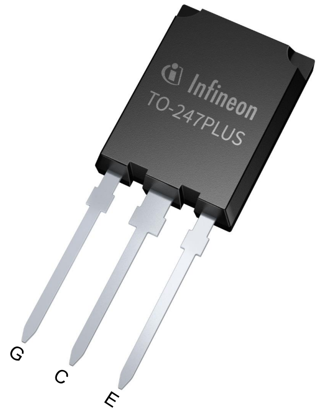
Short circuit rugged 1200 V TRENCHSTOP™ IGBT 7 technology



Features

- V_{CE} = 1200 V
- I_C = 75 A
- Low saturation voltage V_{CEsat} = 2.0 V at T_{vj} = 175°C
- Short circuit ruggedness 8 µs
- Wide range of dv/dt controllability
- Complete product spectrum and PSpice Models: http://www.infineon.com/igbt/

Potential applications

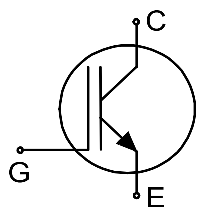
- Industrial power supplies
- Solar

Product validation

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

Halogen-free
Lead-free
Green
RoHS

Description



Type	Package	Marking
IGQ75N120S7	PG-TO247-3-PLUS-NN3.7	G75MS7

Table of contents

1 Package

Table 1 Characteristic values

Parameter	Symbol	Note or test condition	Values			Unit
			Min.	Typ.	Max.	
Internal emitter inductance measured 5 mm (0.197 in.) from case	L_E			13		nH
Storage temperature	T_{stg}		-55		150	°C
Soldering temperature	T_{sold}	wave soldering 1.6 mm (0.063 in.) from case for 10 s			260	°C
Thermal resistance, junction-ambient	$R_{th(j-a)}$				40	K/W
IGBT thermal resistance, junction-case	$R_{th(j-c)}$			0.17	0.24	K/W

2 IGBT

Table 2 Maximum rated values

Parameter	Symbol	Note or test condition		Values	Unit
Collector-emitter voltage	V_{CE}	$T_{vj} \geq 25$ °C		1200	V
DC collector current, limited by T_{vjmax}	I_C	limited by bondwire	$T_c = 25$ °C	154	A
			$T_c = 100$ °C	103	
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpulse}			225	A
Turn-off safe operating area		$V_{CE} \leq 1200$ V, $T_{vj} \leq 175$ °C		225	A
Gate-emitter voltage	V_{GE}			±20	V
Transient gate-emitter voltage	V_{GE}	$t_p \leq 0.5$ µs, $D < 0.001$		±25	V
Short-circuit withstand time	t_{SC}	$V_{CC} \leq 600$ V, $V_{GE} = 15$ V, Allowed number of short circuits < 1000, Time between short circuits ≥ 1.0 s, $T_{vj} = 150$ °C		8	µs
Power dissipation	P_{tot}	$T_{vj} \leq 175$ °C	$T_c = 25$ °C	630	W
			$T_c = 100$ °C	315	

Table 3 Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Collector-emitter saturation voltage	V_{CEsat}	$I_C = 75$ A, $V_{GE} = 15$ V	$T_{vj} = 25$ °C		1.65	2	V
			$T_{vj} = 175$ °C		2		

(table continues...)

Table 3 (continued) Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Gate-emitter threshold voltage	V_{GEth}	I_C = 1.5 mA, V_{CE} = V_{GE}		5.1	5.7	6.5	V
Zero gate-voltage collector current	I_{CES}	V_{CE} = 1200 V, V_{GE} = 0 V	T_{vj} = 25 °C			20	µA
			T_{vj} = 175 °C		6600		
Gate-emitter leakage current	I_{GES}	V_{CE} = 0 V, V_{GE} = 20 V				100	nA
Transconductance	g_{fs}	I_C = 75 A, V_{CE} = 20 V, T_{vj} = 175 °C			30		S
Short-circuit collector current	I_{SC}	V_{CC} ≤ 600 V, V_{GE} = 15 V, t_{SC} ≤ 8 µs, Allowed number of short circuits < 1000, Time between short circuits ≥ 1.0 s, T_{vj} = 150 °C			450		A
Input capacitance	C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz			11.2		nF
Output capacitance	C_{oes}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz			210		pF
Reverse transfer capacitance	C_{res}	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz			50		pF
Gate charge	Q_G	I_C = 75 A, V_{GE} = 15 V, V_{CC} = 960 V			450		nC
Turn-on delay time	$t_{d(on)}$	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 2.1 Ω, $R_{G(off)}$ = 2.1 Ω	T_{vj} = 25 °C, I_C = 75 A		38		ns
			T_{vj} = 175 °C, I_C = 75 A		36		
Rise time (inductive load)	t_r	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 2.1 Ω, $R_{G(off)}$ = 2.1 Ω	T_{vj} = 25 °C, I_C = 75 A		23		ns
			T_{vj} = 175 °C, I_C = 75 A		26		
Turn-off delay time	$t_{d(off)}$	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 2.1 Ω, $R_{G(off)}$ = 2.1 Ω	T_{vj} = 25 °C, I_C = 75 A		190		ns
			T_{vj} = 175 °C, I_C = 75 A		253		
Fall time (inductive load)	t_f	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 2.1 Ω, $R_{G(off)}$ = 2.1 Ω	T_{vj} = 25 °C, I_C = 75 A		107		ns
			T_{vj} = 175 °C, I_C = 75 A		230		
Turn-on energy	E_{on}	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 2.1 Ω, $R_{G(off)}$ = 2.1 Ω	T_{vj} = 25 °C, I_C = 75 A		5.13		mJ
			T_{vj} = 175 °C, I_C = 75 A		7.32		

(table continues...)

