IGW08T120

Low Loss IGBT in TrenchStop® and Fieldstop technology

- Short circuit withstand time – 10µs
- Designed for :
    - Frequency Converters
    - Uninterrupted Power Supply
- TrenchStop® and Fieldstop technology for 1200 V applications offers :
    - very tight parameter distribution
    - high ruggedness, temperature stable behavior
- NPT technology offers easy parallel switching capability due to positive temperature coefficient in $V_{CE(sat)}$
- Low EMI
- Low Gate Charge
- 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/
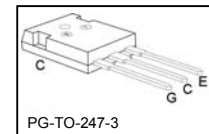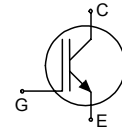
PG-TO-247-3

Type	V_{CE}	I_C	$V_{CE(sat),Tj=25°C}$	$T_{j,max}$	Marking Code	Package
IGW08T120	1200V	8A	1.7V	150°C	G08T120	PG-TO-247-3

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CE}	1200	V
DC collector current	I_C		A
T_C = 25°C		16	
T_C = 100°C		8	
Pulsed collector current, t_p limited by T_{jmax}	I_{Cpuls}	24	
Turn off safe operating area	-	24	
$V_{CE} \leq 1200V$, $T_j \leq 150°C$			
Gate-emitter voltage	V_{GE}	±20	V
Short circuit withstand time[2]	t_{SC}	10	µs
V_{GE} = 15V, $V_{CC} \leq 1200V$, $T_j \leq 150°C$			
Power dissipation	P_{tot}	70	W
T_C = 25°C			
Operating junction temperature	T_j	-40...+150	°C
Storage temperature	T_{stg}	-55...+150	
Soldering temperature, 1.6mm (0.063 in.) from case for 10s	-	260	

[1] J-STD-020 and JESD-022
[2] Allowed number of short circuits: <1000; time between short circuits: >1s.

Power Semiconductors

IGW08T120

TrenchStop® Series

Thermal Resistance

Parameter	Symbol	Conditions	Max. Value	Unit
Characteristic				
IGBT thermal resistance, junction – case	R_{thJC}		1.7	K/W
Thermal resistance, junction – ambient	R_{thJA}		40	

Electrical Characteristic, at T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value min.	Value typ.	Value max.	Unit
Static Characteristic						
Collector-emitter breakdown voltage	$V_{(BR)CES}$	V_{GE}=0V, I_C=0.5mA	1200	-	-	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	V_{GE} = 15V, I_C=8A				
		T_j=25°C	-	1.7	2.2	
		T_j=125°C	-	2.0	-	
		T_j=150°C	-	2.2	-	
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C=0.3mA, V_{CE}=V_{GE}	5.0	5.8	6.5	
Zero gate voltage collector current	I_{CES}	V_{CE}=1200V, V_{GE}=0V				mA
		T_j=25°C	-	-	0.2	
		T_j=150°C	-	-	2.0	
Gate-emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V	-	-	100	nA
Transconductance	g_{fs}	V_{CE}=20V, I_C=8A	-	5	-	S
Integrated gate resistor	R_{Gint}		none			Ω

Dynamic Characteristic

Parameter	Symbol	Conditions	Value min.	Value typ.	Value max.	Unit
Input capacitance	C_{iss}	V_{CE}=25V,	-	600	-	pF
Output capacitance	C_{oss}	V_{GE}=0V,	-	36	-	
Reverse transfer capacitance	C_{rss}	f=1MHz	-	28	-	
Gate charge	Q_{Gate}	V_{CC}=960V, I_C=8A V_{GE}=15V	-	53	-	nC
Internal emitter inductance measured 5mm (0.197 in.) from case	L_E		-	13	-	nH
Short circuit collector current[1]	$I_{C(SC)}$	V_{GE}=15V, t_{SC}≤10μs V_{CC} = 600V, T_j = 25°C	-	48	-	A

[1] Allowed number of short circuits: <1000; time between short circuits: >1s.

Power Semiconductors   2   Rev. 2.6   Nov. 09

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}=600V, I_C=8A, V_{GE}=-15/15V, R_G=81Ω, $L_\sigma{}^{2)}$=180nH, $C_\sigma{}^{2)}$=39pF Energy losses include "tail" and diode reverse recovery.	-	40	-	ns
Rise time	t_r		-	23	-	
Turn-off delay time	$t_{d(off)}$		-	450	-	
Fall time	t_f		-	70	-	
Turn-on energy	E_{on}		-	0.67	-	mJ
Turn-off energy	E_{off}		-	0.7	-	
Total switching energy	E_{ts}		-	1.37	-	

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}=600V, I_C=8A, V_{GE}=-15/15V, R_G= 81Ω, $L_\sigma{}^{2)}$=180nH, $C_\sigma{}^{2)}$=39pF Energy losses include "tail" and diode reverse recovery.	-	40	-	ns
Rise time	t_r		-	26	-	
Turn-off delay time	$t_{d(off)}$		-	570	-	
Fall time	t_f		-	140	-	
Turn-on energy	E_{on}		-	1.08	-	mJ
Turn-off energy	E_{off}		-	1.2	-	
Total switching energy	E_{ts}		-	2.28	-	

[2] Leakage inductance L_σ and Stray capacity C_σ due to dynamic test circuit in Figure E.

