



SUPER-SEMI



Super Junction Insulated Gate Bipolar Transistor

650V Trench and Super Junction IGBT
SI*75N65G2P2K

Rev. 1.0
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www.supersemi.com.cn

SIW75N65G2P2K

650V Trench and Super Junction IGBT

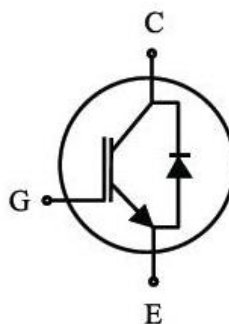
General Description

Super-Semi Trench and Super Junction IGBTs, designed according to the super junction (SJ) technology. The SJ-IGBT series provides low switching losses, high energy efficiency and high avalanche ruggedness for motor control, solar application and welding machine, etc.

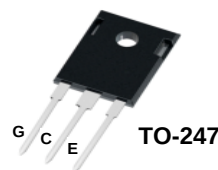
V_{CE}	650	V
I_C	75	A
$V_{CE(sat)}, I_C=75A$	1.5	V

Features

- High breakdown voltage to 650V for improved reliability
- Super junction Technology offering :
 - High speed switching
 - High ruggedness, temperature stable
 - Low $V_{CE(sat)}$
 - Easy parallel switching capability due to positive temperature coefficient in $V_{CE(sat)}$
- Enhanced avalanche capability



SIW75N65G2P2K



Applications

- Uninterruptible Power Supply(UPS)
- Power Factor Correction(PFC)
- Welding Converters
- Inverter
- Converter with high switching frequency

Absolute Maximum Ratings (T_j = 25 °C unless otherwise specified)

Symbol	Parameter	Value	Unit
V _{CE}	Collector-Emitter Breakdown Voltage	650	V
I _C	DC collector current* -Continuous (T _C = 25°C) , limited by bondwire -Continuous (T _C = 100°C)	90 75	A
I _F	Diode Forward current* -Continuous (T _C = 25°C) , limited by bondwire -Continuous (T _C = 100°C)	90 75	A
V _{GE}	Continuous Gate-Emitter Voltage	±20	V
	Transient Gate-Emitter Voltage	±30	V
	Turn off safe operating area V _{CE} ≤ 600V, T _j ≤ 150°C, T _p = 1μs	300	A
I _{CM}	Pulsed Collector Current, V _{GE} = 15V, tp limited by T _{jmax}	300	A
T _j	Operating junction temperature	-40 to +175	°C
T _{STG}	Storage Temperature Range	-55 to +150	°C
P _D	Power Dissipation, T _C = 25°C	270	W
M	Mounting torque (TO-247) M3 and M3.5 screws	60	Ncm
	Soldering temperature, wave soldering 1.6mm (0.063in.) from case for 10s	260	°C

* Current limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	Max. Value	Unit
R _{θJC} (IGBT)	IGBT Thermal Resistance, Junction-to-Case	0.5	°C/W
R _{θJC} (FRD)	Diode Thermal Resistance, Junction-to-Case	0.52	°C/W
R _{θJA}	Thermal Resistance, Junction-to-Ambient	40	°C/W

Electrical Characteristics (T_j= 25 °C unless otherwise specified)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static Characteristics						
BV _{CES}	Collector-Emitter Breakdown Voltage	V _{GE} = 0V, I _C = 250μA	650	-	-	V
		V _{GE} = 0V, I _C = 1mA	650	-	-	V
V _{GE(th)}	Gate Threshold Voltage	V _{GE} = V _{CE} , I _C = 250μA	4.0	4.8	6.0	V
V _{CE(sat)}	Collector-Emitter Saturation Voltage	V _{GE} = 15V, I _C = 75A -T _J = 25°C	-	1.5	1.9	V
		-T _J = 150°C	-	1.75	-	V
I _{CES}	Zero Gate Voltage Collector Current	V _{CE} = 650V, V _{GE} = 0V -T _J = 25°C	-	1	20	μA
		-T _J = 150°C	-	1000	-	μA
I _{GES}	Gate-Emitter Leakage Current	V _{CE} = 0V, V _{GE} = ±20V	-	-	100	nA
g _{FS}	Forward Transconductance	V _{CE} = 20V, I _C = 75A	-	30	-	S

