IGBT

Low $V_{CE(sat)}$ IGBT in TRENCHSTOP™ 5 technology

IGW30N65L5

650V IGBT Low $V_{CE(sat)}$ series fifth generation

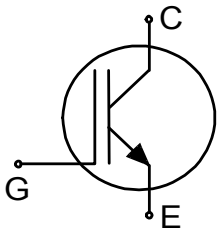
Data sheet

Industrial Power Control

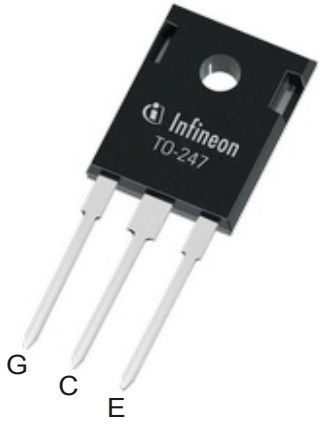
Low $V_{CE(sat)}$ series fifth generation

Low $V_{CE(sat)}$ IGBT in TRENCHSTOP™ 5 technology

Features and Benefits:



Low $V_{CE(sat)}$ L5 technology offering
• Very low collector-emitter saturation voltage V_{CEsat}
• Best-in-Class tradeoff between conduction and switching losses
• 650V breakdown voltage
• Low gate charge Q_G
• 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
• Solar photovoltaic inverters
• Welding machines

Product Validation:

Qualified for industrial applications according to the relevant tests of JEDEC47/20/22

Green

Halogen-Free

RoHS

Key Performance and Package Parameters

Type	V_{CE}	I_C	V_{CEsat}, T_{vj}=25°C	T_{vjmax}	Marking	Package
IGW30N65L5	650V	30A	1.05V	175°C	G30EL5	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, $T_{vj} \geq 25°C$	V_{CE}	650	V
DC collector current, limited by T_{vjmax} T_c = 25°C value limited by bondwire T_c = 100°C	I_C	 85.0 62.0	A
Pulsed collector current, t_p limited by T_{vjmax} [1]	I_{Cpuls}	120.0	A
Turn off safe operating area $V_{CE} \leq 650V$, $T_{vj} \leq 175°C$, t_p = 1µs [1]	-	120.0	A
Gate-emitter voltage Transient Gate-emitter voltage ($t_p \leq 10µs$, $D < 0.010$)	V_{GE}	±20 ±30	V
Power dissipation T_c = 25°C Power dissipation T_c = 100°C	P_{tot}	227.0 114.0	W
Operating junction temperature	T_{vj}	-40...+175	°C
Storage temperature	T_{stg}	-55...+150	°C
Soldering temperature, [2] 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	Value			Unit
			min.	typ.	max.	
R_{th} Characteristics						
IGBT thermal resistance, junction - case	$R_{th(j-c)}$		-	-	0.66	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 = 0.20mA	650	-	-	V
Collector-emitter saturation voltage	V_{CEsat}	V_{GE} = 15.0V, I_C = 30.0A T_{vj} = 25°C T_{vj} = 100°C T_{vj} = 150°C	 - - -	 1.05 1.05 1.04	 1.35 - -	V
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C = 0.40mA, V_{CE} = 20V	4.2	5.0	5.8	V
Zero gate voltage collector current	I_{CES}	V_{CE} = 650V, V_{GE} = 0V T_{vj} = 25°C T_{vj} = 150°C T_{vj} = 175°C	 - - -	 - 400 2000	 40 - -	µA
Gate-emitter leakage current	I_{GES}	V_{CE} = 0V, V_{GE} = 20V	-	-	100	nA
Transconductance	g_{fs}	V_{CE} = 20V, I_C = 30.0A	-	65.0	-	S

[1] Defined by design. Not subject to production test.
[2] Package not recommended for surface mount applications.

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 = 1000kHz	-	4900	-	pF
Output capacitance	C_{oes}		-	42	-	
Reverse transfer capacitance	C_{res}		-	18	-	
Gate charge	Q_G	V_{CC} = 520V, I_C = 30.0A, V_{GE} = 15V	-	168.0	-	nC
Internal emitter inductance measured 5mm (0.197 in.) from case	L_E		-	13.0	-	nH

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} = 400V, I_C = 30.0A, V_{GE} = 0.0/15.0V, $R_{G(on)}$ = 10.0Ω, $R_{G(off)}$ = 10.0Ω, $L\sigma$ = 60nH, $C\sigma$ = 30pF $L\sigma$, $C\sigma$ from Fig. E Energy losses include “tail” and diode reverse recovery. Diode: IDW30E65D1.	-	33	-	ns
Rise time	t_r		-	11	-	ns
Turn-off delay time	$t_{d(off)}$		-	308	-	ns
Fall time	t_f		-	51	-	ns
Turn-on energy	E_{on}		-	0.47	-	mJ
Turn-off energy	E_{off}		-	1.35	-	mJ
Total switching energy	E_{ts}		-	1.82	-	mJ

Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
IGBT Characteristic, at T_{vj} = 150°C						
Turn-on delay time	$t_{d(on)}$	T_{vj} = 150°C, V_{CC} = 400V, I_C = 30.0A, V_{GE} = 0.0/15.0V, $R_{G(on)}$ = 10.0Ω, $R_{G(off)}$ = 10.0Ω, $L\sigma$ = 60nH, $C\sigma$ = 30pF $L\sigma$, $C\sigma$ from Fig. E Energy losses include “tail” and diode reverse recovery. Diode: IDW30E65D1.	-	31	-	ns
Rise time	t_r		-	13	-	ns
Turn-off delay time	$t_{d(off)}$		-	370	-	ns
Fall time	t_f		-	150	-	ns
Turn-on energy	E_{on}		-	0.68	-	mJ
Turn-off energy	E_{off}		-	2.18	-	mJ
Total switching energy	E_{ts}		-	2.86	-	mJ

