Never stop thinking

IGBT

High speed IGBT in Trench and Fieldstop technology

IGB20N60H3

600V high speed switching series third generation

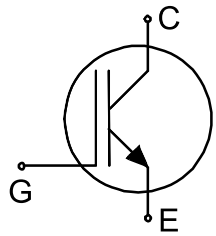
Datasheet

Industrial & Multimarket

High speed IGBT in Trench and Fieldstop technology

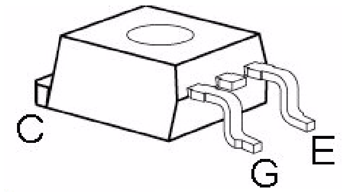
Features:

TRENCHSTOP™ technology offering
- very low V_{CEsat}
- low EMI
- maximum junction temperature 175°C
- qualified according to JEDEC for target applications
- Pb-free lead plating; RoHS compliant
- complete product spectrum and PSpice Models: http://www.infineon.com/igbt/



Applications:

- uninterruptible power supplies
- welding converters
- converters with high switching frequency



PG-TO263-3

Key Performance and Package Parameters

Type	V_{CE}	I_C	V_{CEsat}, T_{vj}=25°C	T_{vjmax}	Marking	Package
IGB20N60H3	600V	20A	1.95V	175°C	G20H603	PG-TO263-3

Table of Contents

Maximum ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CE}	600	V
DC collector current, limited by T_{vjmax} T_C = 25°C T_C = 100°C	I_C	40.0 20.0	A
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpuls}	80.0	A
Turn off safe operating area V_{CE} ≤ 600V, T_{vj} ≤ 175°C	-	80.0	A
Gate-emitter voltage	V_{GE}	±20	V
Short circuit withstand time V_{GE} = 15.0V, V_{CC} ≤ 400V Allowed number of short circuits < 1000 Time between short circuits: ≥ 1.0s T_{vj} = 150°C	t_{SC}	5	µs
Power dissipation T_C = 25°C Power dissipation T_C = 100°C	P_{tot}	170.0 85.0	W
Operating junction temperature	T_{vj}	-40...+175	°C
Storage temperature	T_{stg}	-55...+150	°C
Soldering temperature, reflow soldering (according to JEDEC J-STA-020)		260	°C

Thermal Resistance

Parameter	Symbol	Conditions	Max. Value	Unit
Characteristic				
IGBT thermal resistance, junction - case	$R_{th(j-c)}$		0.88	K/W
Thermal resistance, min. footprint junction - ambient	$R_{th(j-a)}$		65	K/W
Thermal resistance, 6cm² Cu on PCB junction - ambient	$R_{th(j-a)}$		40	K/W

Electrical Characteristic, at T_{vj} = 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 = 2.00mA	600	-	-	V
Collector-emitter saturation voltage	V_{CEsat}	V_{GE} = 15.0V, I_C = 20.0A T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 175°C	- - -	1.95 2.30 2.50	2.40 - -	V
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C = 0.29mA, V_{CE} = V_{GE}	4.1	5.1	5.7	V
Zero gate voltage collector current	I_{CES}	V_{CE} = 600V, V_{GE} = 0V T_{vj} = 25°C T_{vj} = 175°C	- -	- -	40.0 1000.0	µA
Gate-emitter leakage current	I_{GES}	V_{CE} = 0V, V_{GE} = 20V	-	-	100	nA
Transconductance	g_{fs}	V_{CE} = 20V, I_C = 20.0A	-	10.9	-	S

Electrical Characteristic, at T_{vj} = 25°C, unless otherwise specified

Parameter	Symbol	Conditions	Value min.	Value typ.	Value max.	Unit
Dynamic Characteristic						
Input capacitance	C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz	-	1100	-	pF
Output capacitance	C_{oes}		-	70	-	
Reverse transfer capacitance	C_{res}		-	32	-	
Gate charge	Q_G	V_{CC} = 480V, I_C = 20.0A, V_{GE} = 15V	-	120.0	-	nC
Short circuit collector current Max. 1000 short circuits Time between short circuits: ≥ 1.0s	$I_{C(SC)}$	V_{GE} = 15.0V, V_{CC} ≤ 400V, t_{SC} ≤ 5μs T_{vj} = 150°C	-	120	-	A

Switching Characteristic, Inductive Load, at T_{vj} = 25°C

Parameter	Symbol	Conditions	Value min.	Value typ.	Value max.	Unit
IGBT Characteristic						
Turn-on delay time	$t_{d(on)}$	T_{vj} = 25°C, V_{CC} = 400V, I_C = 20.0A, V_{GE} = 0.0/15.0V, r_G = 14.6Ω, $L_σ$ = 75nH, $C_σ$ = 30pF $L_σ$, $C_σ$ from Fig. E Energy losses include “tail” and diode (IKP20N60H3) reverse recovery.	-	16	-	ns
Rise time	t_r		-	20	-	ns
Turn-off delay time	$t_{d(off)}$		-	194	-	ns
Fall time	t_f		-	11	-	ns
Turn-on energy	E_{on}		-	0.45	-	mJ
Turn-off energy	E_{off}		-	0.24	-	mJ
Total switching energy	E_{ts}		-	0.69	-	mJ

Switching Characteristic, Inductive Load, at T_{vj} = 175°C

Parameter	Symbol	Conditions	Value min.	Value typ.	Value max.	Unit
IGBT Characteristic						
Turn-on delay time	$t_{d(on)}$	T_{vj} = 175°C, V_{CC} = 400V, I_C = 20.0A, V_{GE} = 0.0/15.0V, r_G = 14.6Ω, $L_σ$ = 75nH, $C_σ$ = 30pF $L_σ$, $C_σ$ from Fig. E Energy losses include “tail” and diode (IKP20N60H3) reverse recovery.	-	16	-	ns
Rise time	t_r		-	15	-	ns
Turn-off delay time	$t_{d(off)}$		-	227	-	ns
Fall time	t_f		-	14	-	ns
Turn-on energy	E_{on}		-	0.60	-	mJ
Turn-off energy	E_{off}		-	0.36	-	mJ
Total switching energy	E_{ts}		-	0.96	-	mJ