Power Semiconductors   3   Rev. 2.6   Nov. 09
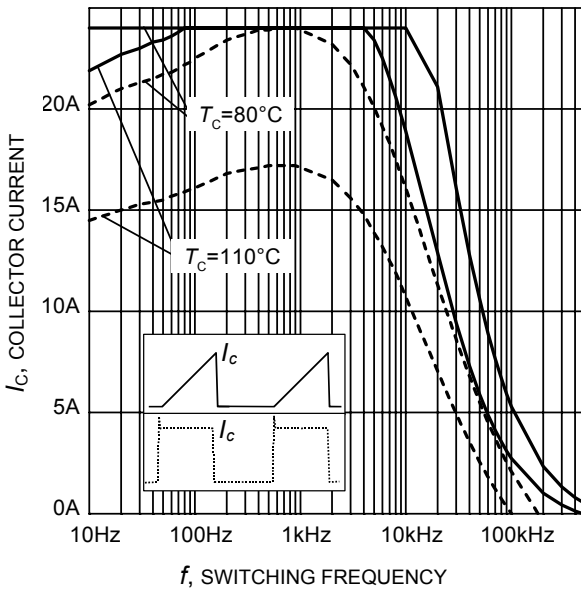
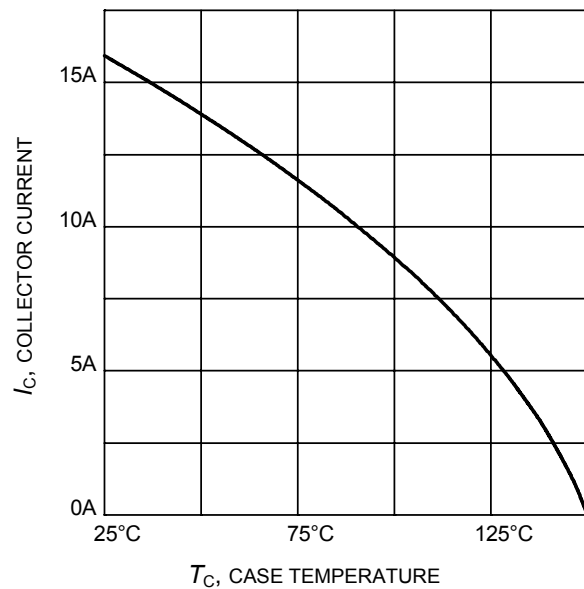**Figure 1. Collector current as a function of switching frequency**
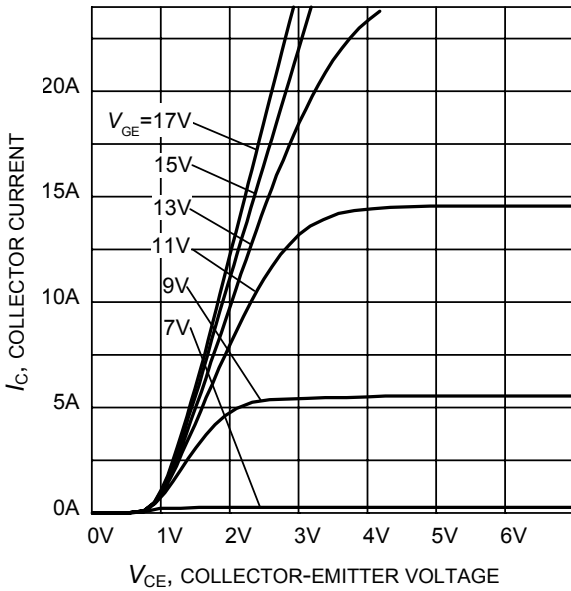($T_j \le 150°C$, $D = 0.5$, $V_{CE} = 600V$, $V_{GE} = 0/+15V$, $R_G = 81\Omega$)
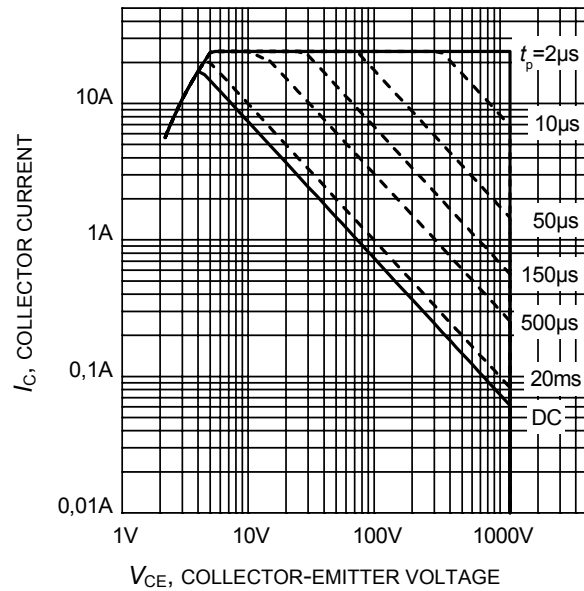
Figure 2. Safe operating area
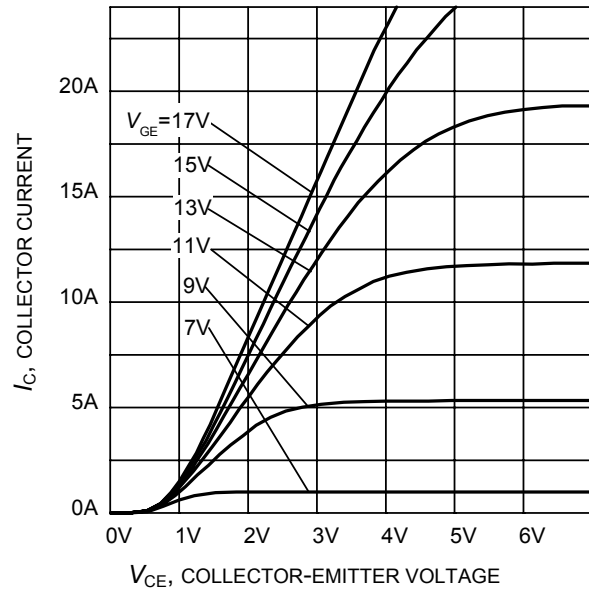($D = 0$, $T_C = 25°C$, $T_j \le 150°C$; $V_{GE}=15V$)
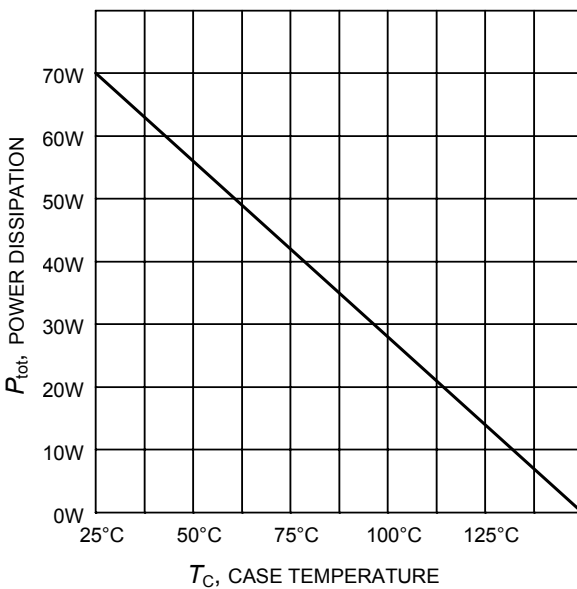
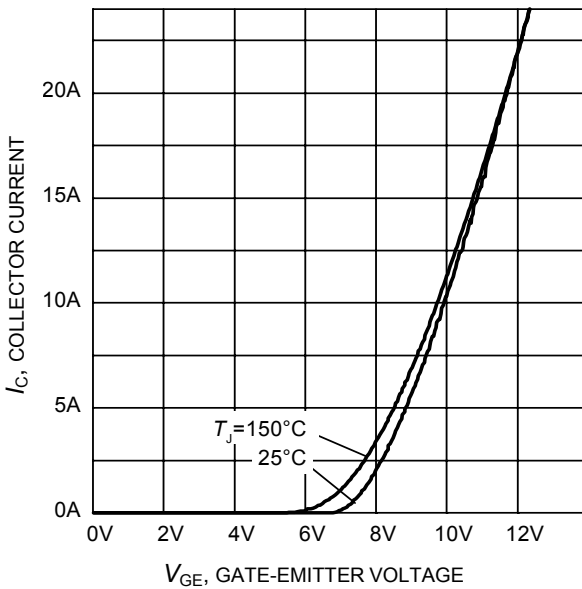**Figure 3. Power dissipation as a function of case temperature**
($T_j \le 150°C$)

