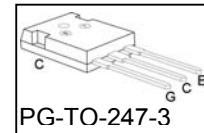
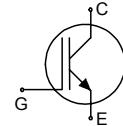


### Low Loss IGBT in TrenchStop® and Fieldstop technology

- Approx. 1.0V reduced  $V_{CE(sat)}$  compared to BUP313
- Short circuit withstand time – 10 $\mu$ s
- 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<sup>1</sup> for target applications
- Pb-free lead plating; RoHS compliant
- Complete product spectrum and PSpice Models : <http://www.infineon.com/igbt/>



Type	$V_{CE}$	$I_c$	$V_{CE(sat), TJ=25^\circ C}$	$T_{j,max}$	Marking Code	Package
IGW15T120	1200V	15A	1.7V	150°C	G15T120	PG-T0-247-3

#### Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	$V_{CE}$	1200	V
DC collector current	$I_c$		A
$T_c = 25^\circ C$		30	
$T_c = 100^\circ C$		15	
Pulsed collector current, $t_p$ limited by $T_{j,max}$	$I_{Cpuls}$	45	
Turn off safe operating area	-	45	
$V_{CE} \leq 1200V, T_j \leq 150^\circ C$			
Gate-emitter voltage	$V_{GE}$	$\pm 20$	V
Short circuit withstand time <sup>2)</sup>	$t_{SC}$	10	$\mu s$
$V_{GE} = 15V, V_{CC} \leq 1200V, T_j \leq 150^\circ C$			
Power dissipation	$P_{tot}$	110	W
$T_c = 25^\circ C$			
Operating junction temperature	$T_j$	-40...+150	$^\circ C$
Storage temperature	$T_{stg}$	-55...+150	
Soldering temperature, 1.6mm (0.063 in.) from case for 10s	-	260	

<sup>1</sup> J-STD-020 and JESD-022

<sup>2)</sup> Allowed number of short circuits: <1000; time between short circuits: >1s.

**Thermal Resistance**

Parameter	Symbol	Conditions	Max. Value	Unit
<b>Characteristic</b>				
IGBT thermal resistance, junction – case	$R_{thJC}$		1.1	K/W
Thermal resistance, junction – ambient	$R_{thJA}$		40	

**Electrical Characteristic, at  $T_j = 25^\circ\text{C}$ , unless otherwise specified**

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
<b>Static Characteristic</b>						
Collector-emitter breakdown voltage	$V_{(BR)CES}$	$V_{GE}=0\text{V}, I_C=0.5\text{mA}$	1200	-	-	V
Collector-emitter saturation voltage	$V_{CE(\text{sat})}$	$V_{GE} = 15\text{V}, I_C=15\text{A}$	-	1.7	2.2	
		$T_j=25^\circ\text{C}$	-	2.0	-	
		$T_j=125^\circ\text{C}$	-	2.2	-	
Gate-emitter threshold voltage	$V_{GE(\text{th})}$	$I_C=0.6\text{mA}, V_{CE}=V_{GE}$	5.0	5.8	6.5	
Zero gate voltage collector current	$I_{CES}$	$V_{CE}=1200\text{V}, V_{GE}=0\text{V}$	-	-	0.2	
		$T_j=25^\circ\text{C}$	-	-	2.0	
		$T_j=150^\circ\text{C}$	-	-		
Gate-emitter leakage current	$I_{GES}$	$V_{CE}=0\text{V}, V_{GE}=20\text{V}$	-	-	100	nA
Transconductance	$g_{fs}$	$V_{CE}=20\text{V}, I_C=15\text{A}$	-	10	-	S
Integrated gate resistor	$R_{Gint}$			none		$\Omega$

**Dynamic Characteristic**

Input capacitance	$C_{iss}$	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$	-	1100	-	pF
Output capacitance	$C_{oss}$		-	100	-	
Reverse transfer capacitance	$C_{rss}$		-	50	-	
Gate charge	$Q_{\text{Gate}}$	$V_{CC}=960\text{V}, I_C=15\text{A}$	-	85	-	nC
Internal emitter inductance measured 5mm (0.197 in.) from case	$L_E$		-	13	-	nH
Short circuit collector current <sup>1)</sup>	$I_{C(\text{sc})}$	$V_{GE}=15\text{V}, t_{\text{sc}} \leq 10\mu\text{s}$	-	90	-	A
		$V_{CC} = 600\text{V}, T_j = 25^\circ\text{C}$				

<sup>1)</sup> Allowed number of short circuits: <1000; time between short circuits: >1s.

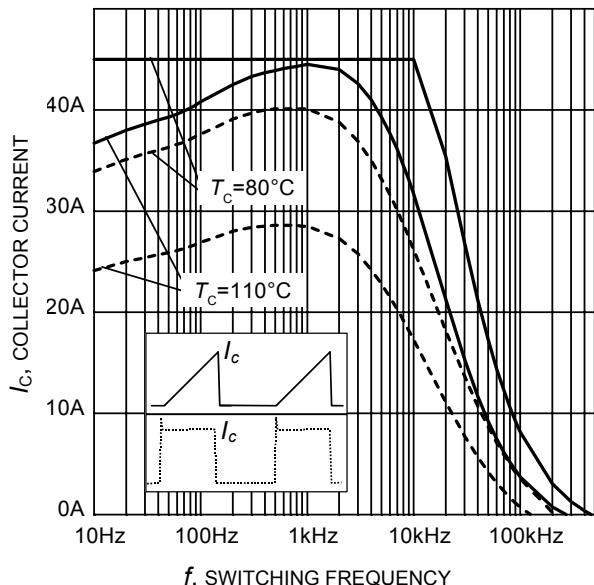
**Switching Characteristic, Inductive Load, at  $T_j=25\text{ }^\circ\text{C}$** 