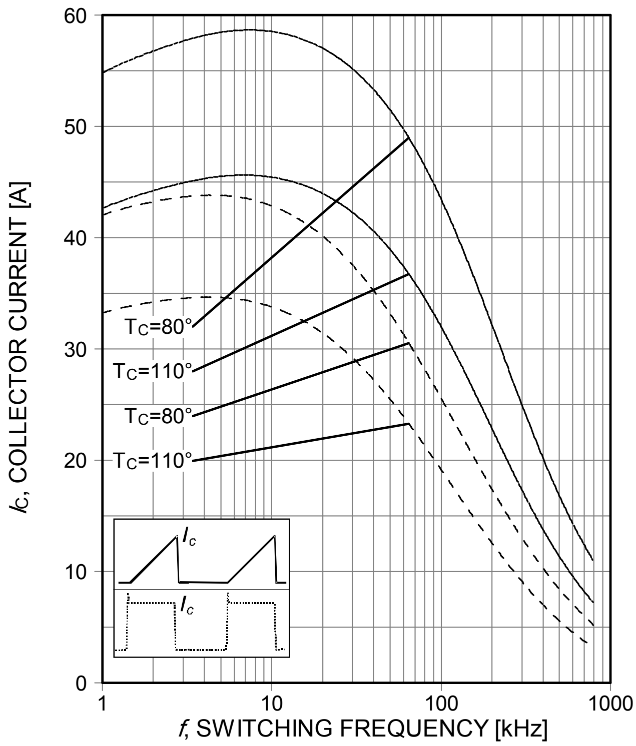


Figure 1. Collector current as a function of switching frequency
($T_j \leq 175°C$, D=0.5, V_{CE}=400V, V_{GE}=15/0V, R_G=14,6Ω)

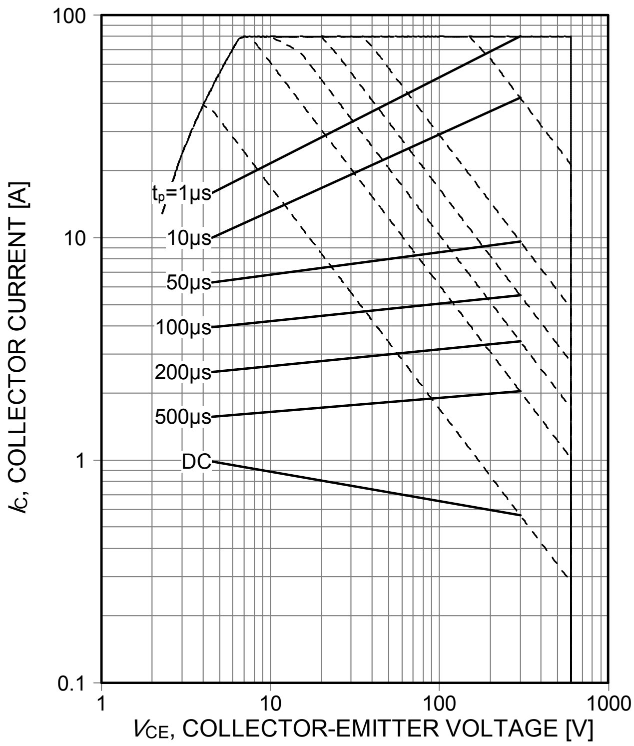


Figure 2. Forward bias safe operating area
(D=0, T_C=25°C, $T_j \leq 175°C$; V_{GE}=15V)

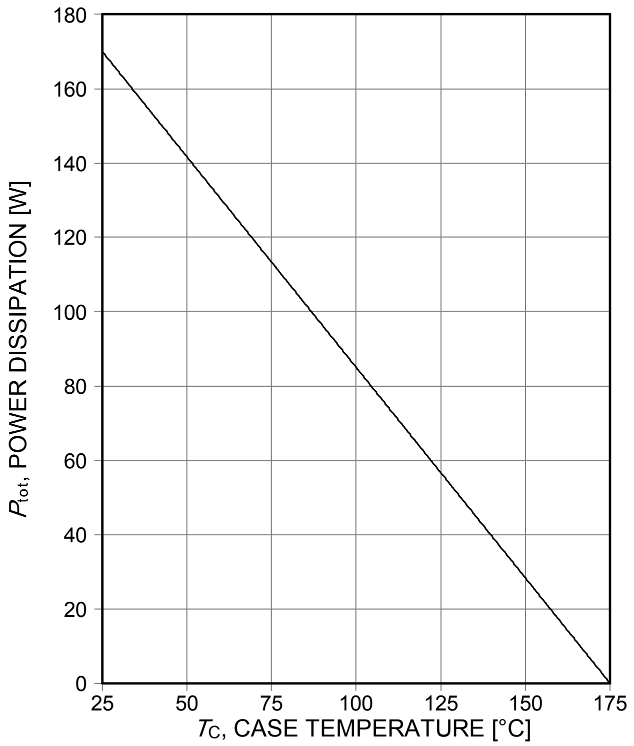


Figure 3. Power dissipation as a function of case temperature
($T_j \leq 175°C$)

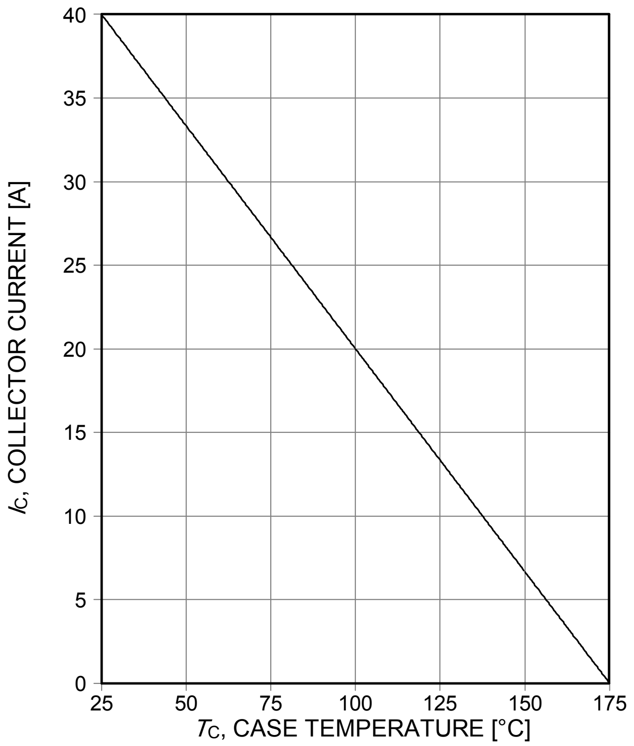


Figure 4. Collector current as a function of case temperature
($V_{GE} \geq 15V$, $T_j \leq 175°C$)

