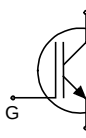
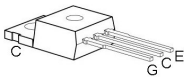
SGP07N120
SGB07N120

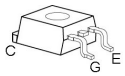
Fast IGBT in NPT-technology

- 40lower E_{off} compared to previous generation
- Short circuit withstand time – 10 µs
- Designed for:
  - Motor controls
  - Inverter
  - SMPS
- NPT-Technology offers:
  - very tight parameter distribution
  - high ruggedness, temperature stable behaviour
  - parallel switching capability





P-TO-220-3-1
(TO-220AB)



P-TO-263-3-2 (D²-PAK)
(TO-263AB)

- Complete product spectrum and PSpice Models : http://www.infineon.com/igbt/

Type	V_{CE}	I_C	E_{off}	T_j	Package	Ordering Code
SGP07N120	1200V	8A	0.7mJ	150°C	TO-220AB	Q67040-S4272
SGB07N120					TO-263AB(D2PAK)	Q67040-S4273

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CE}	1200	V
DC collector current T_C = 25°C T_C = 100°C	I_C	 16.5 7.9	A
Pulsed collector current, t_p limited by T_{jmax}	I_{Cpuls}	27	
Turn off safe operating area $V_{CE} \le 1200V$, $T_j \le 150°C$	-	27	
Gate-emitter voltage	V_{GE}	±20	V
Avalanche energy, single pulse I_C = 8A, V_{CC} = 50V, R_{GE} = 25Ω, start at T_j = 25°C	E_{AS}	40	mJ
Short circuit withstand time[1)] V_{GE} = 15V, 100V ≤ V_{CC} ≤ 1200V, $T_j \le 150°C$	t_{SC}	10	µs
Power dissipation T_C = 25°C	P_{tot}	125	W
Operating junction and storage temperature	T_j , T_{stg}	-55...+150	°C
Soldering temperature, 1.6mm (0.063 in.) from case for 10s	-	260	

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

Thermal Resistance

Parameter	Symbol	Conditions	Max. Value	Unit
Characteristic				
IGBT thermal resistance, junction – case	R_{thJC}		1	K/W
Thermal resistance, junction – ambient	R_{thJA}	TO-220AB	62	
SMD version, device on PCB[1)]	R_{thJA}	TO-263AB(D2PAK)	40	

Electrical Characteristic, at T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
Static Characteristic						
Collector-emitter breakdown voltage	$V_{(BR)CES}$	V_{GE}=0V, I_C=500µA	1200	-	-	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	V_{GE} = 15V, I_C=8A				
		T_j=25°C	2.5	3.1	3.6	
		T_j=150°C	-	3.7	4.3	
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C=350µA, V_{CE}=V_{GE}	3	4	5	
Zero gate voltage collector current	I_{CES}	V_{CE}=1200V, V_{GE}=0V				µA
		T_j=25°C	-	-	100	
		T_j=150°C	-	-	400	
Gate-emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V	-	-	100	nA
Transconductance	g_{fs}	V_{CE}=20V, I_C=8A		6	-	S
Dynamic Characteristic						
Input capacitance	C_{iss}	V_{CE}=25V,	-	720	870	pF
Output capacitance	C_{oss}	V_{GE}=0V,	-	60	75	
Reverse transfer capacitance	C_{rss}	f=1MHz	-	40	50	
Gate charge	Q_{Gate}	V_{CC}=960V, I_C=8A	-	70	90	nC
		V_{GE}=15V				
Internal emitter inductance measured 5mm (0.197 in.) from case	L_E	TO-220AB	-	7	-	nH
Short circuit collector current[2)]	$I_{C(SC)}$	V_{GE}=15V, t_{SC}≤10µs 100V≤V_{CC}≤1200V, T_j ≤ 150°C	-	75	-	A

[1)] Device on 50mm*50mm*1.5mm epoxy PCB FR4 with 6cm^2 (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.

Switching Characteristic, Inductive Load, at T_j=25 °C

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
IGBT Characteristic						
Turn-on delay time	$t_{d(on)}$	T_j=25°C, V_{CC}=800V, I_C=8A, V_{GE}=15V/0V, R_G=47Ω, L_σ[1)]=180nH, C_σ[1)]=40pF Energy losses include "tail" and diode reverse recovery.	-	27	35	ns
Rise time	t_r		-	29	38	
Turn-off delay time	$t_{d(off)}$		-	440	570	
Fall time	t_f		-	21	27	
Turn-on energy	E_{on}		-	0.6	0.8	mJ
Turn-off energy	E_{off}		-	0.4	0.55	
Total switching energy	E_{ts}		-	1.0	1.35	

Switching Characteristic, Inductive Load, at T_j=150 °C

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
IGBT Characteristic						
Turn-on delay time	$t_{d(on)}$	T_j=150°C V_{CC}=800V, I_C=8A, V_{GE}=15V/0V, R_G=47Ω, L_σ[1)]=180nH, C_σ[1)]=40pF Energy losses include "tail" and diode reverse recovery.	-	30	36	ns
Rise time	t_r		-	26	31	
Turn-off delay time	$t_{d(off)}$		-	490	590	
Fall time	t_f		-	30	36	
Turn-on energy	E_{on}		-	1.0	1.2	mJ
Turn-off energy	E_{off}		-	0.7	0.9	
Total switching energy	E_{ts}		-	1.7	2.1	

[1)] Leakage inductance L_σ and stray capacity C_σ due to dynamic test circuit in figure E.