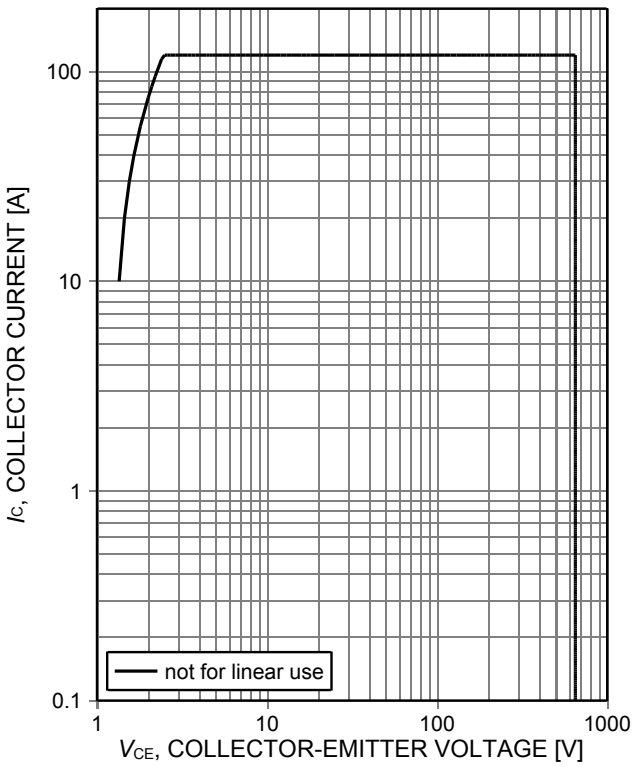


Figure 1. **Forward bias safe operating area** (D=0, T_C=25°C, T_{vj}≤175°C, V_{GE}=15V, t_p=1µs, I_{Cmax} defined by design - not subject to production test)

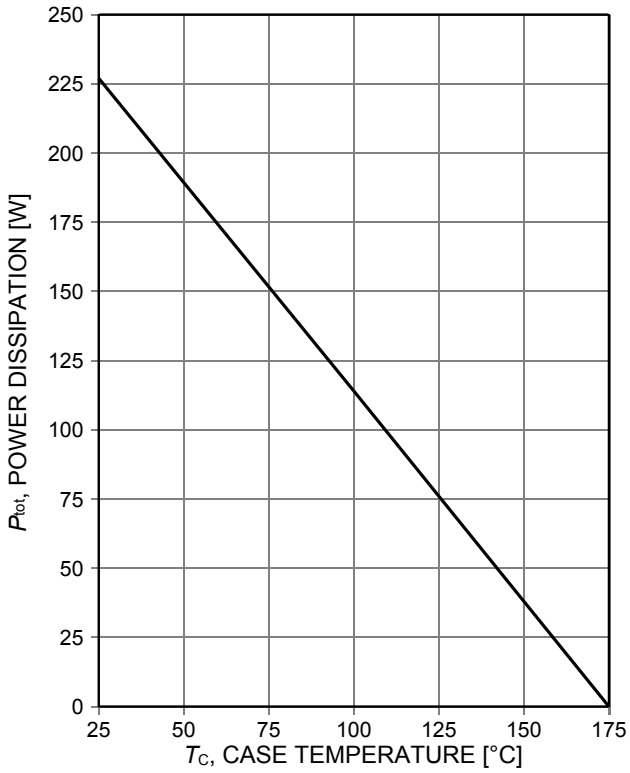


Figure 2. **Power dissipation as a function of case temperature** (T_{vj}≤175°C)

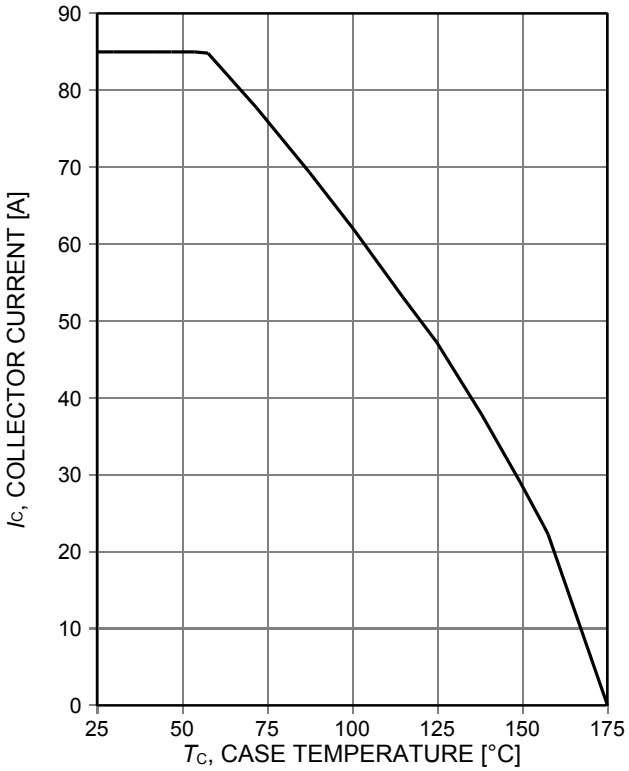


Figure 3. **Collector current as a function of case temperature** (V_{GE}≥15V, T_{vj}≤175°C)

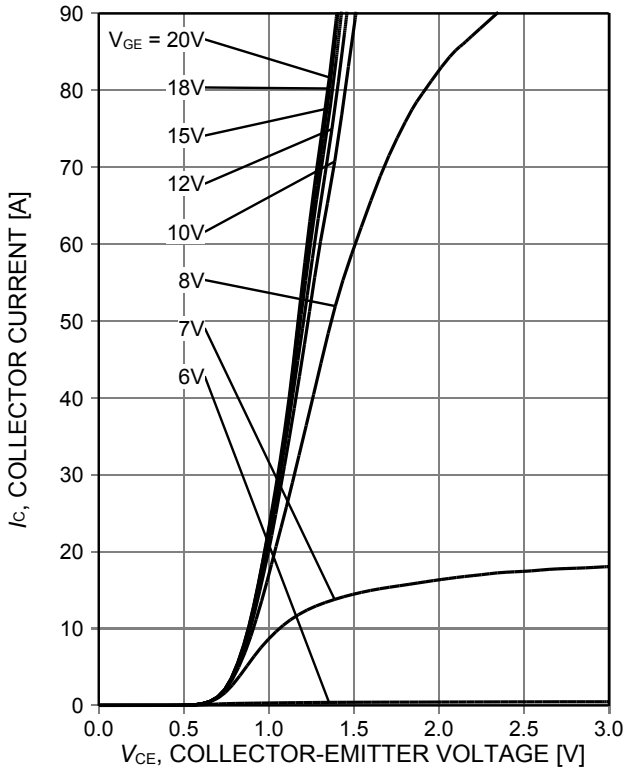


Figure 4. **Typical output characteristic** (T_{vj}=25°C)

