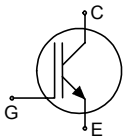
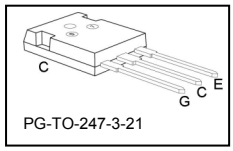
SGW02N120

Fast IGBT in NPT-technology



- Lower 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



- Qualified according to JEDEC[1] for target applications
- Pb-free lead plating; RoHS compliant
- Complete product spectrum and PSpice Models : http://www.infineon.com/igbt/

Type	V_{CE}	I_C	E_{off}	T_j	Marking	Package
SGW02N120	1200V	2A	0.11mJ	150°C	G02N120	PG-TO-247-3-21

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	 6.2 2.8	A
Pulsed collector current, t_p limited by T_{jmax}	I_{Cpuls}	9.6	
Turn off safe operating area $V_{CE} \le 1200V$, $T_j \le 150°C$	-	9.6	
Gate-emitter voltage	V_{GE}	±20	V
Avalanche energy, single pulse I_C = 2A, V_{CC} = 50V, R_{GE} = 25Ω, start at T_j = 25°C	E_{AS}	10	mJ
Short circuit withstand time[2] V_{GE} = 15V, 100V ≤ V_{CC} ≤ 1200V, $T_j \le 150°C$	t_{SC}	10	µs
Power dissipation T_C = 25°C	P_{tot}	50	W
Operating junction and storage temperature	T_j , T_{stg}	-55...+150	°C
Soldering temperature, 1.6mm (0.063 in.) from case for 10s	T_s	260	

[1] J-STD-020 and JESD-022
[2] 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}		2.5	K/W
Thermal resistance, junction – ambient	R_{thJA}		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=100µA	1200	-	-	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	V_{GE} = 15V, I_C=2A				
		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=100µA, 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	-	-	25	
		T_j=150°C	-	-	100	
Gate-emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V	-	-	100	nA
Transconductance	g_{fs}	V_{CE}=20V, I_C=2A		1.5	-	S
Dynamic Characteristic						
Input capacitance	C_{iss}	V_{CE}=25V,	-	205	250	pF
Output capacitance	C_{oss}	V_{GE}=0V,	-	20	25	
Reverse transfer capacitance	C_{rss}	f=1MHz	-	12	14	
Gate charge	Q_{Gate}	V_{CC}=960V, I_C=2A	-	11	-	nC
		V_{GE}=15V				
Internal emitter inductance measured 5mm (0.197 in.) from case	L_E		-	13	-	nH
Short circuit collector current[2)]	$I_{C(SC)}$	V_{GE}=15V, t_{SC}≤10µs	-	24	-	A
		100V≤V_{CC}≤1200V,				
		T_j ≤ 150°C				

[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=2A, V_{GE}=15V/0V, R_G=91Ω, L_σ [1)]=180nH, C_σ [1)]=40pF Energy losses include "tail" and diode reverse recovery.	-	23	30	ns
Rise time	t_r		-	16	21	
Turn-off delay time	$t_{d(off)}$		-	260	340	
Fall time	t_f		-	61	80	
Turn-on energy	E_{on}		-	0.16	0.21	mJ
Turn-off energy	E_{off}		-	0.06	0.08	
Total switching energy	E_{ts}		-	0.22	0.29	

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=2A, V_{GE}=15V/0V, R_G=91Ω, L_σ [1)]=180nH, C_σ [1)]=40pF Energy losses include "tail" and diode reverse recovery.	-	26	31	ns
Rise time	t_r		-	14	17	
Turn-off delay time	$t_{d(off)}$		-	290	350	
Fall time	t_f		-	85	102	
Turn-on energy	E_{on}		-	0.27	0.33	mJ
Turn-off energy	E_{off}		-	0.11	0.15	
Total switching energy	E_{ts}		-	0.38	0.48	

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

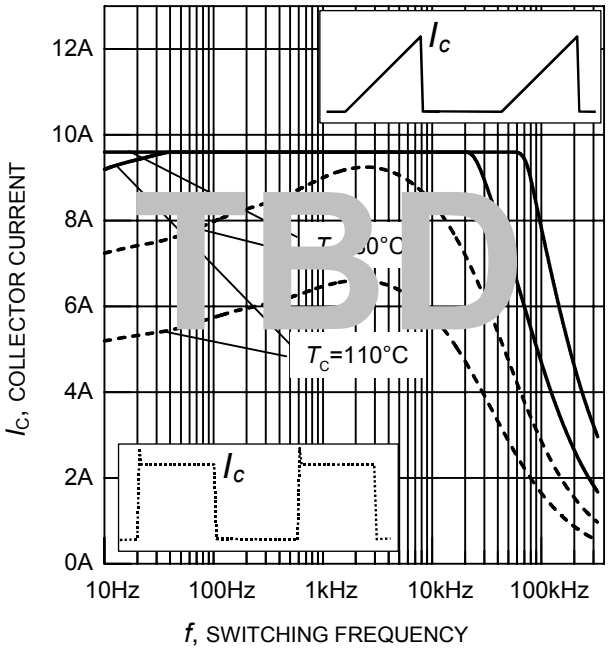


Figure 1. Collector current as a function of switching frequency
($T_j \le 150°C$, $D = 0.5$, $V_{CE} = 800V$, $V_{GE} = +15V/0V$, $R_G = 91\Omega$)