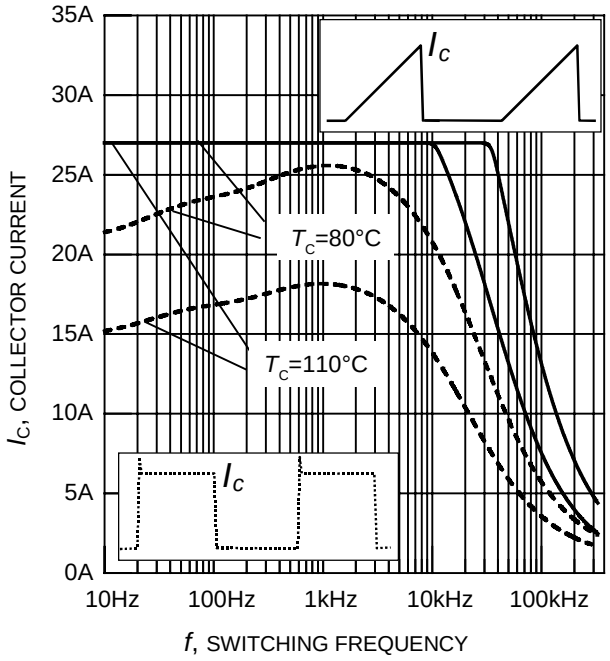


Figure 1. Collector current as a function of switching frequency
($T_j \le 150°C$, $D = 0.5$, $V_{CE} = 800V$, $V_{GE} = +15V/0V$, $R_G = 47\Omega$)

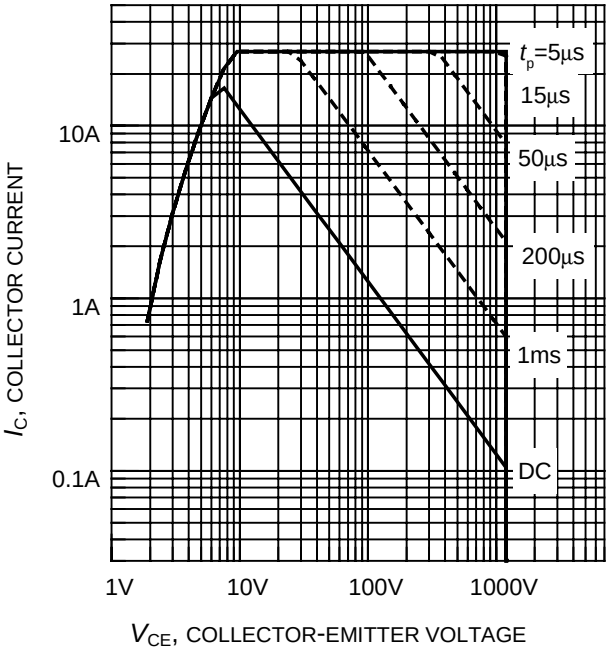


Figure 2. Safe operating area
($D = 0$, $T_C = 25°C$, $T_j \le 150°C$)

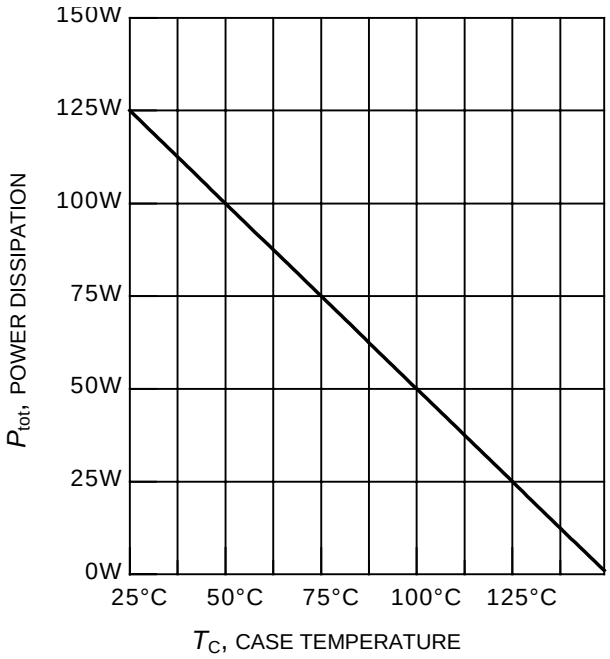


Figure 3. Power dissipation as a function of case temperature
($T_j \le 150°C$)

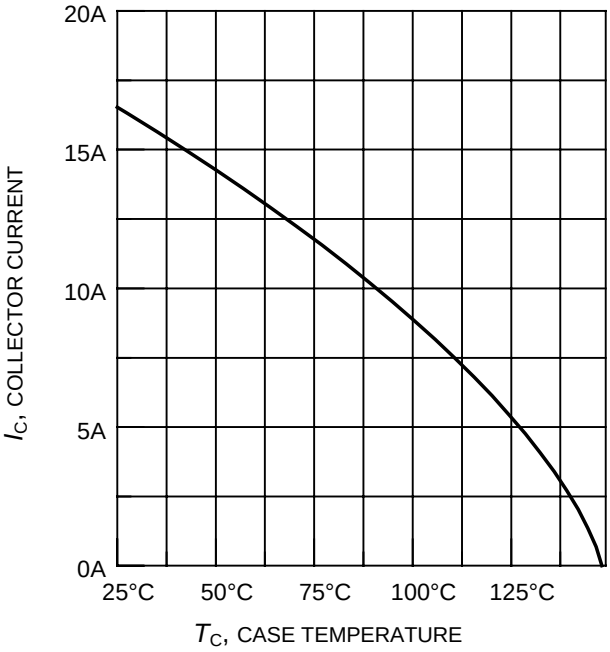


Figure 4. Collector current as a function of case temperature
($V_{GE} \le 15V$, $T_j \le 150°C$)

