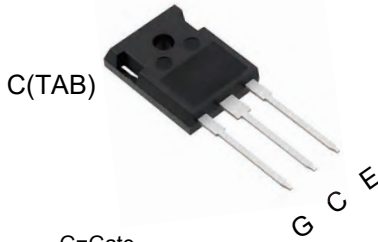


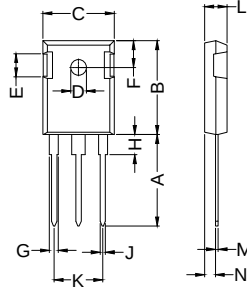
SG15N135RCB2

Discrete Reverse Conducting IGBTs

Dimensions TO-247AD



G=Gate,
C=Collector,
E=Emitter,
TAB=Collector



Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	19.81	20.32	0.780	0.800
B	20.80	21.46	0.819	0.845
C	15.75	16.26	0.620	0.640
ØD	3.15	3.65	0.124	0.144
E	4.32	5.49	0.170	0.216
F	5.40	6.30	0.213	0.248
G	1.65	2.18	0.065	0.086
H	3.80	4.50	0.150	0.177
J	1.00	1.40	0.039	0.055
K	10.80	11.10	0.425	0.437
L	4.70	5.30	0.185	0.209
M	0.40	0.80	0.016	0.031
N	1.50	2.49	0.059	0.099

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Maximum Ratings

Symbol	Parameter	Value	Unit
V_{CE}	Collector-emitter voltage	1350	V
	DC collector current		A
I_C	$T_C = 25^\circ\text{C}$ $T_C = 100^\circ\text{C}$	30 15	
I_{Cpuls}	Pulsed collector current, t_p limited by T_{jmax}	45	
-	Turn off safe operating area $V_{CE} \leq 1200\text{V}$, $T_j \leq 150^\circ\text{C}$	45	
V_{GE}	Gate-emitter voltage	± 30	V
E_A	Avalanche energy, single pulse $I_C = 15\text{A}$, $V_{CC} = 50\text{V}$, $R_{GE} = 25\Omega$, start at $T_j = 25^\circ\text{C}$	85	mJ
t_C	Short circuit withstand time ¹⁾ $V_{GE} = 15\text{V}$, $100\text{V} \leq V_{CC} \leq 1200\text{V}$, $T_j \leq 150^\circ\text{C}$	10	μs
t_{ot}	Power dissipation $T_C = 25^\circ\text{C}$	195	W
T_j, T_{stg}	Operating junction and storage temperature	-55... 150	$^\circ\text{C}$
-	Soldering temperature, 1.6mm (0.063 in.) from case for 10s	260	

Thermal Resistance

Symbol	Parameter	Conditions	Max. Value	Unit
Characteristic				
R_{thJC}	IGBT thermal resistance, junction – case		0.54	K/W
R_{thJA}	Thermal resistance, junction – ambient	TO-247AD	40	

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Discrete Reverse Conducting IGBTs

Electrical Characteristic, at $T_j = 25^\circ\text{C}$, unless otherwise specified

Symbol	Parameter	Conditions	Value			Unit
			min.	typ.	max.	
Static Characteristic						
V _{(BR)CES}	Collector-emitter breakdown voltage	V _{GE} =0V, I _C =1000μA	1350	1400	-	V
V _{CE(sat)}	Collector-emitter saturation voltage	V _{GE} = 15V, I _C =15A T _J =25°C T _J =150°C	-	2.70 3.10	3.30 3.70	
V _{GE(th)}	Gate-emitter threshold voltage	I _C =250μA,V _{CE} =V _{GE}	3.00	5.00	6.00	
I _{CES}	Zero gate voltage collector current	V _{CE} =1200V,V _{GE} =0V T _J =25°C T _J =150°C	- -	- -	200 1000	μA
I _{GES}	Gate-emitter leakage current	V _{CE} =0V,V _{GE} =20V	-	-	100	nA
g _{fs}	Transconductance	V _{CE} =20V, I _C =15A		11	-	S
Dynamic Characteristic						
C _{iss}	Input capacitance	V _{CE} =25V, V _{GE} =0V, f=1MHz	-	694	900	pF
C _{oss}	Output capacitance Reverse		-	64	90	
C _{rss}	transfer capacitance		-	15	20	
Q _{Gate}	Gate charge	V _{CC} =960V, I _C =15A V _{GE} =15V	-	120	170	nC
L _E	Internal emitter inductance measured 5mm (0.197 in.) from case	TO-247AD	-	13	-	nH
I _{C(SC)}	Short circuit collector current ²⁾	V _{GE} =15V,t _{SC} ≤5 μs 100V≤V _{CC} ≤1 200V, T _J ≤ 150°C	-	145	-	A

