

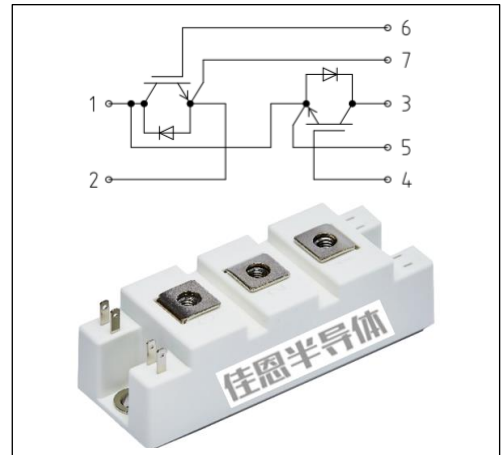
IGBT 34mm 半桥模块

Features

- 1200V 150A
- $V_{CE(sat)(typ.)} = 1.6V @ V_{GE} = 15V, I_C = 150A$
- Soft turn off
- Positive $V_{CE(on)}$ Temperature Coefficient
- Easy paralleling

General Description

JIAEN Trench FS IGBTs offer lower losses and higher energy efficiency for general inverter and other soft switching applications. such as motor drive, AC and DC servo drive amplifier, power supply.



IGBT Maximum Rated Values

Symbol	Parameter	Value	Units
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	± 20	V
I_C	Continuous Collector Current ($T_C=70^\circ C, T_{vj\ max}=150^\circ C$)	150	A
I_{CRM}	Repetitive Peak Collector Current ($tp= 1\ ms$)	300	A
P_D	Maximum Power Dissipation ($T_C=25^\circ C, T_{vj\ max}=150^\circ C$)	658	W

IGBT Characteristics

Symbol	Parameter	Test Condition	Min	Typ	Max	Units
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE}=15V, I_C=150A$ $T_{vj}=25^\circ C$	-	1.6	1.9	V
	Collector-Emitter Saturation Voltage	$V_{GE}=15V, I_C=150A$ $T_{vj}=150^\circ C$	-	1.9	-	V
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE}=V_{CE}, I_C=5.7mA$	5.0	5.8	6.6	V
Q_g	Total Gate Charge	$V_{GE}=-15V \dots +15V$	-	1.05	-	μC
C_{ies}	Input Capacitance	$V_{CE}=25V$ $V_{GE}=0V$ $f=100KHz$	-	29.8	-	nF
C_{oes}	Output Capacitance		-	0.78	-	nF
C_{res}	Reverse Transfer Capacitance		-	0.24	-	nF
I_{CES}	Collector-Emitter Leakage Current	$V_{CE}=1200V, V_{GE}=0V$	-	-	1.0	mA
I_{GES}	Gate Leakage Current, Forward	$V_{GE}=20V, V_{CE}=0V$	-	-	200	nA
	Gate Leakage Current, Reverse	$V_{GE}=-20V, V_{CE}=0V$	-	-	-200	nA

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V$ $V_{GE}=\pm 15V$ $I_C=150A$ $R_G=3\Omega$ Inductive Load $T_{vj}=25^\circ C$	-	139	-	ns
t_r	Turn-on Rise Time		-	67	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	301	-	ns
t_f	Turn-off Fall Time		-	274	-	ns
Eon	Turn-on Switching Loss		-	4.4	-	mJ
Eoff	Turn-off Switching Loss		-	12.3	-	mJ
Ets	Total Switching Loss	-	16.7	-	mJ	
$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V$ $V_{GE}=\pm 15V$ $I_C=150A$ $R_G=3\Omega$ Inductive Load $T_{vj}=125^\circ C$	-	161	-	ns
t_r	Turn-on Rise Time		-	73	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	325	-	ns
t_f	Turn-off Fall Time		-	406	-	ns
Eon	Turn-on Switching Loss		-	7.0	-	mJ
Eoff	Turn-off Switching Loss		-	16.7	-	mJ
Ets	Total Switching Loss	-	23.7	-	mJ	
$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V$ $V_{GE}=\pm 15V$ $I_C=150A$ $R_G=3\Omega$ Inductive Load $T_{vj}=150^\circ C$	-	169	-	ns
t_r	Turn-on Rise Time		-	73	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	333	-	ns
t_f	Turn-off Fall Time		-	434	-	ns
Eon	Turn-on Switching Loss		-	7.8	-	mJ
Eoff	Turn-off Switching Loss		-	17.8	-	mJ
Ets	Total Switching Loss	-	25.6	-	mJ	
Isc	Short circuit current	$V_{GE}=15V, T_p \leq 10\mu s$ $T_{vj}=150^\circ C, V_{CC}=600V$ $V_{CEM\ Chip} \leq 1200V$	-	500	-	A
$R_{th\ j-c}$	Thermal resistance, junction to case		-	-	0.19	K/W
$T_{vj\ op}$	Temperature under switching condition		-40	-	150	$^\circ C$