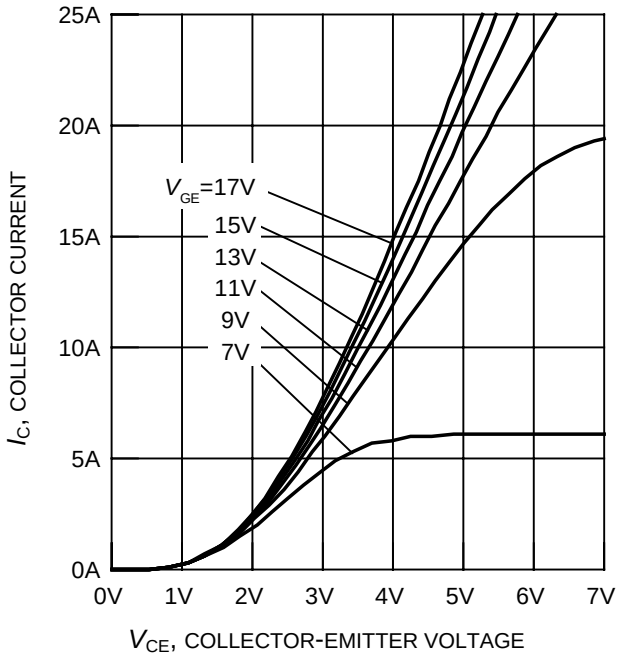


Figure 5. Typical output characteristics
(T_j = 25°C)

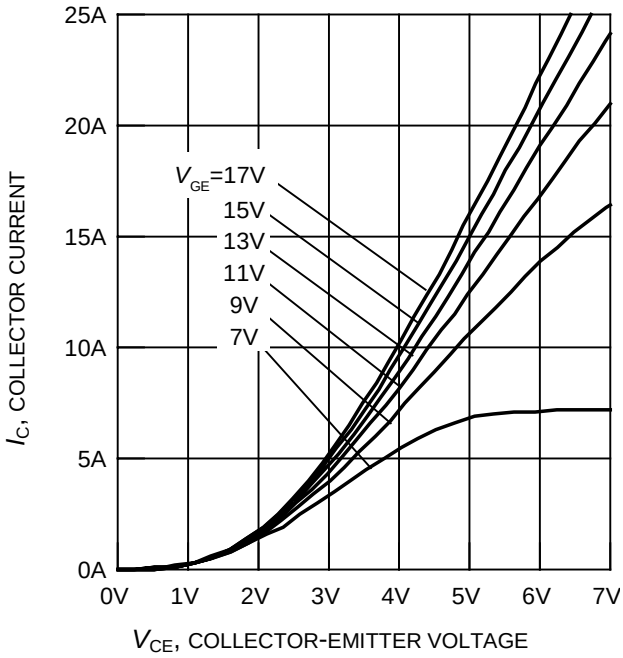


Figure 6. Typical output characteristics
(T_j = 150°C)

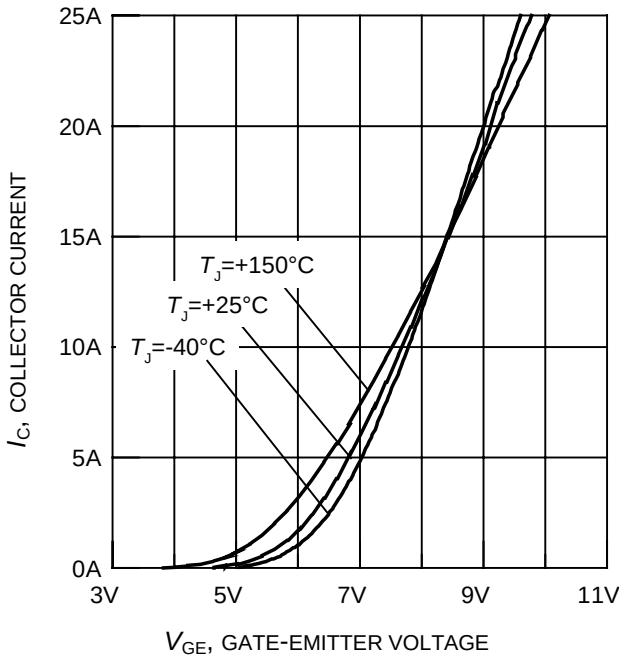


Figure 7. Typical transfer characteristics
(V_{CE} = 20V)

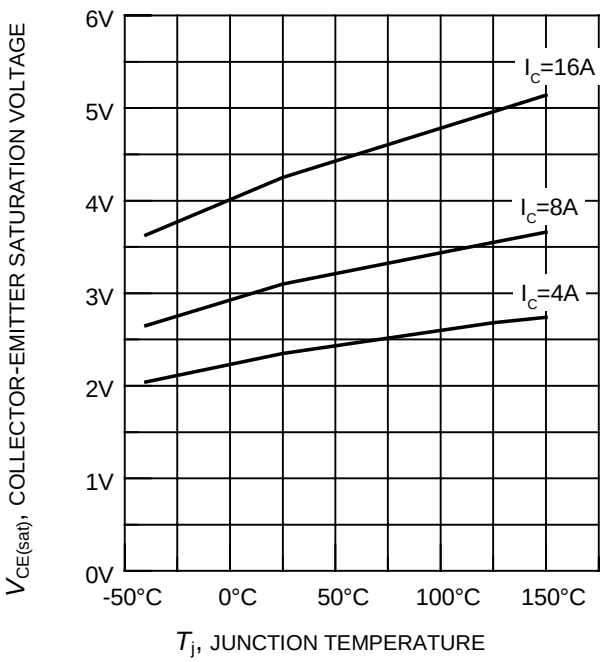


Figure 8. Typical collector-emitter saturation voltage as a function of junction temperature
(V_{GE} = 15V)