1) Device on 50mm*50mm*1.5mm epoxy PCB FR4 with 6cm² (one layer, 70μm thick) copper area for collector connection. PCB is vertical without blown air.

2) Allowed number of short circuits: <1000; time between short circuits: >1s.



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Discrete Reverse Conducting IGBTs

Switching Characteristic, Inductive Load, at $T_J=25^\circ\text{C}$

Symbol	Parameter	Conditions	Value			Unit
			min.	typ.	max.	
IGBT Characteristic						
t _{d(on)}	Turn-on delay time	T _j =25°C, V _{CC} =600V,I _C =15A, V _{GE} =15V/0V, R _G =33Ω, L _σ ¹⁾ =180nH, C _σ ¹⁾ =40pF Energy losses include “tail” and diode reverse recovery.	-	34	45	ns
t _r	Rise time		-	22	36	
t _{d(off)}	Turn-off delay time		-	227	307	
t _f	Fall time		-	152	252	
E _{on}	Turn-on energy		-	0.82	1.40	mJ
E _{off}	Turn-off energy		-	0.89	1.20	
E _{ts}	Total switching energy		-	1.71	2.60	

Reverse Diode (Reverse conducting Diode)

($T_J=25^\circ\text{C}$, unless otherwise specified)

Symbol	Test Conditions	Characteristic Values			Unit
		min.	typ.	max.	
V_F	$I_F=15\text{A}$; $V_{GE}=0\text{V}$		2.50	3.30	V
I_F	$T_C=25^\circ\text{C}$ $T_C=90^\circ\text{C}$			30 15	A
I_{RM}	$I_F=20\text{V}$; $-di_F/dt=400\text{A/us}$; $V_R=600\text{V}$		15		A
t_{rr}	$V_{GE}=0\text{V}$; $T_J=125^\circ\text{C}$ $I_F=1\text{A}$; $-di_F/dt=100\text{A/us}$; $V_R=30\text{V}$; $V_{GE}=0\text{V}$		210 40		ns

Features

- NPT IGBT technology
- Low switching losses
- Switching frequency up to 20KHz
- Square RBSOA, no latch up
- High short circuit capability
- Positive temperature coefficient for easy parallelling
- MOS input, voltage controlled
- Reverse conducting IGBT with monolithic body diode

Application

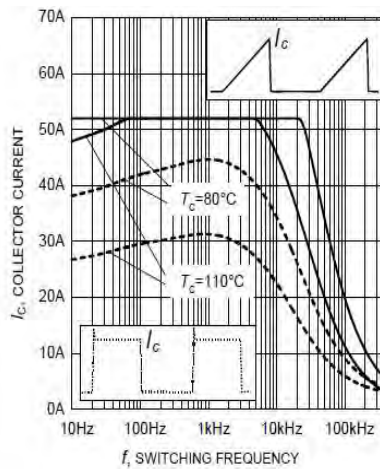
- Inductive cooking
- Inverterized microwave oven
- Resonant converter
- Soft switching application

Advantages

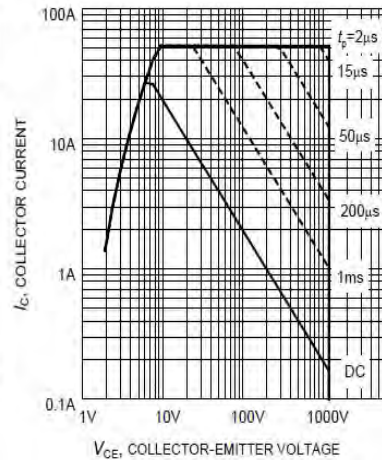
- space and weight savings
- reduced protection circuits

