THE DATASHEET OF

IGW15N120H3FKSA1

IGBT

High speed IGBT in Trench and Fieldstop technology

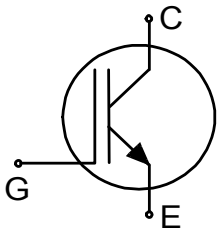
IGW15N120H3

1200V high speed switching series third generation

Data sheet

Industrial Power Control

High speed IGBT in Trench and Fieldstop technology



Features:

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

Applications:

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

Package pin definition:

• Pin 1 - gate
• Pin 2 & backside - collector
• Pin 3 - emitter

Key Performance and Package Parameters

Type	V_{CE}	I_C	V_{CEsat}, T_{vj}=25°C	T_{vjmax}	Marking	Package
IGW15N120H3	1200V	15A	2.05V	175°C	G15H1203	PG-TO247-3

Table of Contents

Maximum Ratings

For optimum lifetime and reliability, Infineon recommends operating conditions that do not exceed 80% of the maximum ratings stated in this datasheet.

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CE}	1200	V
DC collector current, limited by T_{vjmax} T_C = 25°C T_C = 100°C	I_C	 30.0 15.0	A
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpuls}	60.0	A
Turn off safe operating area $V_{CE} \le 1200V$, $T_{vj} \le 175°C$	-	60.0	A
Gate-emitter voltage	V_{GE}	±20	V
Short circuit withstand time V_{GE} = 15.0V, $V_{CC} \le 600V$ Allowed number of short circuits < 1000 Time between short circuits: ≥ 1.0s T_{vj} = 175°C	t_{SC}	 10	µs
Power dissipation T_C = 25°C Power dissipation T_C = 100°C	P_{tot}	217.0 105.0	W
Operating junction temperature	T_{vj}	-40...+175	°C
Storage temperature	T_{stg}	-55...+150	°C
Soldering temperature, wave soldering 1.6mm (0.063in.) from case for 10s		260	°C
Mounting torque, M3 screw Maximum of mounting processes: 3	M	0.6	Nm

Thermal Resistance

Parameter	Symbol	Conditions	Max. Value	Unit
Characteristic				
IGBT thermal resistance, junction - case	$R_{th(j-c)}$		0.70	K/W
Thermal resistance 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 = 0.50mA	1200	-	-	V
Collector-emitter saturation voltage	V_{CEsat}	V_{GE} = 15.0V, I_C = 15.0A T_{vj} = 25°C T_{vj} = 125°C T_{vj} = 175°C	 - - -	 2.05 2.50 2.70	 2.40 - -	V
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C = 0.50mA, V_{CE} = V_{GE}	5.0	5.8	6.5	V
Zero gate voltage collector current	I_{CES}	V_{CE} = 1200V, V_{GE} = 0V T_{vj} = 25°C T_{vj} = 175°C	 - -	 - -	 250.0 2500.0	µA
Gate-emitter leakage current	I_{GES}	V_{CE} = 0V, V_{GE} = 20V	-	-	600	nA
Transconductance	g_{fs}	V_{CE} = 20V, I_C = 15.0A	-	7.5	-	S

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

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
Dynamic Characteristic						
Input capacitance	C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz	-	875	-	pF
Output capacitance	C_{oes}		-	60	-	
Reverse transfer capacitance	C_{res}		-	45	-	
Gate charge	Q_G	V_{CC} = 960V, I_C = 15.0A, V_{GE} = 15V	-	75.0	-	nC
Short circuit collector current Max. 1000 short circuits Time between short circuits: ≥ 1.0s	$I_{C(SC)}$	V_{GE} = 15.0V, V_{CC} ≤ 600V, t_{SC} ≤ 10µs T_{vj} = 175°C	-	52	-	A

Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
IGBT Characteristic, at T_{vj} = 25°C						
Turn-on delay time	$t_{d(on)}$	T_{vj} = 25°C, V_{CC} = 600V, I_C = 15.0A, V_{GE} = 0.0/15.0V, $R_{G(on)}$ = 35.0Ω, $R_{G(off)}$ = 35.0Ω, $L\sigma$ = 95nH, $C\sigma$ = 67pF $L\sigma$, $C\sigma$ from Fig. E Energy losses include “tail” and diode (IKW15N120H3) reverse recovery.	-	21	-	ns
Rise time	t_r		-	34	-	ns
Turn-off delay time	$t_{d(off)}$		-	260	-	ns
Fall time	t_f		-	14	-	ns
Turn-on energy	E_{on}		-	1.10	-	mJ
Turn-off energy	E_{off}		-	0.45	-	mJ
Total switching energy	E_{ts}		-	1.55	-	mJ

Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
IGBT Characteristic, at T_{vj} = 175°C						
Turn-on delay time	$t_{d(on)}$	T_{vj} = 175°C, V_{CC} = 600V, I_C = 15.0A, V_{GE} = 0.0/15.0V, $R_{G(on)}$ = 35.0Ω, $R_{G(off)}$ = 35.0Ω, $L\sigma$ = 95nH, $C\sigma$ = 67pF $L\sigma$, $C\sigma$ from Fig. E Energy losses include “tail” and diode (IKW15N120H3) reverse recovery.	-	19	-	ns
Rise time	t_r		-	30	-	ns
Turn-off delay time	$t_{d(off)}$		-	327	-	ns
Fall time	t_f		-	43	-	ns
Turn-on energy	E_{on}		-	1.60	-	mJ
Turn-off energy	E_{off}		-	0.90	-	mJ
Total switching energy	E_{ts}		-	2.50	-	mJ