Table 3 (continued) Characteristic values

Parameter	Symbol	Note or test condition		Values			Unit
				Min.	Typ.	Max.	
Turn-off energy	E_{off}	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 2.1 Ω, $R_{G(off)}$ = 2.1 Ω	T_{vj} = 25 °C, I_C = 75 A		3.48		mJ
			T_{vj} = 175 °C, I_C = 75 A		6.48		
Total switching energy	E_{ts}	V_{CC} = 600 V, V_{GE} = 0/15 V, $R_{G(on)}$ = 2.1 Ω, $R_{G(off)}$ = 2.1 Ω	T_{vj} = 25 °C, I_C = 75 A		8.6		mJ
			T_{vj} = 175 °C, I_C = 75 A		13.8		
Operating junction temperature	T_{vj}			-40		175	°C

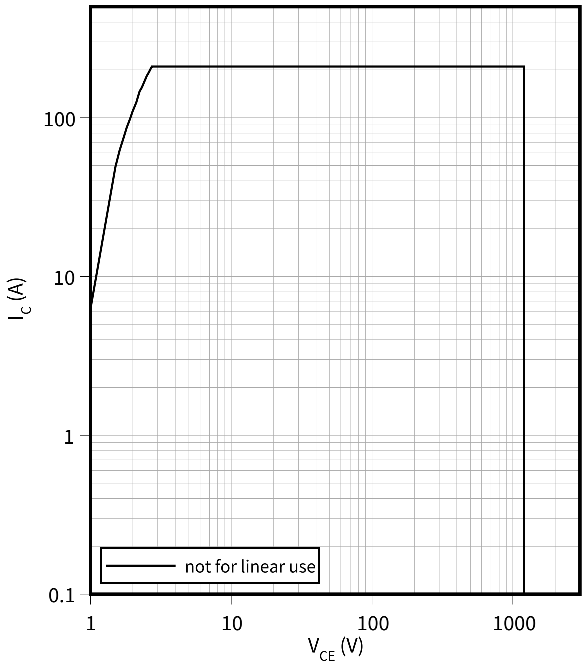
Note: *Electrical Characteristic, at T_{vj} = 25°C, unless otherwise specified.*

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

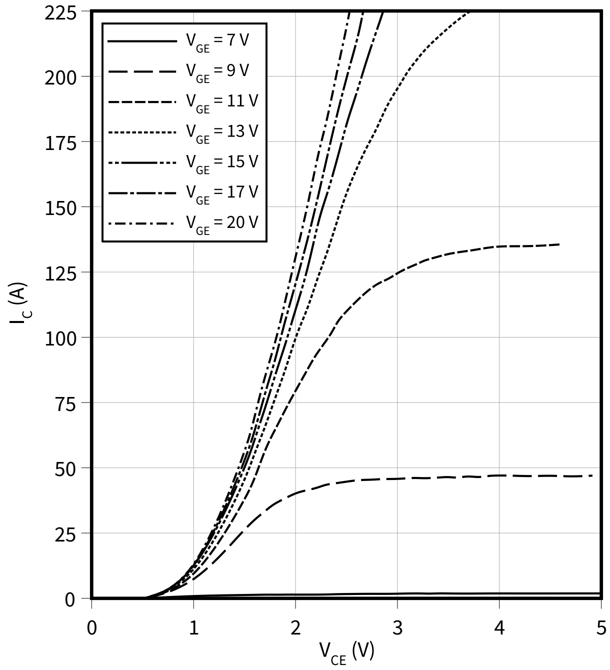
Dynamic test circuit, parasitic inductance L_σ = 30 nH, C_σ = 18 pF. Energy losses include “tail” and diode (IKQ75N120CS7) reverse recovery

3 Characteristics diagrams

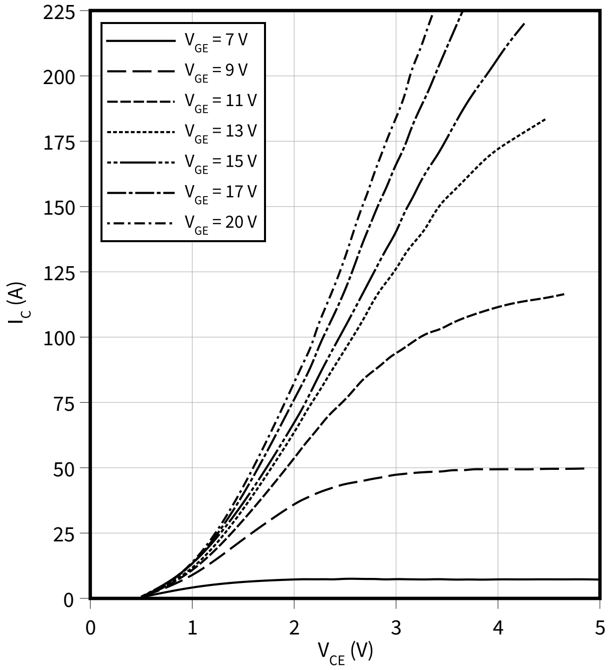
Reverse bias safe operating area
$I_C = f(V_{CE})$
$T_{vj} \leq 175\ °C$, $V_{CE} = 25\ V$