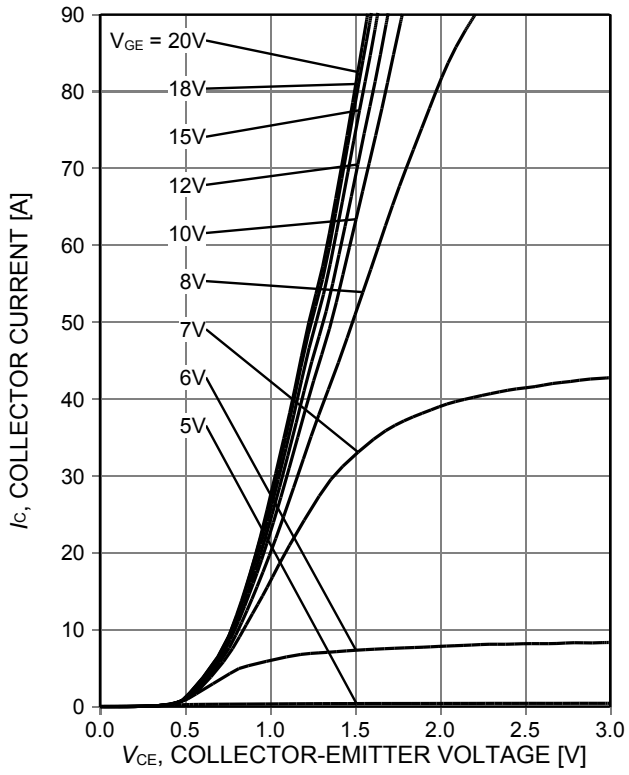


Figure 5. **Typical output characteristic** (T_{vj}=175°C)

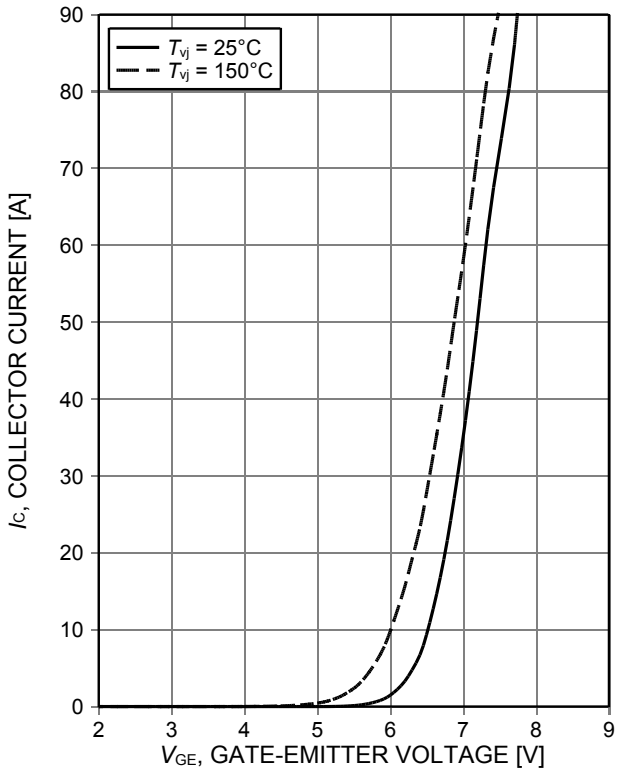


Figure 6. **Typical transfer characteristic** (V_{CE}=20V)

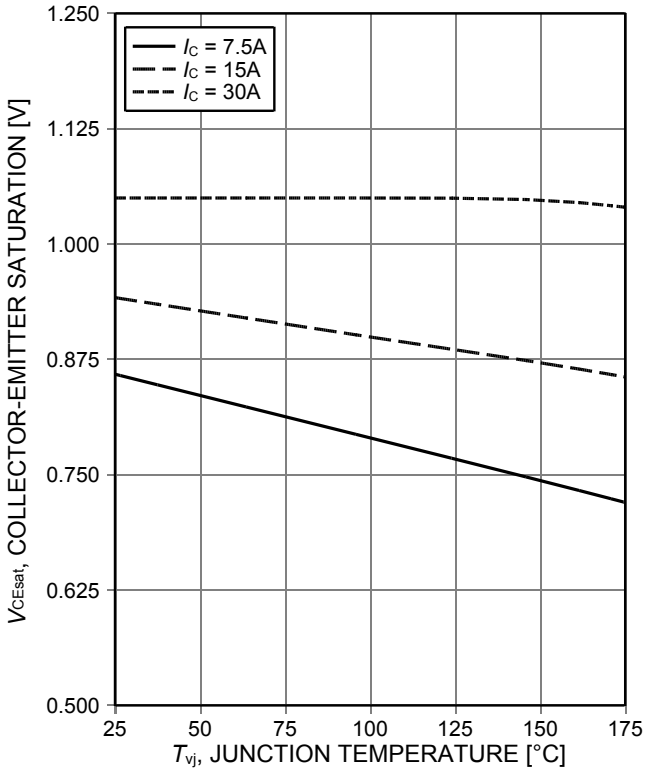


Figure 7. **Typical collector-emitter saturation voltage as a function of junction temperature** (V_{GE}=15V)