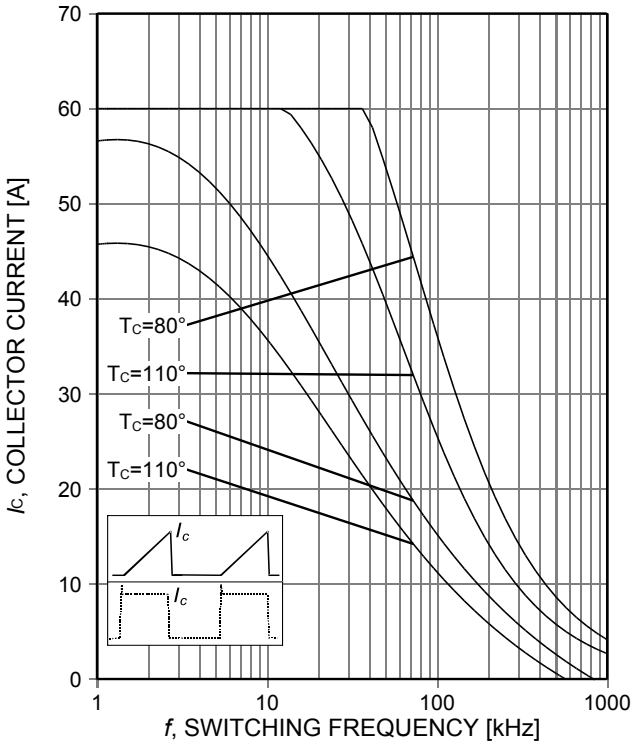


Figure 1. **Collector current as a function of switching frequency**
(T_j≤175°C, D=0.5, V_{CE}=600V, V_{GE}=15/0V, r_G=35Ω)

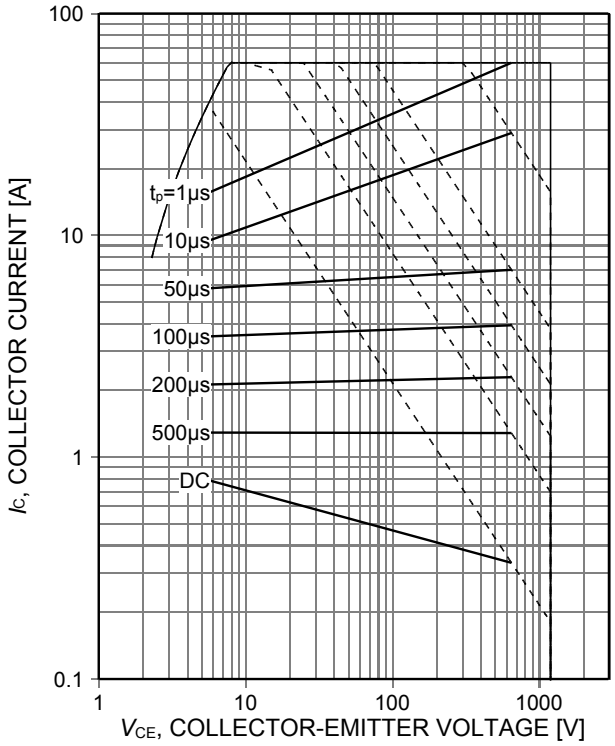


Figure 2. **Forward bias safe operating area**
(D=0, T_C=25°C, T_j≤175°C; V_{GE}=15V)

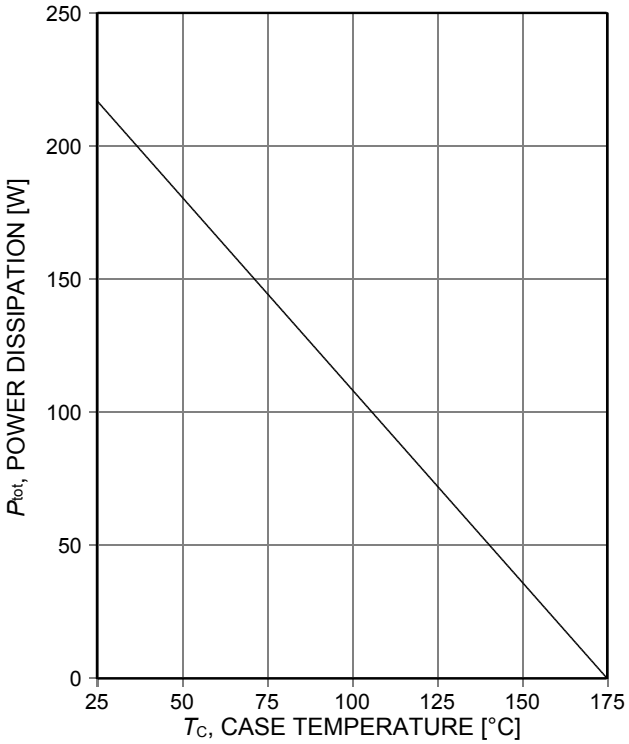


Figure 3. **Power dissipation as a function of case temperature**
(T_j≤175°C)

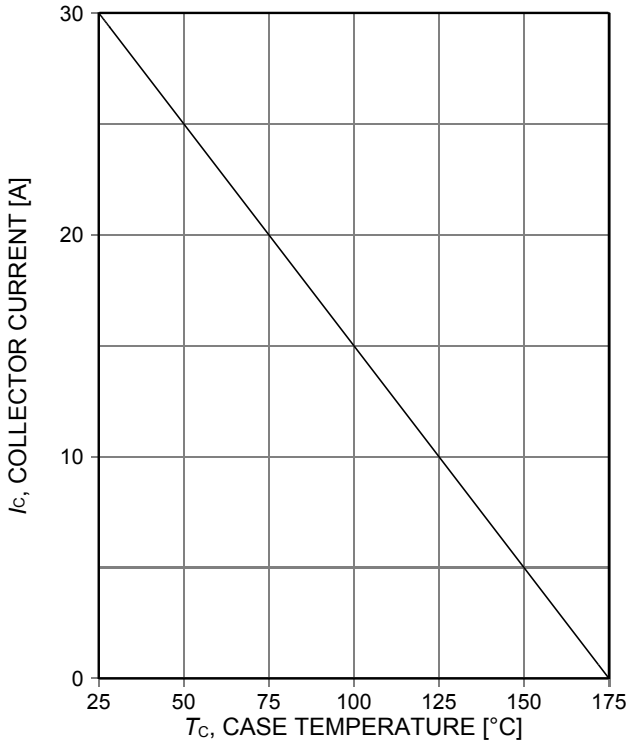


Figure 4. **Collector current as a function of case temperature**
(V_{GE}≥15V, T_j≤175°C)