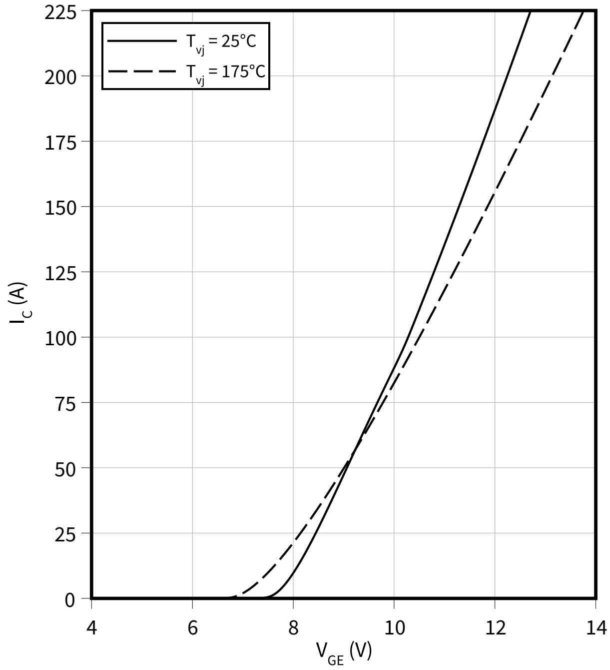
Typical output characteristic
$I_C = f(V_{CE})$
$T_{vj} = 25\ °C$



Typical output characteristic
$I_C = f(V_{CE})$
$T_{vj} = 175\ °C$



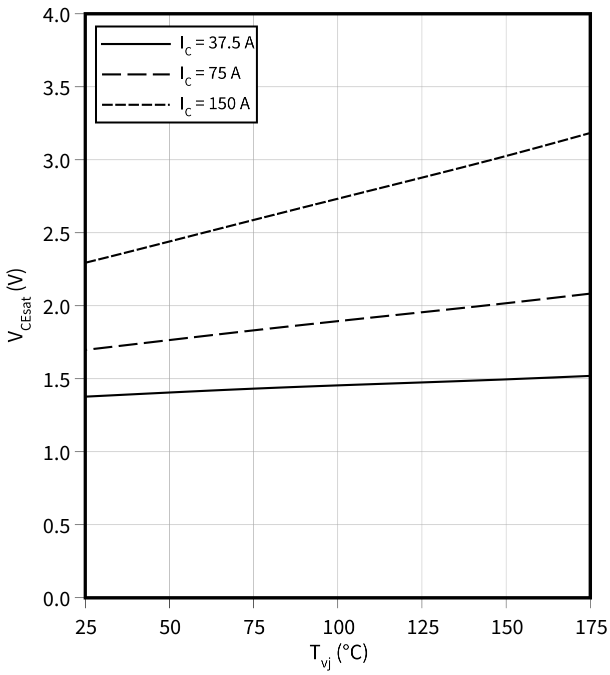
Typical transfer characteristic
$I_C = f(V_{GE})$
$V_{CE} = 20\ V$



Typical collector-emitter saturation voltage as a function of junction temperature