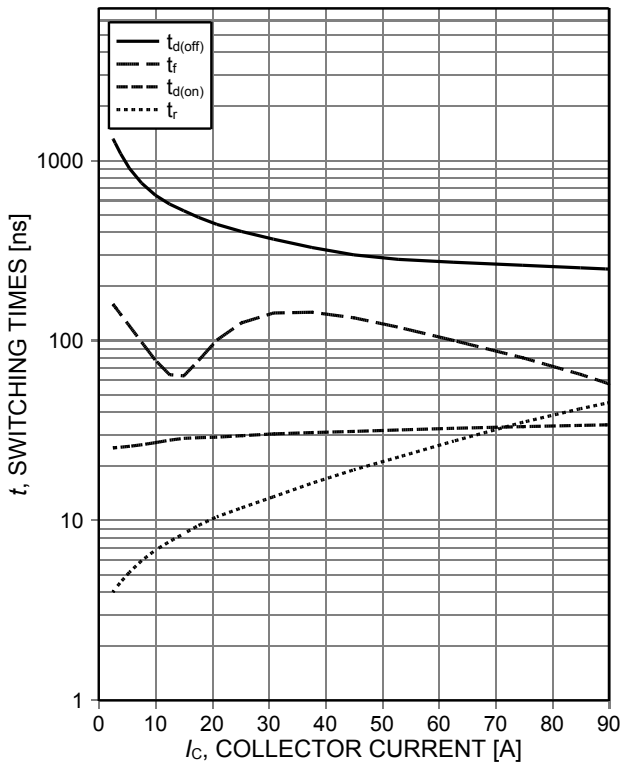


Figure 8. **Typical switching times as a function of collector current** (inductive load, T_{vj}=150°C, V_{CE}=400V, V_{GE}=0/15V, $R_{G(on)}$=10Ω, $R_{G(off)}$=10Ω, dynamic test circuit in Figure E)

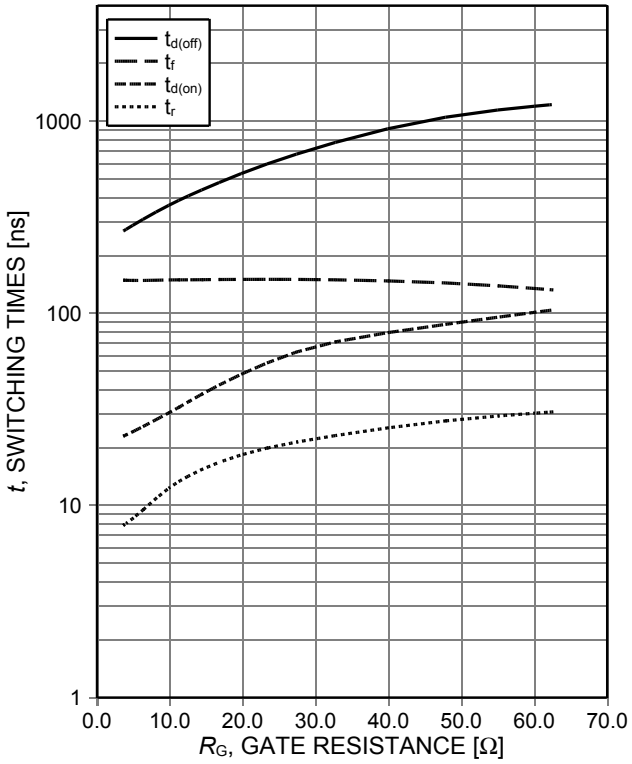


Figure 9. **Typical switching times as a function of gate resistance**
(inductive load, T_{vj}=150°C, V_{CE}=400V, V_{GE}=0/15V, I_C=30A, dynamic test circuit in Figure E)

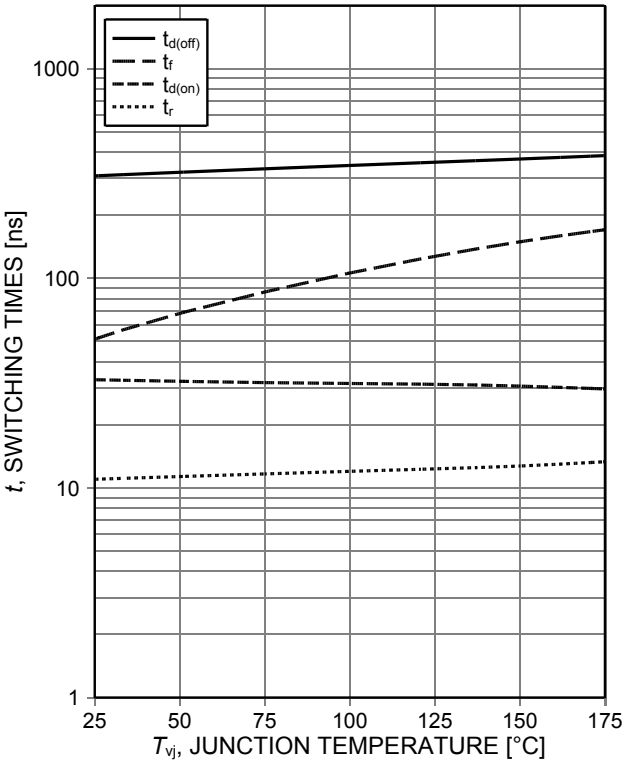


Figure 10. **Typical switching times as a function of junction temperature**
(inductive load, V_{CE}=400V, V_{GE}=0/15V, I_C=30A, $R_{G(on)}$=10Ω, $R_{G(off)}$=10Ω, dynamic test circuit in Figure E)