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

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

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

Figure 7. Typical transfer characteristic
(V_{CE}=20V)
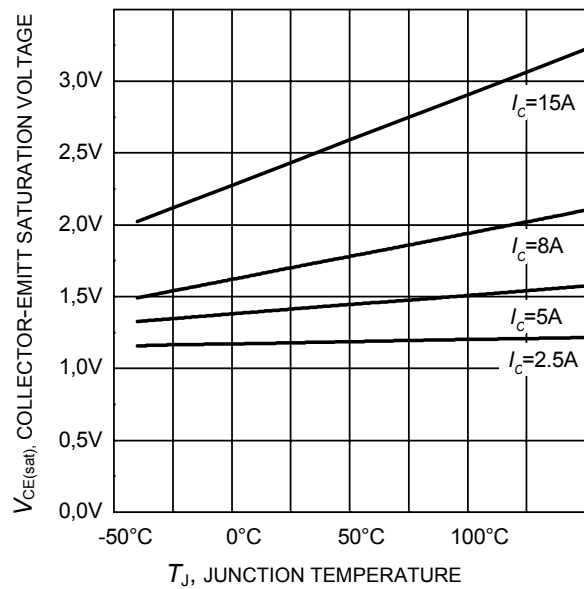
Figure 8. Typical collector-emitter saturation voltage as a function of junction temperature
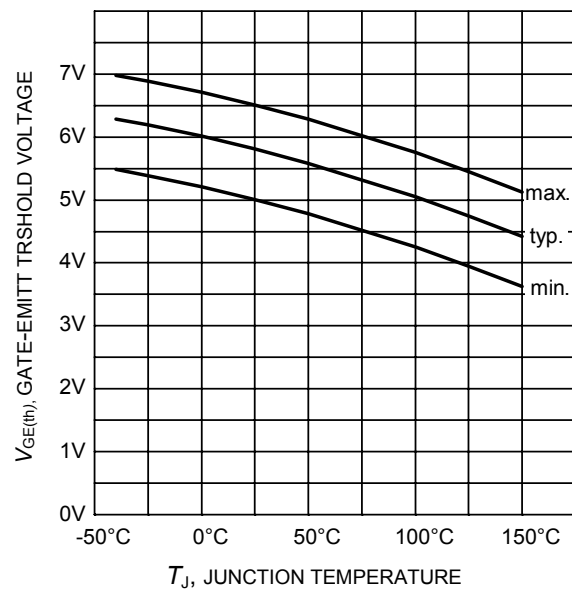(V_{GE} = 15V)
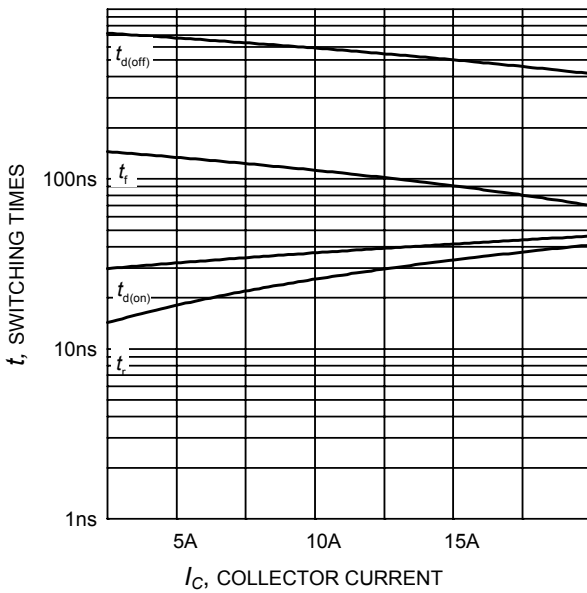
**Figure 9. Typical switching times as a
function of collector current**
(inductive load, T_J=150°C,