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Dynamic Characteristics						
C _{ies}	Input Capacitance	V _{CE} = 50V, V _{GE} = 0V, f = 1.0MHz	-	2813	-	pF
C _{oes}	Output Capacitance		-	210	-	pF
C _{res}	Reverse Transfer Capacitance		-	36	-	pF
Q _G	Gate Charge	V _{CC} = 400V, I _C = 75A, V _{GE} = 15V	-	110	-	nC

Electrical Characteristics (T_j= 25 °C unless otherwise specified)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Switching Characteristics, Inductive Load, T_j=25°C						
td(on)	Turn-On Delay Time	V _{CC} = 400V, I _C = 75A V _{GE} = 0V/15V R _g = 8.2Ω	-	23.8	-	ns
tr	Turn-On Rise Time		-	37.2	-	ns
td(off)	Turn-Off Delay Time		-	148	-	ns
tf	Turn-Off Fall Time		-	65.2	-	ns
Eon	Turn-on Energy		-	2.27	-	mJ
Eoff	Turn-off Energy		-	1.51	-	mJ
Ets	Total-switch Energy		-	3.78	-	mJ

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Diode Characteristics and Maximum Ratings, T_j=25°C						
V _{FM}	Diode Forward Voltage	I _F = 75A	-	1.3	1.6	V
T _{rr}	Reverse Recovery Time	V _R = 400V, I _F = 75A dI _F /dt = 650A/μs	-	114	-	ns
I _{rr}	Reverse Recovery Current		-	19.9	-	A
Q _{rr}	Reverse Recovery Charge		-	1.5	-	μC

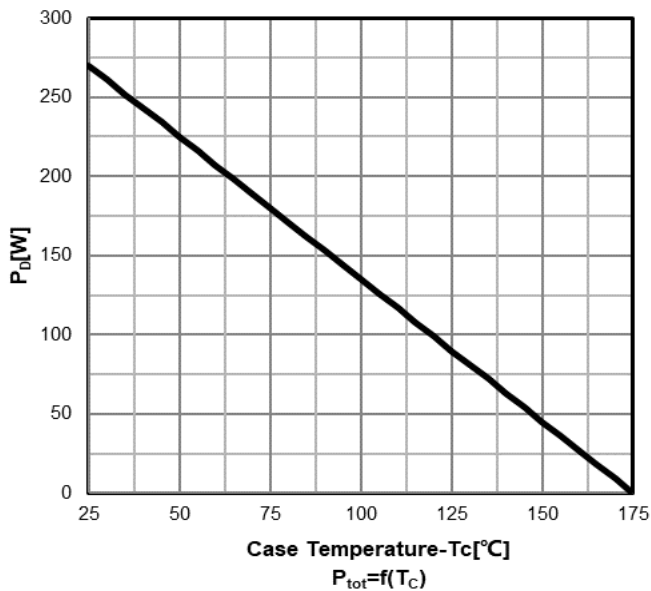
Electrical Characteristics (T_j= 150 °C)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Switching Characteristics, Inductive Load, T_j=150°C						
td(on)	Turn-On Delay Time	V _{CC} = 400V, I _C = 75A V _{GE} = 0V/15V R _g = 8.2Ω	-	24.5	-	ns
tr	Turn-On Rise Time		-	37.6	-	ns
td(off)	Turn-Off Delay Time		-	173	-	ns
tf	Turn-Off Fall Time		-	92.6	-	ns
Eon	Turn-on Energy		-	2.37	-	mJ
Eoff	Turn-off Energy		-	2.35	-	mJ
Ets	Total-switch Energy		-	4.72	-	mJ

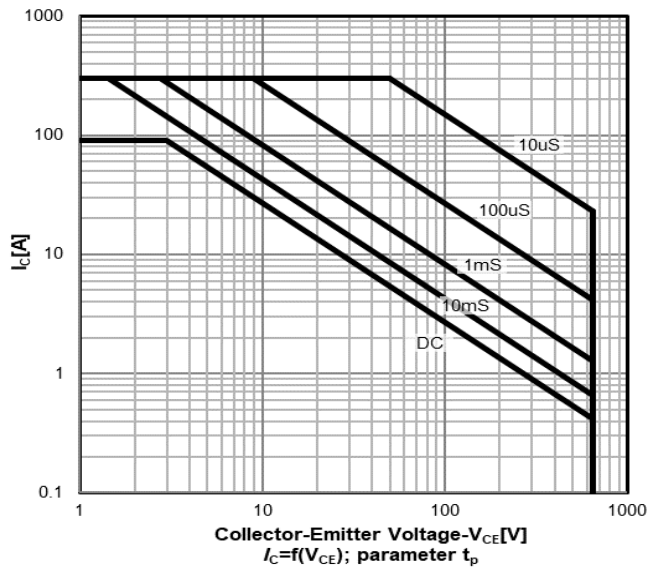
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Diode Characteristics and Maximum Ratings, T_j=150°C						
V _{FM}	Diode Forward Voltage	I _F = 75A	-	1.1	-	V
T _{rr}	Reverse Recovery Time	V _R = 400V, I _F = 75A dI _F /dt = 650A/μs	-	173	-	ns
I _{rr}	Reverse Recovery Current		-	40.0	-	A
Q _{rr}	Reverse Recovery Charge		-	5.1	-	μC