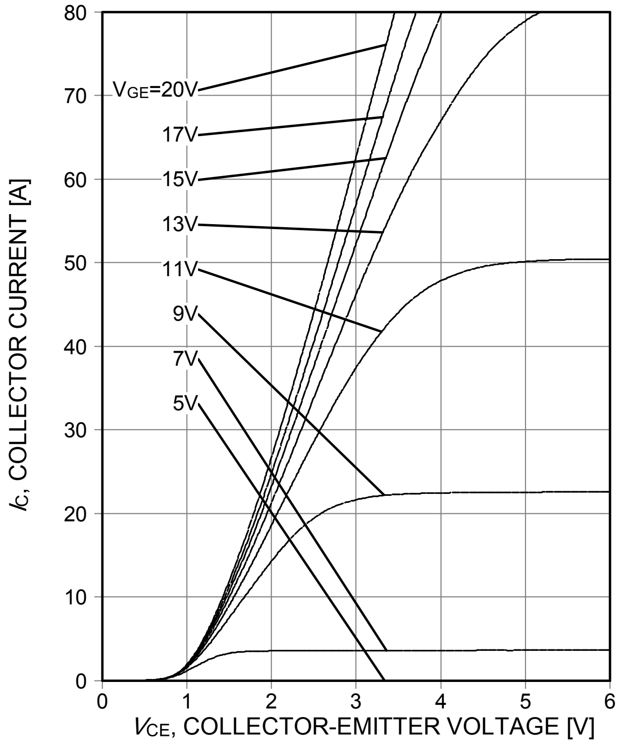


Figure 5. Typical output characteristic
(T_j=25°C)

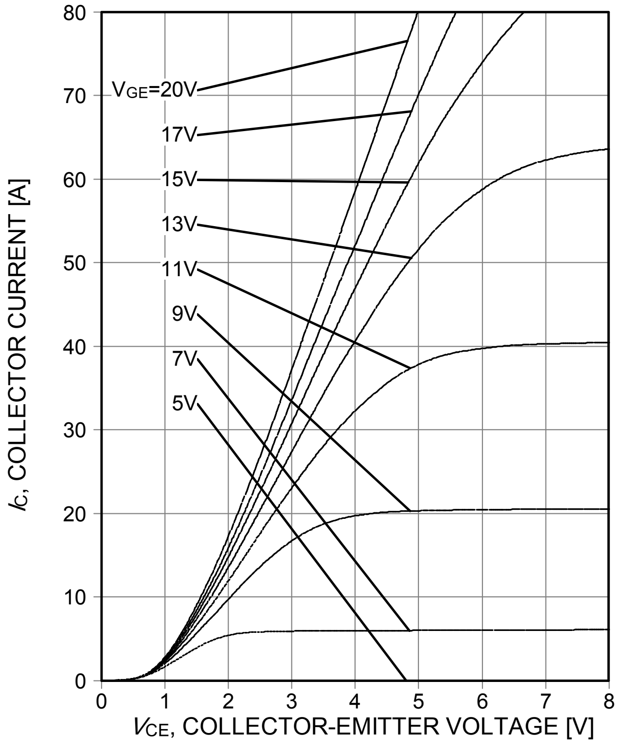


Figure 6. Typical output characteristic
(T_j=175°C)

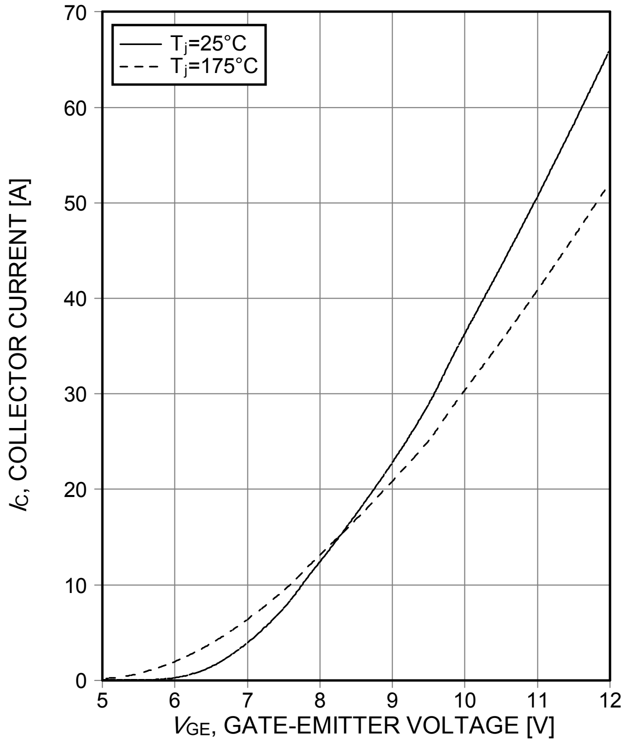


Figure 7. Typical transfer characteristic
(V_{CE}=20V)

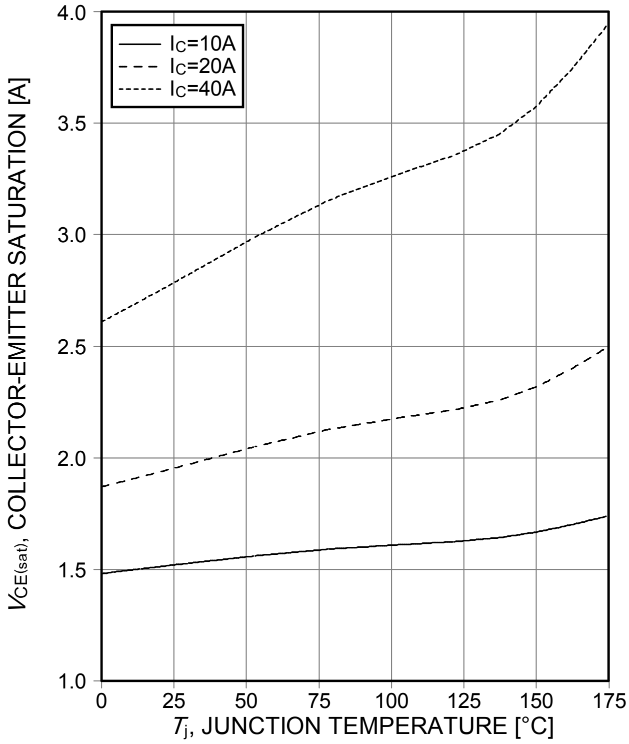


Figure 8. Typical collector-emitter saturation voltage as a function of junction temperature
(V_{GE}=15V)