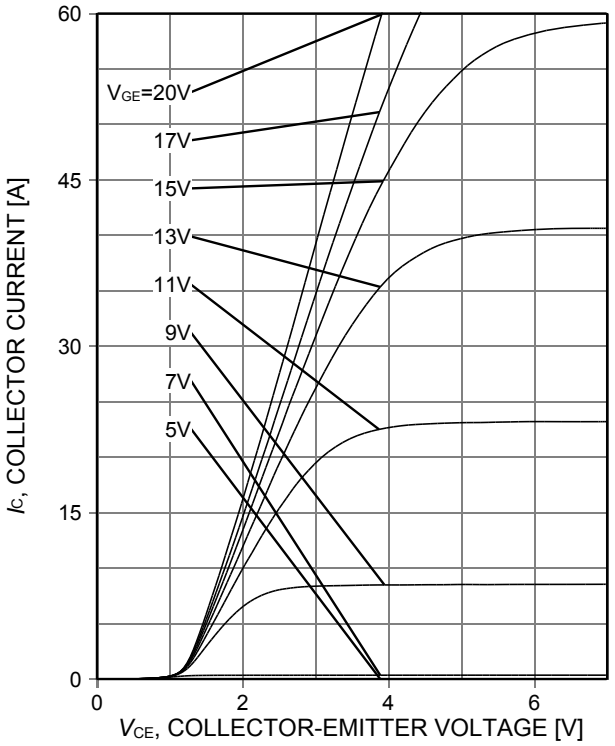


Figure 5. **Typical output characteristic** (T_j=25°C)

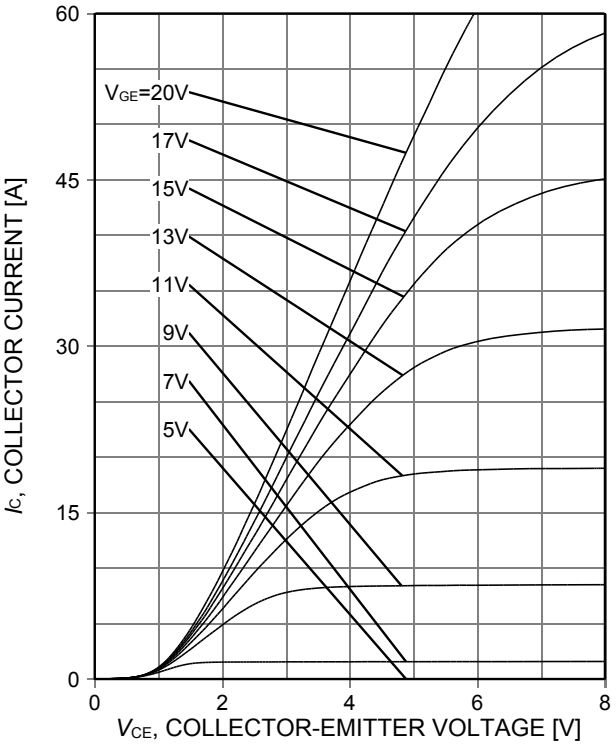


Figure 6. **Typical output characteristic** (T_j=175°C)

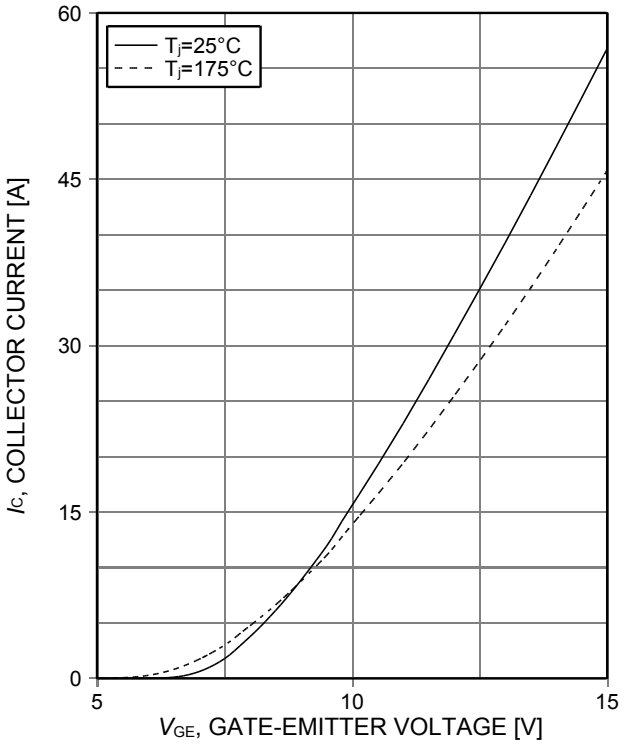


Figure 7. **Typical transfer characteristic** (V_{CE}=20V)

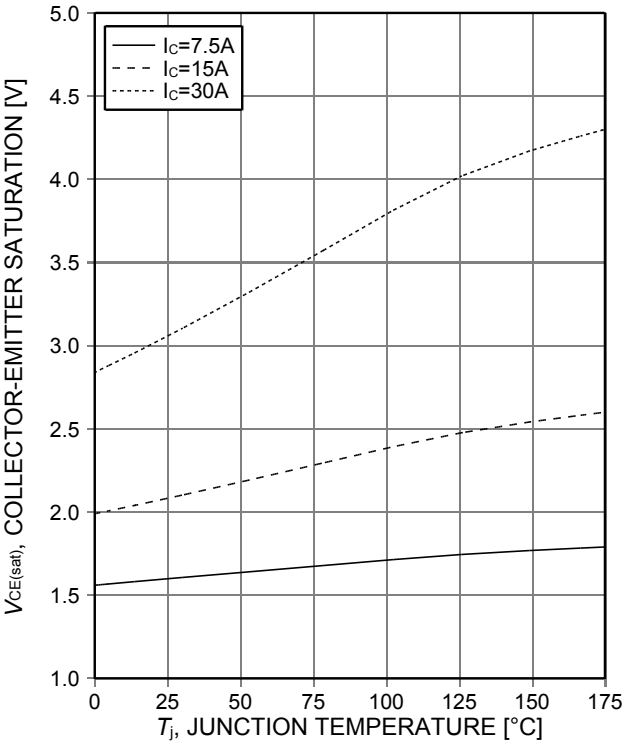


Figure 8. **Typical collector-emitter saturation voltage as a function of junction temperature** (V_{GE}=15V)