$V_{CEsat} = f(T_{vj})$

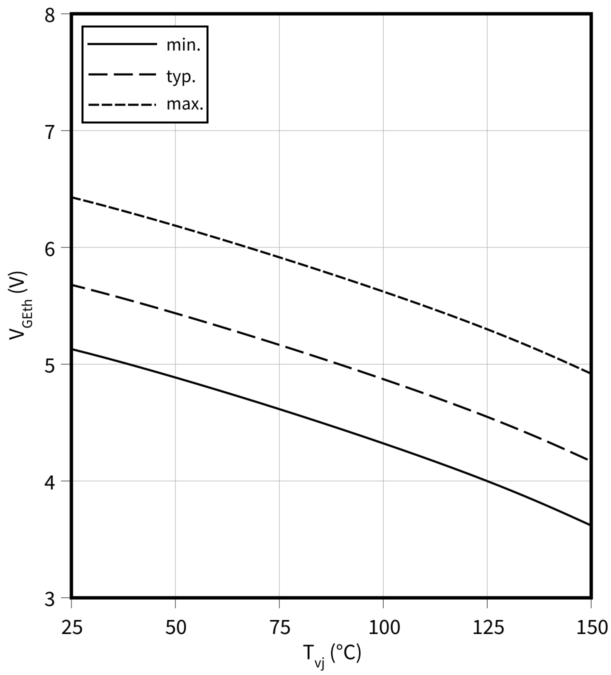
$V_{GE} = 15$ V



Gate-emitter threshold voltage as a function of junction temperature

$V_{GEth} = f(T_{vj})$

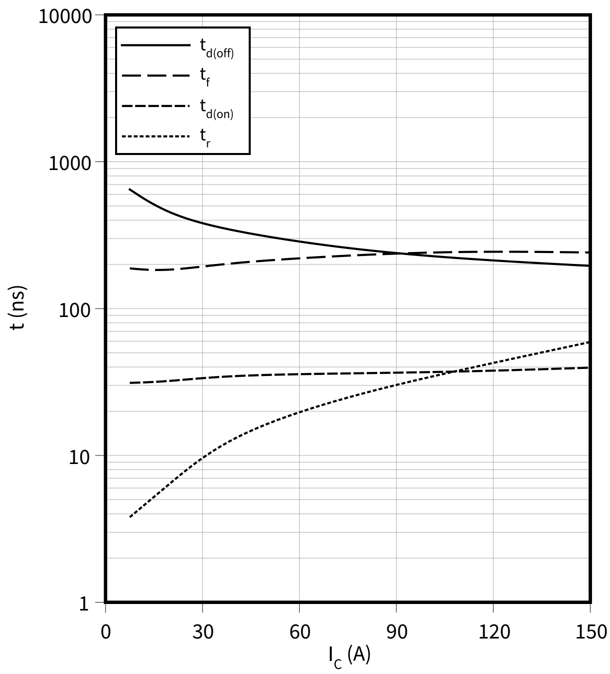
$I_C = 1.5$ mA



Typical switching times as a function of collector current

$t = f(I_C)$

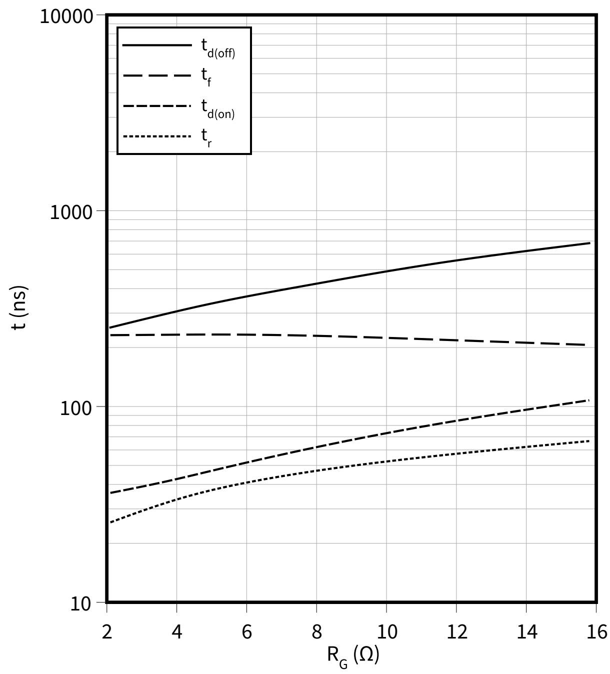
$V_{CC} = 600$ V, $T_{vj} = 175$ °C, $V_{GE} = 0/15$ V, $R_G = 2.1\ \Omega$



Typical switching times as a function of gate resistor

$t = f(R_G)$

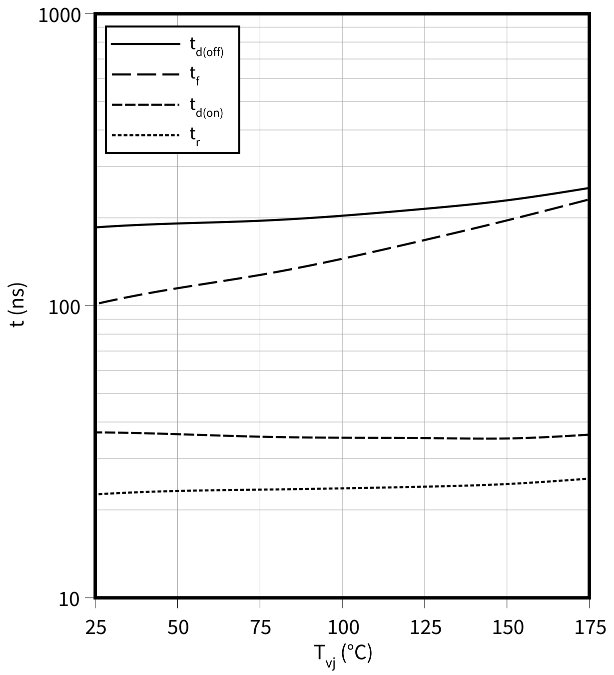
$I_C = 75$ A, $V_{CC} = 600$ V, $T_{vj} = 175$ °C, $V_{GE} = 0/15$ V



Typical switching times as a function of junction temperature

$t = f(T_{vj})$

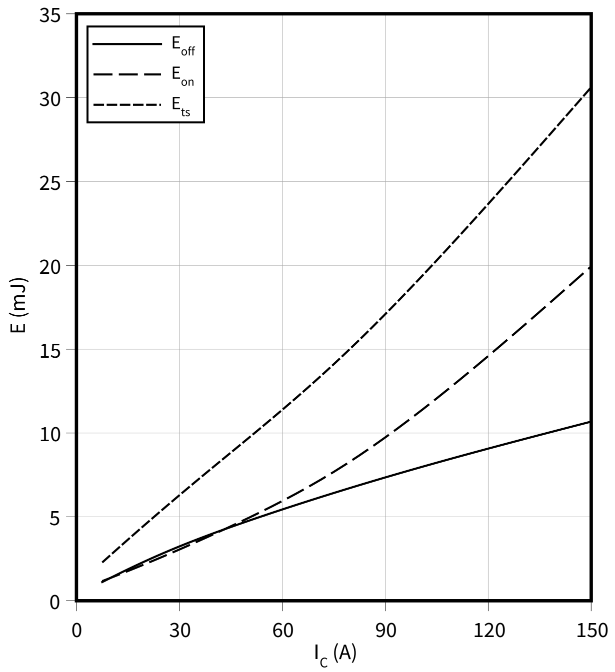
I_C = 75 A, V_{CC} = 600 V, V_{GE} = 0/15 V, R_G = 2.1 Ω