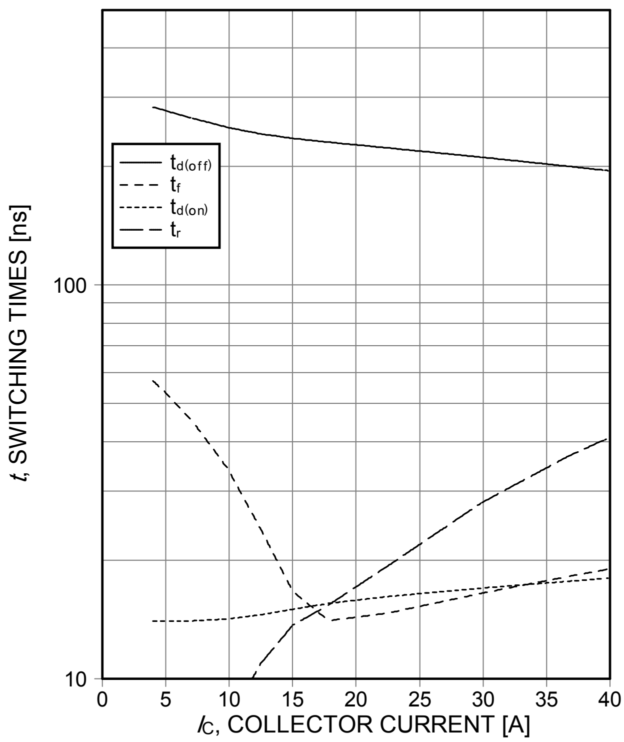


Figure 9. Typical switching times as a function of collector current
(ind. load, T_j=175°C, V_{CE}=400V, V_{GE}=15/0V, R_G=14,6Ω, test circuit in Fig. E)

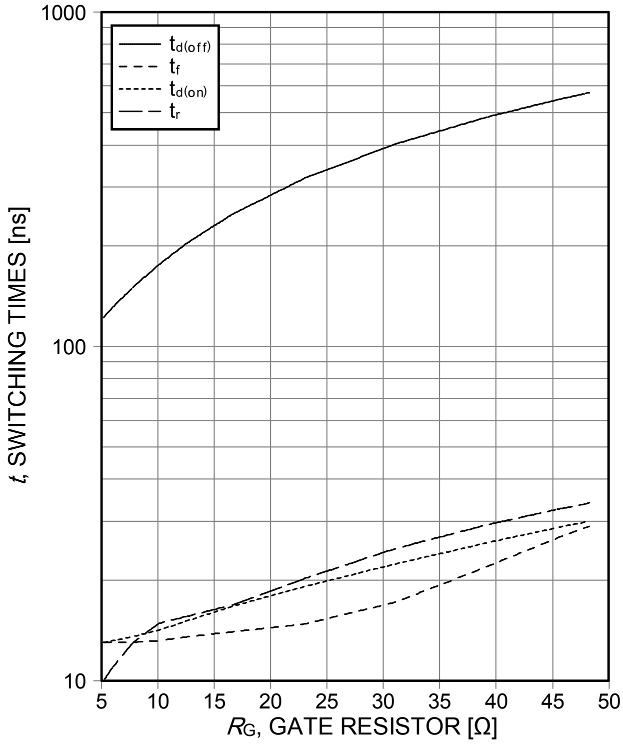


Figure 10. Typical switching times as a function of gate resistor
(ind. load, T_j=175°C, V_{CE}=400V, V_{GE}=15/0V, I_C=20A, test circuit in Fig. E)

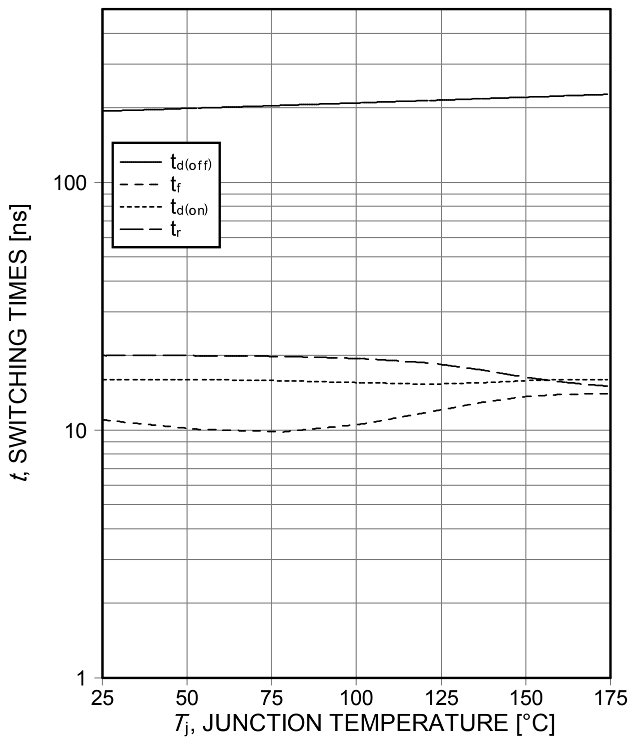


Figure 11. Typical switching times as a function of junction temperature
(ind. load, V_{CE}=400V, V_{GE}=15/0V, I_C=20A, R_G=14,6Ω, test circuit in Fig. E)

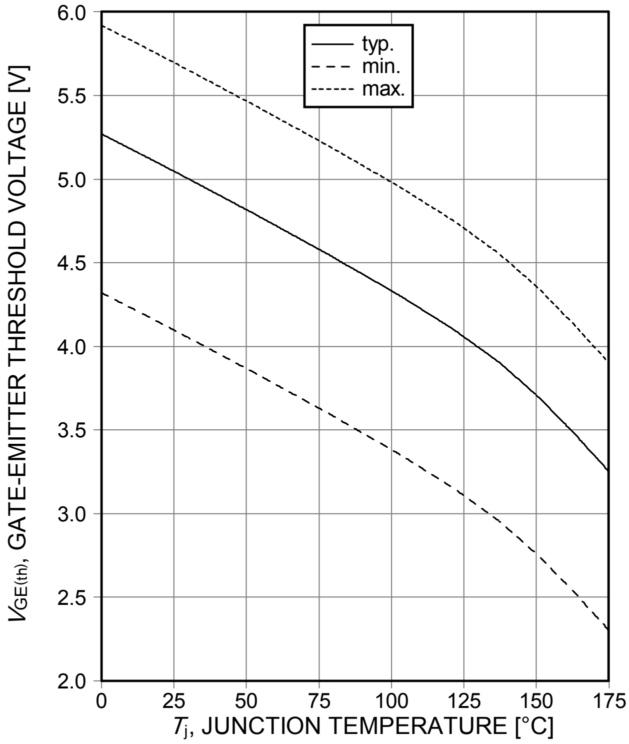


Figure 12. Gate-emitter threshold voltage as a function of junction temperature
(I_C=0.29mA)