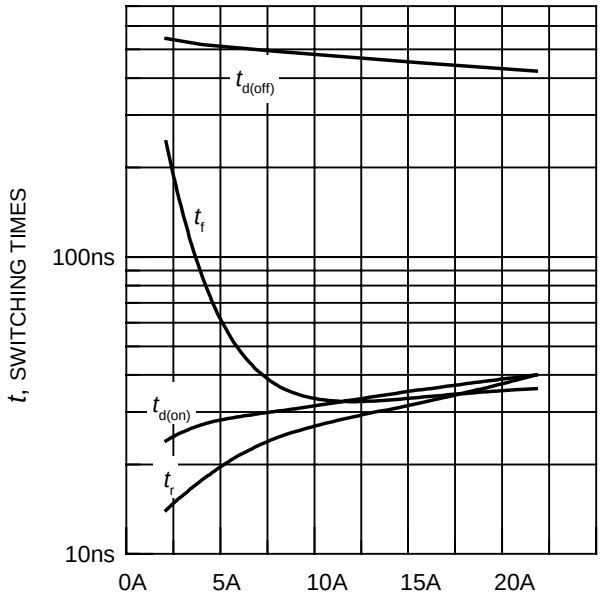


Figure 9. Typical switching times as a function of collector current
(inductive load, T_j = 150°C,
V_{CE} = 800V, V_{GE} = +15V/0V, R_G = 47Ω,
dynamic test circuit in Fig.E)

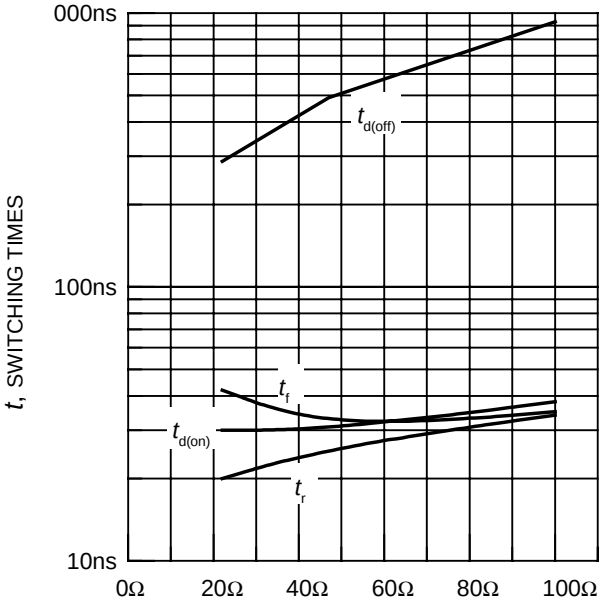


Figure 10. Typical switching times as a function of gate resistor
(inductive load, T_j = 150°C,
V_{CE} = 800V, V_{GE} = +15V/0V, I_C = 8A,
dynamic test circuit in Fig.E)

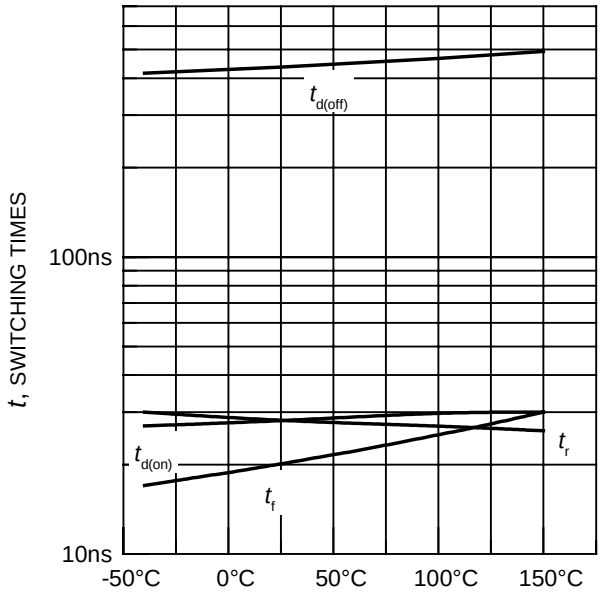


Figure 11. Typical switching times as a function of junction temperature
(inductive load, V_{CE} = 800V,
V_{GE} = +15V/0V, I_C = 8A, R_G = 47Ω,
dynamic test circuit in Fig.E)

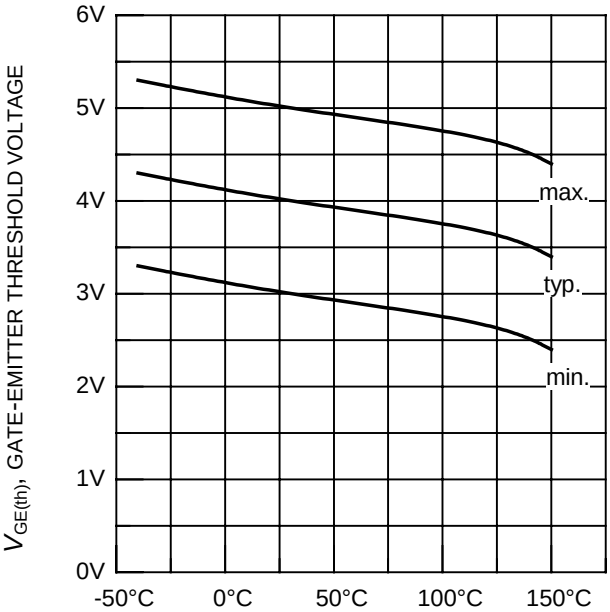


Figure 12. Gate-emitter threshold voltage as a function of junction temperature
(I_C = 0.3mA)