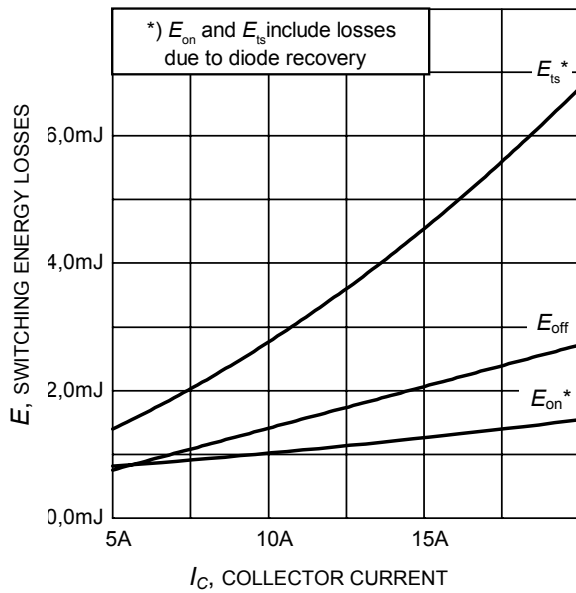V_{CE}=600V, V_{GE}=0/15V, R_G=81Ω,
Dynamic test circuit in Figure E)
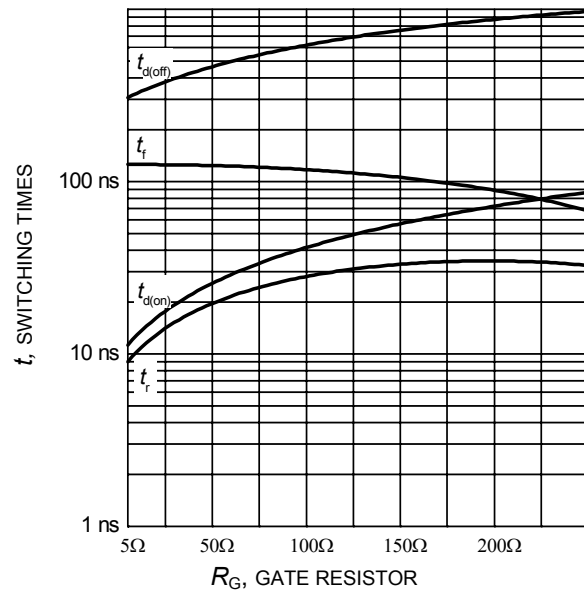
**Figure 10. Typical switching times as a
function of gate resistor**
(inductive load, T_J=150°C,
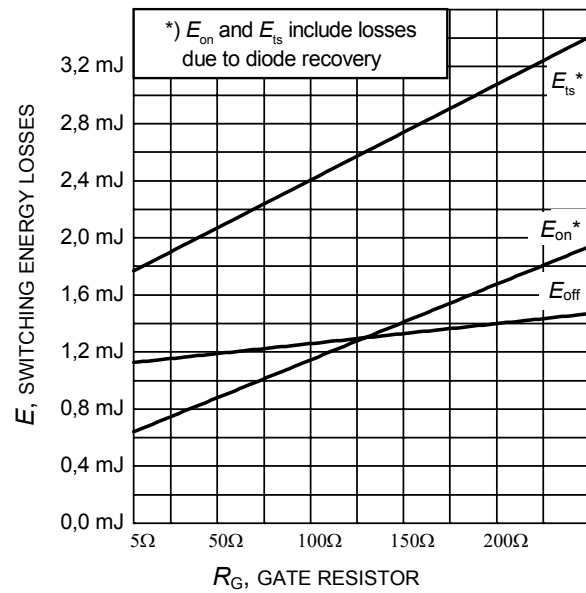V_{CE}=600V, V_{GE}=0/15V, I_C=8A,
Dynamic test circuit in Figure E)
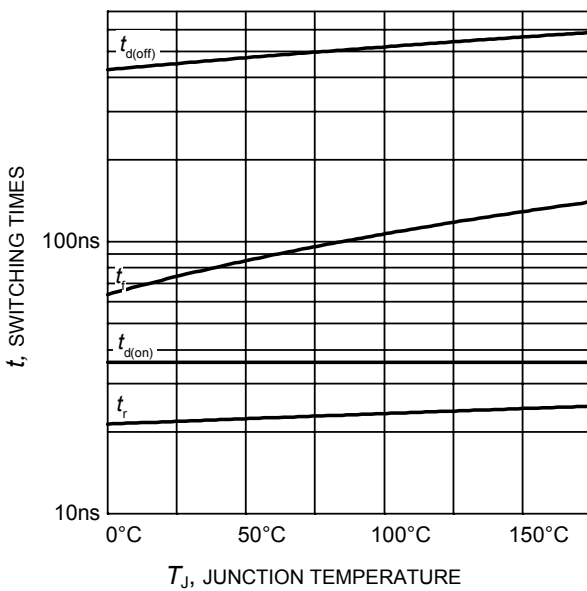
**Figure 11. Typical switching times as a
function of junction temperature**
(inductive load, V_{CE}=600V,
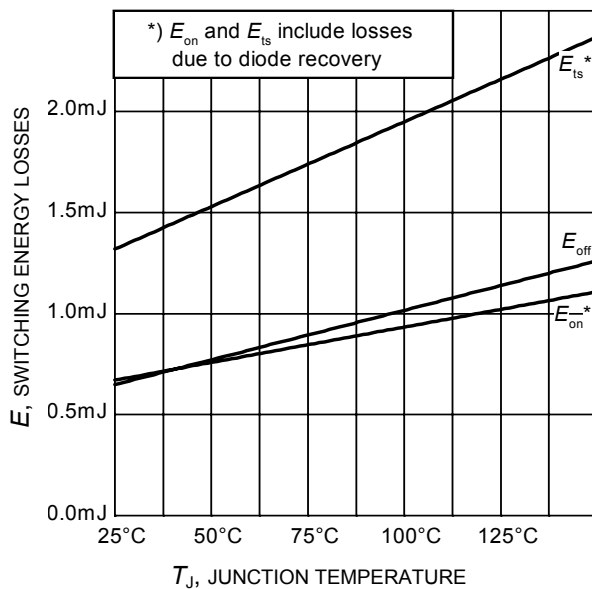V_{GE}=0/15V, I_C=8A, R_G=81Ω,
Dynamic test circuit in Figure E)