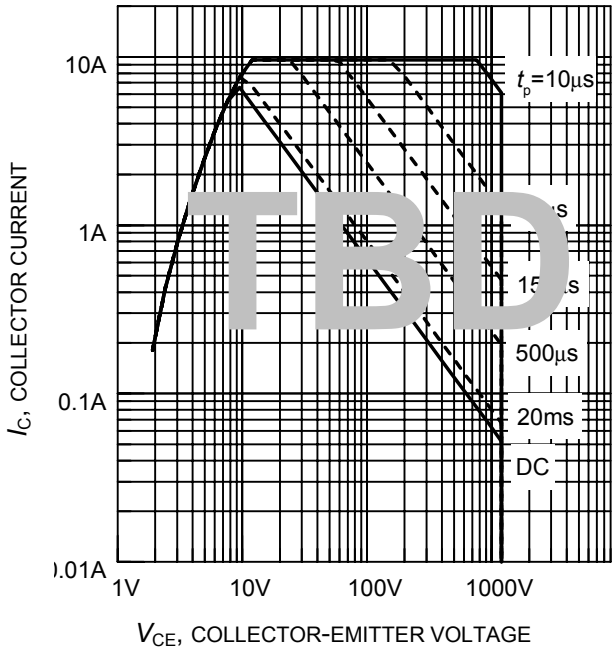


Figure 2. Safe operating area
($D = 0$, $T_C = 25°C$, $T_j \le 150°C$)

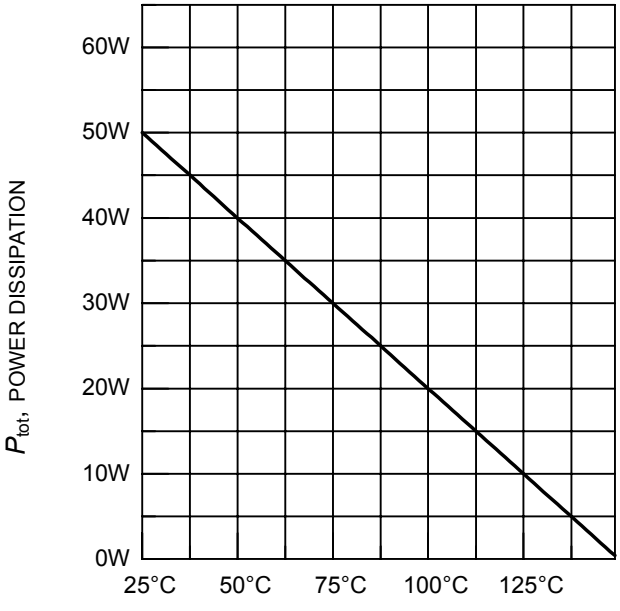


Figure 3. Power dissipation as a function of case temperature
($T_j \le 150°C$)

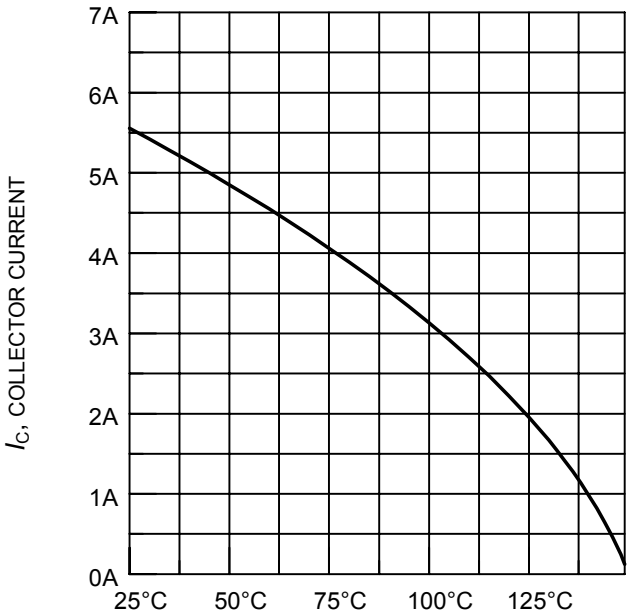


Figure 4. Collector current as a function of case temperature
($V_{GE} \le 15V$, $T_j \le 150°C$)

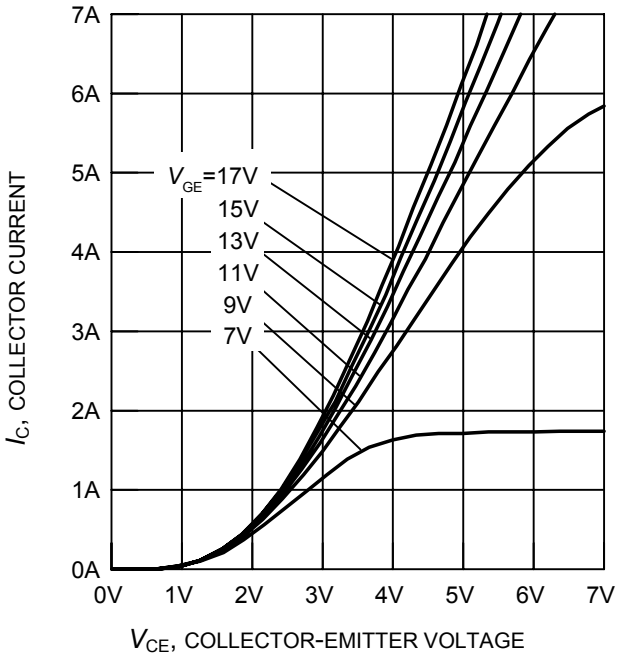


Figure 5. Typical output characteristics
(T_j = 25°C)