Diode Maximum Rated Values

Symbol	Parameter	Value	Units
V _{RRM}	Repetitive peak reverse voltage	1200	V
I _F	Continuous DC Forward Current	150	A
I _{FRM}	Repetitive Peak Collector Current (tp= 1ms)	300	A

Diode Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V _F	Diode Forward Voltage	I _F =150A V _{GE} =0V T _{vj} =25°C	-	2.7	3.2	V
		I _F =150A V _{GE} =0V T _{vj} =150°C	-	1.9	-	V
I _{RM}	Peak reverse recovery current	I _C =150A V _R =600V -di/dt=2500A/us V _{GE} =±15V T _{vj} =25°C	-	98	-	A
Q _{rr}	Diode Reverse Recovery Charge		-	6.0	-	µC
E _{rec}	Reverse recovery energy		-	5.1	-	mJ
I _{RM}	Peak reverse recovery current	I _C =150A V _R =600V -di/dt=2500A/us V _{GE} =±15V T _{vj} =125°C	-	154	-	A
Q _{rr}	Diode Reverse Recovery Charge		-	15.5	-	µC
E _{rec}	Reverse recovery energy		-	9.9	-	mJ
I _{RM}	Peak reverse recovery current	I _C =150A V _R =600V -di/dt=2500A/us V _{GE} =±15V T _{vj} =150°C	-	170	-	A
Q _{rr}	Diode Reverse Recovery Charge		-	19.4	-	µC
E _{rec}	Reverse recovery energy		-	11.5	-	mJ
R _{th j-c}	Thermal resistance, junction to case		-	-	0.31	K/W
T _{vj op}	Temperature under switching condition		-40	-	150	°C

Module

Isolation test voltage	RMS, f=50 Hz, t=1 min	V _{ISOL}	4.0	kV
Material of module baseplate			Cu	
Internal isolation	basic insulation (class 1, IEC 61140)		Al ₂ O ₃	
Clearance distance in air	Terminal to terminal		9.5	mm
Surface creepage distance	Terminal to terminal		20	mm
Comperative tracking index		CTI	>200	
Storage temperature		T _{stg}	-40~150	°C
Mounting torque for module mounting	M6 screws	M	3~5	Nm

Notes:

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

Typical Performance Characteristics

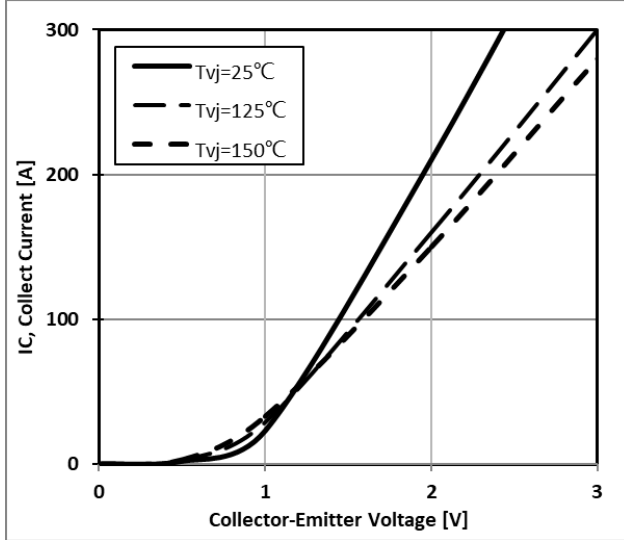


Figure 1: IGBT output characteristics (typical)