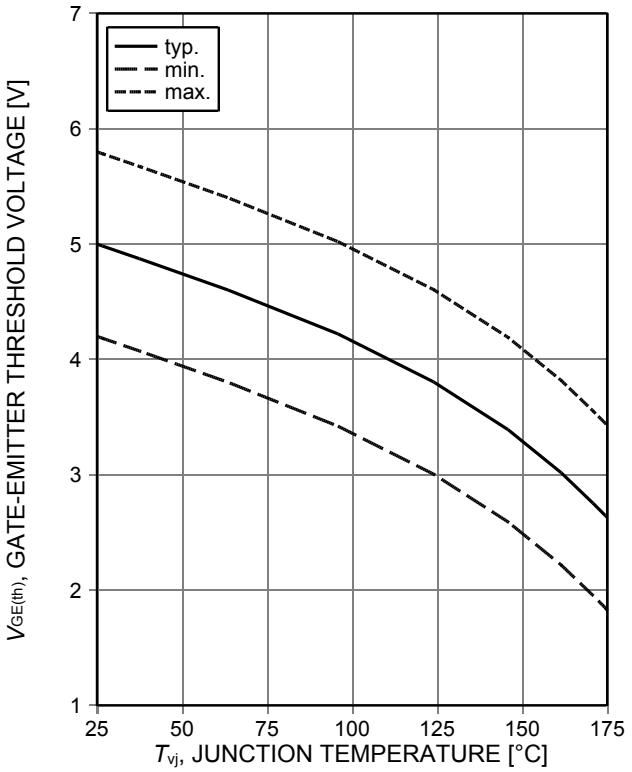


Figure 11. **Gate-emitter threshold voltage as a function of junction temperature**
(I_C=0.4mA)

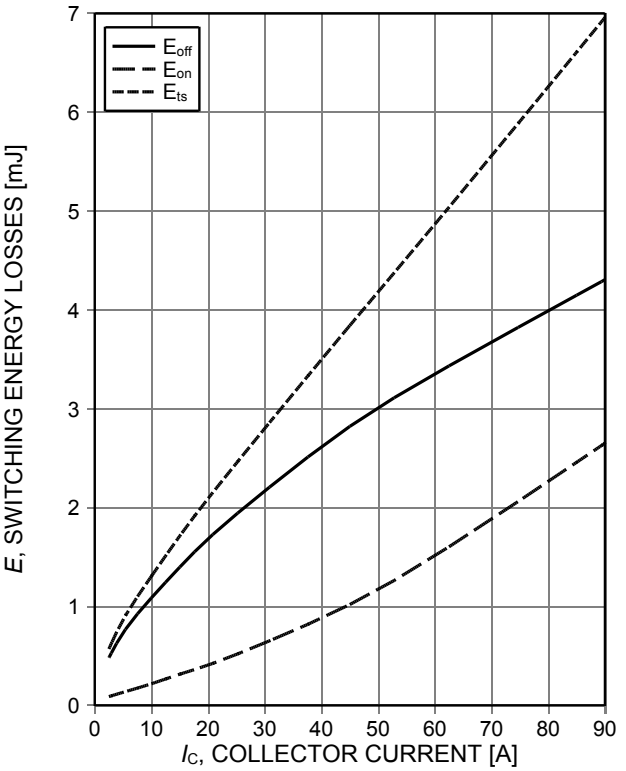


Figure 12. **Typical switching energy losses as a function of collector current**
(inductive load, T_{vj}=150°C, V_{CE}=400V, V_{GE}=0/15V, $R_{G(on)}$=10Ω, $R_{G(off)}$=10Ω, dynamic test circuit in Figure E)

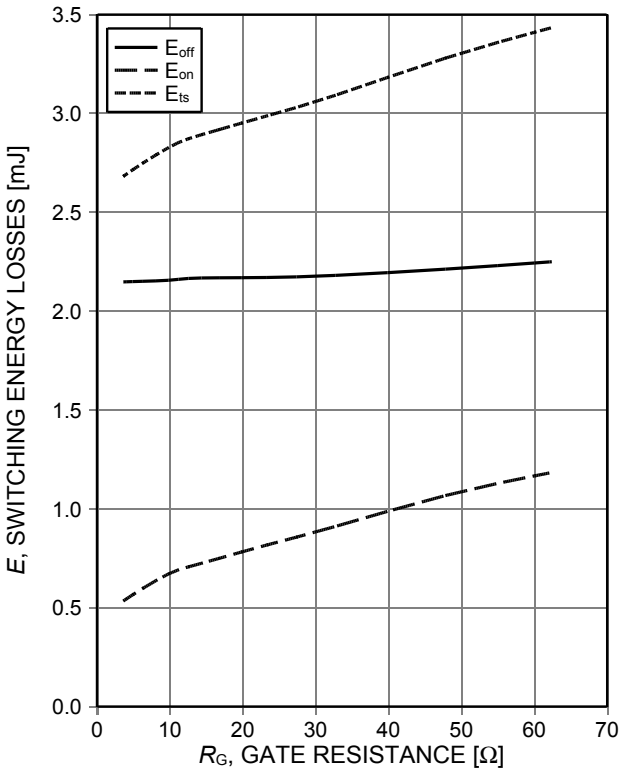


Figure 13. **Typical switching energy losses as a function of gate resistance** (inductive load, T_{vj}=150°C, V_{CE}=400V, V_{GE}=0/15V, I_C=30A, dynamic test circuit in Figure E)

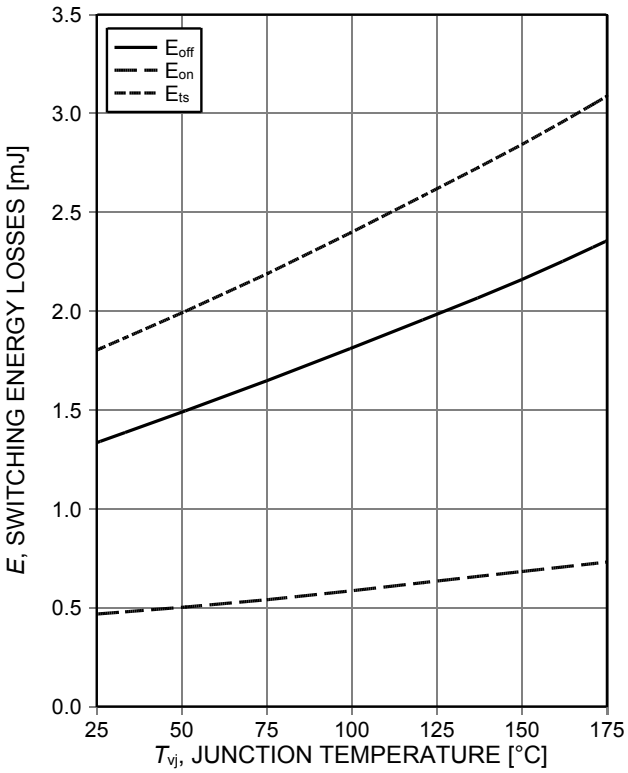


Figure 14. **Typical switching energy losses as a function of junction temperature** (inductive load, V_{CE}=400V, V_{GE}=0/15V, I_C=30A, $R_{G(on)}$=10Ω, $R_{G(off)}$=10Ω, dynamic test circuit in Figure E)