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
<b>IGBT Characteristic</b>						
Turn-on delay time	$t_{d(on)}$	$T_j=25\text{ }^\circ\text{C}$ , $V_{CC}=600\text{V}$ , $I_C=15\text{A}$ , $V_{GE}=0/15\text{V}$ , $R_G=56\Omega$ ,	-	50	-	ns
Rise time	$t_r$	$L_\sigma^{(2)}=180\text{nH}$ , $C_\sigma^{(2)}=39\text{pF}$	-	30	-	
Turn-off delay time	$t_{d(off)}$	$E_{on}$ Energy losses include “tail” and diode reverse recovery.	-	520	-	
Fall time	$t_f$	$E_{off}$	-	60	-	
Turn-on energy	$E_{on}$	$E_{ts}$	-	1.3	-	mJ
Turn-off energy	$E_{off}$		-	1.4	-	
Total switching energy	$E_{ts}$		-	2.7	-	

**Switching Characteristic, Inductive Load, at  $T_j=150\text{ }^\circ\text{C}$** 

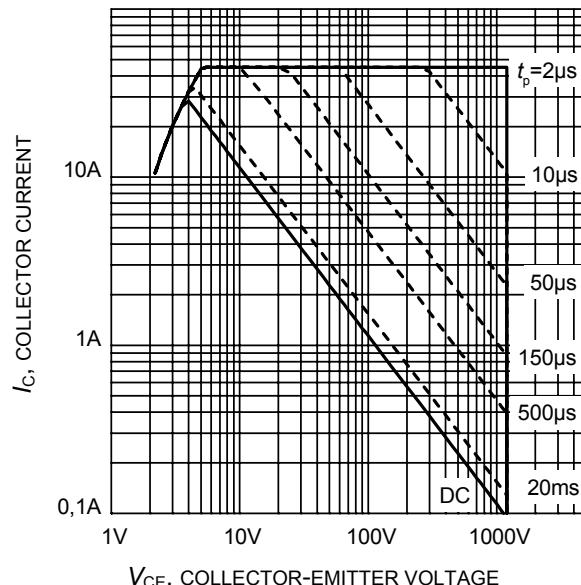
Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
<b>IGBT Characteristic</b>						
Turn-on delay time	$t_{d(on)}$	$T_j=150\text{ }^\circ\text{C}$ , $V_{CC}=600\text{V}$ , $I_C=15\text{A}$ , $V_{GE}=0/15\text{V}$ , $R_G=56\Omega$	-	50	-	ns
Rise time	$t_r$	$L_\sigma^{(2)}=180\text{nH}$ , $C_\sigma^{(2)}=39\text{pF}$	-	35	-	
Turn-off delay time	$t_{d(off)}$	$E_{on}$ Energy losses include “tail” and diode reverse recovery.	-	600	-	
Fall time	$t_f$	$E_{off}$	-	120	-	
Turn-on energy	$E_{on}$	$E_{ts}$	-	2.0	-	mJ
Turn-off energy	$E_{off}$		-	2.1	-	
Total switching energy	$E_{ts}$		-	4.1	-	

<sup>2)</sup> Leakage inductance  $L_\sigma$  and Stray capacity  $C_\sigma$  due to dynamic test circuit in Figure E.



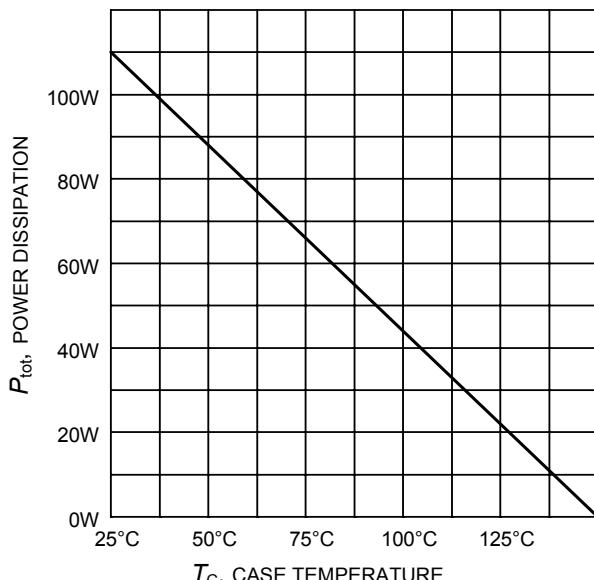
**Figure 1. Collector current as a function of switching frequency**

( $T_j \leq 150^\circ\text{C}$ ,  $D = 0.5$ ,  $V_{\text{CE}} = 600\text{V}$ ,  
 $V_{\text{GE}} = 0/+15\text{V}$ ,  $R_G = 56\Omega$ )



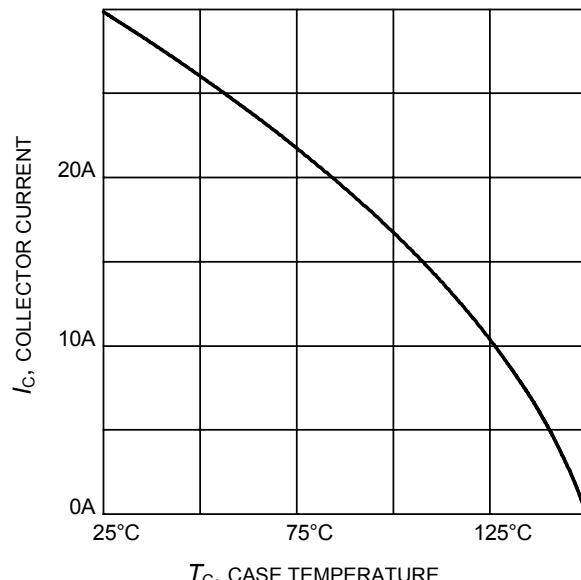
**Figure 2. Safe operating area**

( $D = 0$ ,  $T_C = 25^\circ\text{C}$ ,  
 $T_j \leq 150^\circ\text{C}$ ;  $V_{\text{GE}} = 15\text{V}$ )