Typical switching energy losses as a function of collector current

$E = f(I_C)$

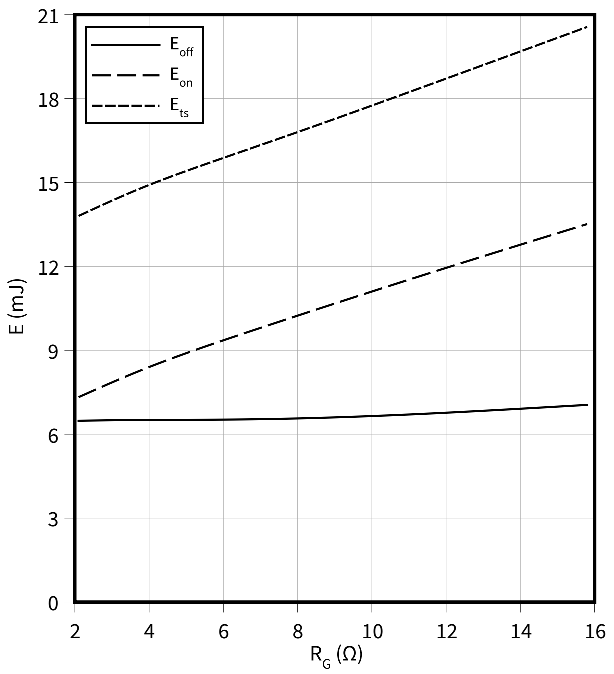
V_{CC} = 600 V, T_{vj} = 175 °C, V_{GE} = 0/15 V, R_G = 2.1 Ω



Typical switching energy losses as a function of gate resistor

$E = f(R_G)$

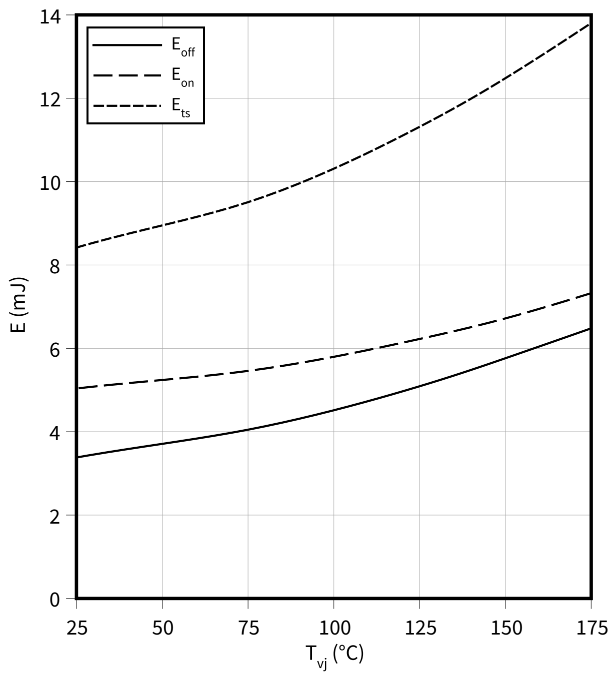
I_C = 75 A, V_{CC} = 600 V, T_{vj} = 175 °C, V_{GE} = 0/15 V



Typical switching energy losses as a function of junction temperature

$E = f(T_{vj})$

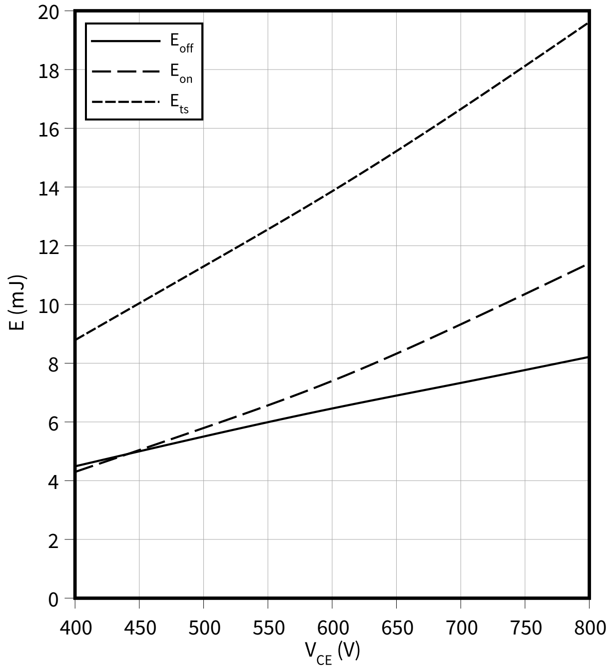
I_C = 75 A, V_{CC} = 600 V, V_{GE} = 0/15 V, R_G = 2.1 Ω



Typical switching energy losses as a function of collector emitter voltage

$E = f(V_{CE})$

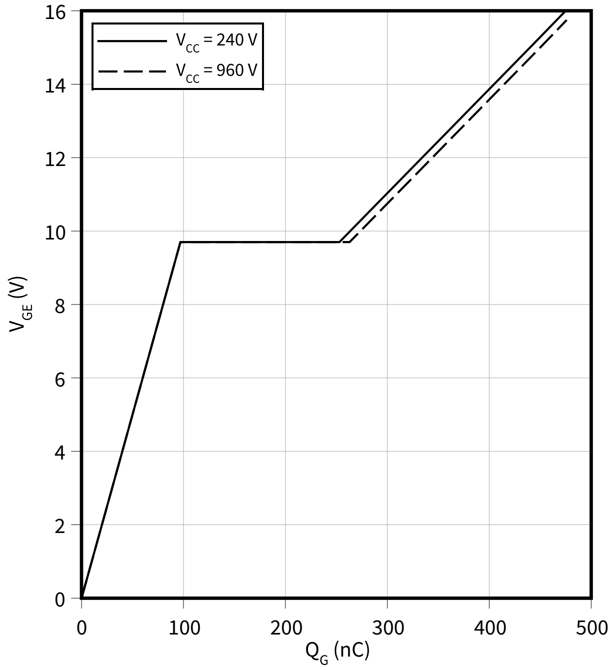
$I_C = 75$ A, $T_{vj} = 175$ °C, $V_{GE} = 0/15$ V, $R_G = 2.1\ \Omega$