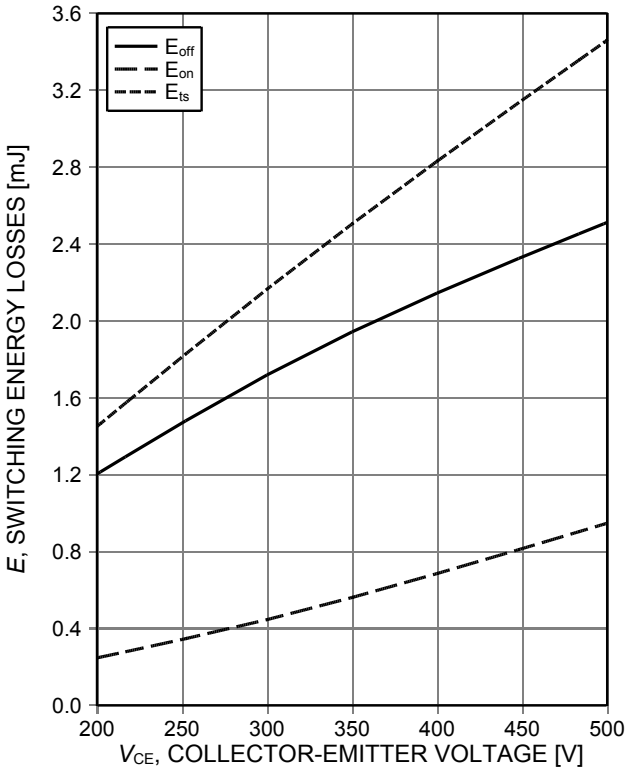


Figure 15. **Typical switching energy losses as a function of collector emitter voltage** (inductive load, T_{vj}=150°C, V_{GE}=0/15V, I_C=30A, $R_{G(on)}$=10Ω, $R_{G(off)}$=10Ω, dynamic test circuit in Figure E)

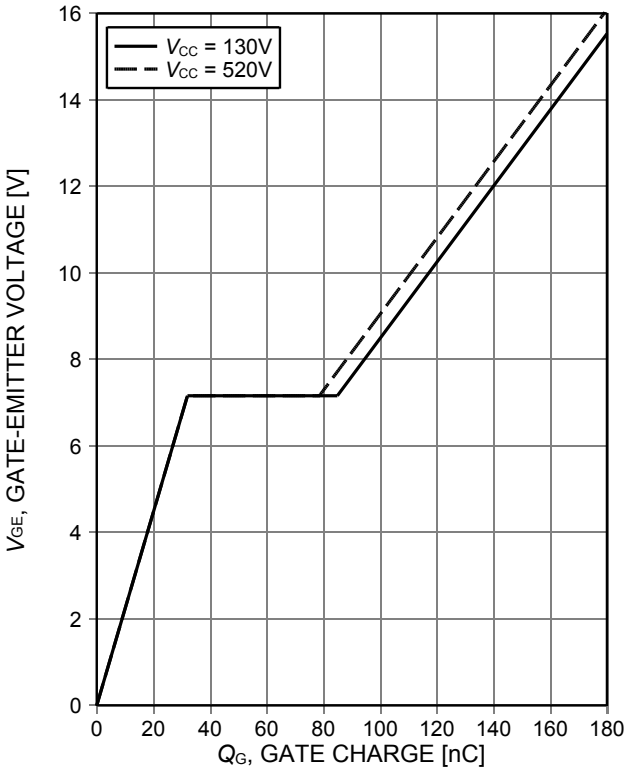


Figure 16. **Typical gate charge** (I_C=30A)

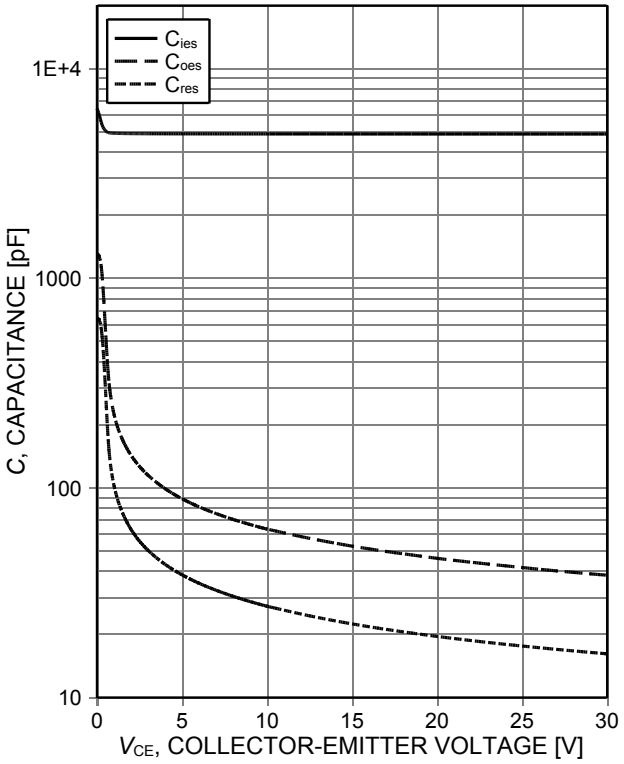


Figure 17. **Typical capacitance as a function of collector-emitter voltage**
(V_{GE}=0V, f=1MHz)