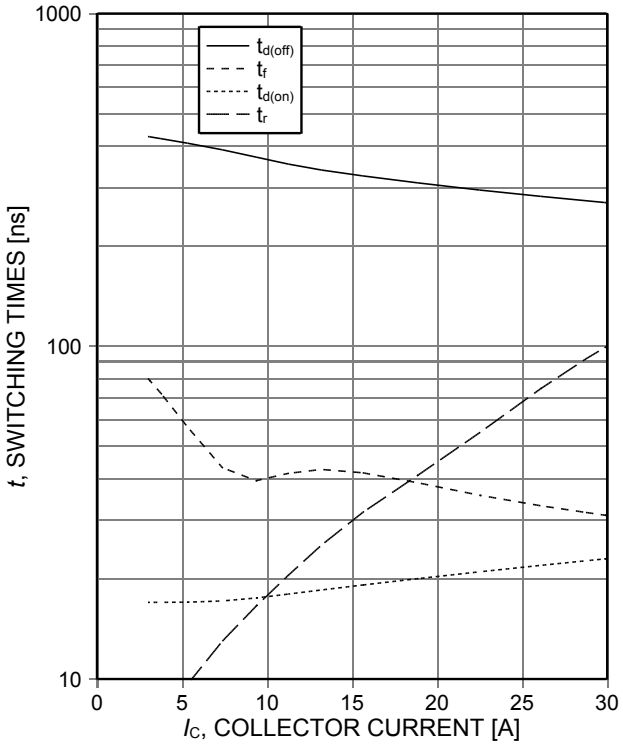


Figure 9. **Typical switching times as a function of collector current**
(ind. load, T_j=175°C, V_{CE}=600V, V_{GE}=15/0V, r_G=35Ω, test circuit in Fig. E)

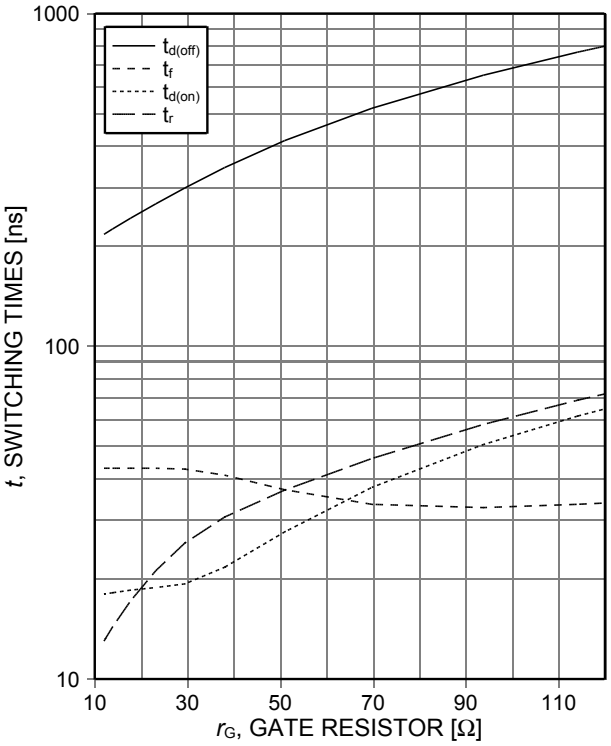


Figure 10. **Typical switching times as a function of gate resistor**
(ind. load, T_j=175°C, V_{CE}=600V, V_{GE}=15/0V, I_C=15A, test circuit in Fig. E)

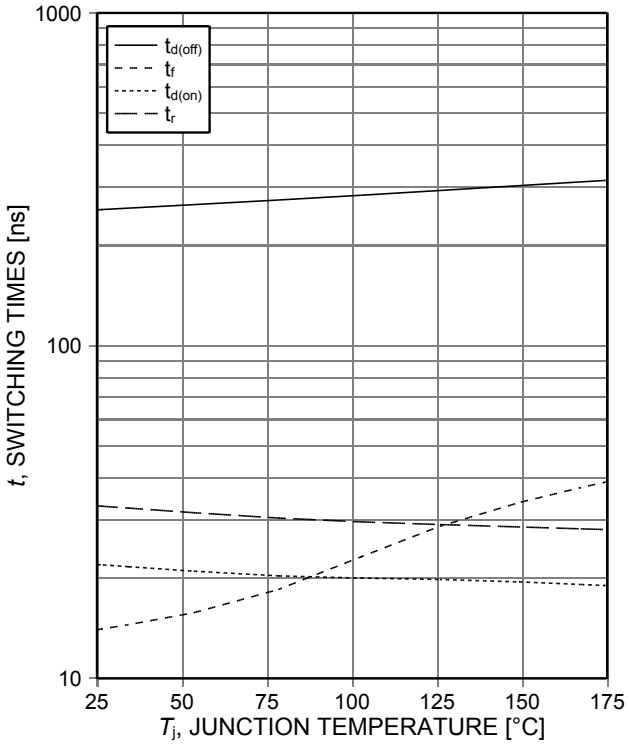


Figure 11. **Typical switching times as a function of junction temperature**
(ind. load, V_{CE}=600V, V_{GE}=15/0V, I_C=15A, r_G=35Ω, test circuit in Fig. E)

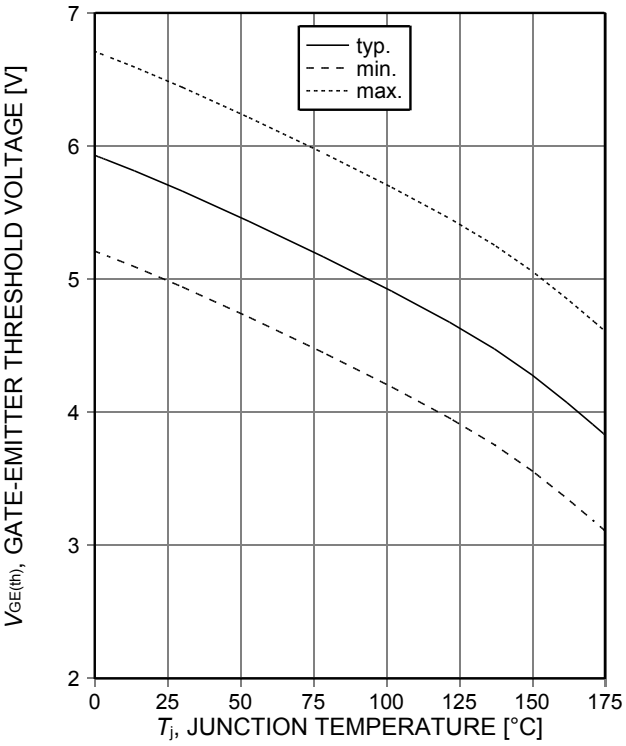


Figure 12. **Gate-emitter threshold voltage as a function of junction temperature**
(I_C=0.5mA)