Typical gate charge

$V_{GE} = f(Q_G)$

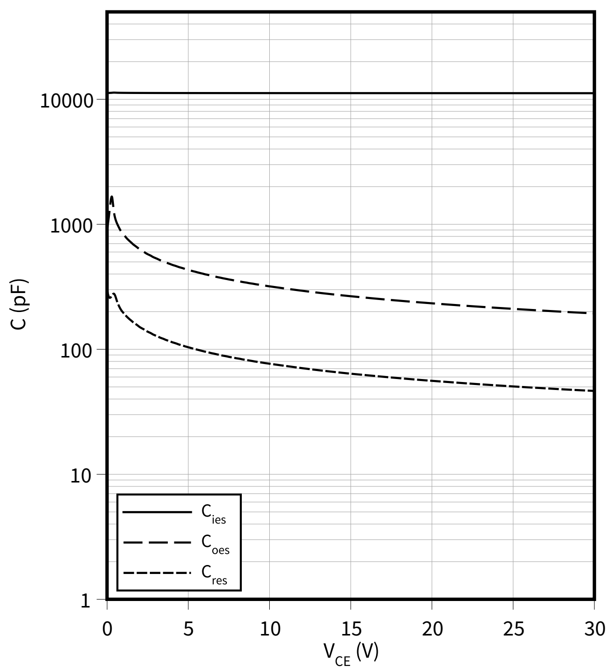
$I_C = 75$ A



Typical capacitance as a function of collector-emitter voltage

$C = f(V_{CE})$

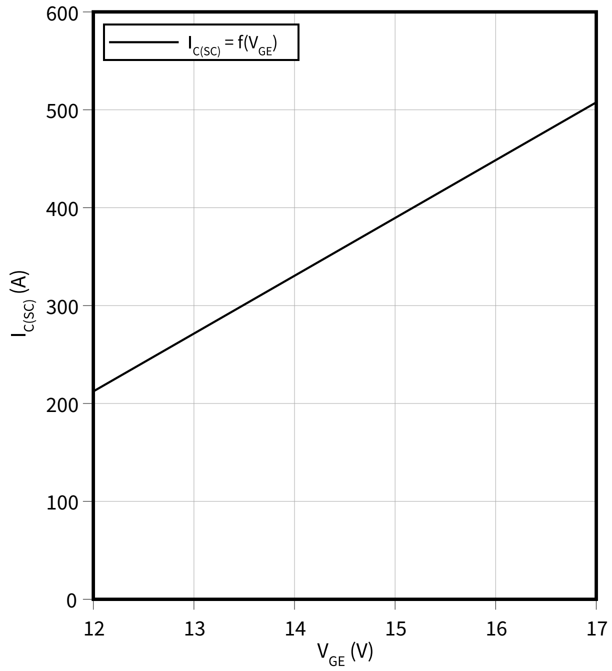
$f = 100$ kHz, $V_{GE} = 0$ V



Typical short circuit collector current as a function of gate-emitter voltage

$I_{C(SC)} = f(V_{GE})$

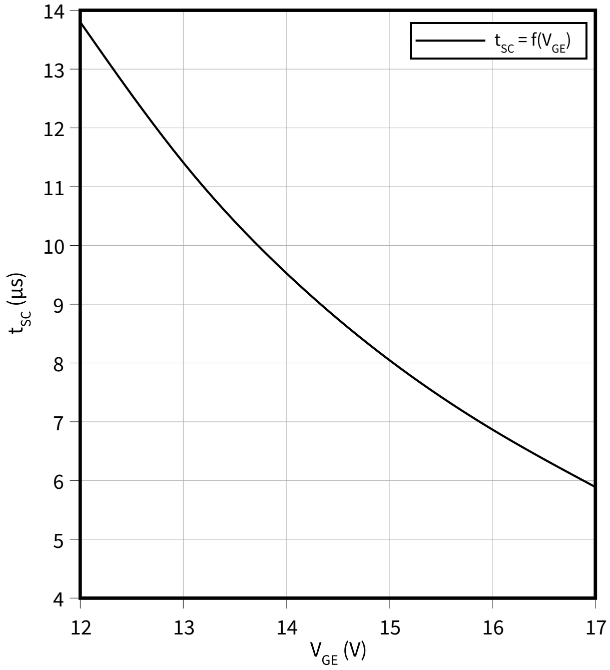
$T_{vj} = 150$ °C, $V_{CC} \leq 600$ V



Short circuit withstand time as a function of gate-emitter voltage

$t_{SC} = f(V_{GE})$

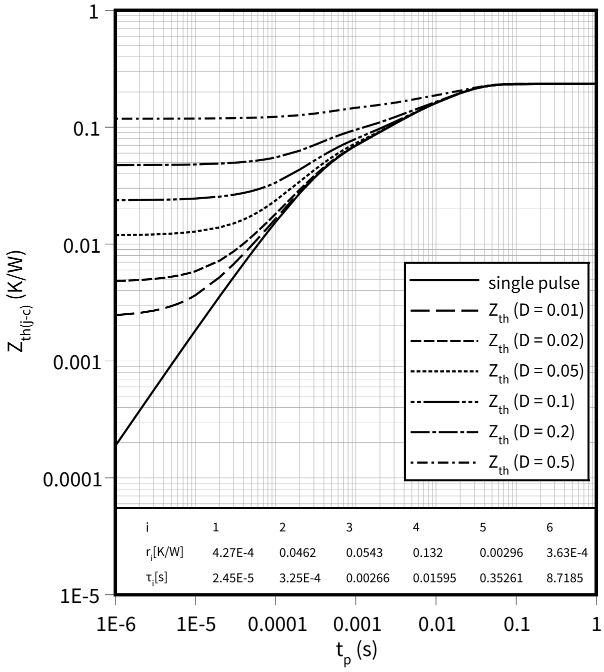
$T_{vj} \leq 150\ °C$, $V_{CC} \leq 600\ V$