Typical Performance Characteristics

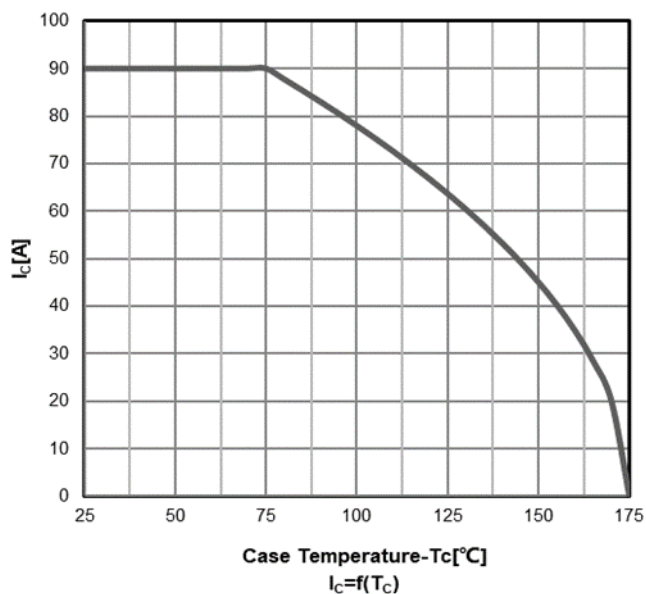
Power dissipation



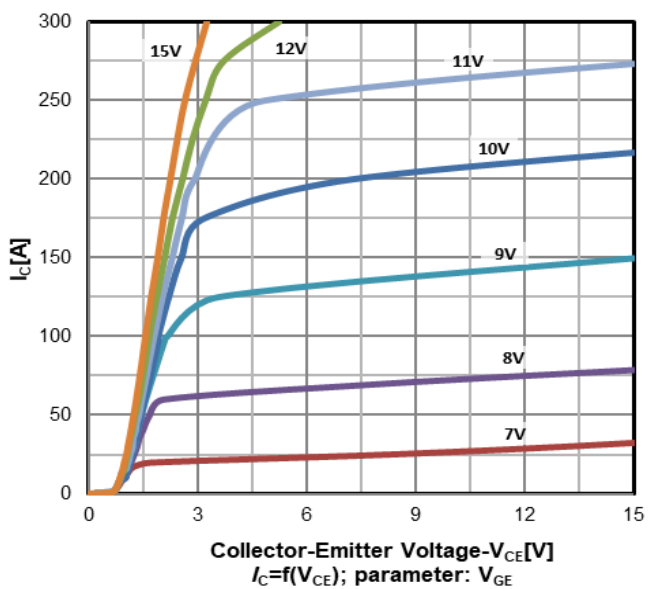
Safe operating area $T_a=25\text{ °C}$



Collector current as a function of Case temperature

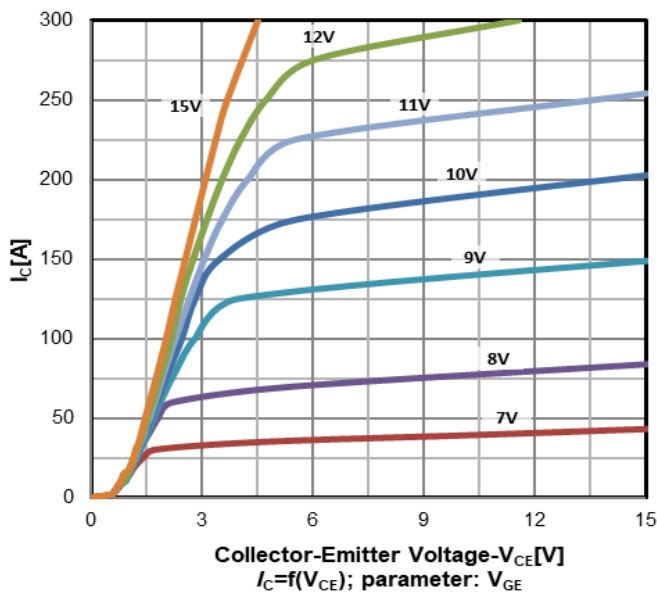


Typ. Output characteristics $T_j=25\text{ °C}$