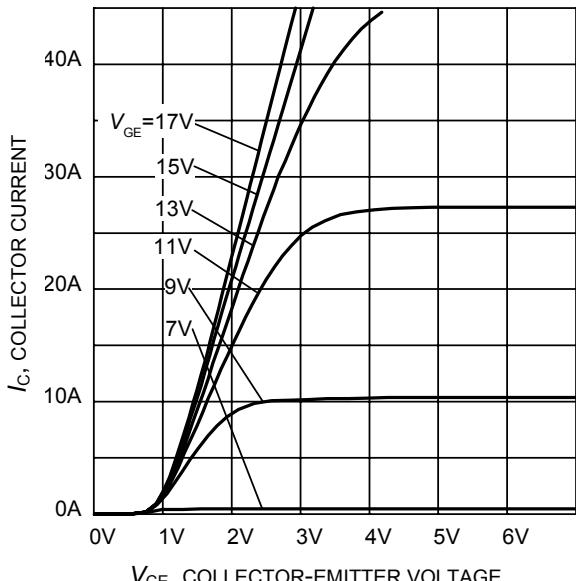
**Figure 3. Power dissipation as a function of case temperature**

( $T_j \leq 150^\circ\text{C}$ )

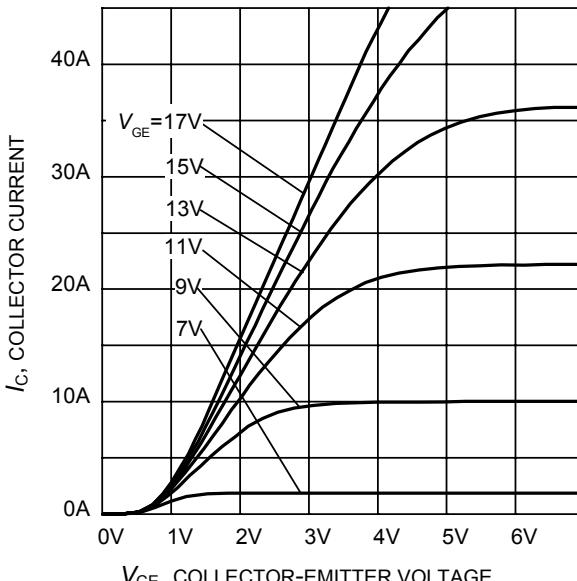


**Figure 4. Collector current as a function of case temperature**

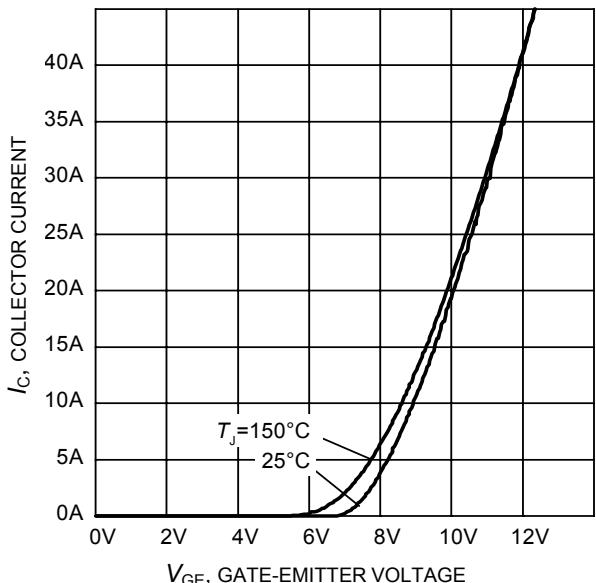
( $V_{\text{GE}} \geq 15\text{V}$ ,  $T_j \leq 150^\circ\text{C}$ )



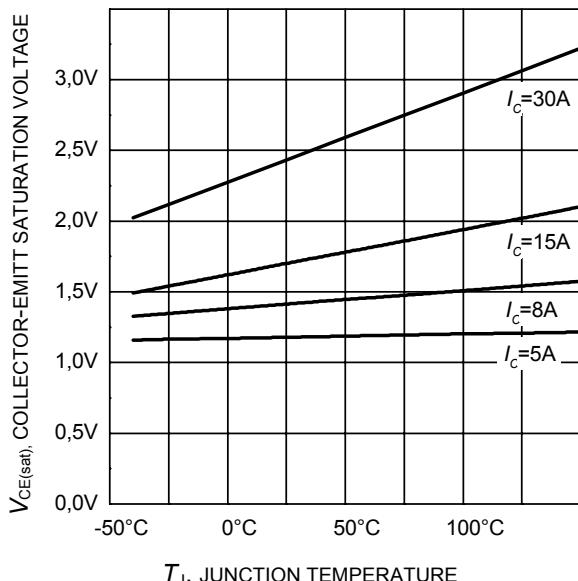
**Figure 5. Typical output characteristic**  
( $T_j = 25^\circ\text{C}$ )



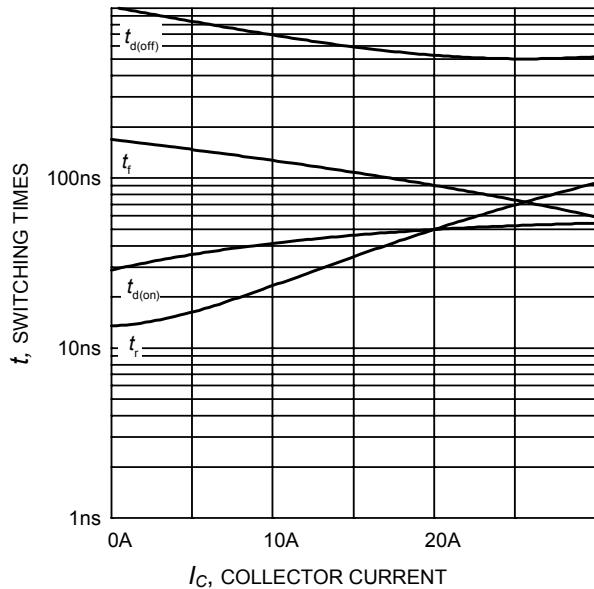
**Figure 6. Typical output characteristic**  
( $T_j = 150^\circ\text{C}$ )