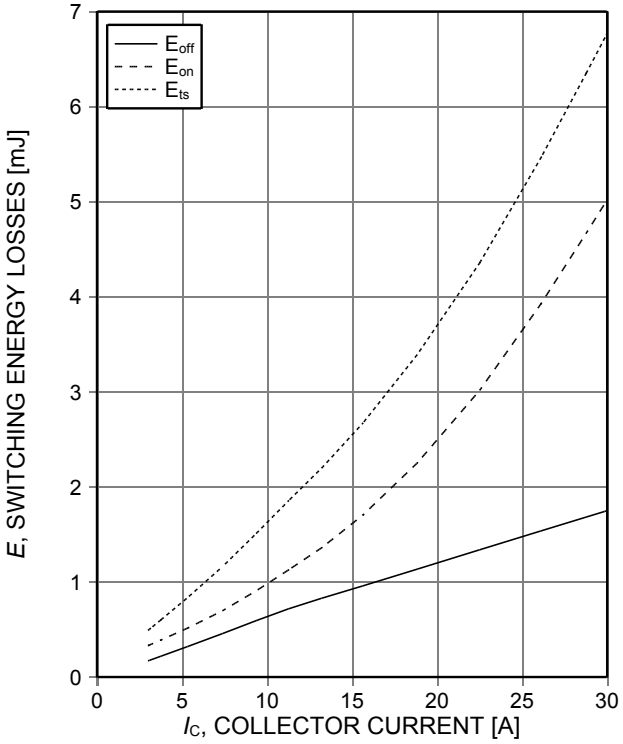


Figure 13. **Typical switching energy losses as a function of collector current**
(ind. load, T_j=175°C, V_{CE}=600V, V_{GE}=15/0V, r_G=35Ω, test circuit in Fig. E)

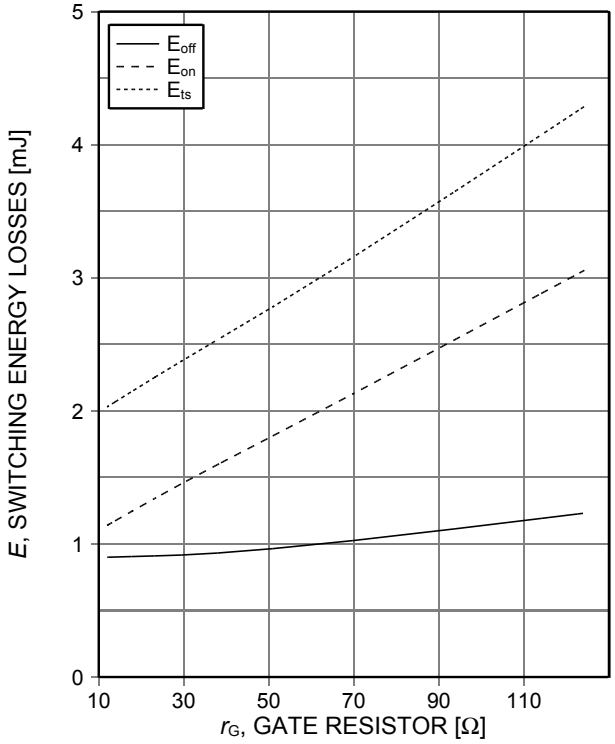


Figure 14. **Typical switching energy losses as a function of gate resistor**
(ind. load, T_j=175°C, V_{CE}=600V, V_{GE}=15/0V, I_C=15A, test circuit in Fig. E)

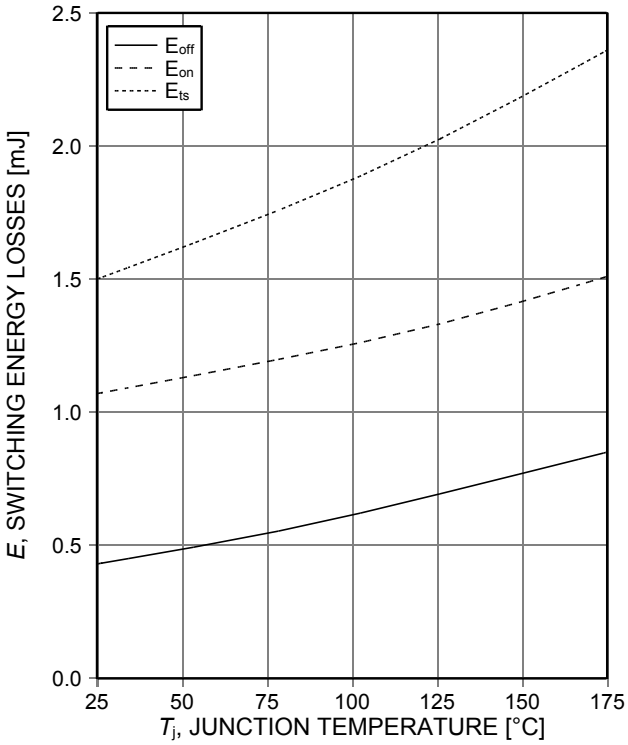


Figure 15. **Typical switching energy losses as a function of junction temperature**
(ind load, V_{CE}=600V, V_{GE}=15/0V, I_C=15A, r_G=35Ω, test circuit in Fig. E)

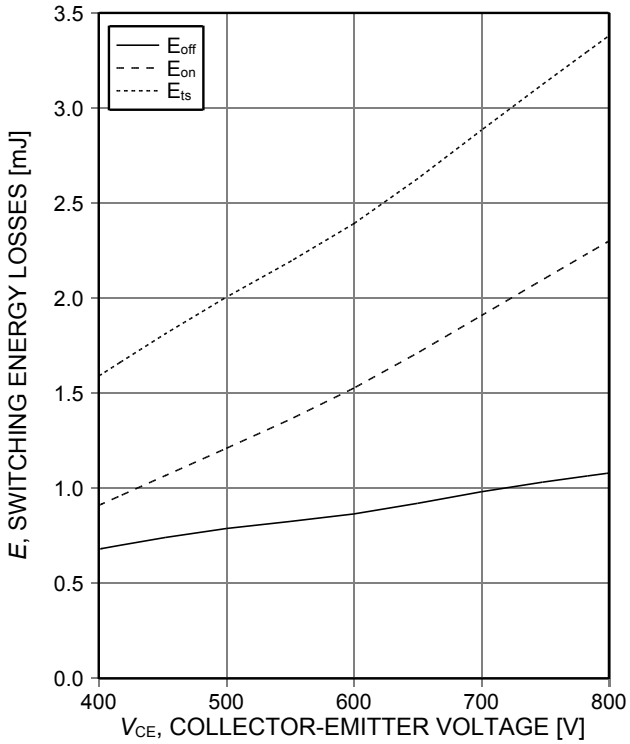


Figure 16. **Typical switching energy losses as a function of collector emitter voltage**
(ind. load, T_j=175°C, V_{GE}=15/0V, I_C=15A, r_G=35Ω, test circuit in Fig. E)