$$I_C = f(V_{CE}) \quad V_{GE} = 15\text{V}$$

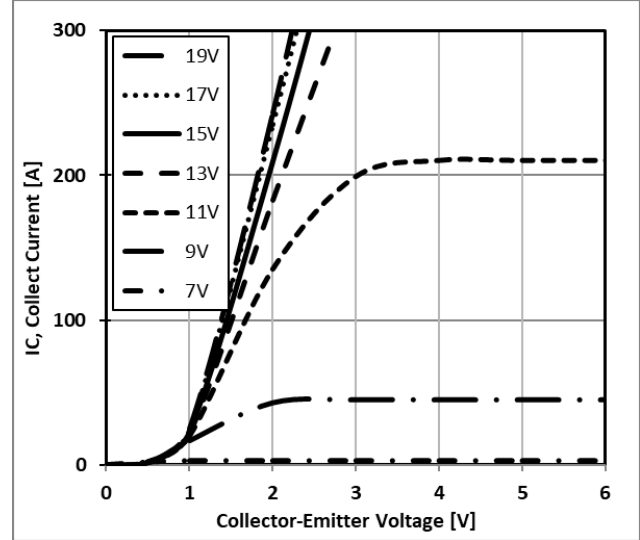


Figure 2: IGBT output characteristics (typical)

$$I_C = f(V_{CE}) \quad T_{vj} = 25^\circ\text{C}$$

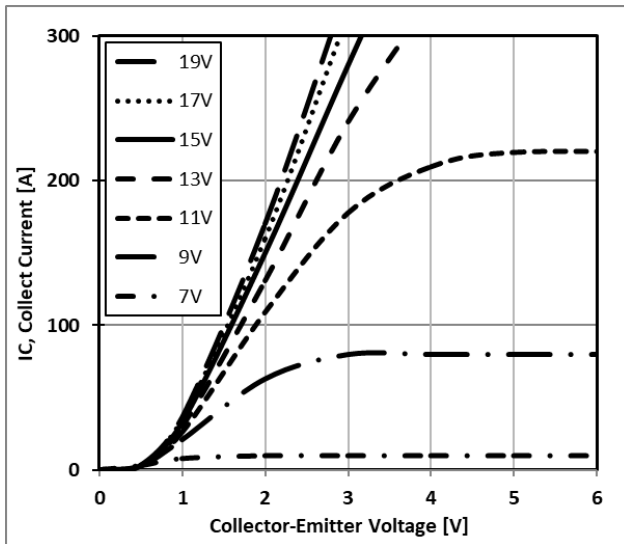


Figure 3: IGBT output characteristics (typical)

$$I_C = f(V_{CE}) \quad T_{vj} = 150^\circ\text{C}$$

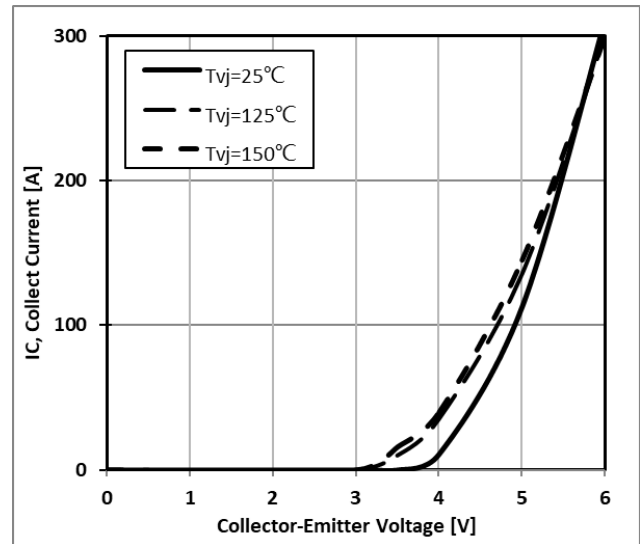


Figure 4: IGBT transfer characteristics (typical)

$$I_C = f(V_{GE}) \quad V_{CE} = V_{GE}$$

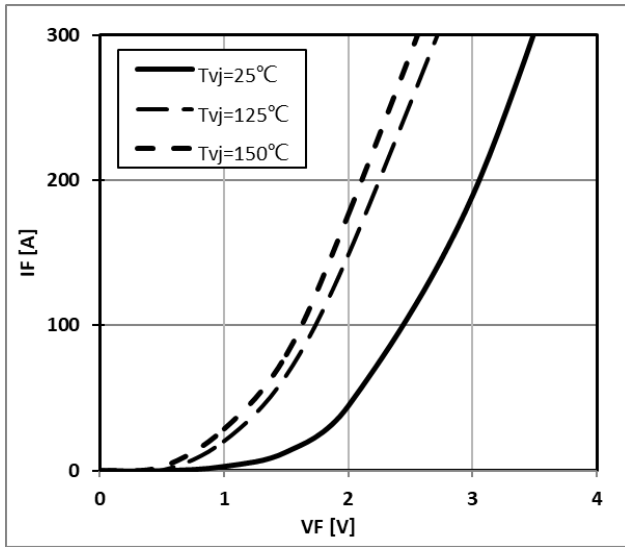


Figure 5: Diode forward characteristic (typical)