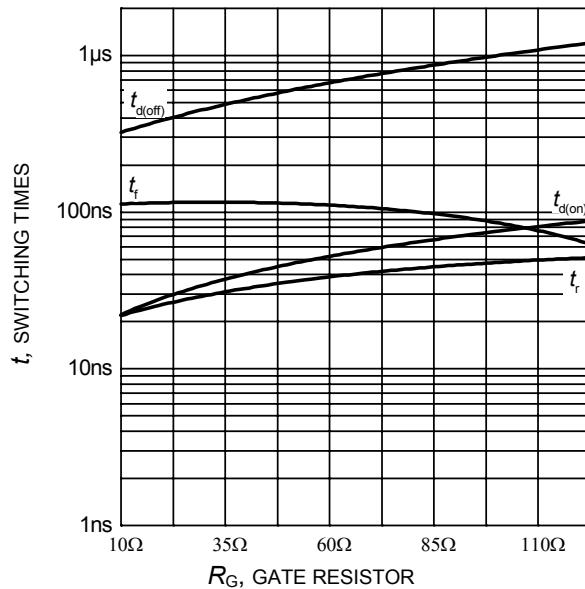
**Figure 7. Typical transfer characteristic**  
( $V_{CE} = 20\text{V}$ )



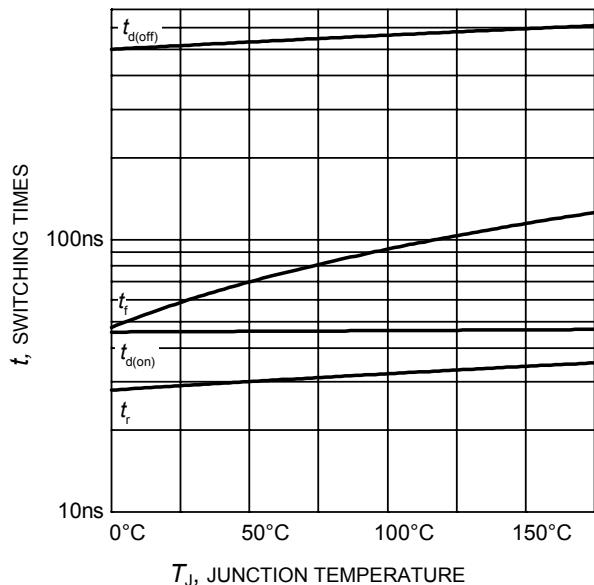
**Figure 8. Typical collector-emitter saturation voltage as a function of junction temperature**  
( $V_{GE} = 15\text{V}$ )



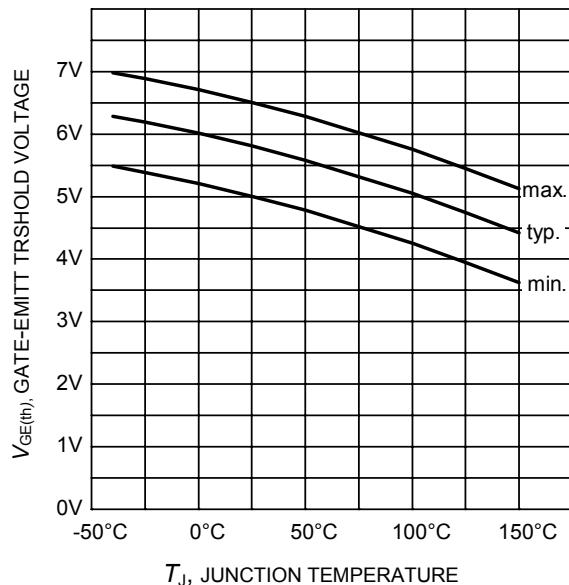
**Figure 9. Typical switching times as a function of collector current**  
(inductive load,  $T_J=150^\circ\text{C}$ ,  
 $V_{CE}=600\text{V}$ ,  $V_{GE}=0/15\text{V}$ ,  $R_G=56\Omega$ ,  
Dynamic test circuit in Figure E)



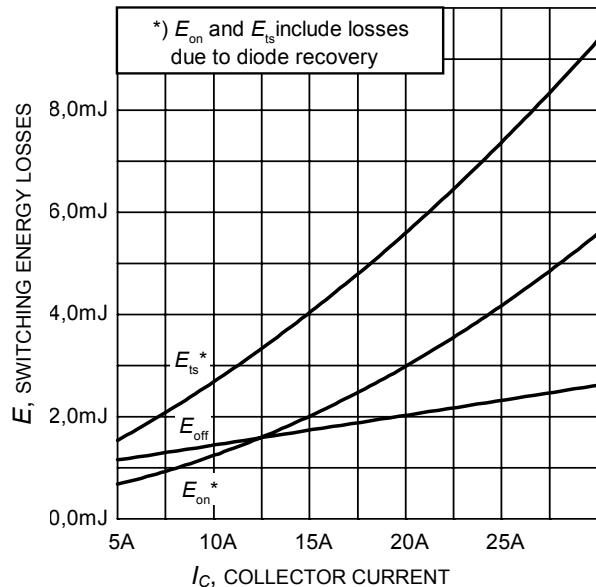
**Figure 10. Typical switching times as a function of gate resistor**  
(inductive load,  $T_J=150^\circ\text{C}$ ,  
 $V_{CE}=600\text{V}$ ,  $V_{GE}=0/15\text{V}$ ,  $I_C=15\text{A}$ ,  
Dynamic test circuit in Figure E)



