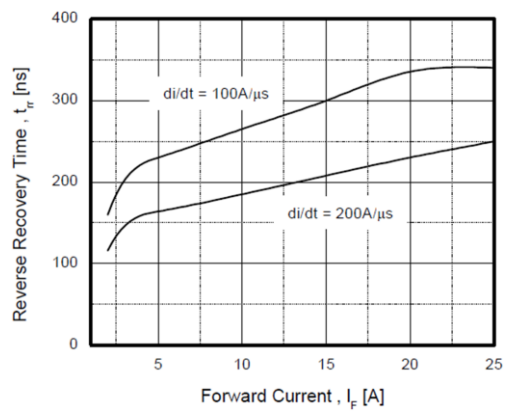


Figure 18. Reverse Recovery Time

Typical Performance Characteristics

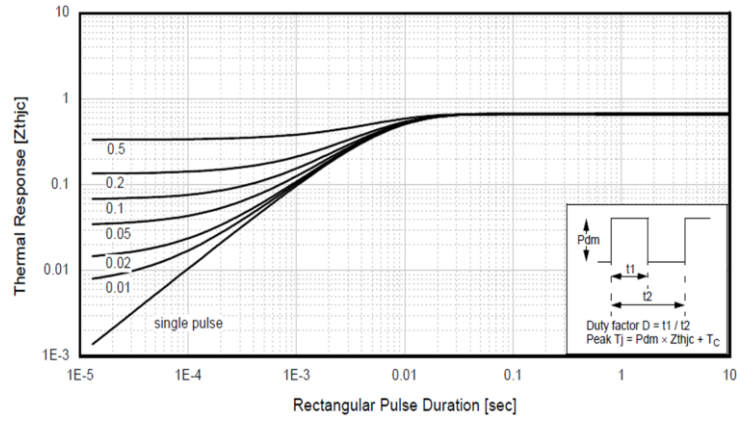
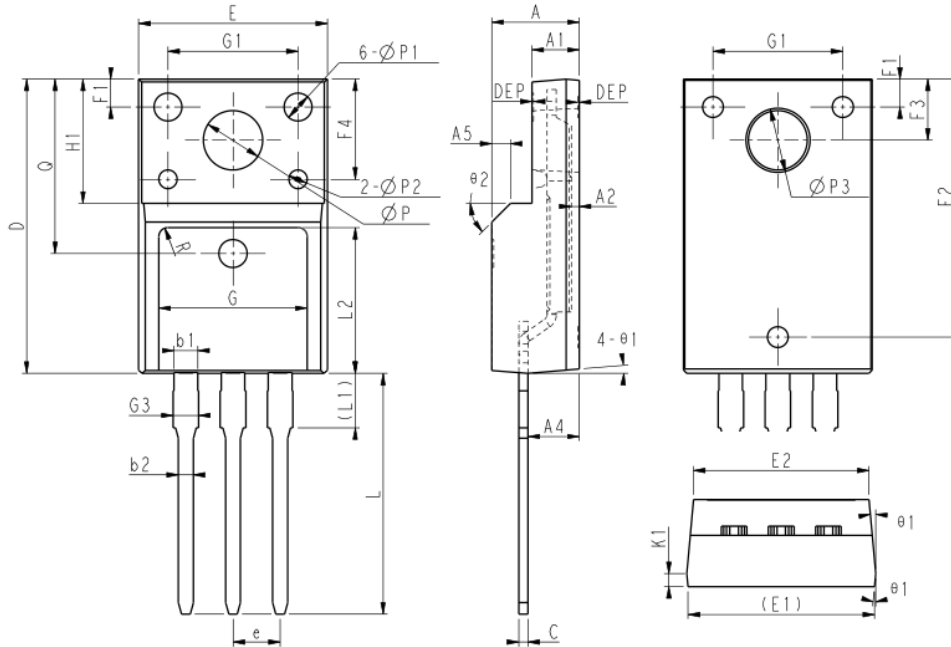


Figure 19. Transient Thermal Impedance of IGBT ³⁾

note:

3) Limited by maximum thermal resistance. Applicable for TO220 standard package.

TO-220F-3L PACKAGE OUTLINE



COMMON DIMENSIONS

SYMBOL	MM		
	MIN	NOM	MAX
E	10.00	10.16	10.32
E1	9.94	10.04	10.14
E2	9.36	9.46	9.56
A	4.50	4.70	4.90
A1	2.34	2.54	2.74
A2	0.43	-	0.48
A4	2.66	2.76	2.86
A5	1.00REF		
c	0.45	0.50	0.60
D	15.67	15.87	16.07
Q	9.40REF		
H1	6.70REF		
e	2.54BSC		
ΦP	3.18REF		
L	12.78	12.98	13.18
L1	2.83	2.93	3.03
L2	7.70	7.80	7.90
ΦP1	1.40	1.50	1.60
ΦP2	0.95	1.00	1.05
ΦP3	3.45REF		
θ1	3°	5°	7°
θ2	45°		
DEP	0.05	0.10	0.15
F1	1.00	1.50	2.00
F2	13.80	13.90	14.00
F3	3.20	3.30	3.40
F4	5.30	5.40	5.50
G	7.80	8.00	8.20
G1	6.90	7.00	7.10
G3	1.25	1.35	1.45
b1	1.23	1.28	1.38
b2	0.75	0.80	0.90
K1	0.65	0.70	0.75
R	0.50REF		

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