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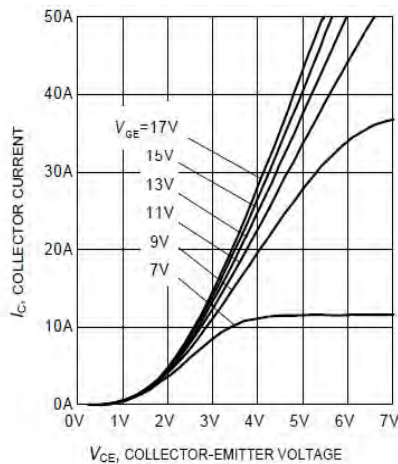
Discrete Reverse Conducting IGBTs



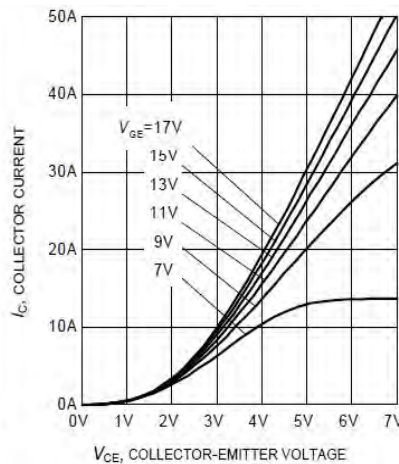
Collector current versus switching frequency



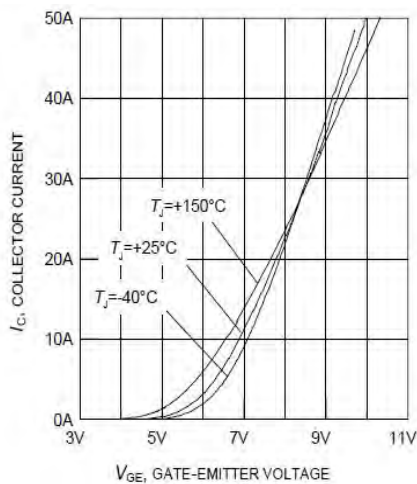
Safe working area



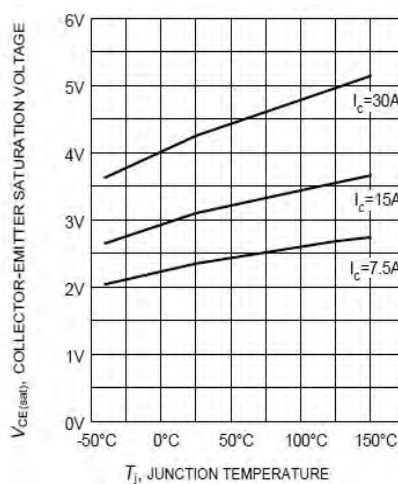
Output characteristic ($T_c=25^\circ\text{C}$)



Output characteristic ($T_c=150^\circ\text{C}$)



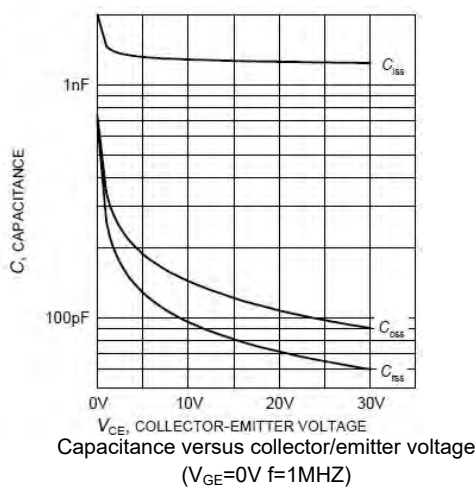
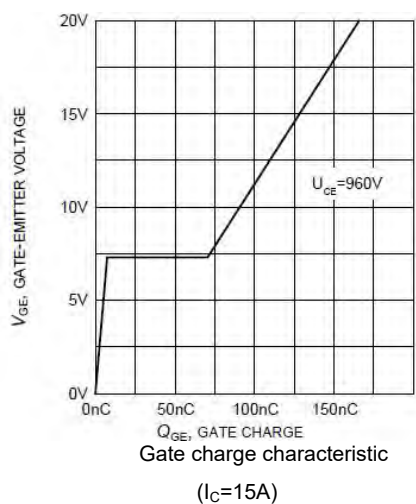
Transmission characteristic