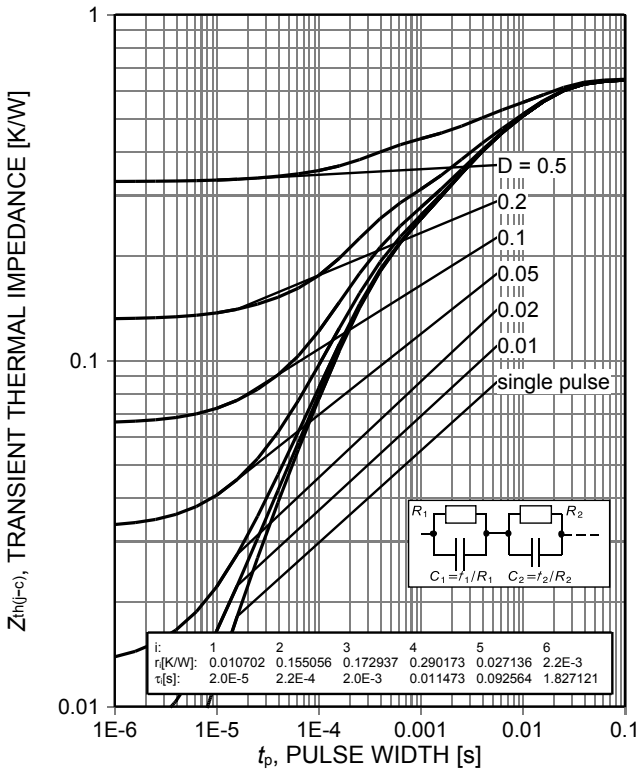
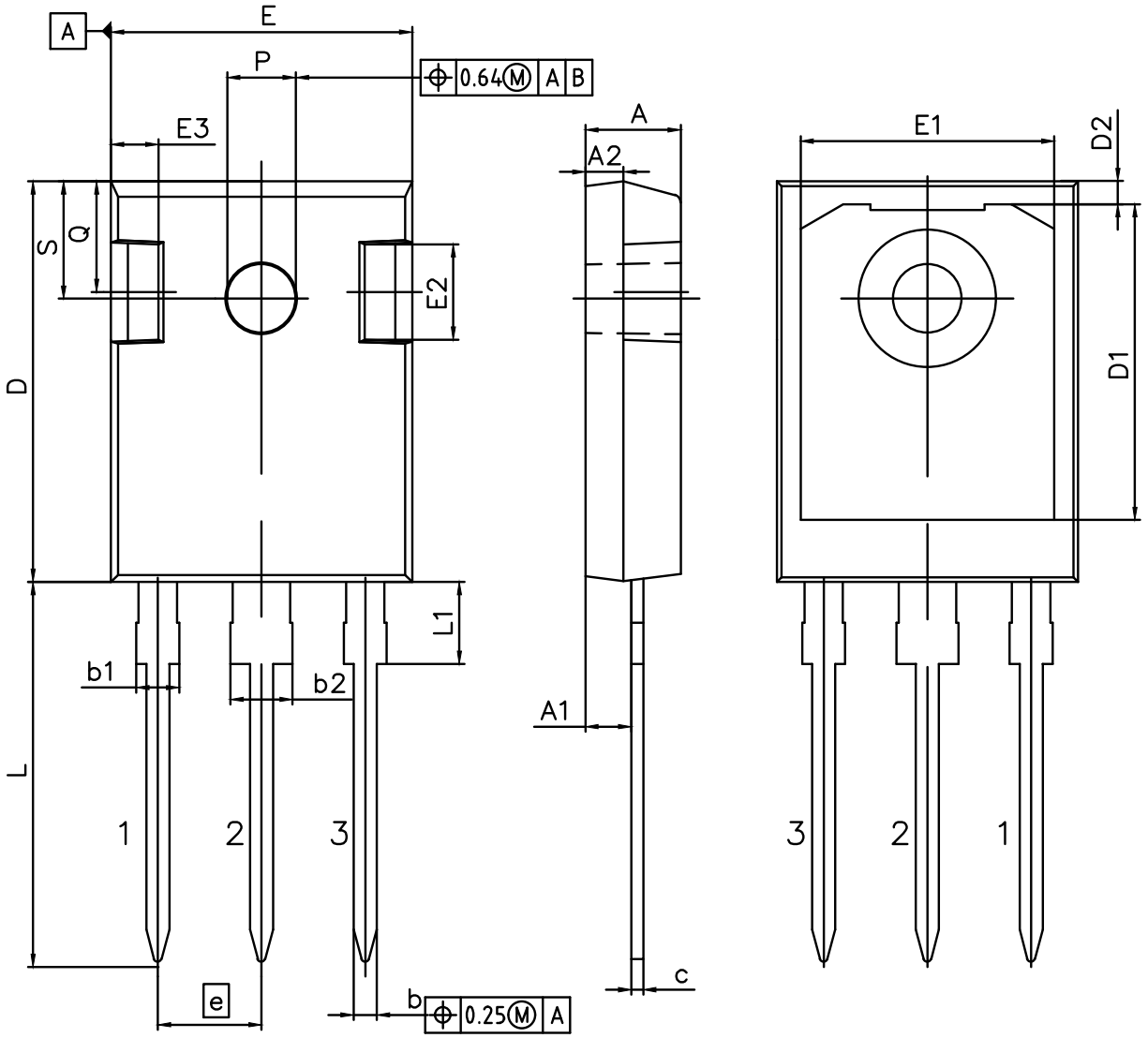


Figure 18. **IGBT transient thermal impedance**
(D=t_p/T)