$$I_F = f(V_F)$$

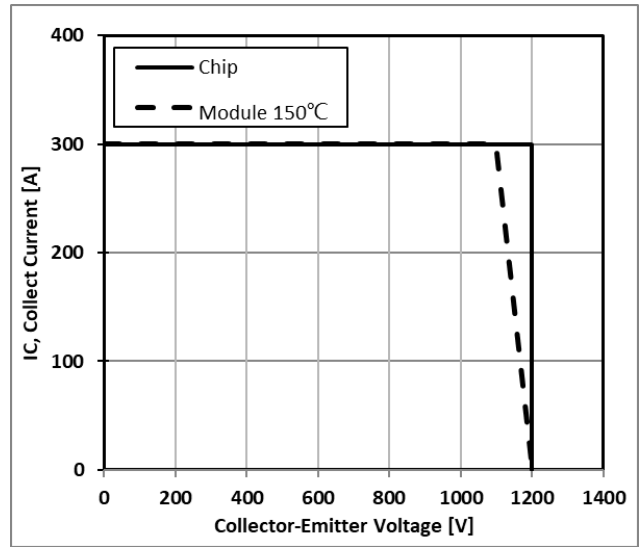


Figure 6: IGBT RBSOA

$$I_C = f(V_{CEm}) \quad R_{goff} = 8 \Omega, \quad V_{GE} = \pm 15V$$

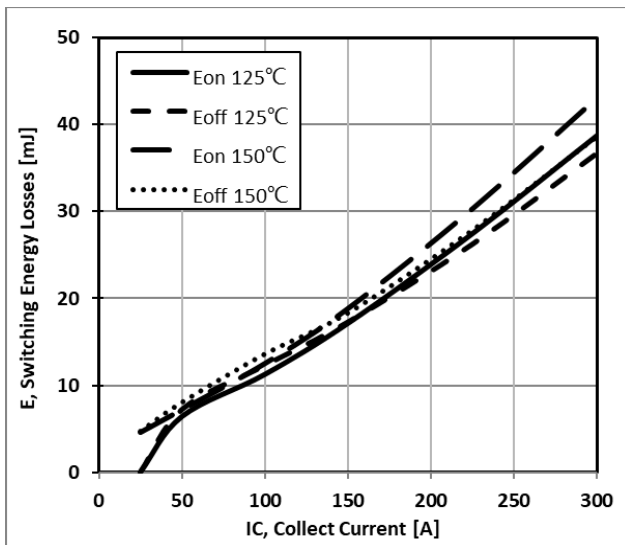


Figure 7: IGBT switching losses (typical)

$$E = f(I_{CE})$$

$$V_{CE} = 600V, \quad R_{Gon} = 8 \Omega, \quad R_{Goff} = 8 \Omega, \quad V_{GE} = \pm 15V$$

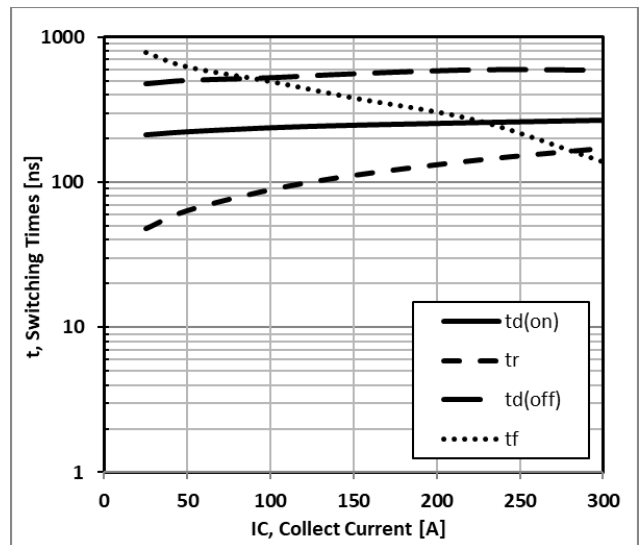


Figure 8: IGBT switching times (typical)

$$t = f(I_{CE}) \quad T_{vj} = 150^\circ C$$

$$V_{CE} = 600V, \quad R_{Gon} = 8 \Omega, \quad R_{Goff} = 8 \Omega, \quad V_{GE} = \pm 15V$$