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

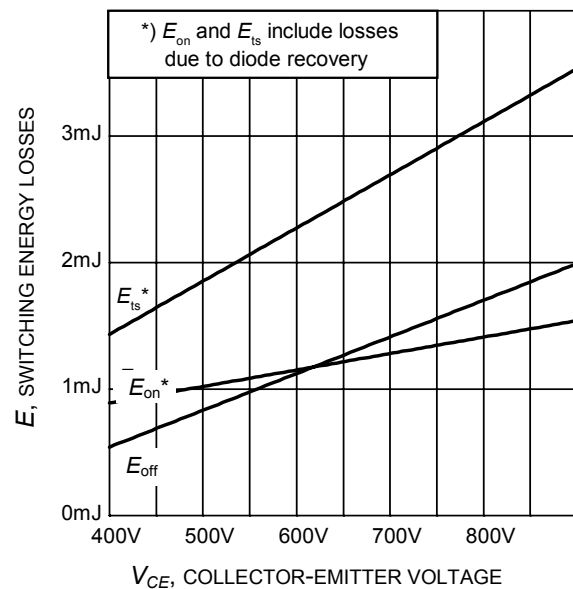**Figure 13. Typical switching energy losses as a function of collector current** (inductive load, T_J=150°C, V_{CE}=600V, V_{GE}=0/15V, R_G=81Ω, Dynamic test circuit in Figure E)


Figure 14. Typical switching energy losses as a function of gate resistor (inductive load, T_J=150°C, V_{CE}=600V, V_{GE}=0/15V, I_C=8A, Dynamic test circuit in Figure E)


Figure 15. Typical switching energy losses as a function of junction temperature (inductive load, V_{CE}=600V, V_{GE}=0/15V, I_C=8A, R_G=81Ω, Dynamic test circuit in Figure E)
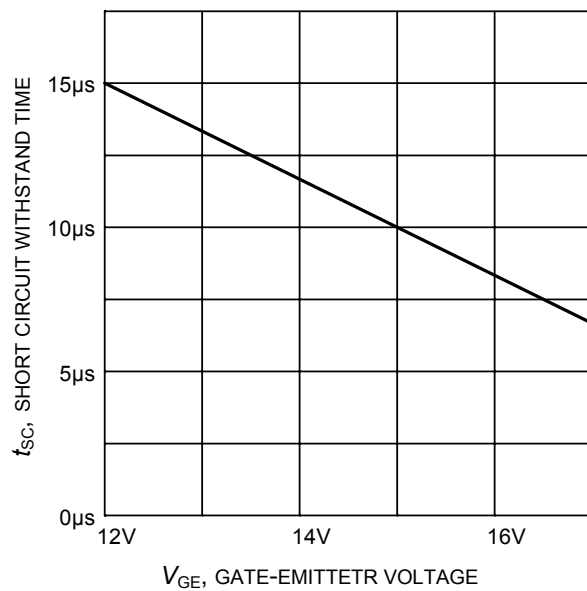