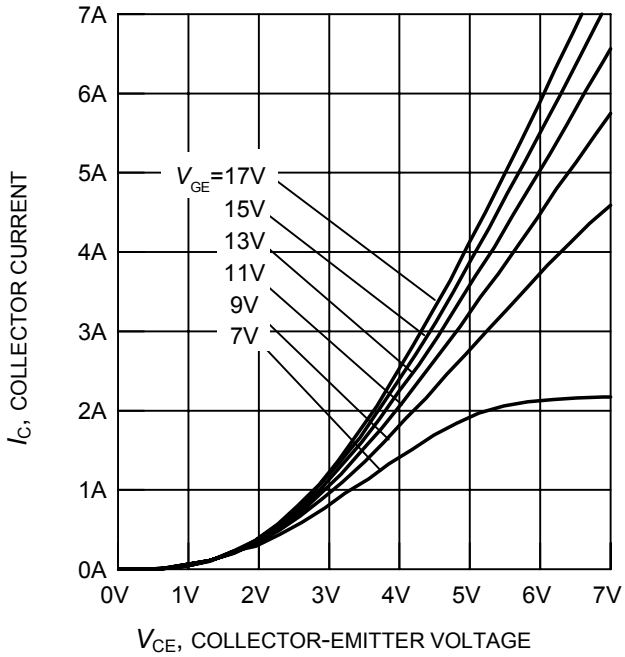


Figure 6. Typical output characteristics
(T_j = 150°C)

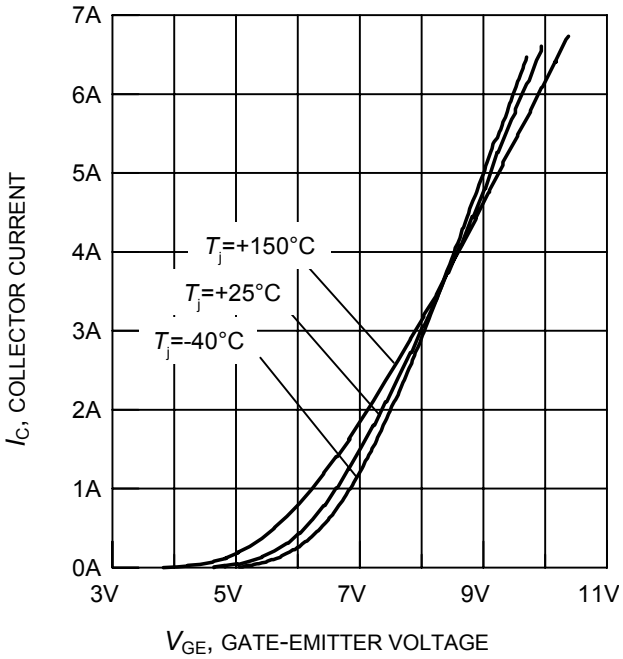


Figure 7. Typical transfer characteristics
(V_{CE} = 20V)

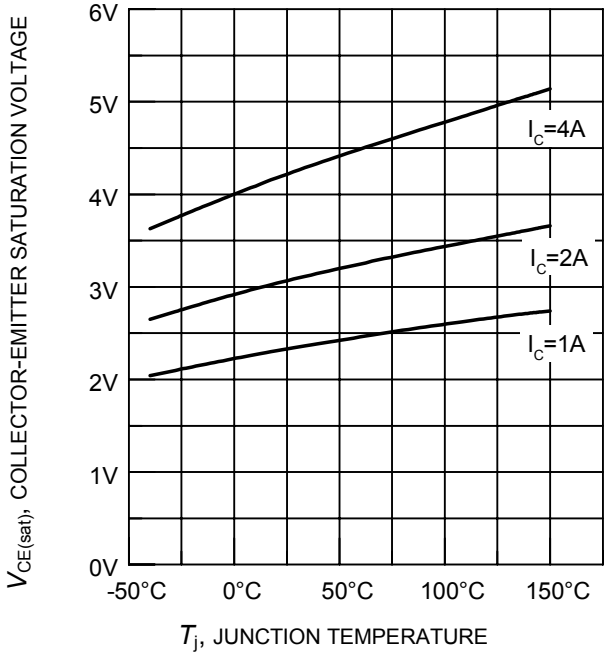


Figure 8. Typical collector-emitter saturation voltage as a function of junction temperature
(V_{GE} = 15V)