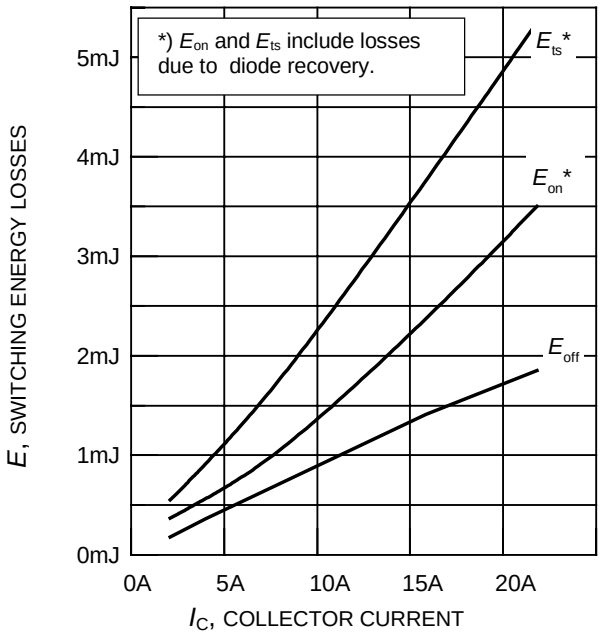


Figure 13. Typical switching energy losses as a function of collector current
(inductive load, T_j = 150°C,
V_{CE} = 800V, V_{GE} = +15V/0V, R_G = 47Ω,
dynamic test circuit in Fig.E)

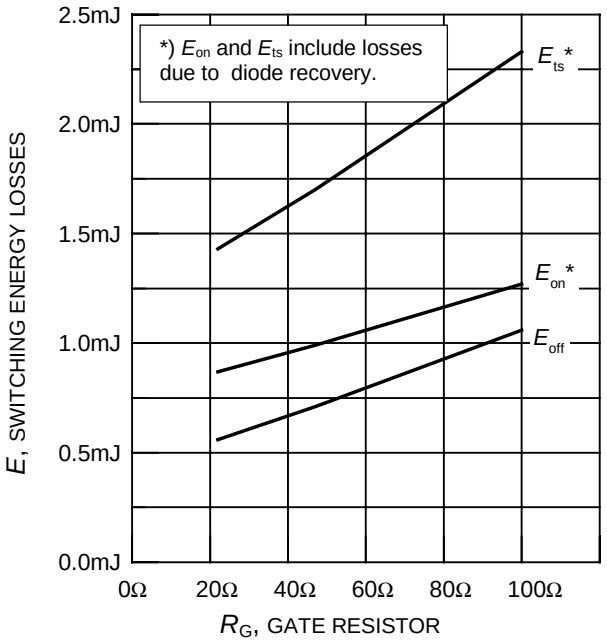


Figure 14. Typical switching energy losses as a function of gate resistor
(inductive load, T_j = 150°C,
V_{CE} = 800V, V_{GE} = +15V/0V, I_C = 8A,
dynamic test circuit in Fig.E)

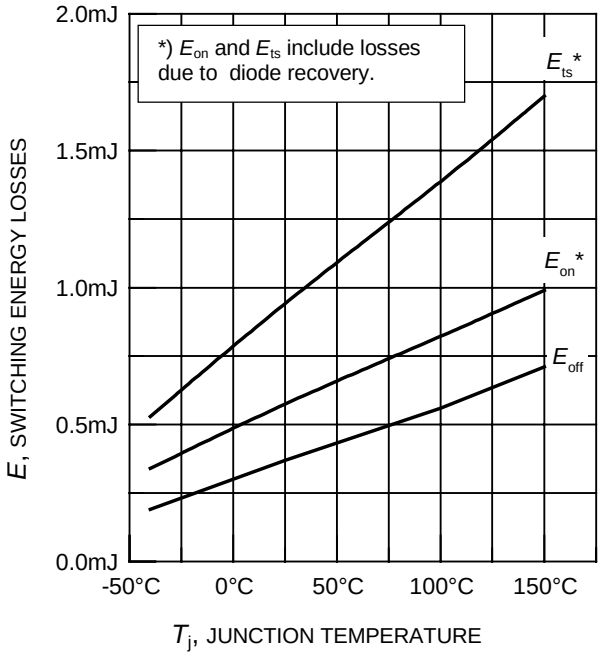


Figure 15. Typical switching energy losses as a function of junction temperature
(inductive load, V_{CE} = 800V,
V_{GE} = +15V/0V, I_C = 8A, R_G = 47Ω,
dynamic test circuit in Fig.E)