Figure 16. Typical switching energy losses as a function of collector emitter voltage (inductive load, T_J=150°C, V_{GE}=0/15V, I_C=8A, R_G=81Ω, Dynamic test circuit in Figure E)
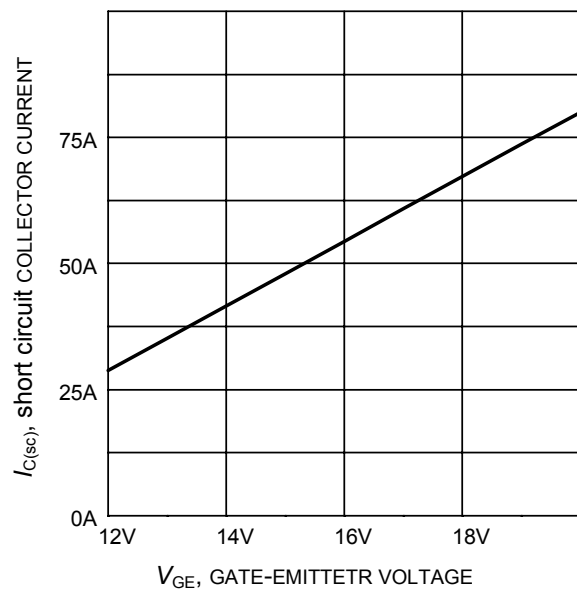
Power Semiconductors

7

Rev. 2.6   Nov. 09
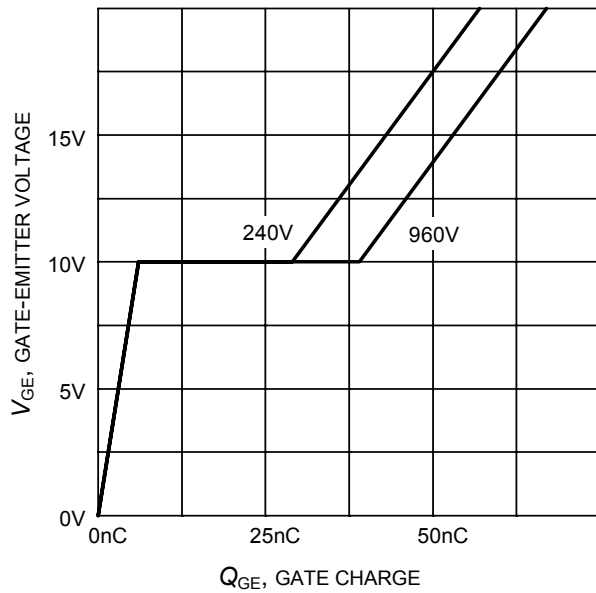
Figure 17. Typical gate charge
(I_C=8 A)
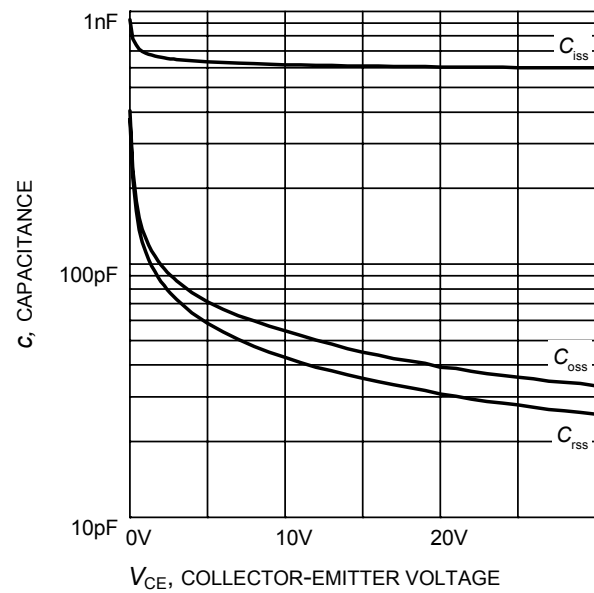
Figure 18. Typical capacitance as a function of collector-emitter voltage
(V_{GE}=0V, f = 1 MHz)

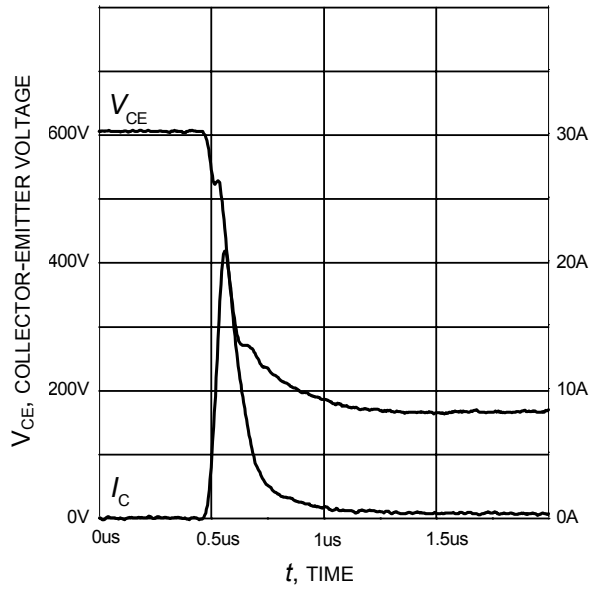**Figure 19. Short circuit withstand time as a function of gate-emitter voltage**
(V_{CE}=600V, start at T_J=25°C)

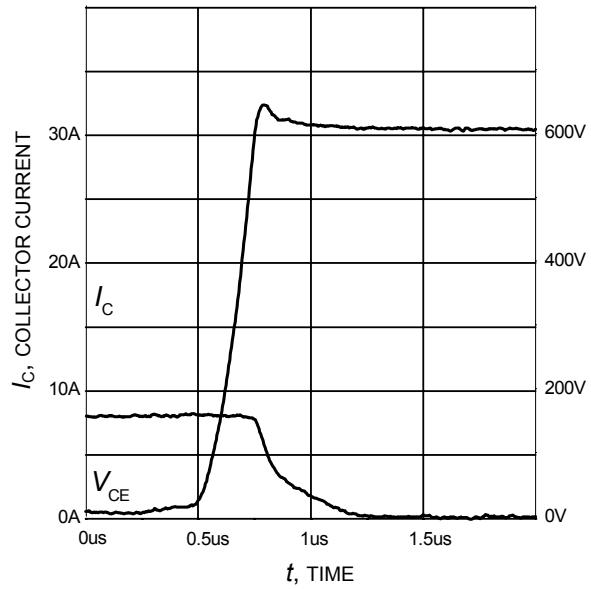
Figure 20. Typical short circuit collector current as a function of gate-emitter voltage
($V_{CE} \leq$ 600V, $T_j \leq$ 150°C)