IGBT transient thermal impedance as a function of pulse width

$Z_{th(j\text{-}c)} = f(t_p)$

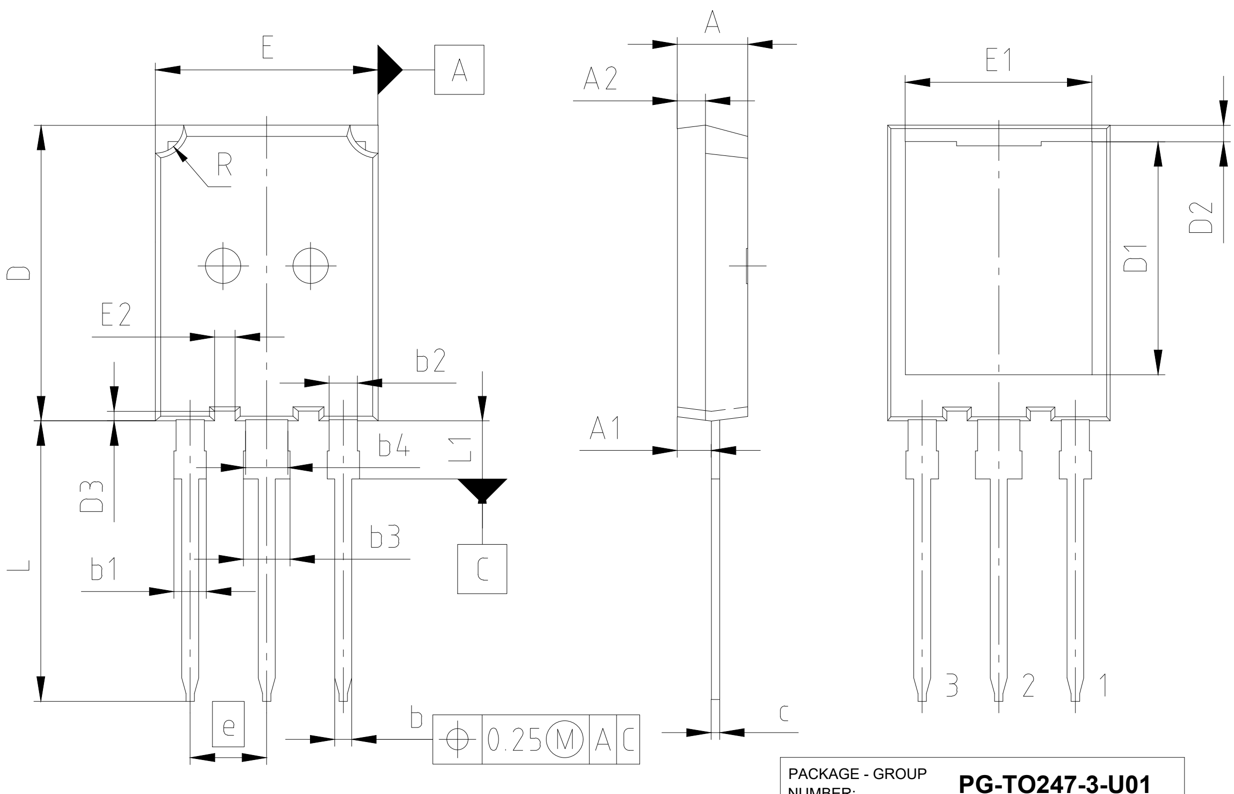
$D = t_p/T$



i	1	2	3	4	5	6
r_i[K/W]	4.27E-4	0.0462	0.0543	0.132	0.00296	3.63E-4
τ_i[s]	2.45E-5	3.25E-4	0.00266	0.01595	0.35261	8.7185

4 Package outlines

PG-TO247-3-PLUS-NN3.7



PACKAGE - GROUP NUMBER:	PG-TO247-3-U01	
DIMENSIONS	**MILLIMETERS**	
	MIN.	MAX.
A	4.90	5.10
A1	2.31	2.51
A2	1.90	2.10
b	1.16	1.26
b1	---	2.25
b2	1.96	2.06
b3	---	3.25
b4	2.96	3.06
c	0.59	0.66
D	20.90	21.10
D1	16.25	16.85
D2	1.05	1.35
D3	0.58	0.78
E	15.70	15.90
E1	13.10	13.50
E2	1.35	1.55
e	5.44 (BSC)	
N	3	
L	19.80	20.10
L1	3.90	4.30
R	1.90	2.10