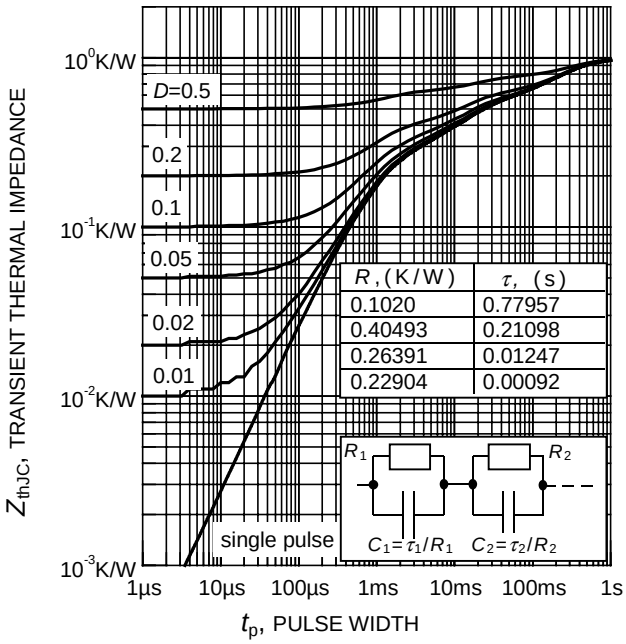


Figure 16. IGBT transient thermal impedance as a function of pulse width
($D = t_p / T$)

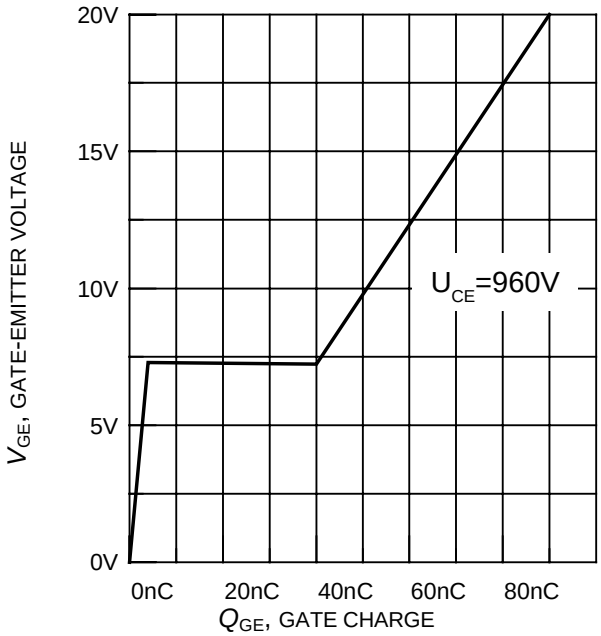


Figure 17. Typical gate charge
(I_C = 8A)

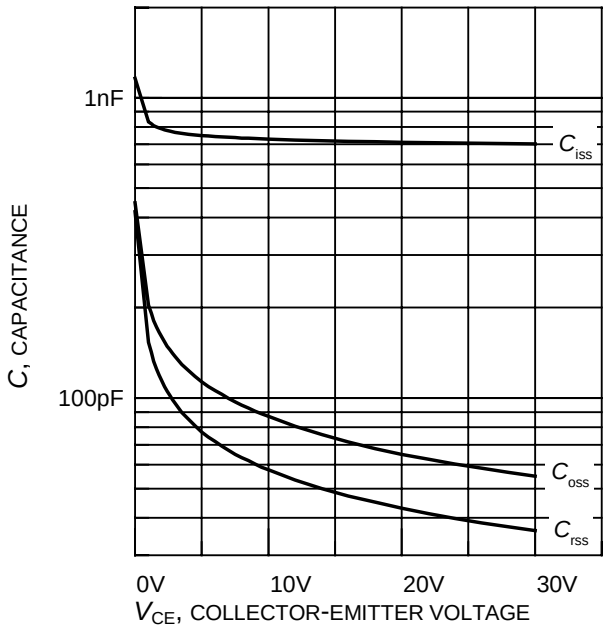


Figure 18. Typical capacitance as a function of collector-emitter voltage
(V_{GE} = 0V, f = 1MHz)

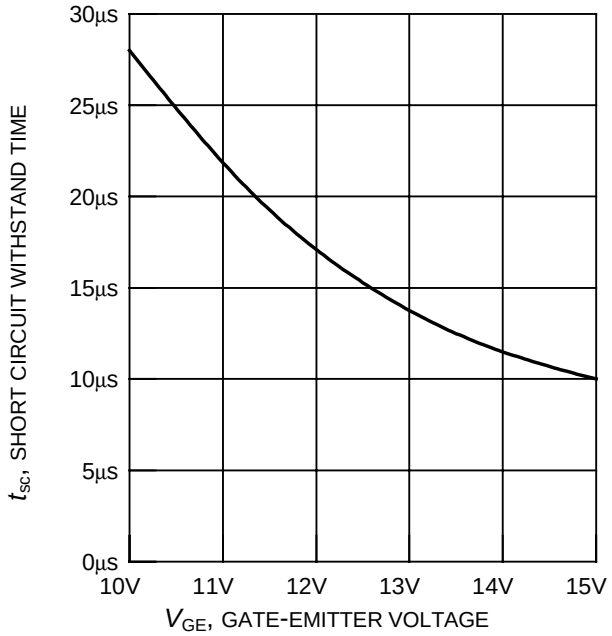


Figure 19. Short circuit withstand time as a function of gate-emitter voltage
(V_{CE} = 1200V, start at T_j = 25°C)