Power Semiconductors

8

Figure 21. Typical turn on behavior
(V_{GE}=0/15V, R_G=81Ω, T_j = 150°C,
Dynamic test circuit in Figure E)

Figure 22. Typical turn off behavior
(V_{GE}=15/0V, R_G=81Ω, T_j = 150°C,
Dynamic test circuit in Figure E)

R, (K / W)	τ, (s)
0.187	$1.73*10^{-1}$
0.575	$2.75*10^{-2}$
0.589	$2.57*10^{-3}$
0.350	$2.71*10^{-4}$

$C_1 = \tau_1 / R_1$ $C_2 = \tau_2 / R_2$
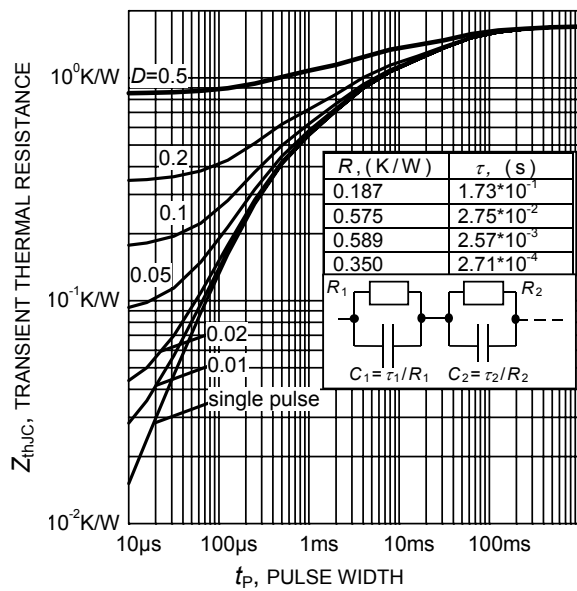
Figure 23. IGBT transient thermal resistance
($D = t_p / T$)

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Rev. 2.6   Nov. 09

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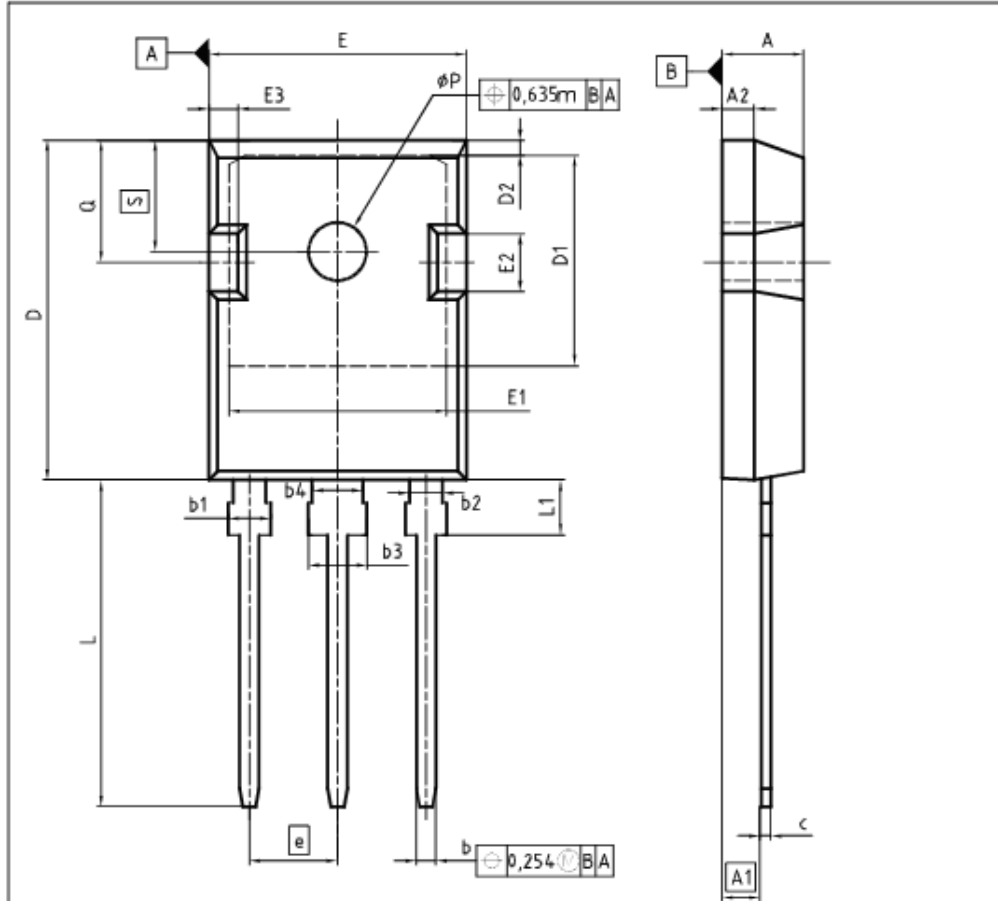
| DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.83	5.21	0.190	0.205
A1	2.27	2.54	0.089	0.100
A2	1.85	2.16	0.073	0.085
b	1.07	1.33	0.042	0.052
b1	1.90	2.41	0.075	0.095
b2	1.90	2.16	0.075	0.085
b3	2.87	3.38	0.113	0.133
b4	2.87	3.13	0.113	0.123
c	0.55	0.68	0.022	0.027
D	20.80	21.10	0.819	0.831
D1	16.25	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		0.214	
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