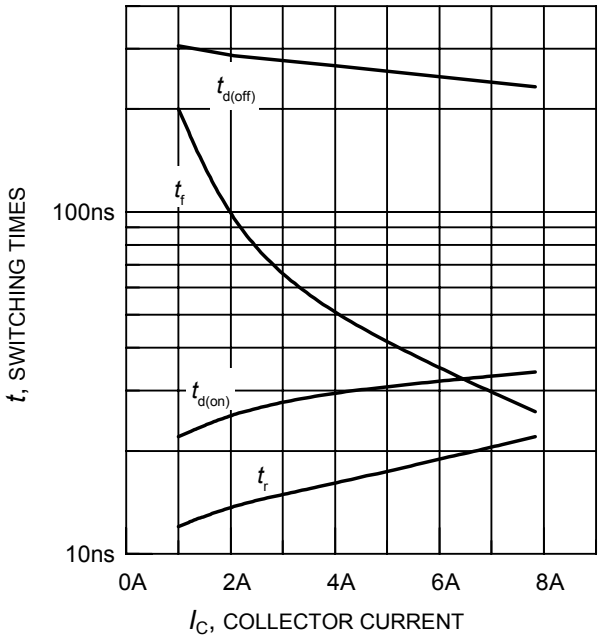


Figure 9. Typical switching times as a function of collector current
(inductive load, T_j = 150°C,
V_{CE} = 800V, V_{GE} = +15V/0V, R_G = 91Ω,
dynamic test circuit in Fig.E)

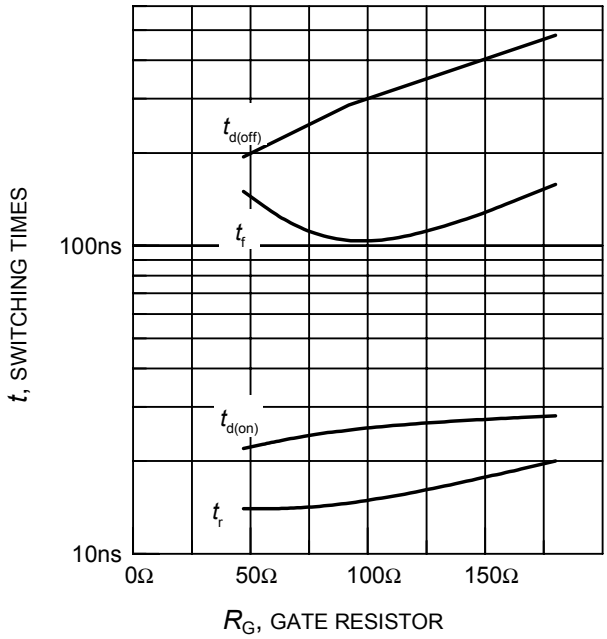


Figure 10. Typical switching times as a function of gate resistor
(inductive load, T_j = 150°C,
V_{CE} = 800V, V_{GE} = +15V/0V, I_C = 2A,
dynamic test circuit in Fig.E)

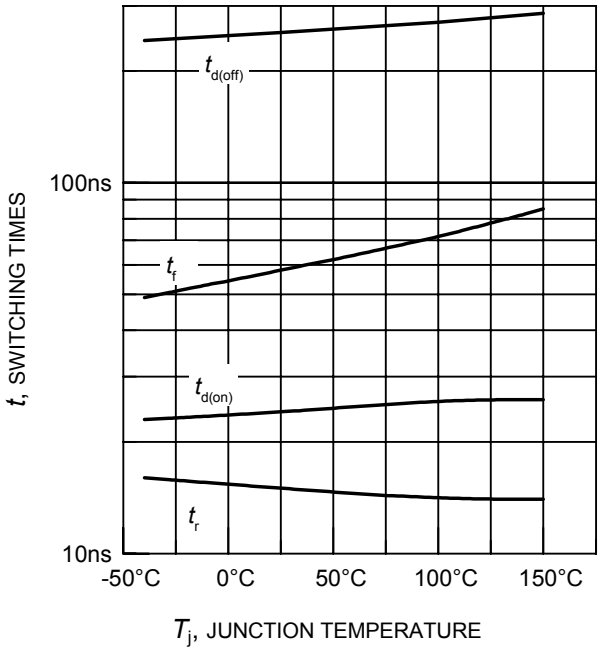


Figure 11. Typical switching times as a function of junction temperature
(inductive load, V_{CE} = 800V,
V_{GE} = +15V/0V, I_C = 2A, R_G = 91Ω,
dynamic test circuit in Fig.E)

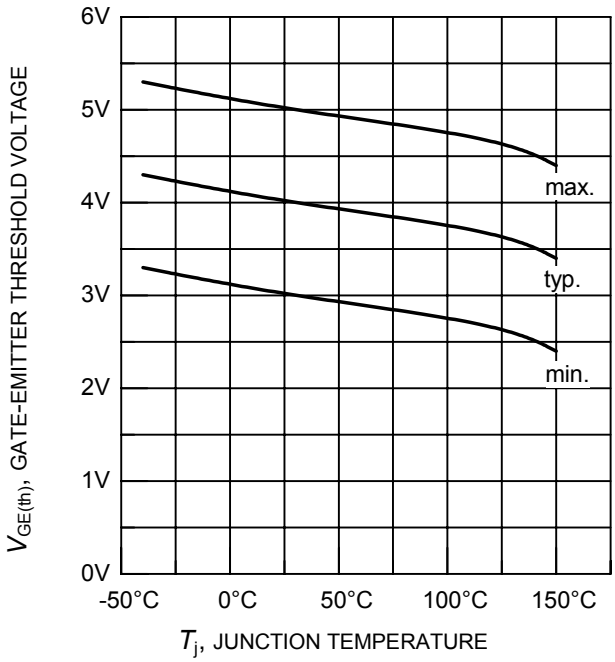


Figure 12. Gate-emitter threshold voltage as a function of junction temperature
(I_C = 0.3mA)