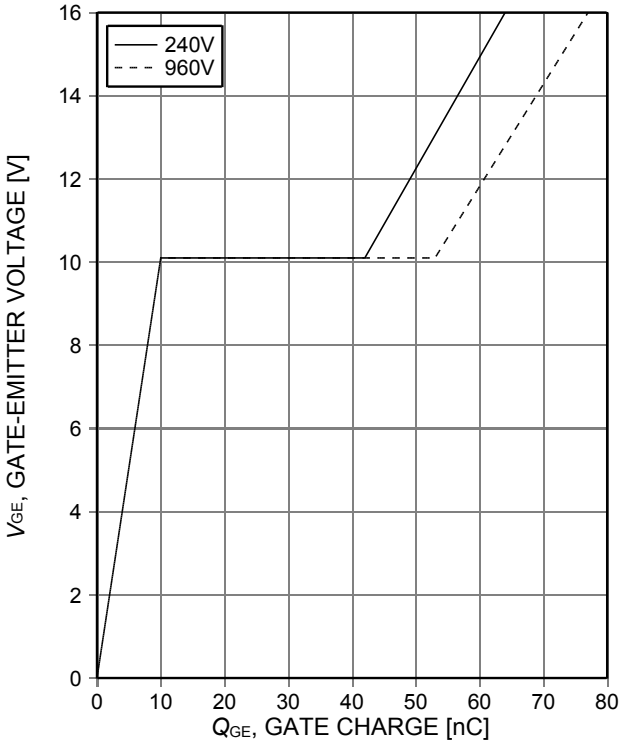


Figure 17. **Typical gate charge**
(I_C=15A)

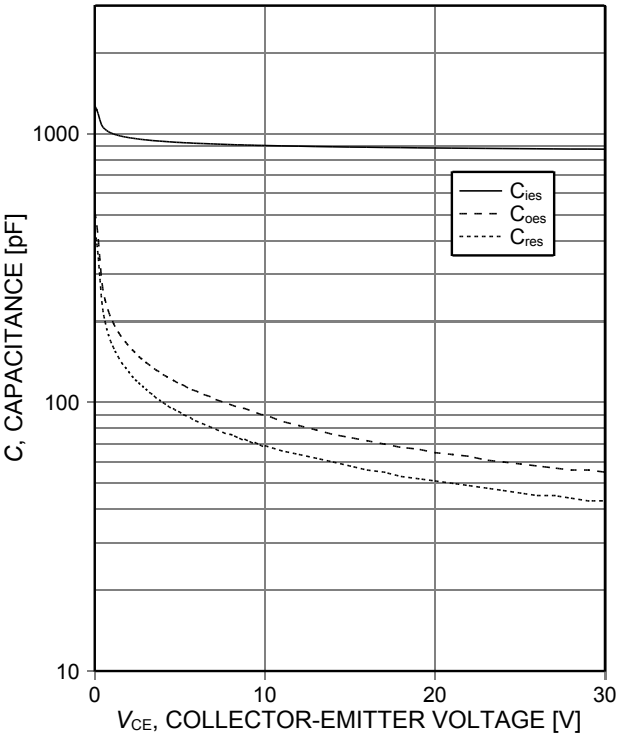


Figure 18. **Typical capacitance as a function of collector-emitter voltage**
(V_{GE}=0V, f=1MHz)

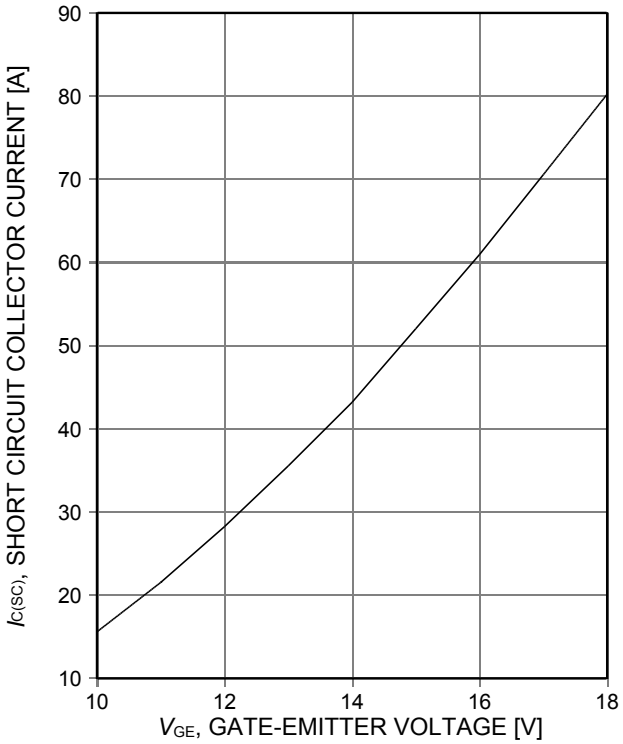


Figure 19. **Typical short circuit collector current as a function of gate-emitter voltage**
(V_{CE}≤600V, start atT_j=25°C)