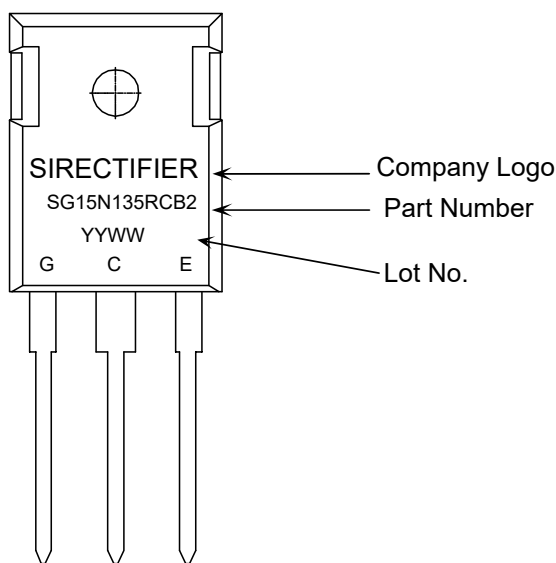
Relationship between $V_{CS(sat)}$ and T_j

SG15N135RCB2

Discrete Reverse Conducting IGBTs



MARKING



ORDERING INFORMATION

Part Number	Package	Shipping	Marking Code
SG15N135RCB2	TO-247AD	30pcs / Tube	SG15N135RCB2