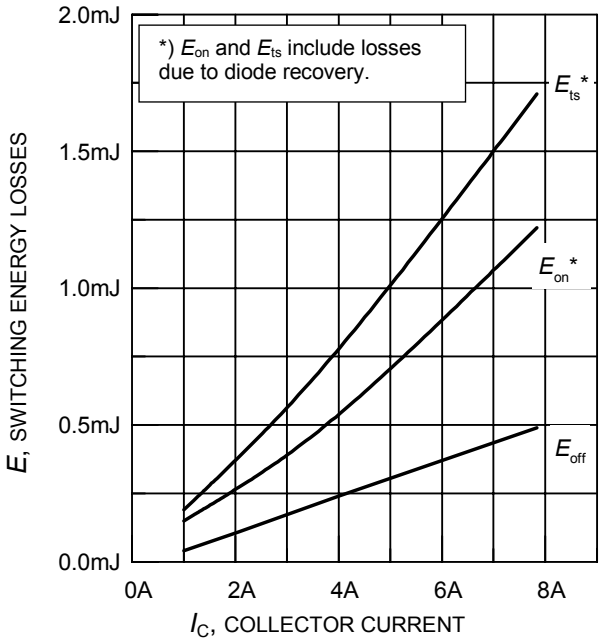


Figure 13. Typical switching energy losses as a function of collector current
(inductive load, T_j = 150°C,
V_{CE} = 800V, V_{GE} = +15V/0V, R_G = 91Ω,
dynamic test circuit in Fig.E)

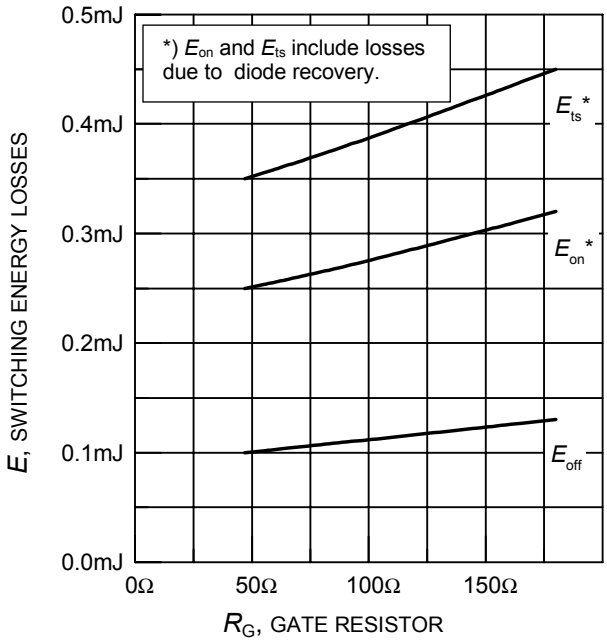


Figure 14. Typical switching energy losses as a function of gate resistor
(inductive load, T_j = 150°C,
V_{CE} = 800V, V_{GE} = +15V/0V, I_C = 2A,
dynamic test circuit in Fig.E)

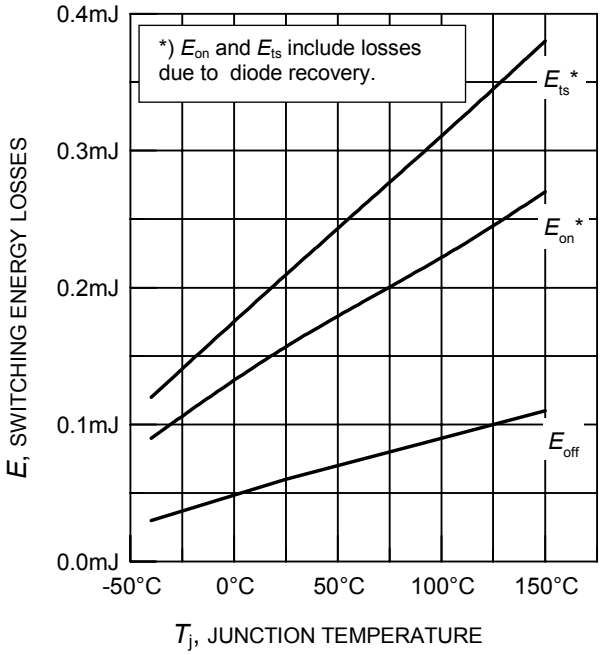


Figure 15. Typical switching energy losses as a function of junction temperature
(inductive load, V_{CE} = 800V,
V_{GE} = +15V/0V, I_C = 2A, R_G = 91Ω,
dynamic test circuit in Fig.E)