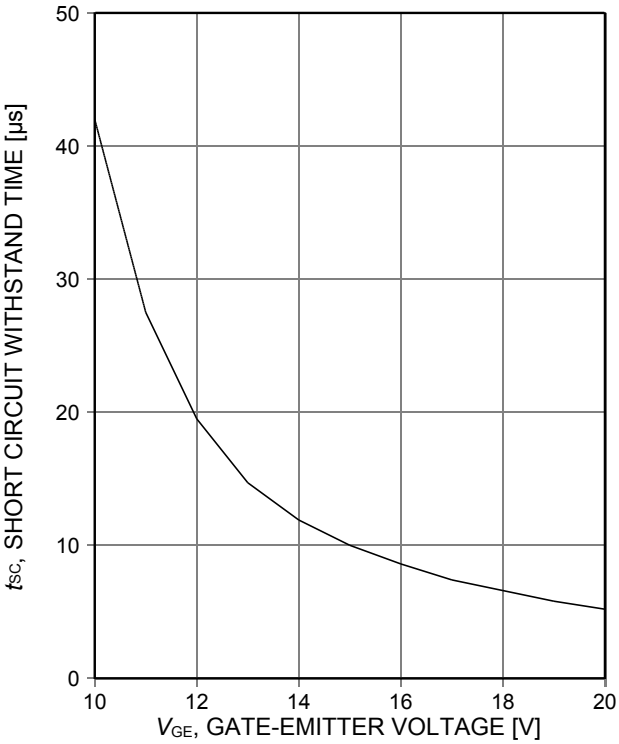


Figure 20. **Short circuit withstand time as a function of gate-emitter voltage**
(V_{CE}≤600V, start at T_j≤150°C)

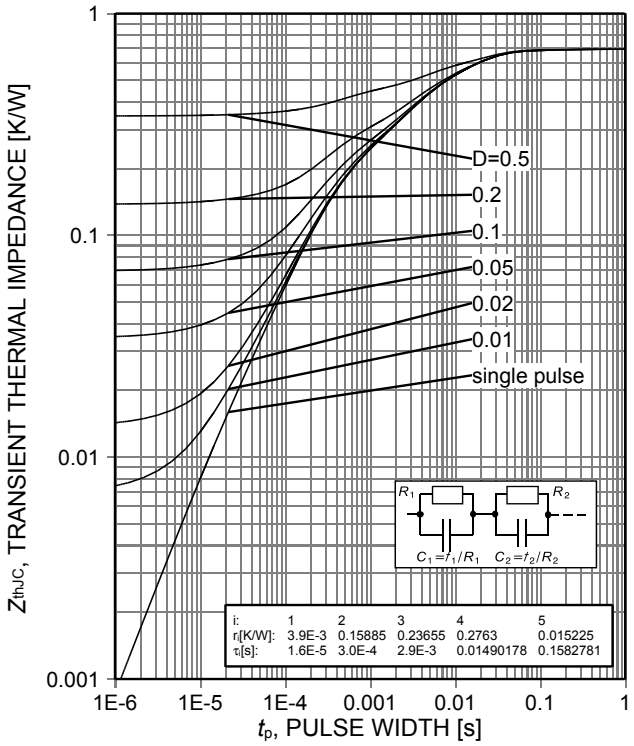
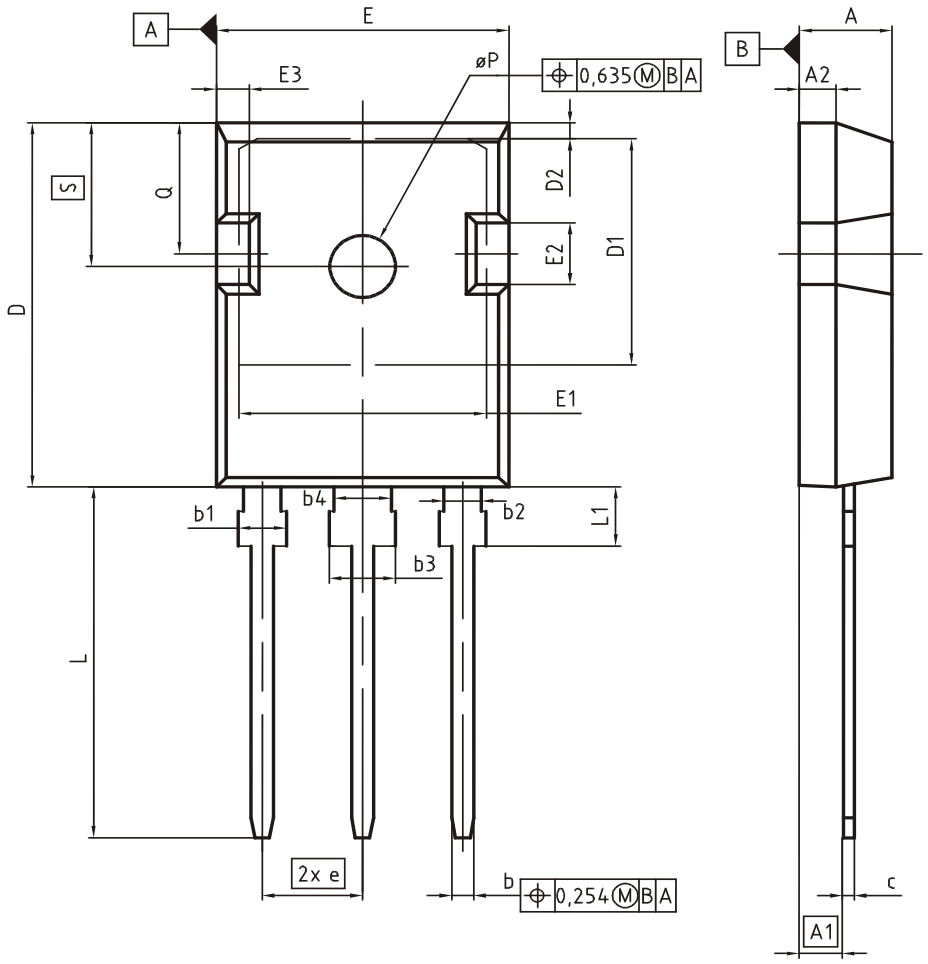


Figure 21. **IGBT transient thermal impedance** ($D=t_p/T$)