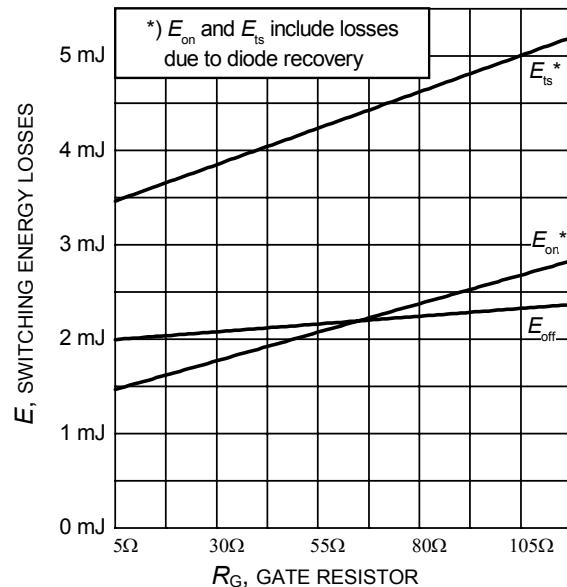
**Figure 11. Typical switching times as a function of junction temperature**  
(inductive load,  $V_{CE}=600\text{V}$ ,  
 $V_{GE}=0/15\text{V}$ ,  $I_C=15\text{A}$ ,  $R_G=56\Omega$ ,  
Dynamic test circuit in Figure E)



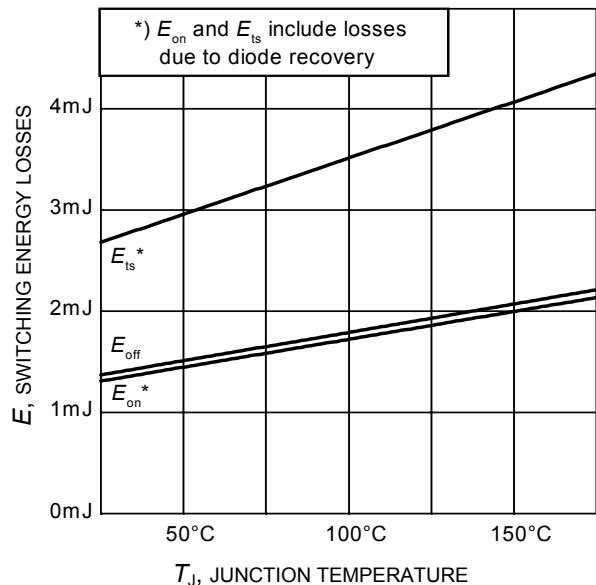
**Figure 12. Gate-emitter threshold voltage as a function of junction temperature**  
( $I_C = 0.6\text{mA}$ )



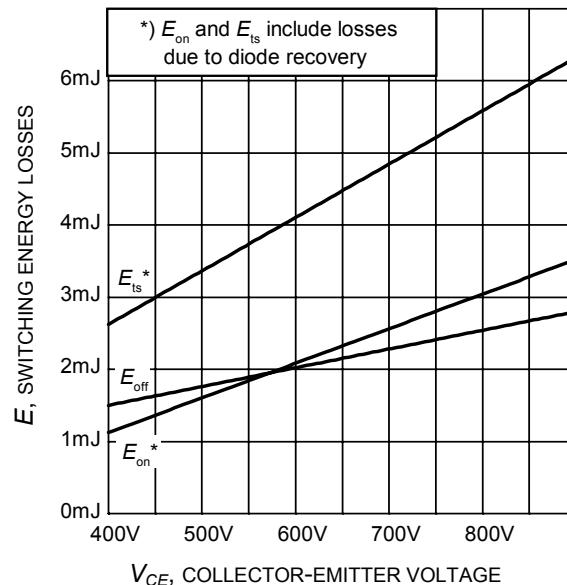
**Figure 13. Typical switching energy losses as a function of collector current**  
(inductive load,  $T_J=150^\circ\text{C}$ ,  
 $V_{CE}=600\text{V}$ ,  $V_{GE}=0/15\text{V}$ ,  $R_G=56\Omega$ ,  
Dynamic test circuit in Figure E)



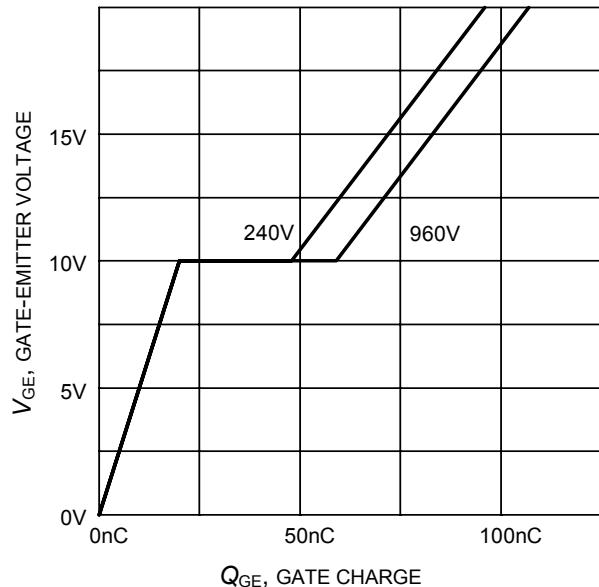
**Figure 14. Typical switching energy losses as a function of gate resistor**  
(inductive load,  $T_J=150^\circ\text{C}$ ,  
 $V_{CE}=600\text{V}$ ,  $V_{GE}=0/15\text{V}$ ,  $I_C=15\text{A}$ ,  
Dynamic test circuit in Figure E)