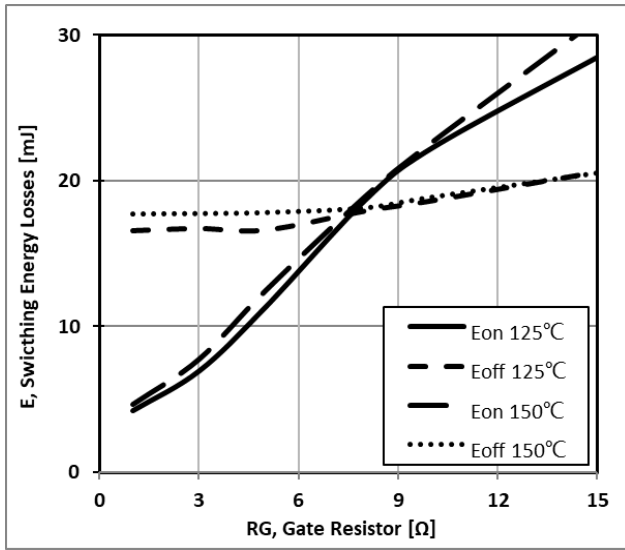


Figure 9: IGBT switching losses (typical)

$$E = f(R_G)$$

$V_{CE}=600V, I_C=150A, V_{GE}=\pm 15V$

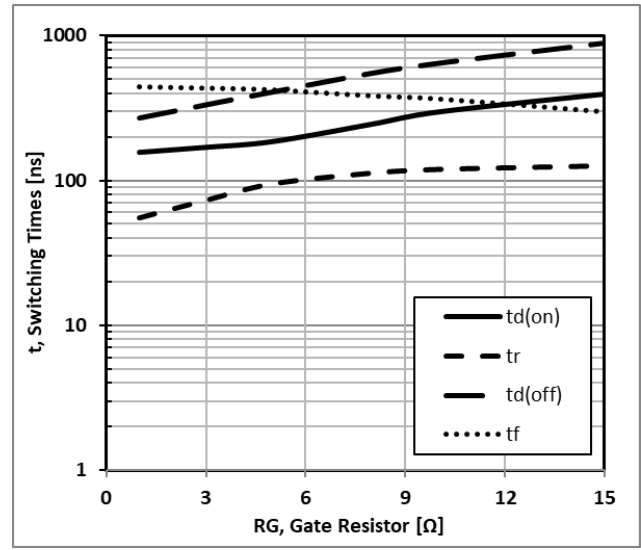


Figure 10: IGBT switching times (typical)

$$t = f(R_G) \quad T_{vj}=150^\circ C$$

$V_{CE}=600V, I_C=150A, V_{GE}=\pm 15V$

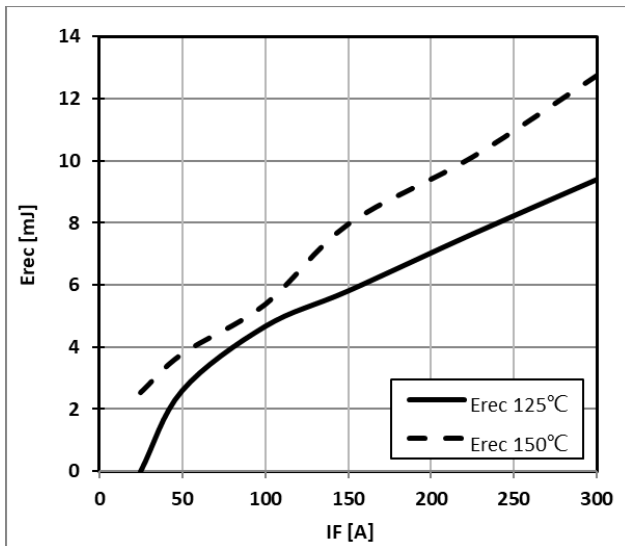


Figure 11: Diode switching characteristics (typical)