SG15N135RCB2

Discrete Reverse Conducting IGBTs

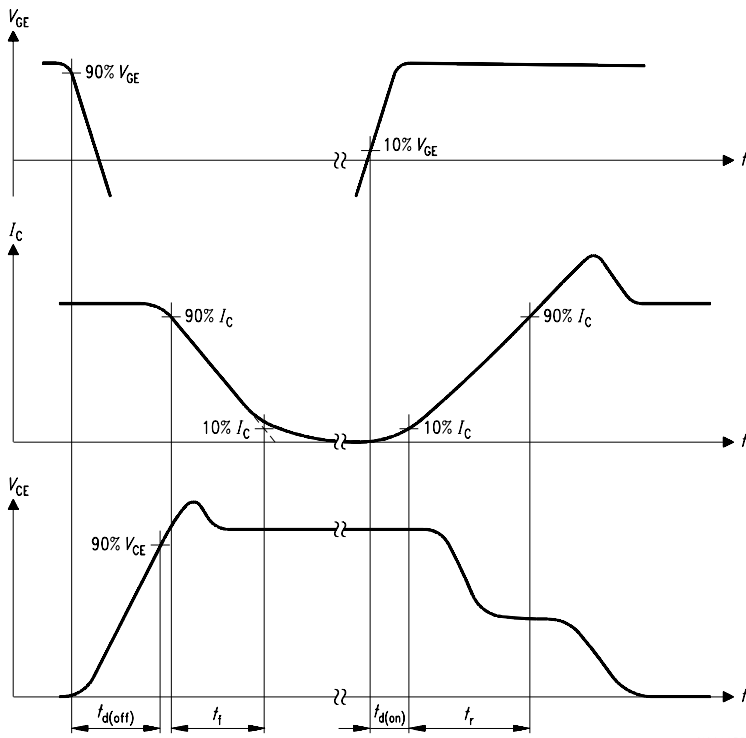


Figure A. Definition of switching times

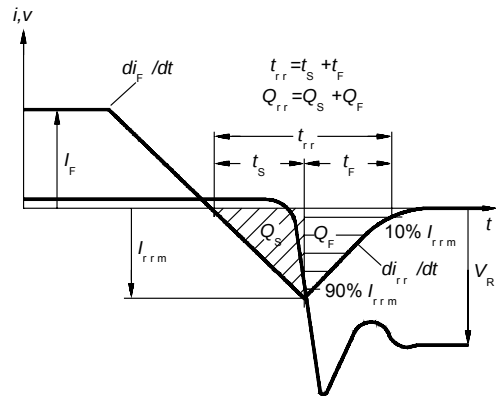


Figure C. Definition of diodes switching characteristics

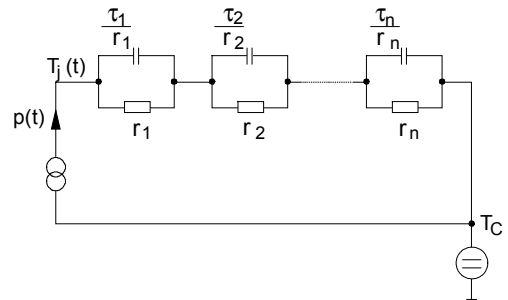


Figure D. Thermal equivalent circuit

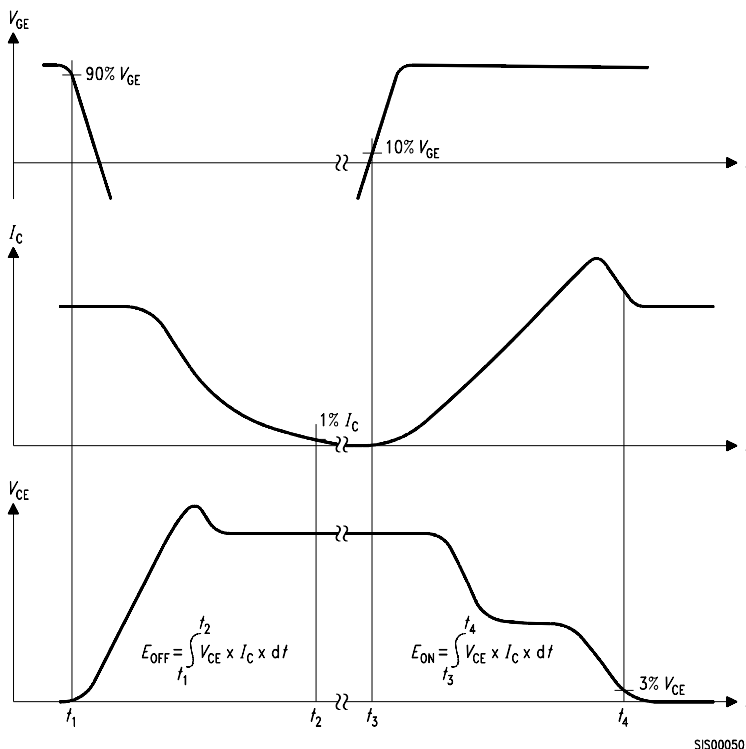


Figure B. Definition of switching losses

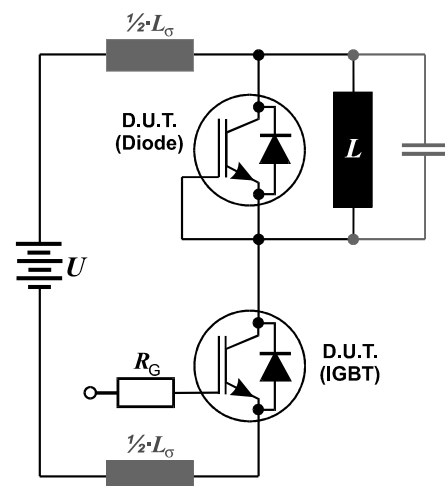


Figure E. Dynamic test circuit
Leakage inductance $L_\sigma=180\text{nH}$,
and stray capacity $C_\sigma=40\text{pF}$.