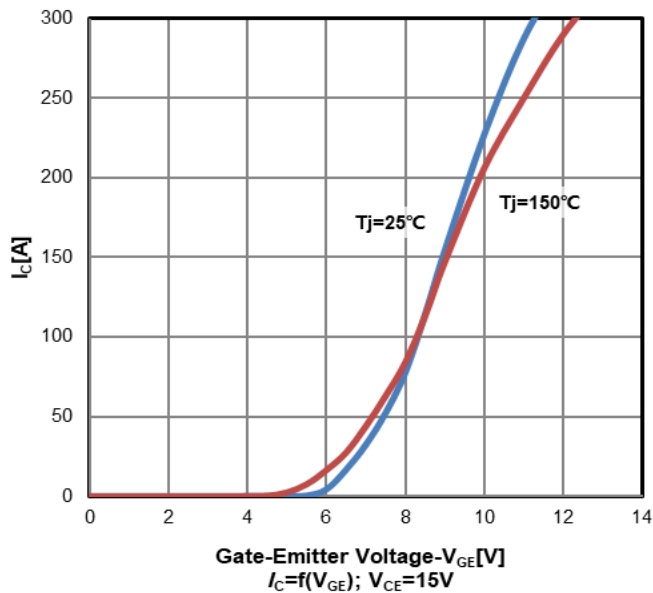


Typical Performance Characteristics

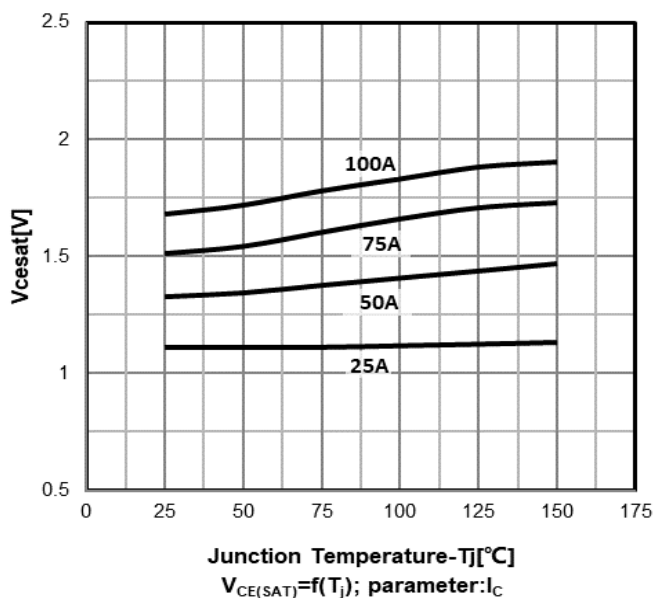
Typ. Output characteristics
 $T_j=150^\circ\text{C}$



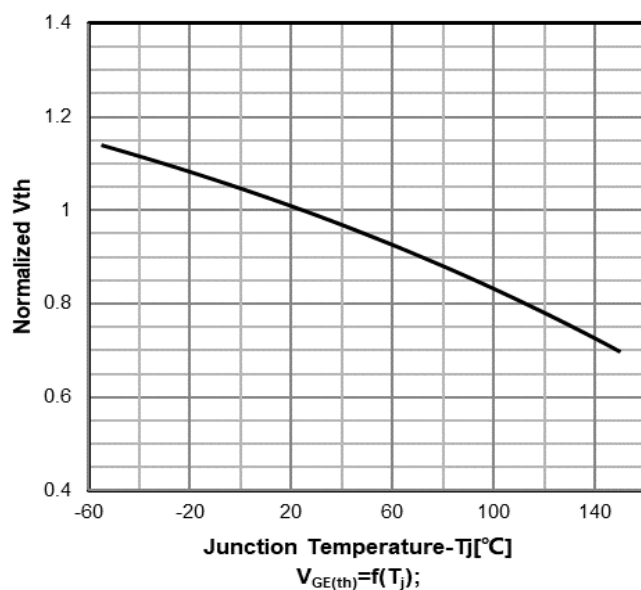
Typ. Transfer characteristics



Typ. Collector-emitter saturation voltage as a function of junction temperature ($V_{GE}=15\text{V}$)