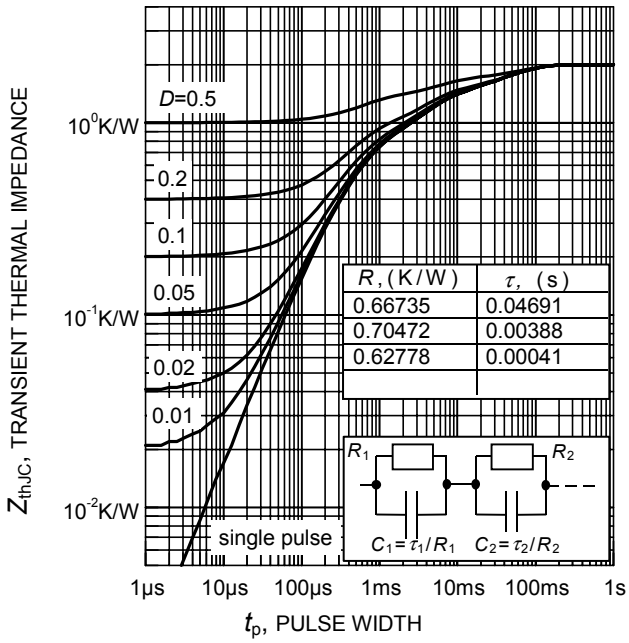


Figure 16. IGBT transient thermal impedance as a function of pulse width
($D = t_p / T$)

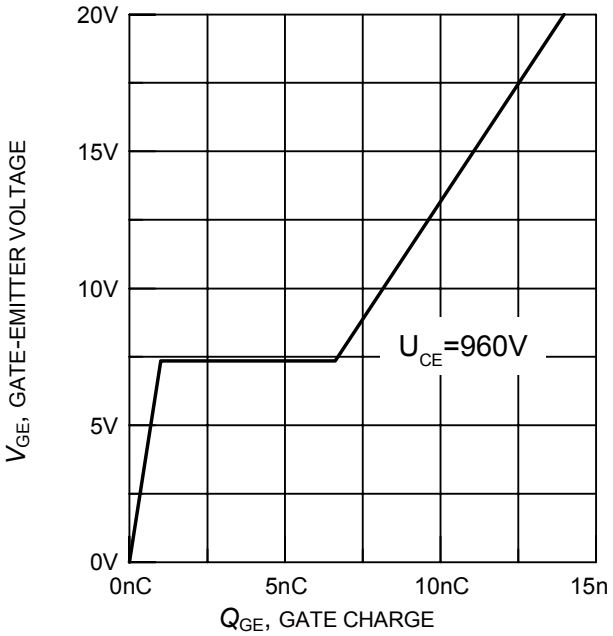


Figure 17. Typical gate charge
(I_C = 2A)

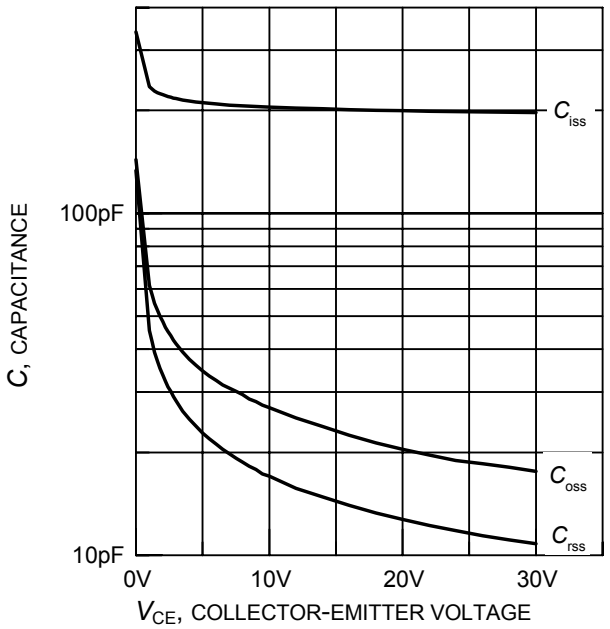


Figure 18. Typical capacitance as a function of collector-emitter voltage
(V_{GE} = 0V, f = 1MHz)

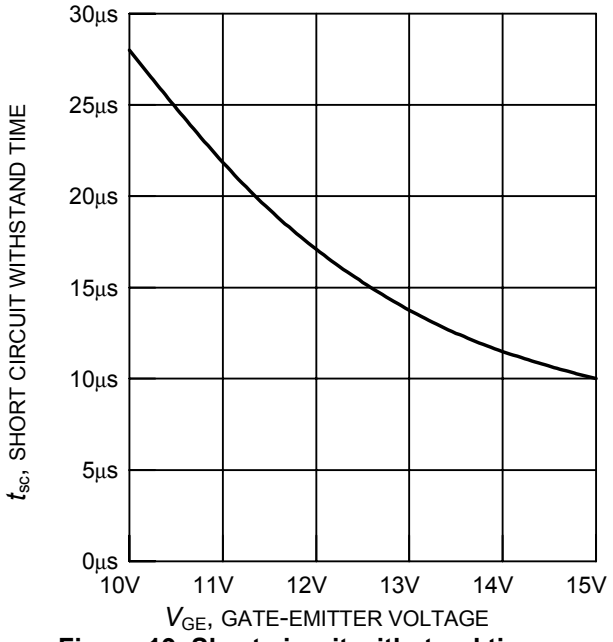


Figure 19. Short circuit withstand time as a function of gate-emitter voltage
(V_{CE} = 1200V, start at T_j = 25°C)