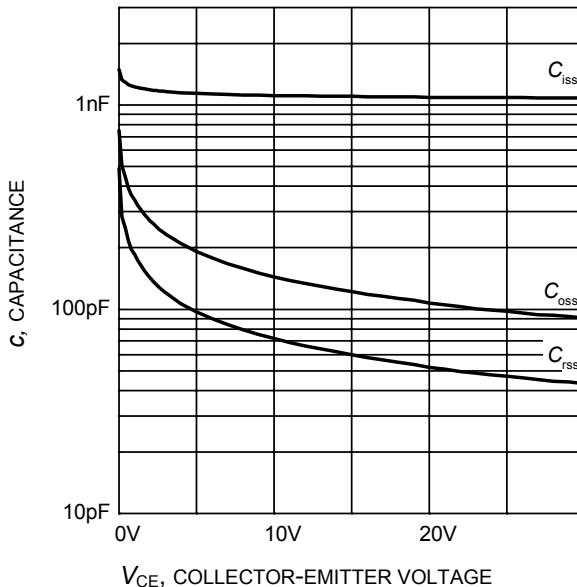
**Figure 15. Typical switching energy losses as a function of junction temperature**  
(inductive load,  $V_{CE}=600\text{V}$ ,  
 $V_{GE}=0/15\text{V}$ ,  $I_C=15\text{A}$ ,  $R_G=56\Omega$ ,  
Dynamic test circuit in Figure E)



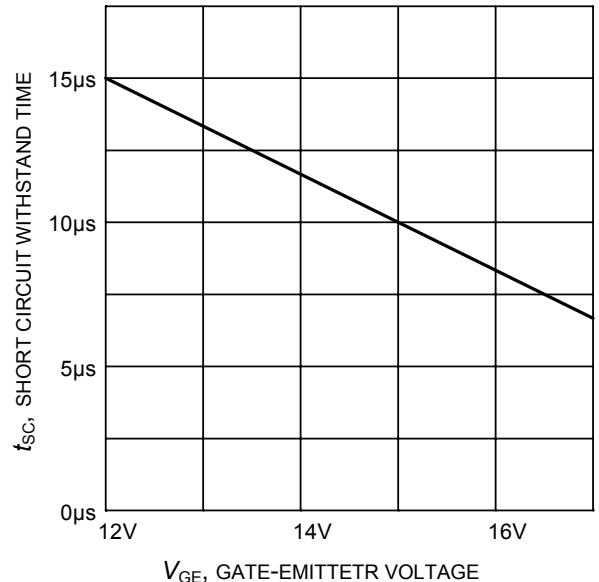
**Figure 16. Typical switching energy losses as a function of collector-emitter voltage**  
(inductive load,  $T_J=150^\circ\text{C}$ ,  
 $V_{GE}=0/15\text{V}$ ,  $I_C=15\text{A}$ ,  $R_G=56\Omega$ ,  
Dynamic test circuit in Figure E)



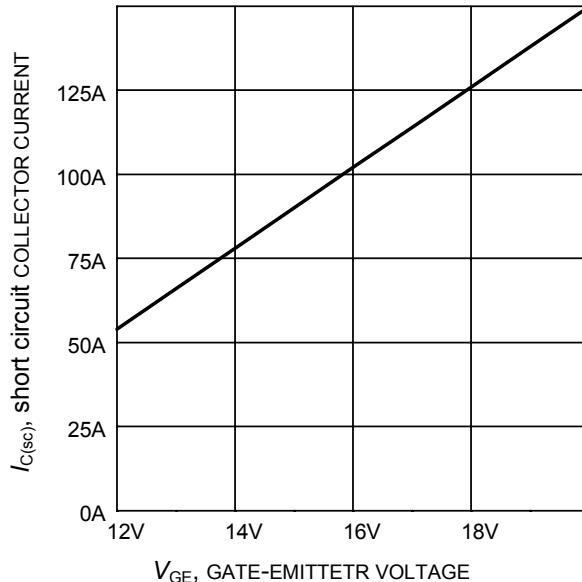
**Figure 17. Typical gate charge**  
( $I_C=15\text{ A}$ )



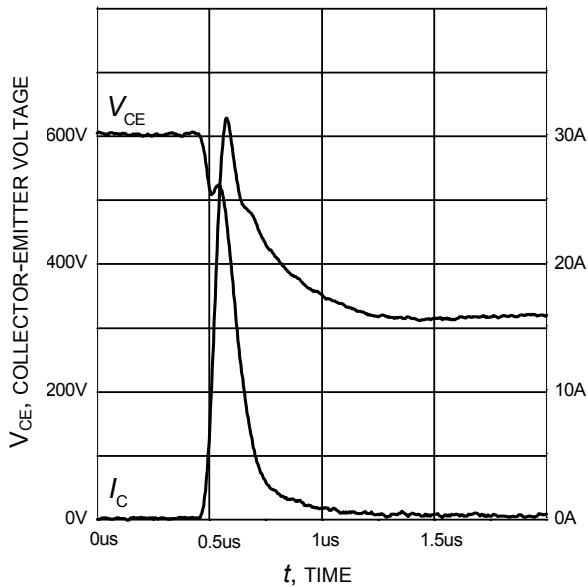
**Figure 18. Typical capacitance as a function of collector-emitter voltage**  
( $V_{GE}=0\text{V}$ ,  $f = 1\text{ MHz}$ )