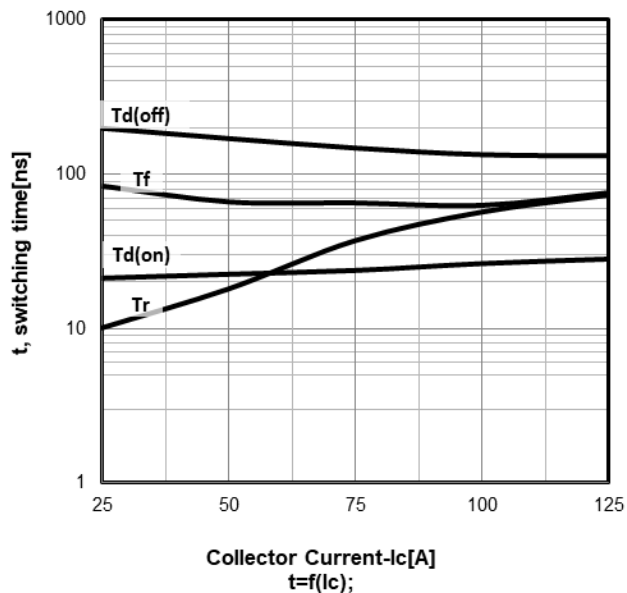


Normalized $V_{GE(th)}$ vs. temperature

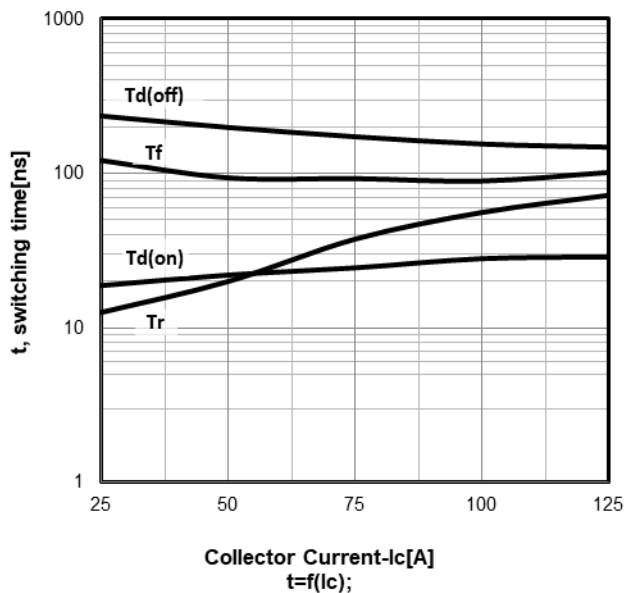


Typical Performance Characteristics

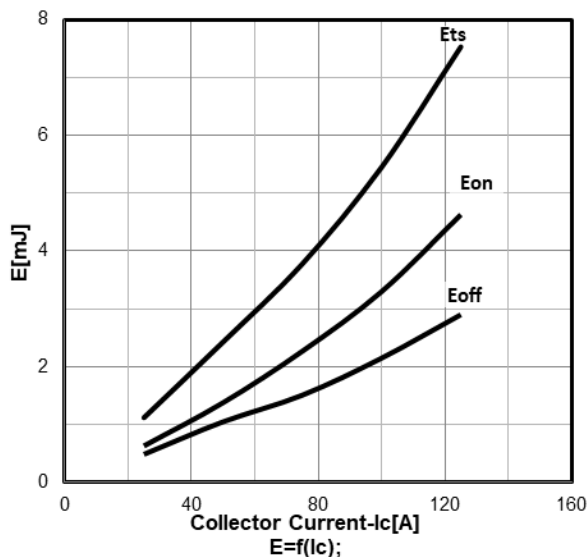
Switching times vs collector current
 $T_j=25\text{ }^{\circ}\text{C}$