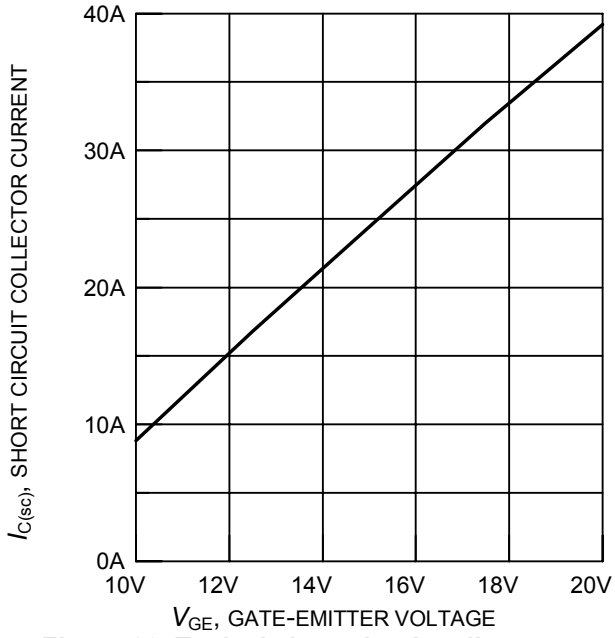


Figure 20. Typical short circuit collector current as a function of gate-emitter voltage
(100V ≤V_{CE} ≤1200V, T_C = 25°C, T_j ≤ 150°C)

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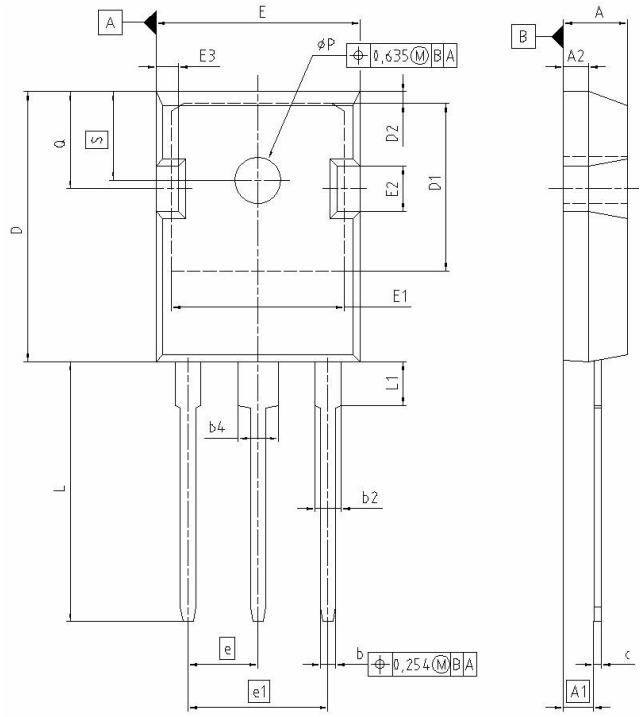

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.903	5.157	0.193	0.203
A1	2.273	2.527	0.092	0.096
A2	1.853	2.107	0.075	0.081
b	1.073	1.327	0.047	0.052
b2	1.903	2.386	0.075	0.094
b4	2.870	3.454	0.113	0.136
c	0.549	0.752	0.024	0.030
D	20.823	21.077	0.820	0.830
D1	17.323	17.831	0.682	0.702
D2	1.063	1.317	0.042	0.052
E	15.773	16.027	0.621	0.631
E1	13.893	14.147	0.547	0.557
E2	3.683	3.937	0.145	0.155
E3	1.683	1.937	0.066	0.076
e	5.450		0.215	
e1	10.900		0.430	
N	3		3	
L	20.053	20.307	0.789	0.799
L1	4.168	4.472	0.164	0.176
øP	3.559	3.661	0.140	0.144
Q	5.493	5.747	0.216	0.226
S	6.043	6.297	0.238	0.248