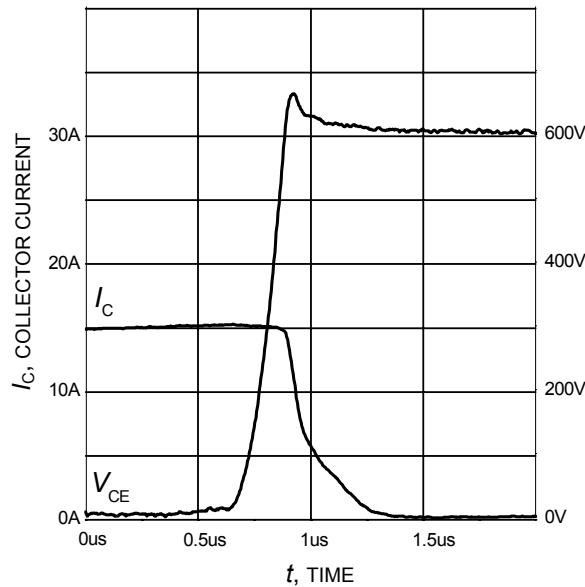
**Figure 19. Short circuit withstand time as a function of gate-emitter voltage**  
( $V_{CE}=600\text{V}$ , start at  $T_j=25^\circ\text{C}$ )



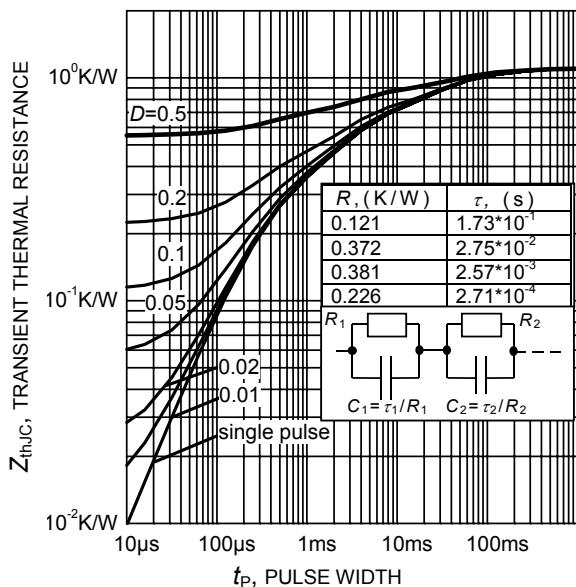
**Figure 20. Typical short circuit collector current as a function of gate-emitter voltage**  
( $V_{CE} \leq 600\text{V}$ ,  $T_j \leq 150^\circ\text{C}$ )



**Figure 21. Typical turn on behavior**  
 $(V_{GE}=0/15V, R_G=56\Omega, T_j = 150^\circ C,$   
Dynamic test circuit in Figure E)

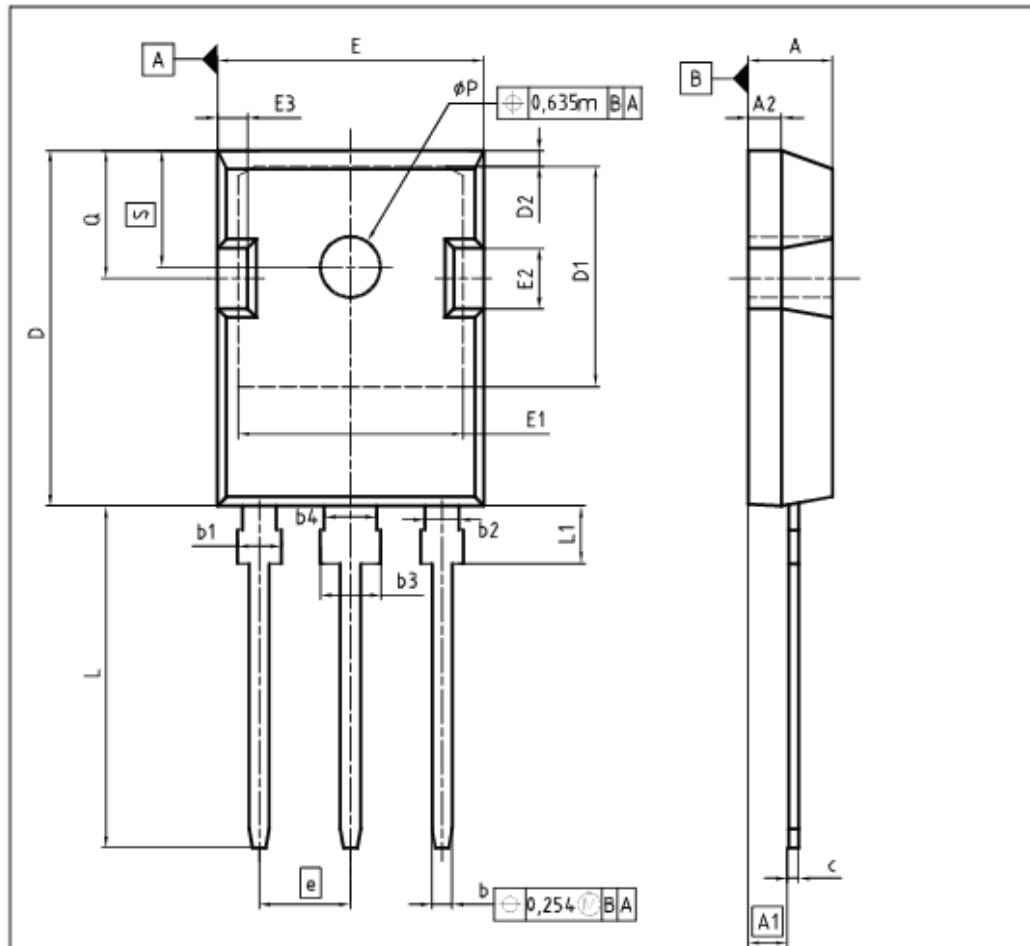


**Figure 22. Typical turn off behavior**  
 $(V_{GE}=15/0V, R_G=56\Omega, T_j = 150^\circ C,$   
Dynamic test circuit in Figure E)