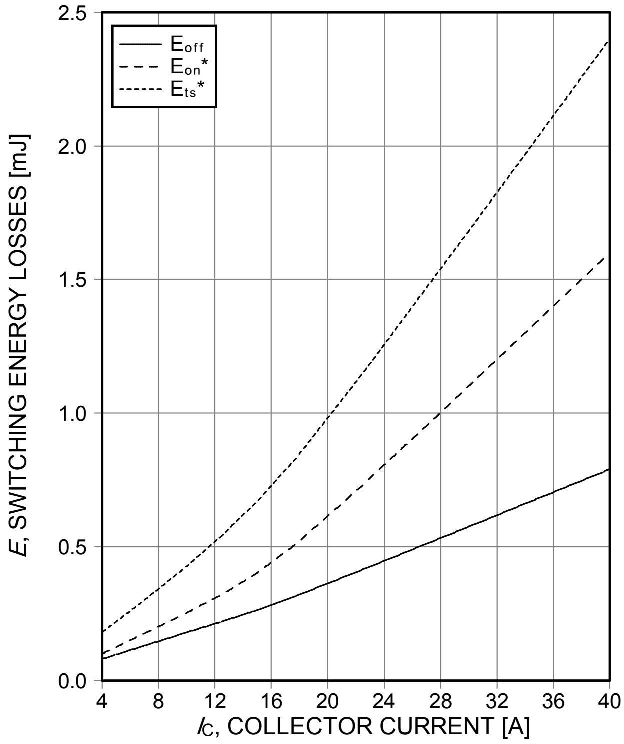


Figure 13. Typical switching energy losses as a function of collector current
(ind. load, T_j=175°C, V_{CE}=400V, V_{GE}=15/0V, R_G=14,6Ω, test circuit in Fig. E)

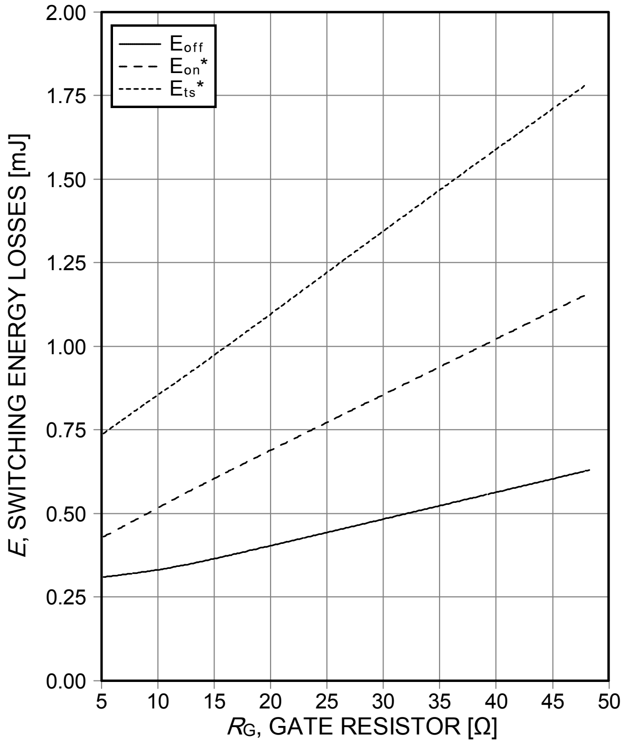


Figure 14. Typical switching energy losses as a function of gate resistor
(ind. load, T_j=175°C, V_{CE}=400V, V_{GE}=15/0V, I_C=20A, test circuit in Fig. E)

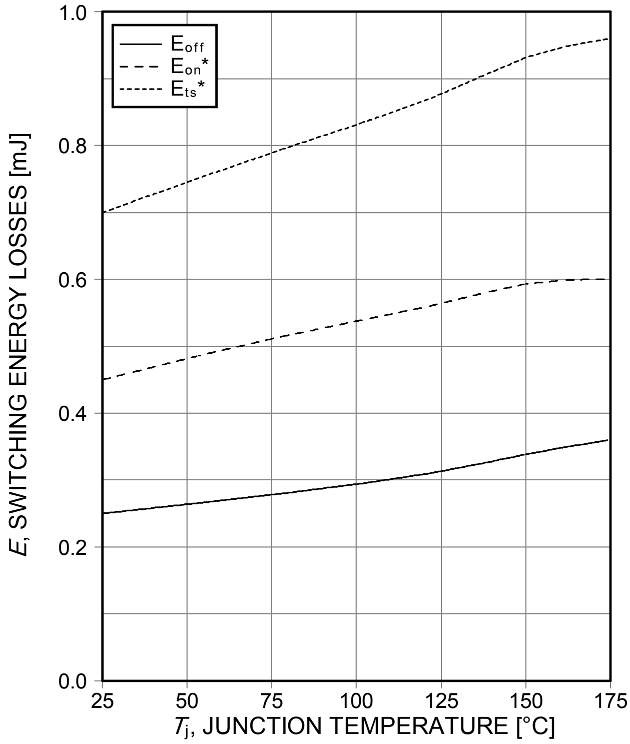


Figure 15. Typical switching energy losses as a function of junction temperature
(ind load, V_{CE}=400V, V_{GE}=15/0V, I_C=20A, R_G=14,6Ω, test circuit in Fig. E)

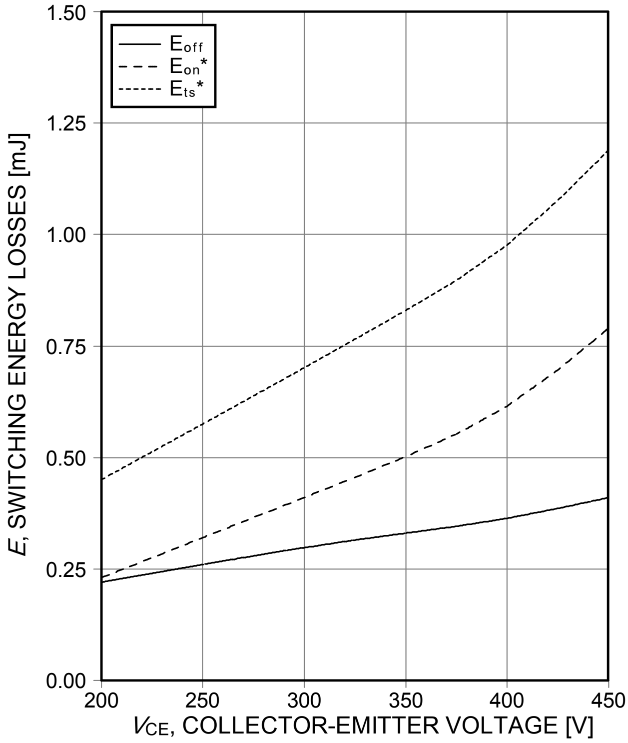


Figure 16. Typical switching energy losses as a function of collector emitter voltage
(ind. load, T_j=175°C, V_{GE}=15/0V, I_C=20A, R_G=14,6Ω, test circuit in Fig. E)