Package Drawing PG-TO247-3



DIMENSIONS	MILLIMETERS	
	MIN.	MAX.
A	4.70	5.30
A1	2.20	2.60
A2	1.50	2.50
b	1.00	1.40
b1	1.60	2.41
b2	2.57	3.43
c	0.38	0.89
D	20.70	21.50
D1	13.08	17.65
D2	0.51	1.35
E	15.50	16.30
E1	12.38	14.15
E2	3.40	5.10
E3	1.00	2.60
e	5.44	
L	19.80	20.40
L1	3.85	4.50
P	3.50	3.70
Q	5.35	6.25
S	6.04	6.30

DOCUMENT NO.	Z8B00003327
REVISION	06
SCALE 3:1	0 1 2 3 4 5mm
EUROPEAN PROJECTION	
ISSUE DATE	25.07.2018

Testing Conditions

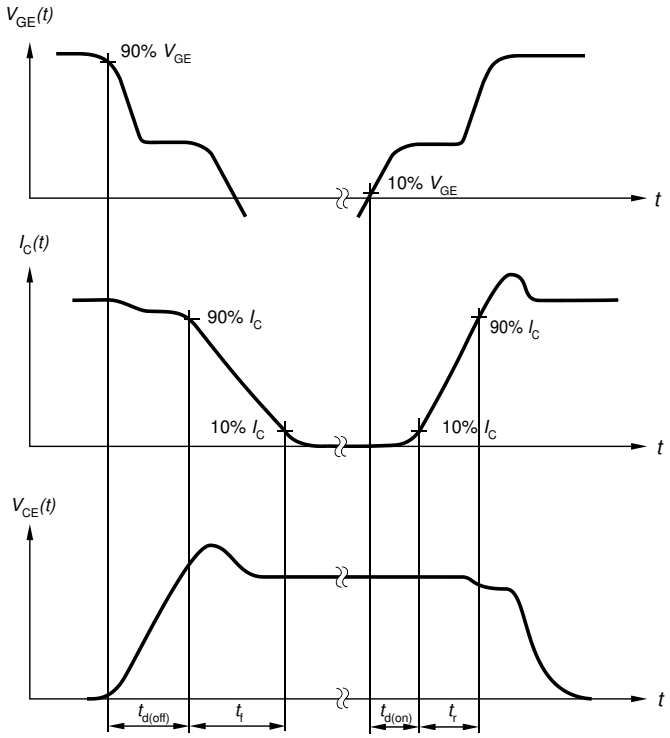


Figure A. **Definition of switching times**

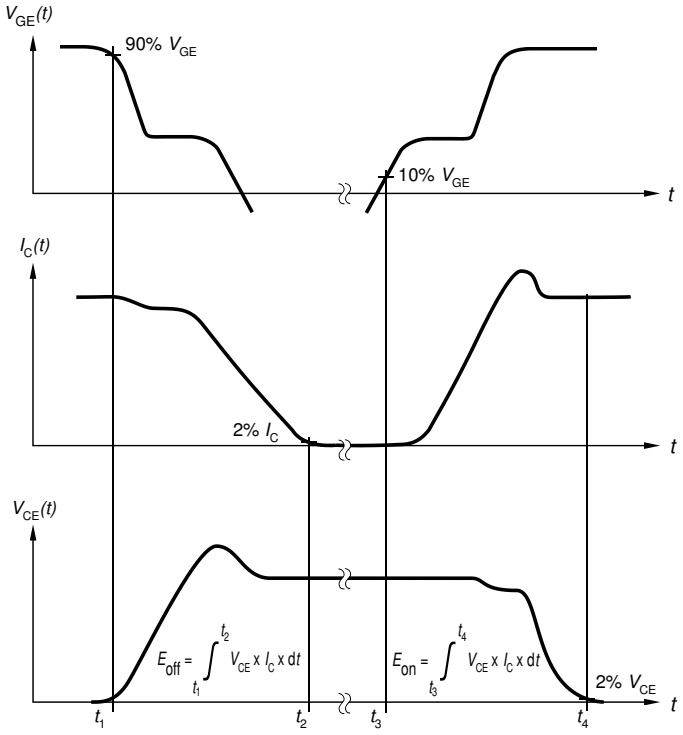


Figure B. **Definition of switching losses**

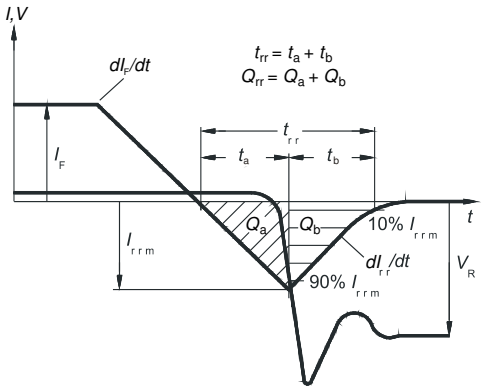


Figure C. **Definition of diode switching characteristics**

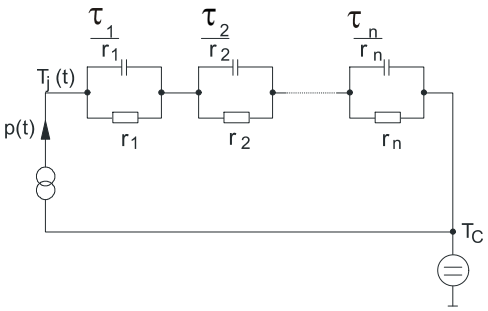


Figure D. **Thermal equivalent circuit**

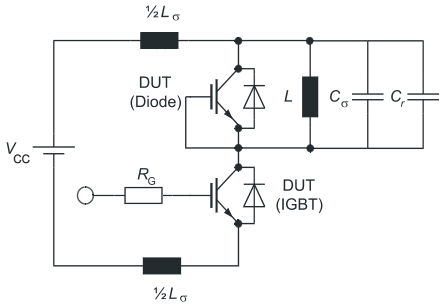


Figure E. **Dynamic test circuit**
Parasitic inductance L_σ,
parasitic capacitor C_σ,
relief capacitor C_r,
(only for ZVT switching)

Revision History

IGW30N65L5

Revision: 2020-10-07, Rev. 2.2

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.1	2014-12-10	Final data sheet
2.2	2020-10-07	VGE(th): test condition update

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