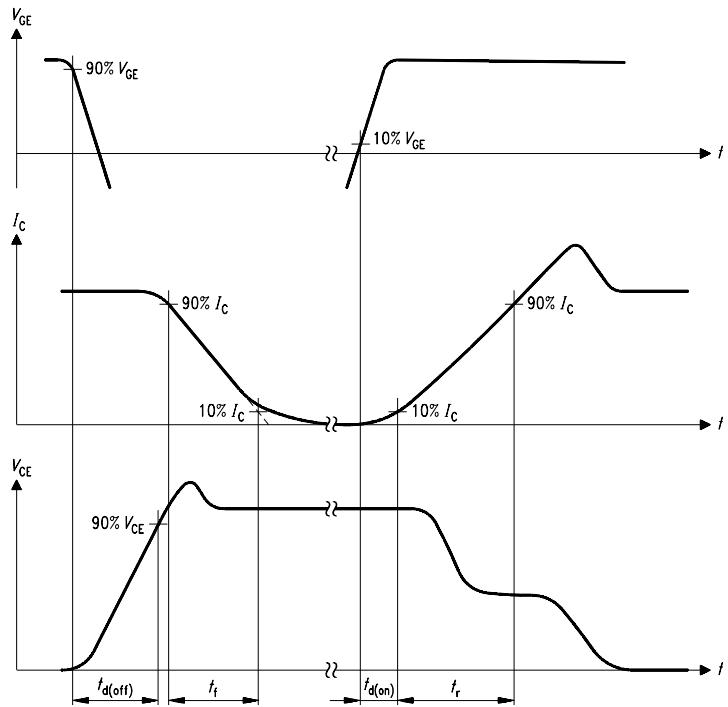
**Figure 23. IGBT transient thermal resistance**  
 $(D = t_p / T)$

## T0247-3



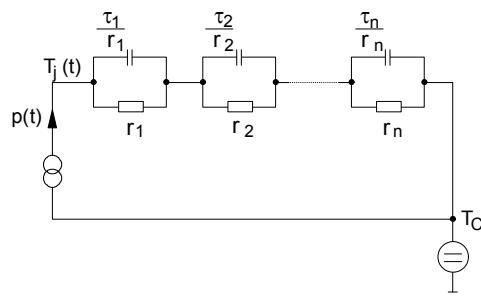
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.83	5.21	0.190	0.205
A1	2.27	2.54	0.089	0.100
A2	1.85	2.16	0.073	0.085
b	1.07	1.33	0.042	0.052
b1	1.90	2.41	0.075	0.095
b2	1.90	2.16	0.075	0.085
b3	2.87	3.38	0.113	0.133
b4	2.87	3.13	0.113	0.123
c	0.55	0.68	0.022	0.027
D	20.80	21.10	0.819	0.831
D1	16.25	17.65	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		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

DOCUMENT NO.	Z8B00003327
SCALE	0 0 5 5 7.5mm
EUROPEAN PROJECTION	
ISSUE DATE	01-10-2009
REVISION	04

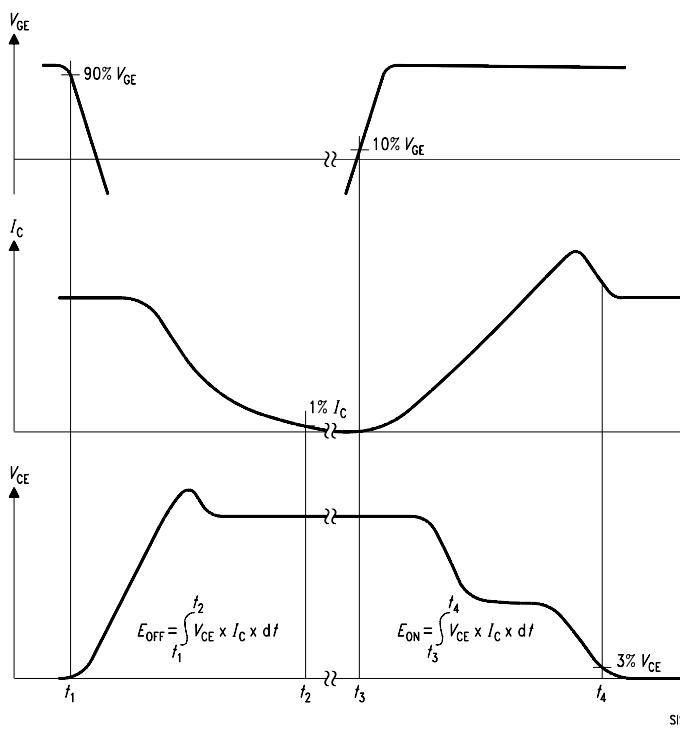


**Figure A. Definition of switching times**

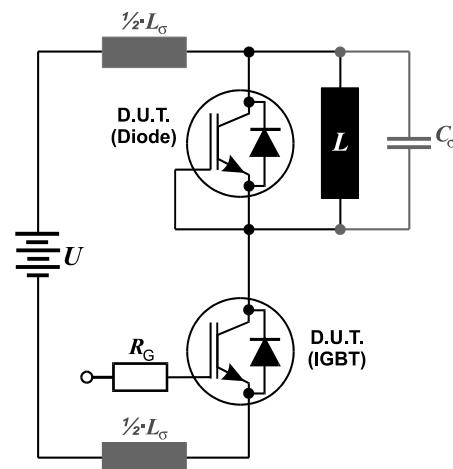
SIS00053



**Figure D. Thermal equivalent circuit**



**Figure B. Definition of switching losses**



**Figure E. Dynamic test circuit**  
Leakage inductance  $L_\sigma = 180\text{nH}$  and Stray capacity  $C_\sigma = 39\text{pF}$ .

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