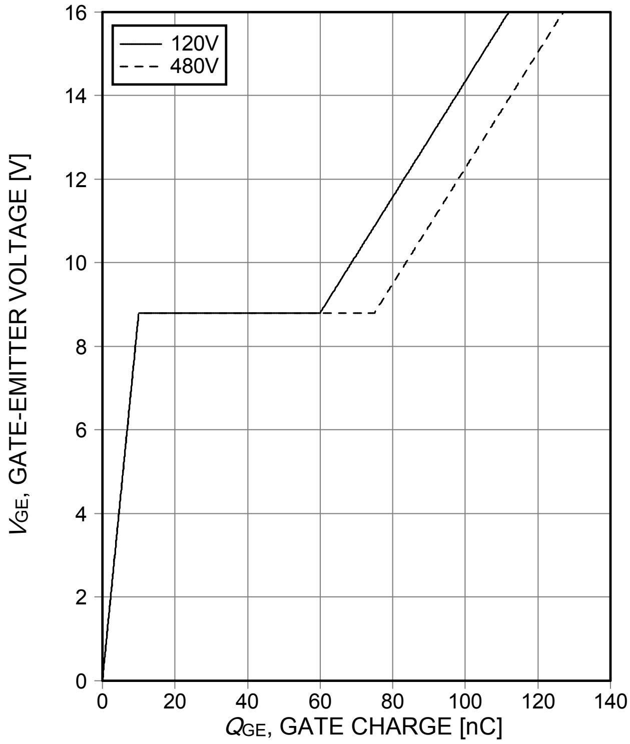


Figure 17. Typical gate charge
(I_C=20A)

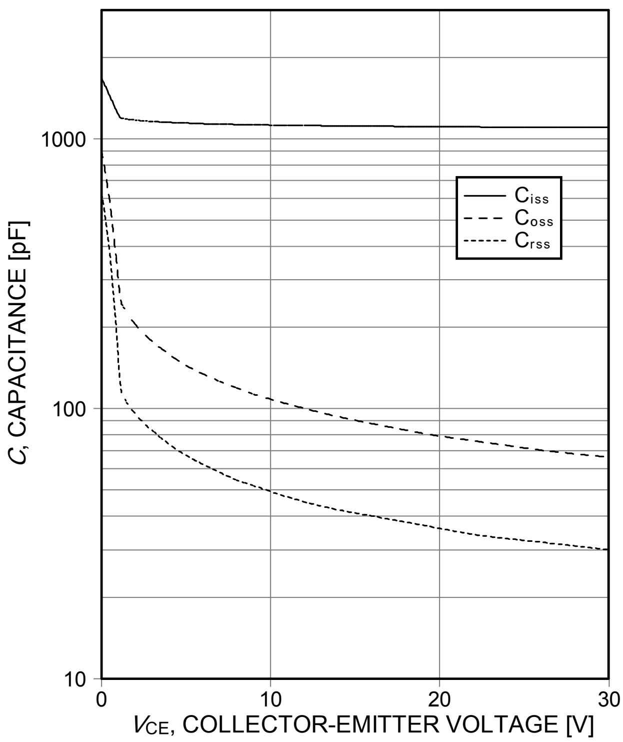


Figure 18. Typical capacitance as a function of collector-emitter voltage
(V_{GE}=0V, f=1MHz)

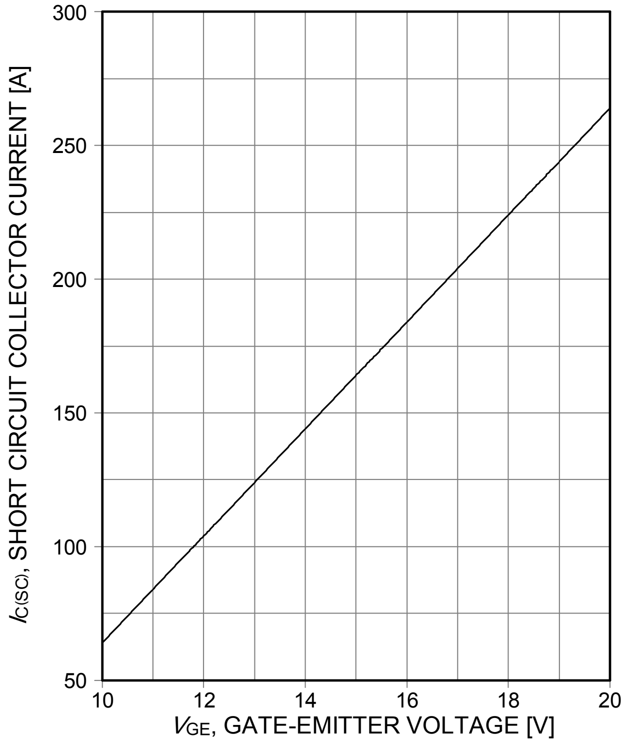


Figure 19. Typical short circuit collector current as a function of gate-emitter voltage
(V_{CE}≤400V, start at T_j=25°C)

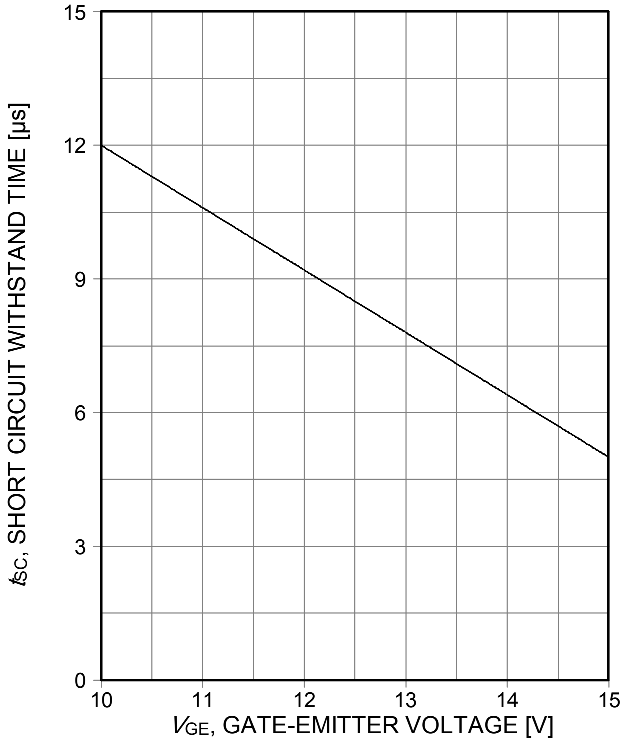


Figure 20. Short circuit withstand time as a function of gate-emitter voltage
(V_{CE}≤400V, start at T_j≤150°C)