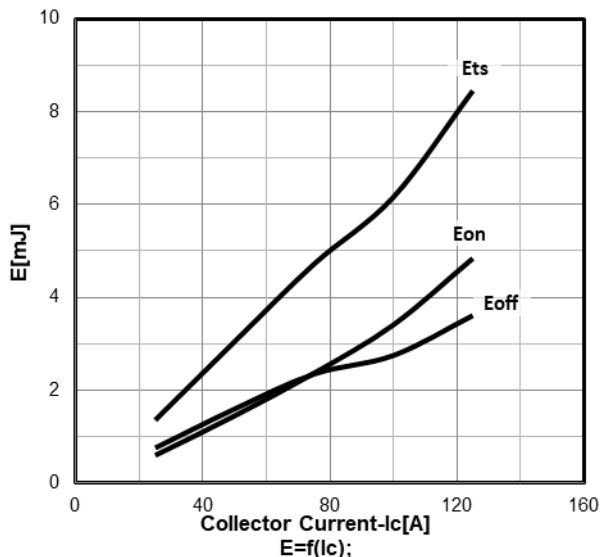
Switching times vs collector current
 $T_j=150\text{ }^{\circ}\text{C}$



Switching energy losses vs collector current
 $T_j=25\text{ }^{\circ}\text{C}$

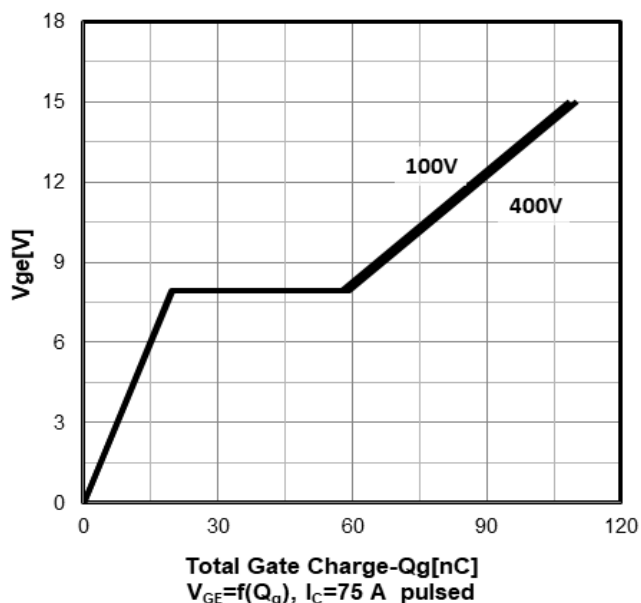


Switching energy losses vs collector current
 $T_j=150\text{ }^{\circ}\text{C}$

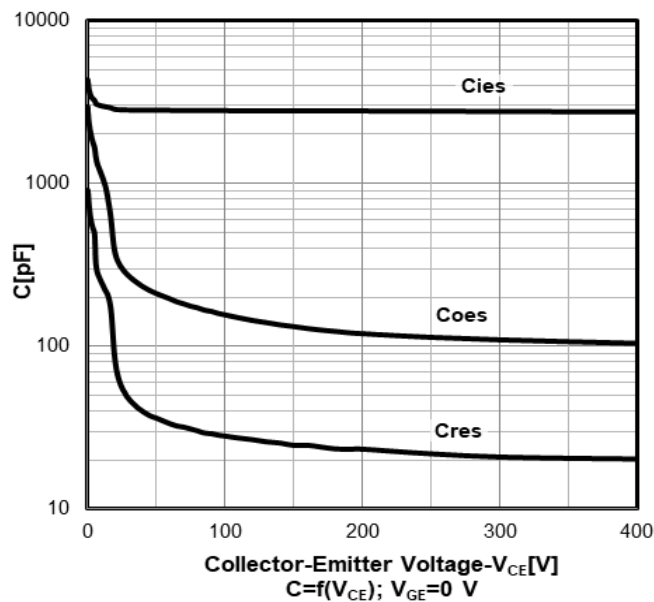