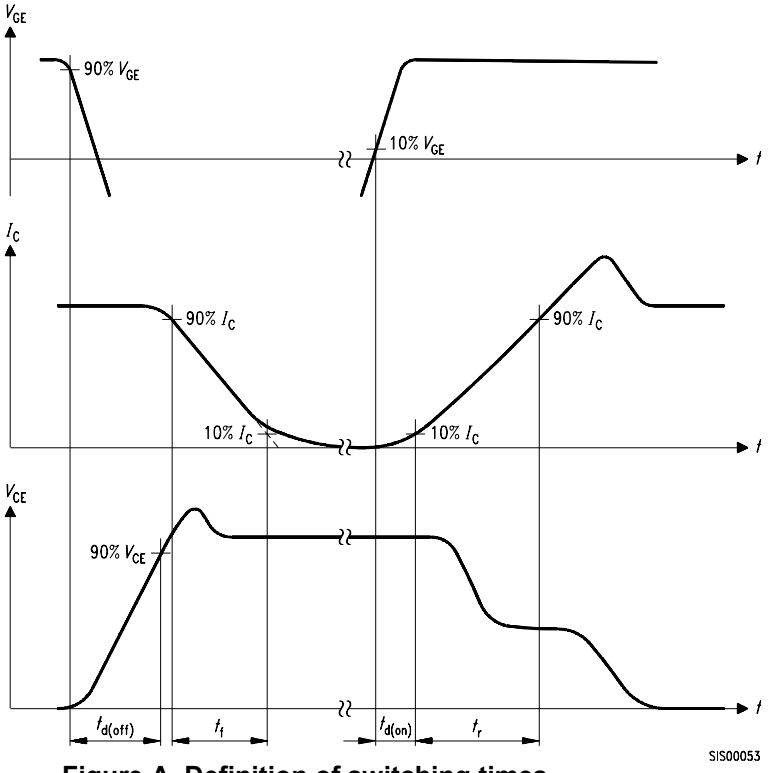

Figure A. Definition of switching times

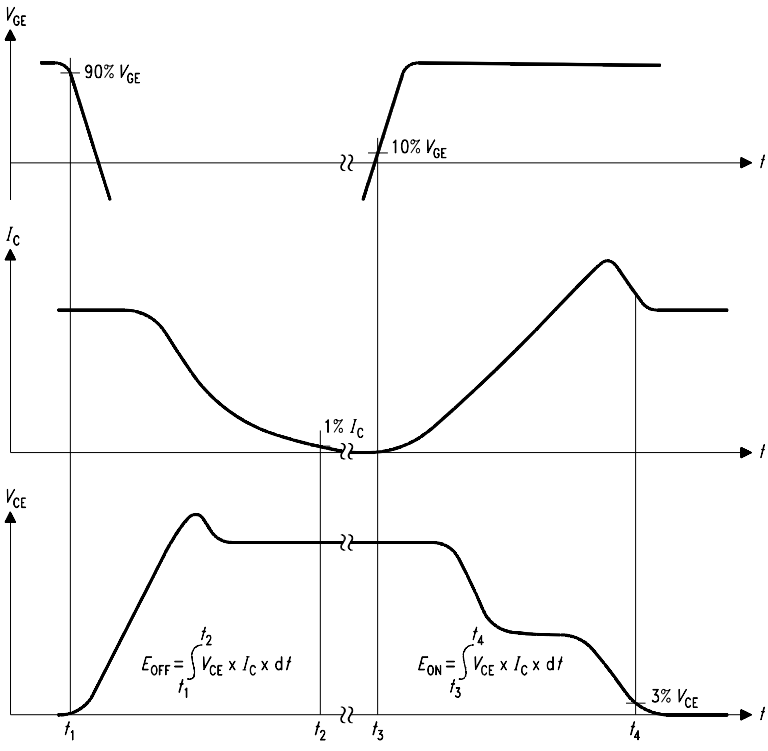

Figure B. Definition of switching losses

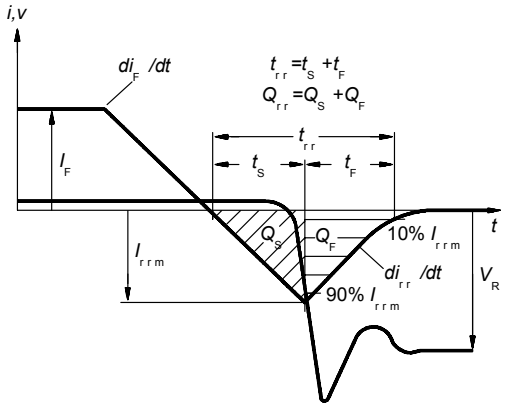

Figure C. Definition of diodes switching characteristics

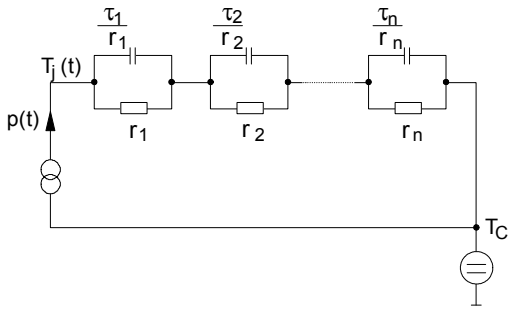

Figure D. Thermal equivalent circuit

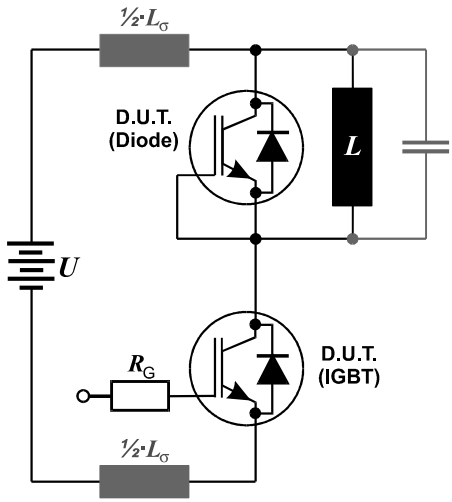

Figure E. Dynamic test circuit
Leakage inductance L_σ=180nH,
and stray capacity C_σ =40pF.

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