PG-TO247-3



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.83	5.21	0.190	0.205
A1	2.27	2.54	0.089	0.100
A2	1.85	2.16	0.073	0.085
b	1.07	1.33	0.042	0.052
b1	1.90	2.41	0.075	0.095
b2	1.90	2.16	0.075	0.085
b3	2.87	3.38	0.113	0.133
b4	2.87	3.13	0.113	0.123
c	0.55	0.68	0.022	0.027
D	20.80	21.10	0.819	0.831
D1	16.25	17.65	0.640	0.695
D2	0.95	1.35	0.037	0.053
E	15.70	16.13	0.618	0.635
E1	13.10	14.15	0.516	0.557
E2	3.68	5.10	0.145	0.201
E3	1.00	2.60	0.039	0.102
e	5.44 (BSC)		0.214 (BSC)	
N	3		3	
L	19.80	20.32	0.780	0.800
L1	4.10	4.47	0.161	0.176
øP	3.50	3.70	0.138	0.146
Q	5.49	6.00	0.216	0.236
S	6.04	6.30	0.238	0.248

DOCUMENT NO.	Z8B00003327
SCALE	0 5 5 7.5mm
EUROPEAN PROJECTION	
ISSUE DATE	09-07-2010
REVISION	05

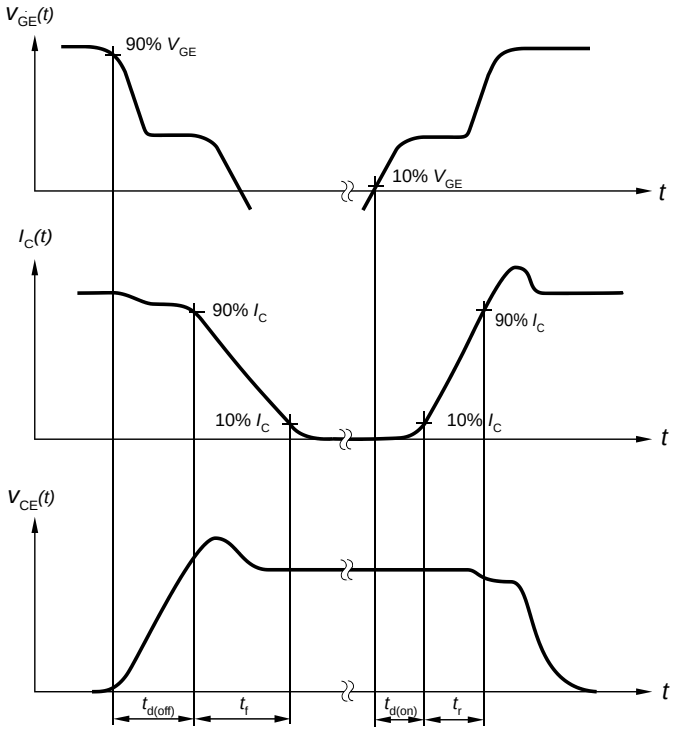


Figure A. **Definition of switching times**

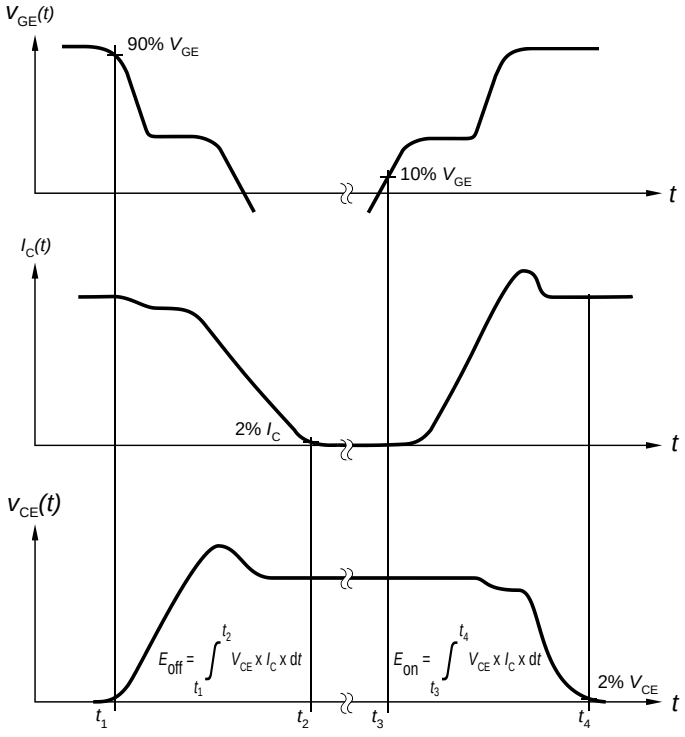


Figure B. **Definition of switching losses**

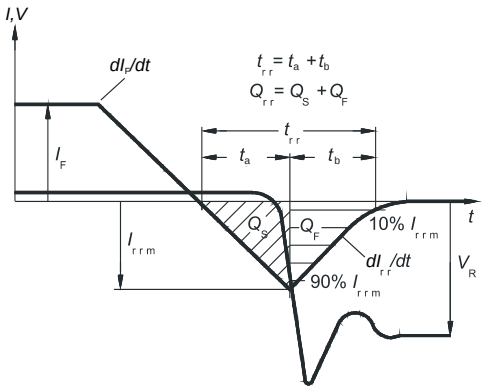


Figure C. **Definition of diode switching characteristics**

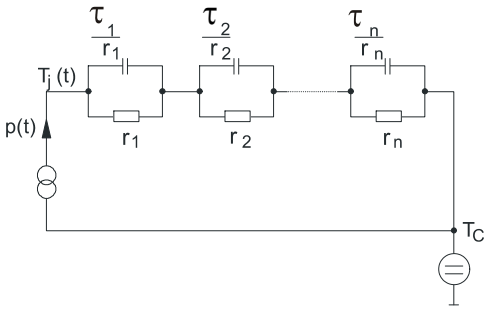


Figure D. **Thermal equivalent circuit**

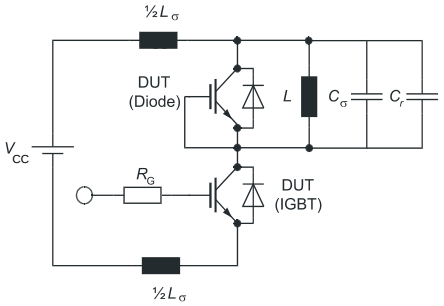


Figure E. **Dynamic test circuit**
Parasitic inductance L_σ,
parasitic capacitor L_σ,
relief capacitor C_r,
(only for ZVT switching)

Revision History

IGW15N120H3

Revision: 2014-12-01, Rev. 2.1

Previous Revision

Revision	Date	Subjects (major changes since last revision)
1.1	2009-11-27	-
2.1	2014-12-01	Final data sheet

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