NOTE:
DIMENSIONS DO NOT INCLUDE MOLDFLASH; PROTRUSION OR GATE BURRS

Figure 1

5 Testing conditions

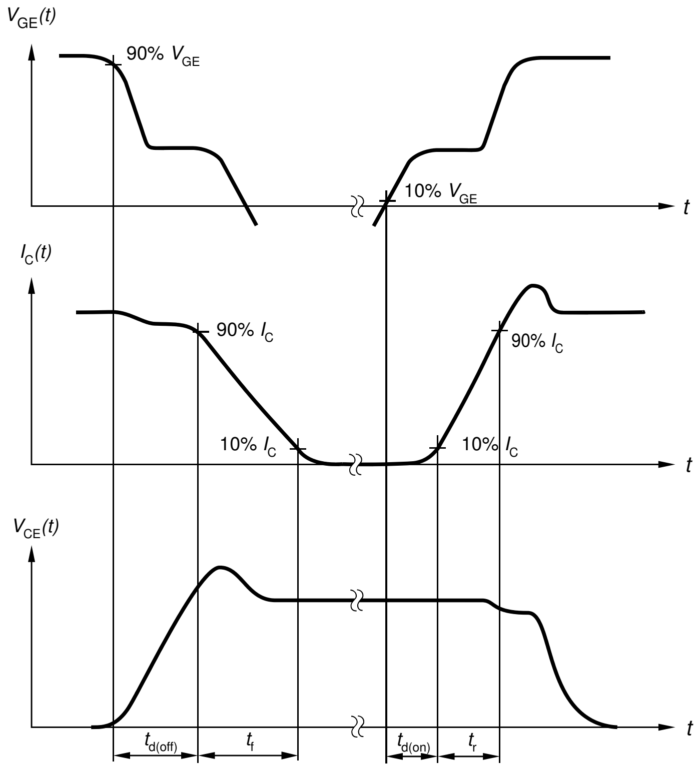


Figure A. **Definition of switching times**

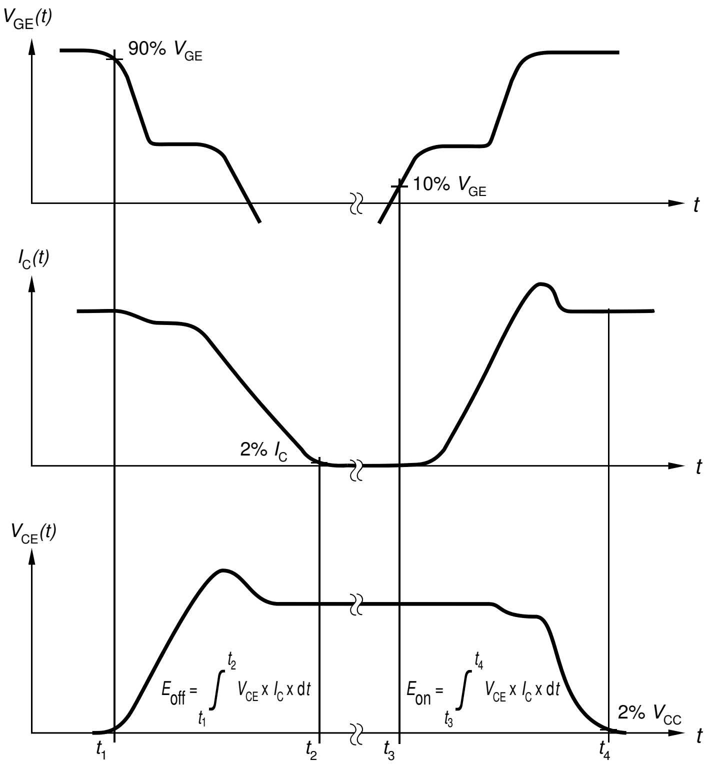


Figure B. **Definition of switching losses**

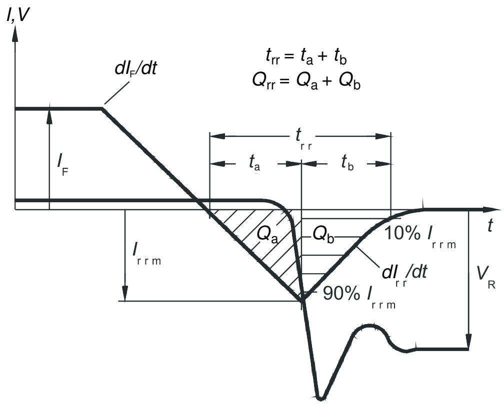


Figure C. **Definition of diode switching characteristics**

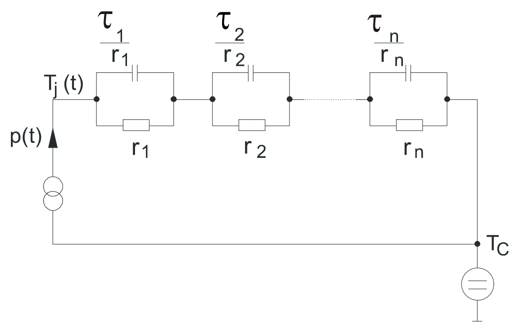


Figure D. **Thermal equivalent circuit**

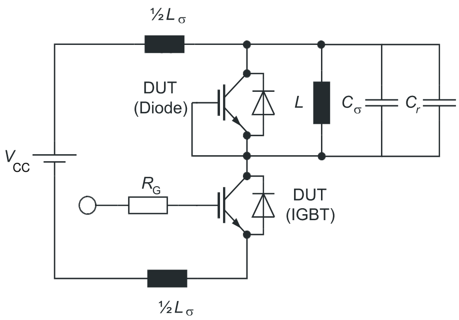


Figure E. **Dynamic test circuit**
Parasitic inductance L_σ,
parasitic capacitor C_σ,
relief capacitor C_r,
(only for ZVT switching)

Figure 2

Revision history

Document revision	Date of release	Description of changes
0.10	2022-05-04	Target datasheet
1.00	2022-12-05	Final datasheet
1.10	2023-01-23	Correction of boundary condition of diagrams $I_{C(SC)}$ = f(V_{GE}) and t_{SC} = f(V_{GE}) Change of product outline drawing on page 11