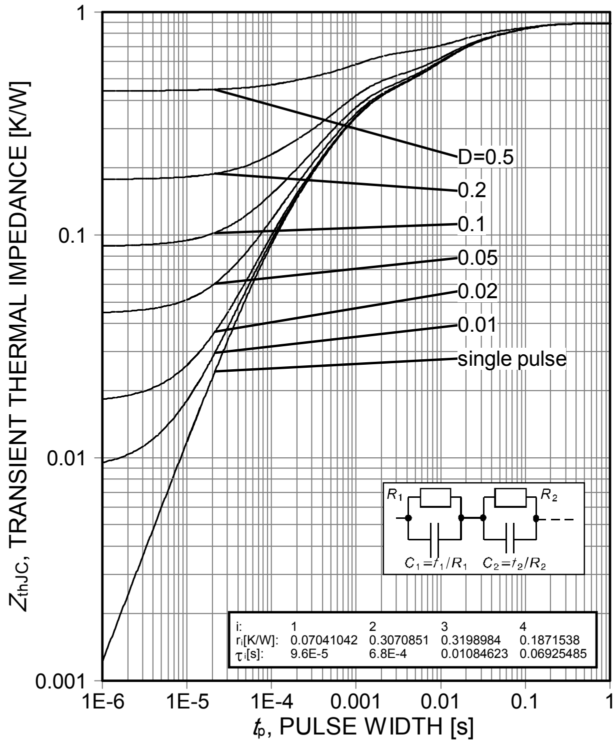
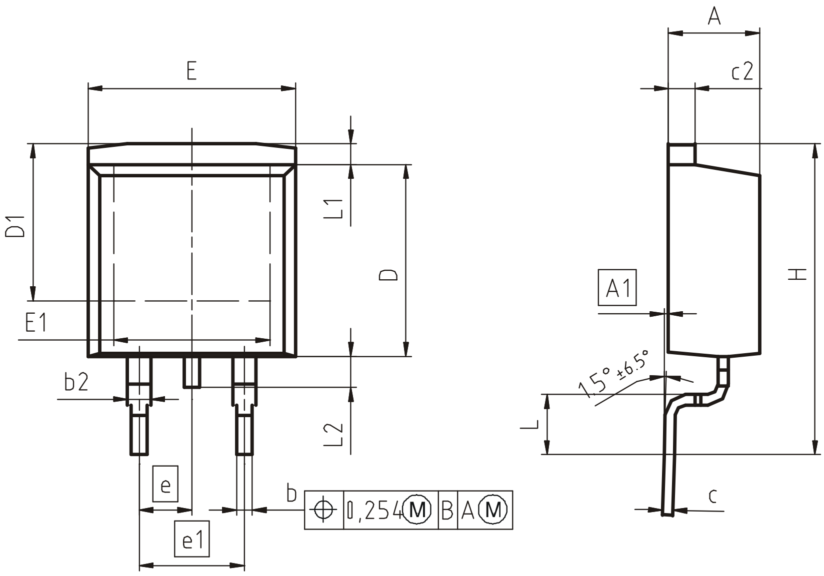
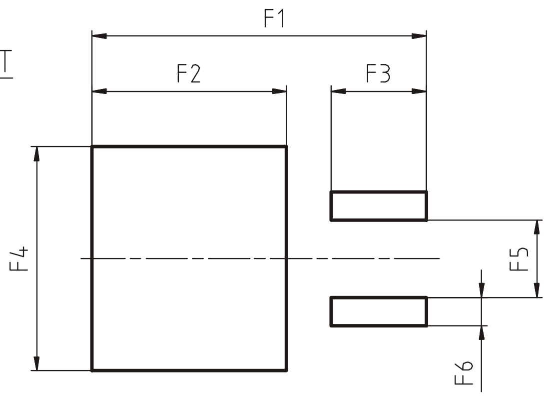


Figure 21. IGBT transient thermal impedance
(D=t_p/T)

PG-TO263-3



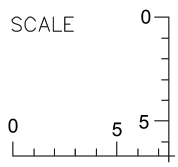
FOOTPRINT



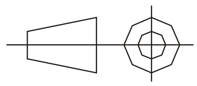
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.30	4.57	0.169	0.180
A1	0.00	0.25	0.000	0.010
b	0.65	0.85	0.026	0.033
b2	0.95	1.15	0.037	0.045
c	0.33	0.65	0.013	0.026
c2	1.17	1.40	0.046	0.055
D	8.51	9.45	0.335	0.372
D1	7.10	7.90	0.280	0.311
E	9.80	10.31	0.386	0.406
E1	6.50	8.60	0.256	0.339
e	2.54		0.100	
e1	5.08		0.200	
N	2		2	
H	14.61	15.88	0.575	0.625
L	2.29	3.00	0.090	0.118
L1	0.70	1.60	0.028	0.063
L2	1.00	1.78	0.039	0.070
F1	16.05	16.25	0.632	0.640
F2	9.30	9.50	0.366	0.374
F3	4.50	4.70	0.177	0.185
F4	10.70	10.90	0.421	0.429
F5	3.65	3.85	0.144	0.152
F6	1.25	1.45	0.049	0.057