Typical Performance Characteristics

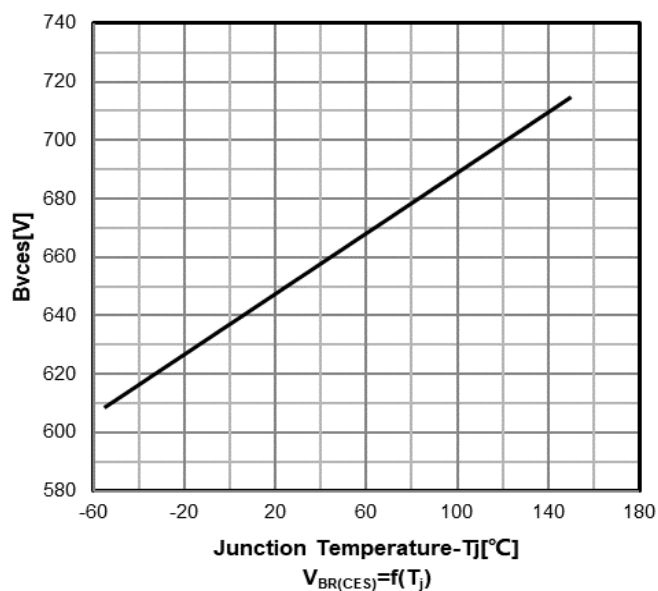
Gate charge characteristics



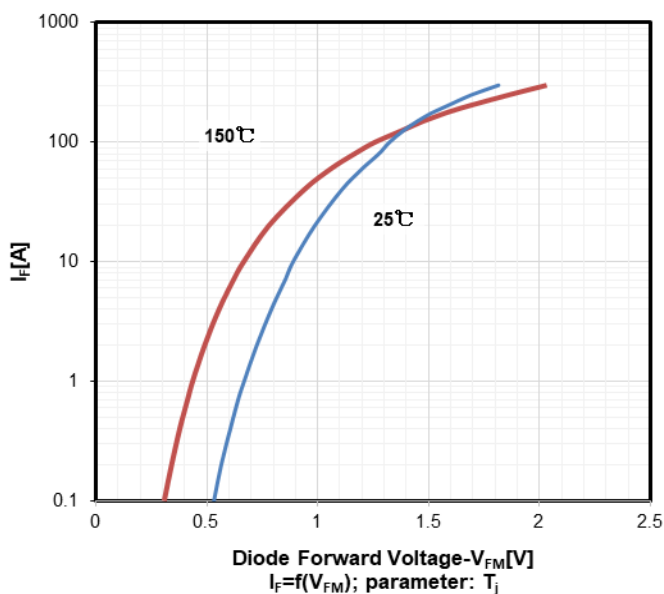
Capacitance characteristics



Collector-emitter breakdown voltage vs. temperature



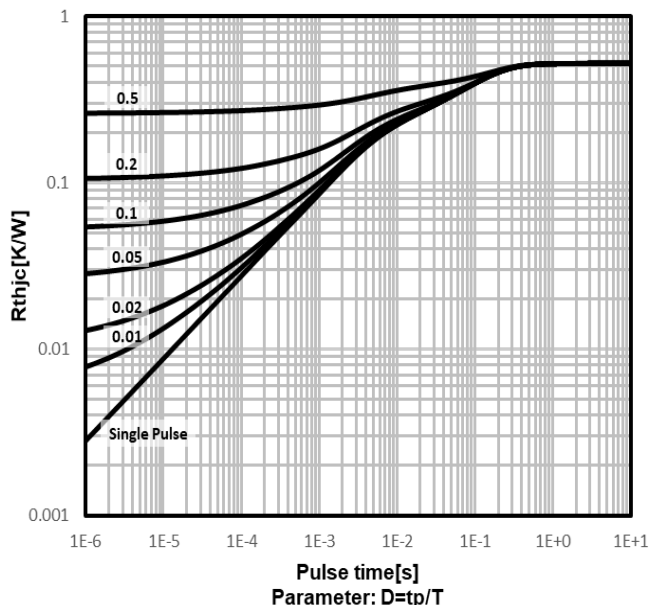
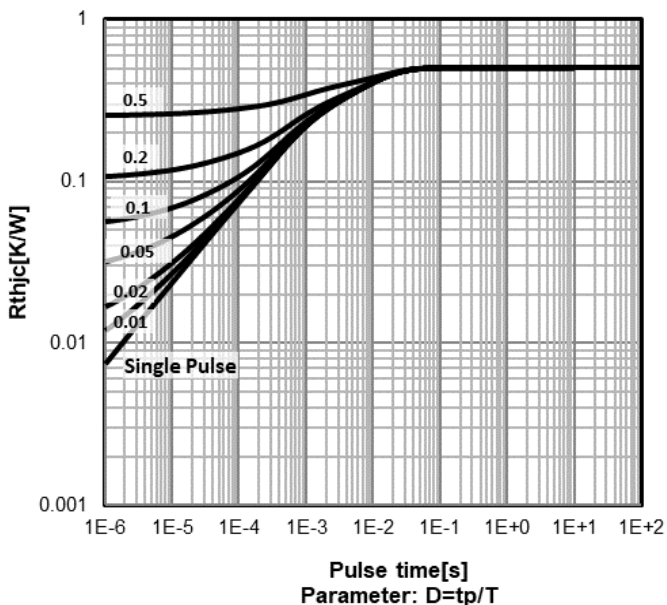
Forward characteristics of diode