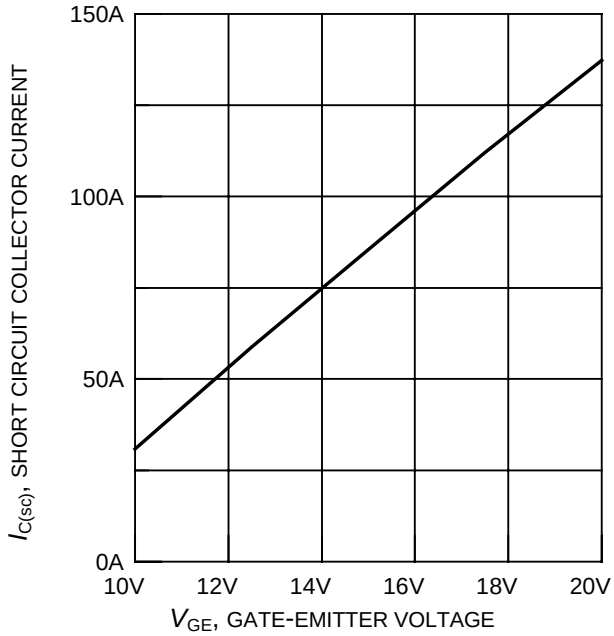
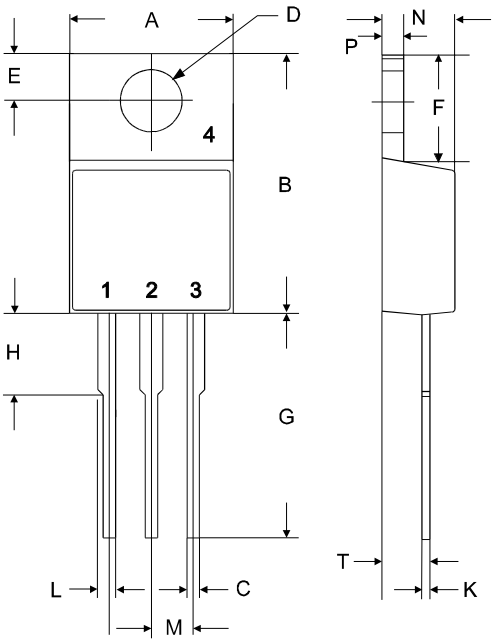


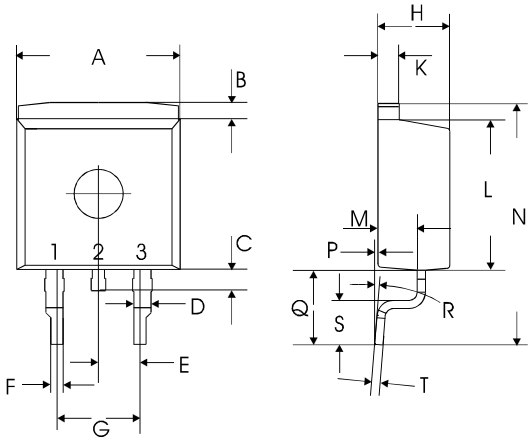
Figure 20. Typical short circuit collector current as a function of gate-emitter voltage
(100V ≤ V_{CE} ≤ 1200V, T_C = 25°C, T_j ≤ 150°C)

TO-220AB

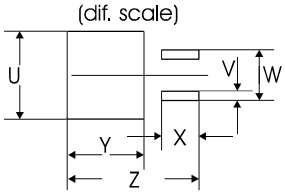


symbol	dimensions			
	[mm]		[inch]	
	min	max	min	max
A	9.70	10.30	0.3819	0.4055
B	14.88	15.95	0.5858	0.6280
C	0.65	0.86	0.0256	0.0339
D	3.55	3.89	0.1398	0.1531
E	2.60	3.00	0.1024	0.1181
F	6.00	6.80	0.2362	0.2677
G	13.00	14.00	0.5118	0.5512
H	4.35	4.75	0.1713	0.1870
K	0.38	0.65	0.0150	0.0256
L	0.95	1.32	0.0374	0.0520
M	2.54 typ.		0.1 typ.	
N	4.30	4.50	0.1693	0.1772
P	1.17	1.40	0.0461	0.0551
T	2.30	2.72	0.0906	0.1071

TO-263AB (D^2Pak)



Footprint
(dif. scale)



symbol	dimensions			
	[mm]		[inch]	
	min	max	min	max
A	9.80	10.20	0.3858	0.4016
B	0.70	1.30	0.0276	0.0512
C	1.00	1.60	0.0394	0.0630
D	1.03	1.07	0.0406	0.0421
E	2.54 typ.		0.1 typ.	
F	0.65	0.85	0.0256	0.0335
G	5.08 typ.		0.2 typ.	
H	4.30	4.50	0.1693	0.1772
K	1.17	1.37	0.0461	0.0539
L	9.05	9.45	0.3563	0.3720
M	2.30	2.50	0.0906	0.0984
N	15 typ.		0.5906 typ.	
P	0.00	0.20	0.0000	0.0079
Q	4.20	5.20	0.1654	0.2047
R	8° max		8° max	
S	2.40	3.00	0.0945	0.1181
T	0.40	0.60	0.0157	0.0236
U	10.80		0.4252	
V	1.15		0.0453	
W	6.23		0.2453	
X	4.60		0.1811	
Y	9.40		0.3701	
Z	16.15		0.6358	