$$E_{REC} = f(I_F)$$

$V_{DC}=600V, R_{Gon}=8 \Omega \text{ (IGBT)}, V_{GE}=\pm 15V \text{ (IGBT)}$

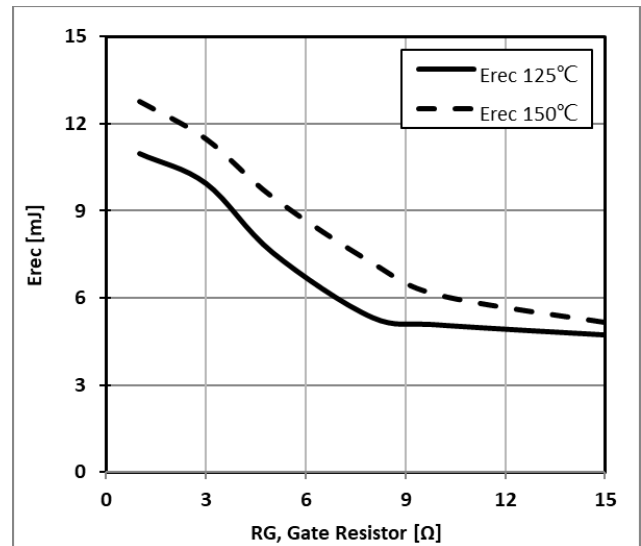


Figure 12: Diode switching characteristics (typical)

$$E_{REC} = f(R_G)$$

$V_{DC}=600V, I_F=150A, V_{GE}=\pm 15V \text{ (IGBT)}$

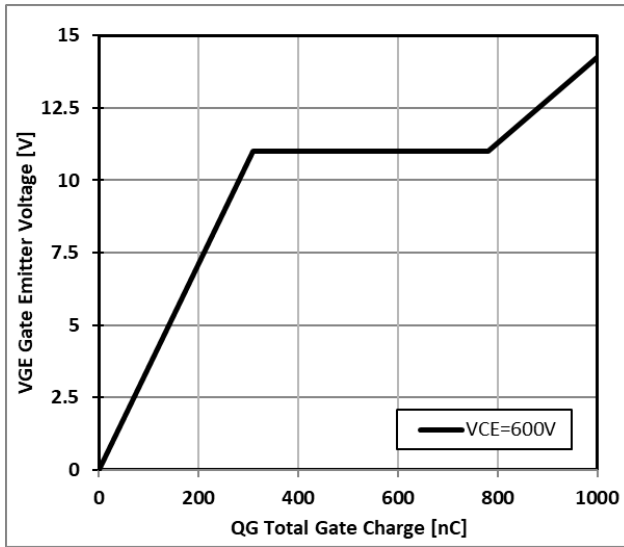


Figure 13: IGBT gate charge (typical)

$$V_{GE}=f(Q_G) \quad T_{vj}=25^{\circ}\text{C}$$

$$V_{CE}=600\text{V}, I_C=150\text{A}$$

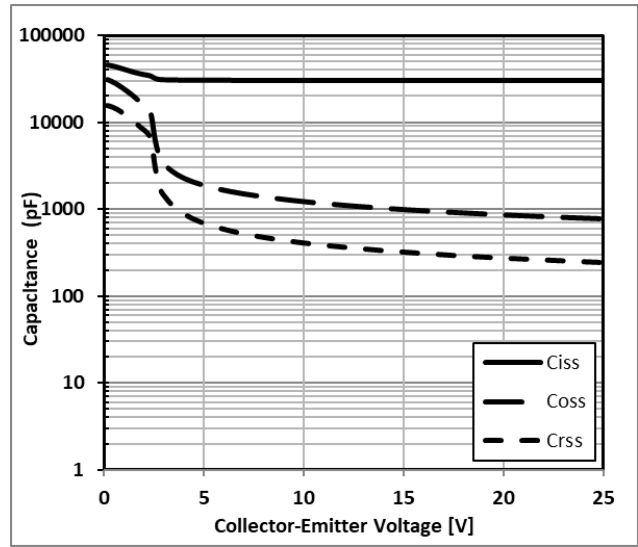


Figure 14: Capacitance characteristics (typical)

$$C=f(V_{CE}) \quad T_{vj}=25^{\circ}\text{C}$$

$$f=100\text{KHz}, V_{GE}=0\text{V}$$

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