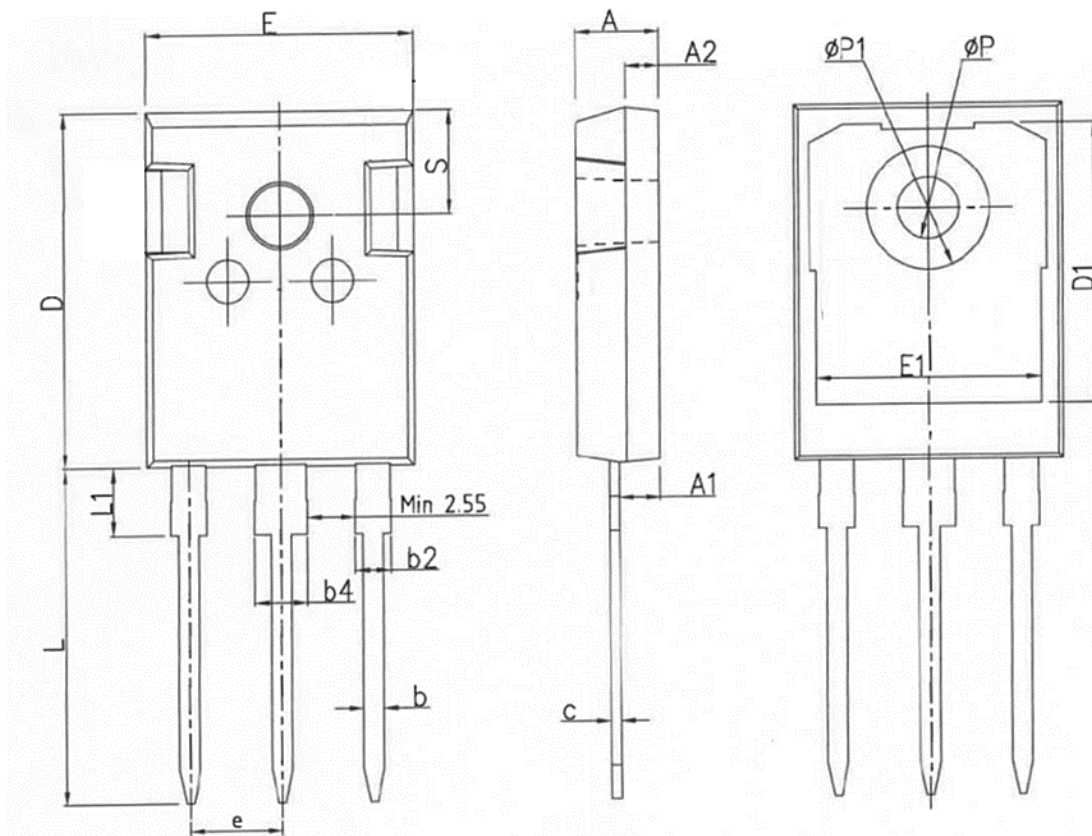


Typical Performance Characteristics

Max. transient thermal impedance
parameter: $D=tp/T$; IGBT

Max. transient thermal impedance
parameter: $D=tp/T$; Diode





COMMON DIMENSIONS

SYMBOL	UNIT(mm)		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.20	2.40	2.60
A2	1.85	2.00	2.15
b	1.10	1.20	1.35
b2	1.91	2.04	2.21
b4	2.91	3.04	3.21
c	0.50	0.60	0.75
D	20.70	21.00	21.30
D1	16.20	16.55	16.90
E	15.50	15.80	16.10
E1	13.00	13.30	13.60
e	5.44BSC		
L	19.60	19.95	20.30
L1	-	-	4.30
ΦP	3.40	3.60	3.80
ΦP1	-	-	7.50
S	6.15BSC		

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