DOCUMENT NO.
Z8B00003324

SCALE



EUROPEAN PROJECTION



ISSUE DATE
30-08-2007

REVISION
01

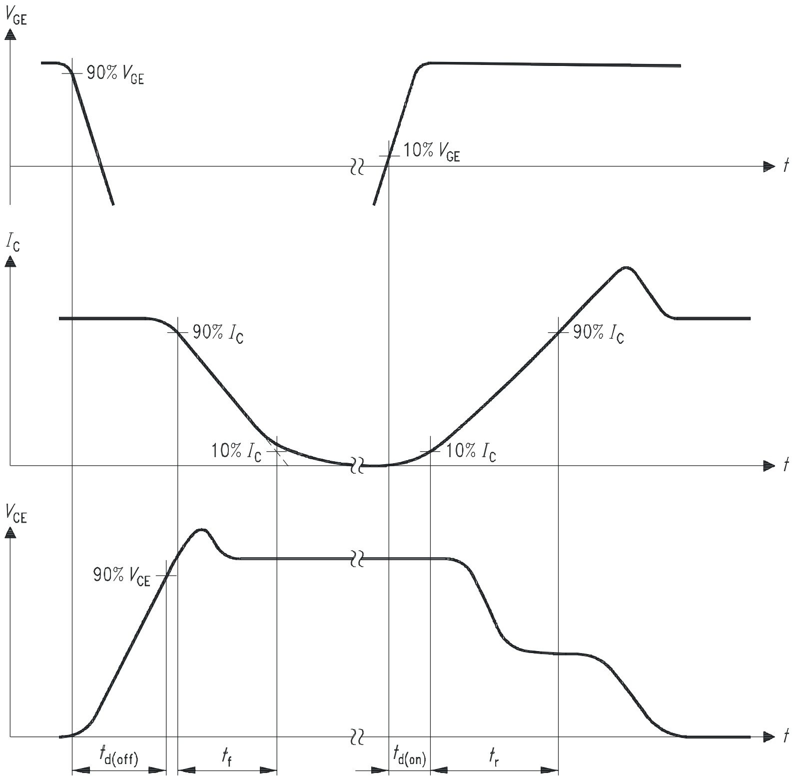


Figure A. Definition of switching times

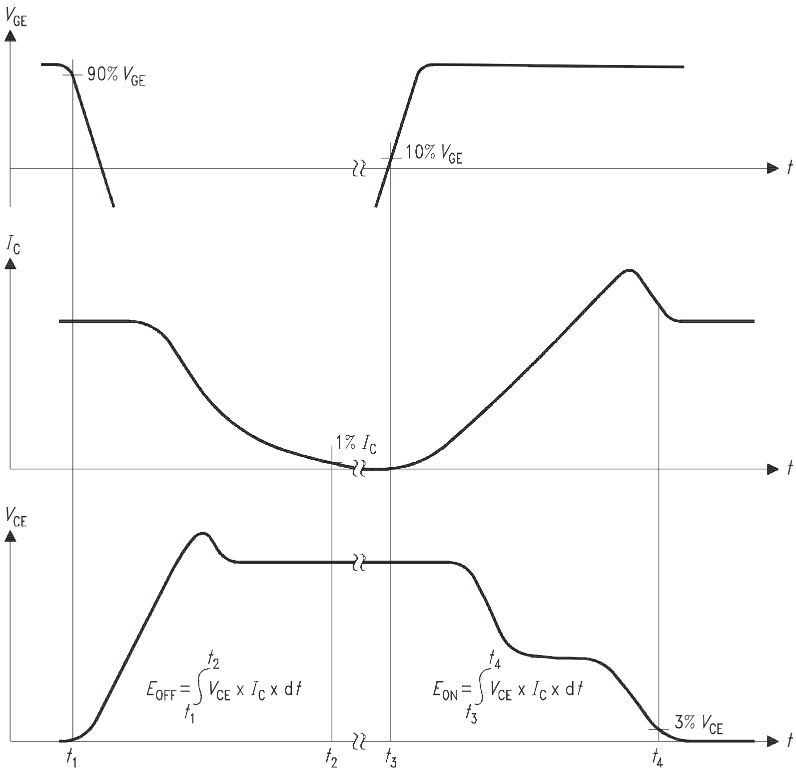


Figure B. Definition of switching losses

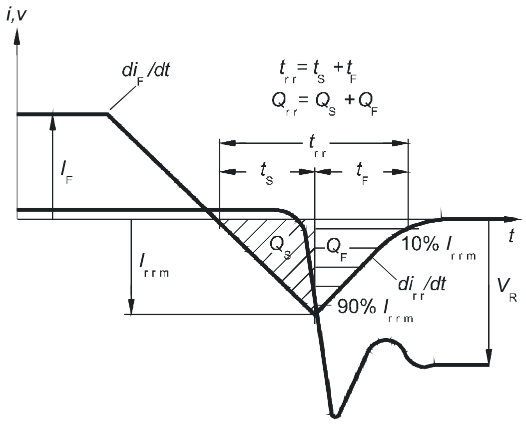


Figure C. Definition of diodes switching characteristics

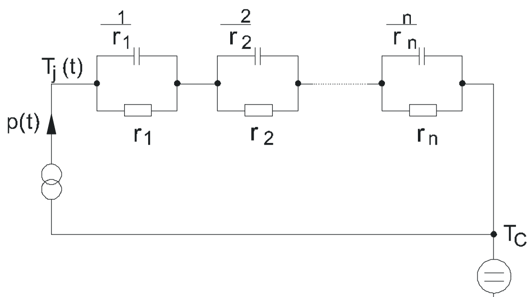


Figure D. Thermal equivalent circuit

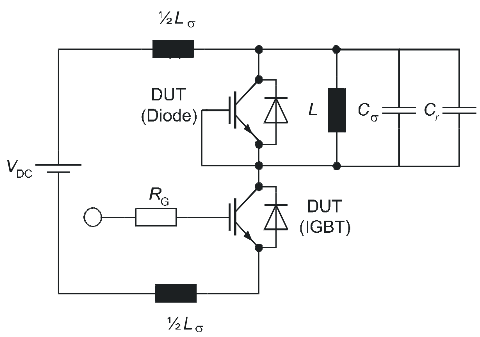


Figure E. Dynamic test circuit

Parasitic inductance L_σ,
Parasitic capacitor C_σ,
Relief capacitor C_r
(only for ZVT switching)

Revision History

IGB20N60H3

Revision: 2010-07-26, Rev. 1.1

Previous Revision		
Revision	Date	Subjects (major changes since last revision)
1.1	-	Preliminary datasheet

We Listen to Your Comments
Any information within this document that you feel is wrong, unclear or missing at all ?
Your feedback will help us to continuously improve the quality of this document.
Please send your proposal (including a reference to this document) to: erratum@infineon.com

Published by
Infineon Technologies AG
81726 Munich, Germany
81726 München, Germany

Legal Disclaimer
The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation, warranties of non-infringement of intellectual property rights of any third party.

Information
For further information on technology, delivery terms and conditions and prices, please contact the nearest Infineon Technologies Office (www.infineon.com).

Warnings
Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office. Infineon Technologies components may be used in life-support devices or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию .

Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

Минимальные сроки поставки, гибкие цены, неограниченный ассортимент и индивидуальный подход к клиентам являются основой для выстраивания долгосрочного и эффективного сотрудничества с предприятиями радиоэлектронной промышленности, предприятиями ВПК и научно-исследовательскими институтами России.

С нами вы становитесь еще успешнее!

Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург, Промышленная ул, дом № 19, литера Н, помещение 100-Н Офис 331