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SCALE

7.5mm

EUROPEAN PROJECTION

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REVISION
04
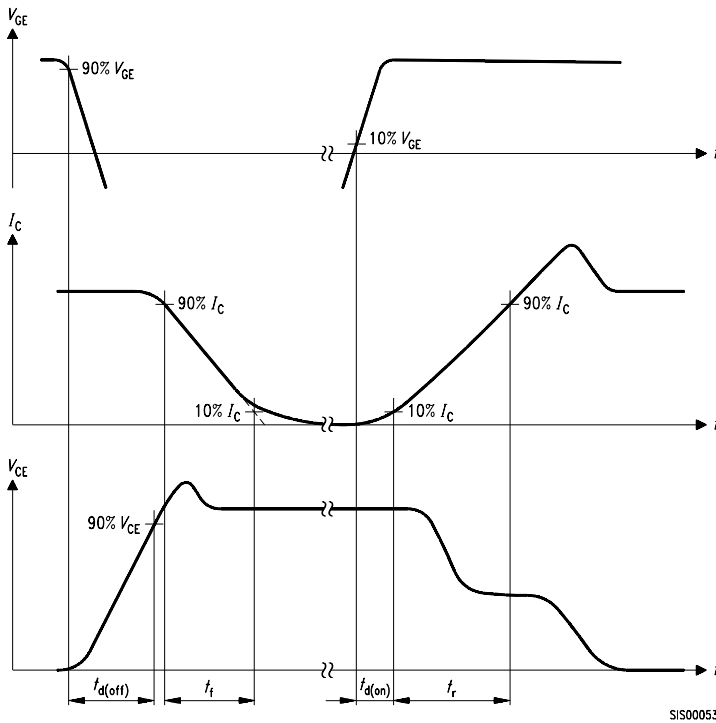
Figure A. Definition of switching times
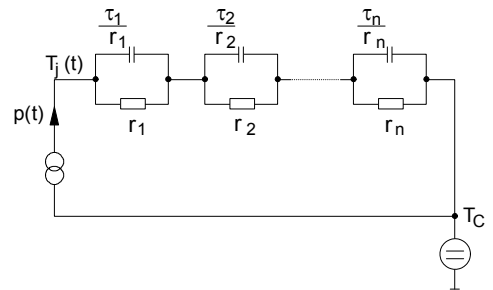
Figure D. Thermal equivalent circuit

$$E_{OFF} = \int_{t_1}^{t_2} V_{CE} \times I_C \times dt$$

$$E_{ON} = \int_{t_3}^{t_4} V_{CE} \times I_C \times dt$$
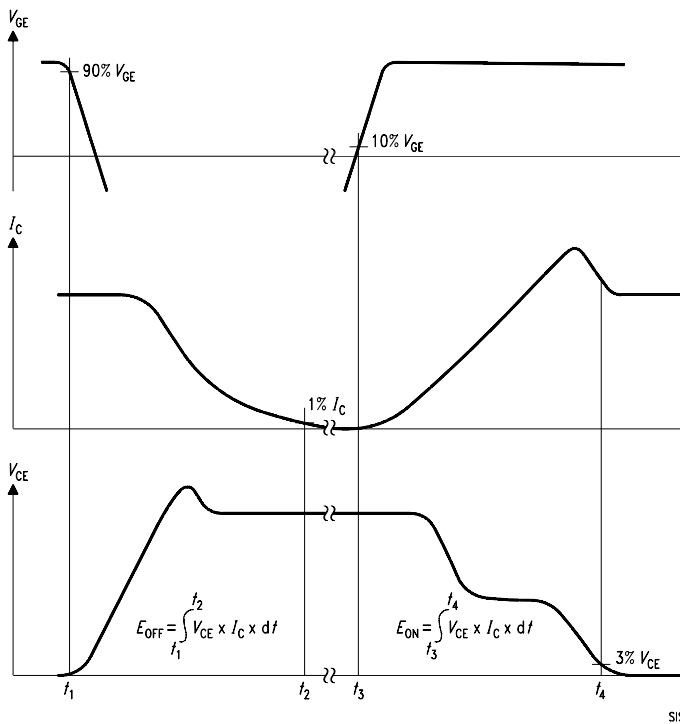
Figure B. Definition of switching losses
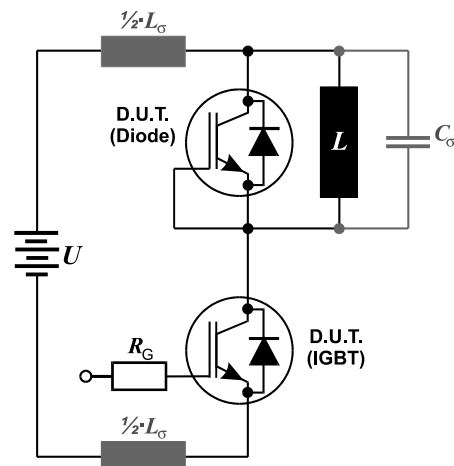
Figure E. Dynamic test circuit
Leakage inductance L_σ =180nH
and Stray capacity C_σ =39pF.

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