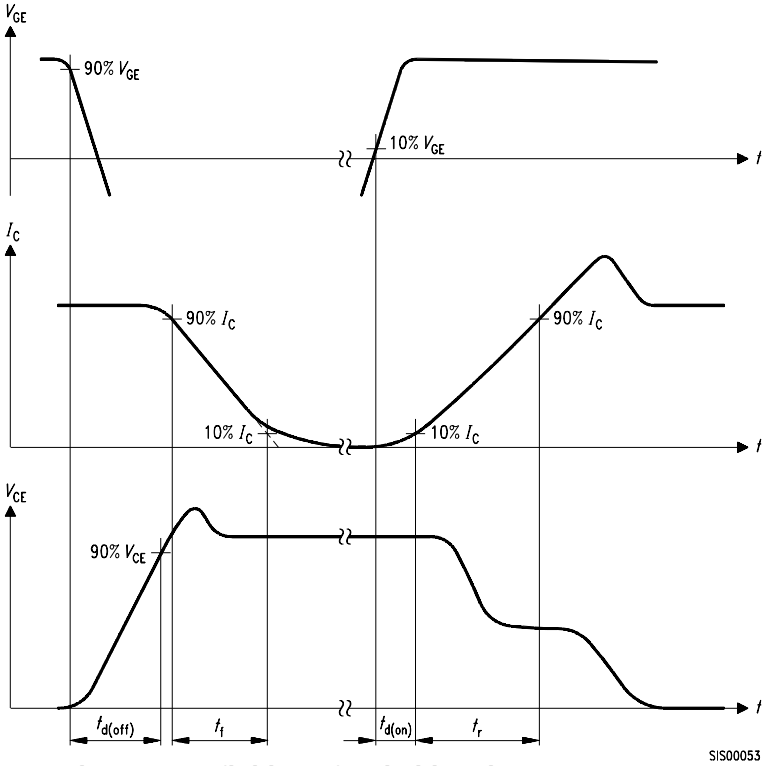


Figure A. Definition of switching times

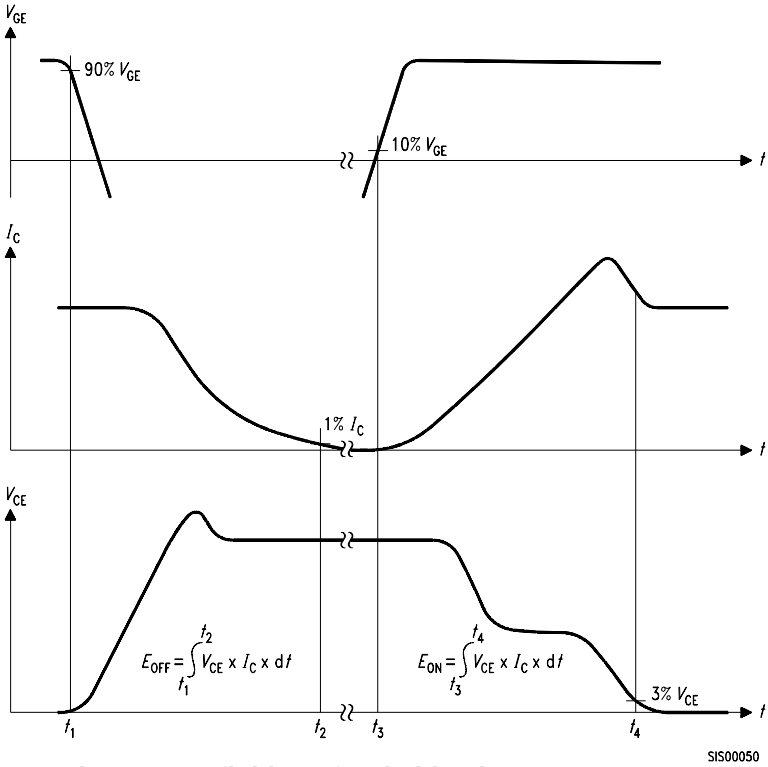


Figure B. Definition of switching losses

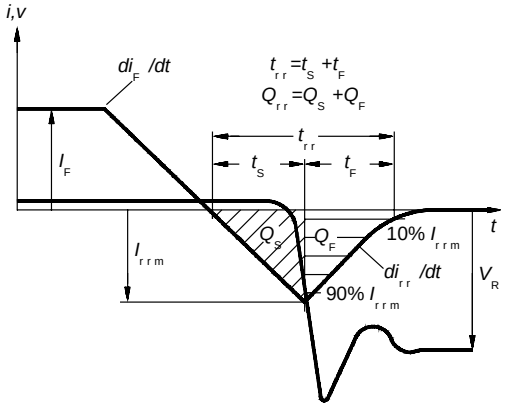


Figure C. Definition of diodes switching characteristics

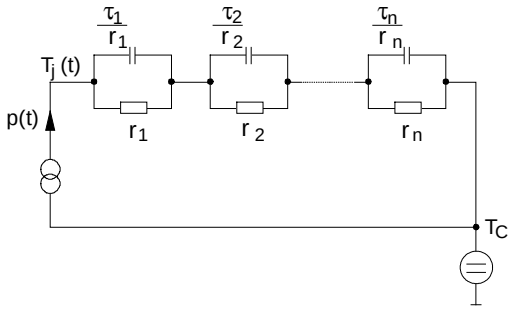


Figure D. Thermal equivalent circuit

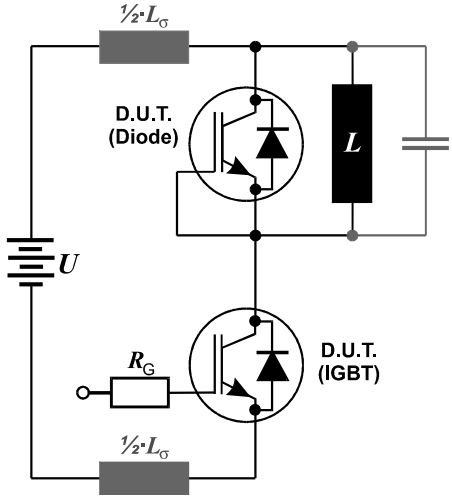


Figure E. Dynamic test circuit
Leakage inductance L_σ=180nH,
and stray capacity C_σ =40pF.

Published by
Infineon Technologies AG i Gr.,
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