Thermal Resistance

Parameter	Symbol	Conditions	Max. Value	Unit
Characteristic				
IGBT thermal resistance, junction – case	R_{thJC}		0.48	K/W
Diode thermal resistance, junction – case	R_{thJCD}		0.48	
Thermal resistance, junction – ambient	R_{thJA}		40	

Electrical Characteristic, at T_j = 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=500µA	1600	-	-	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	V_{GE} = 15V, I_C=30A				
		T_j=25°C	-	1.8	2.1	
		T_j=150°C	-	2.25	-	
		T_j=175°C	-	2.35	-	
Diode forward voltage	V_F	V_{GE}=0V, I_F=30A				
		T_j=25°C	-	1.65	2.0	
		T_j=150°C	-	2.0	-	
		T_j=175°C	-	2.0	-	
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C=0.75mA, V_{CE}=V_{GE}	5.1	5.8	6.4	
Zero gate voltage collector current	I_{CES}	V_{CE}=1600V, V_{GE}=0V				µA
		T_j=25°C	-	-	5	
		T_j=175°C	-	-	2500	
Gate-emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V	-	-	100	nA
Transconductance	g_{fs}	V_{CE}=20V, I_C=30A	-	22.5	-	S
Integrated gate resistor	R_{Gint}			none		Ω

Dynamic Characteristic

Input capacitance	C_{iss}	V_{CE}=25V,	-	2740	-	pF
Output capacitance	C_{oss}	V_{GE}=0V,	-	68.1	-	
Reverse transfer capacitance	C_{rss}	f=1MHz	-	58.7	-	
Gate charge	Q_{Gate}	V_{CC}=1280V, I_C=30A; V_{GE}=15V	-	94	-	nC
Internal emitter inductance measured 5mm (0.197 in.) from case	L_E		-	13	-	nH

Switching Characteristic, Inductive Load, at T_j=25 °C

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
IGBT Characteristic						
Turn-off delay time	$t_{d(off)}$	T_j=25°C,	-	525	-	ns
Fall time	t_f	V_{CC}=600V, I_C=30A	-	38.3	-	
Turn-on energy	E_{on}	V_{GE}=0 /15V,	-	-	-	
Turn-off energy	E_{off}	R_G=10Ω	-	2.53	-	mJ
Total switching energy	E_{ts}		-	2.53	-	

Switching Characteristic, Inductive Load, at T_j=175 °C

Parameter	Symbol	Conditions	Value			Unit
			min.	Typ.	max.	
IGBT Characteristic						
Turn-off delay time	$t_{d(off)}$	T_j=175°C	-	564	-	ns
Fall time	t_f	V_{CC}=600V, I_C=30A,	-	111	-	
Turn-on energy	E_{on}	V_{GE}= 0 /15V,	-	-	-	
Turn-off energy	E_{off}	R_G= 10Ω	-	4.37	-	mJ
Total switching energy	E_{ts}		-	4.37	-	

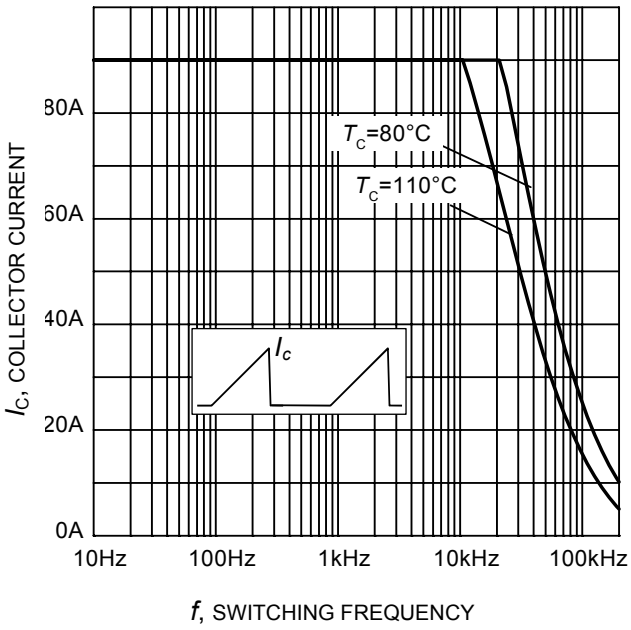

Figure 1. Collector current as a function of switching frequency for hard switching (turn-off)
($T_j \le 175°C$, $D = 0.5$, $V_{CE} = 600V$, $V_{GE} = 0/+15V$, $R_G = 10\Omega$)

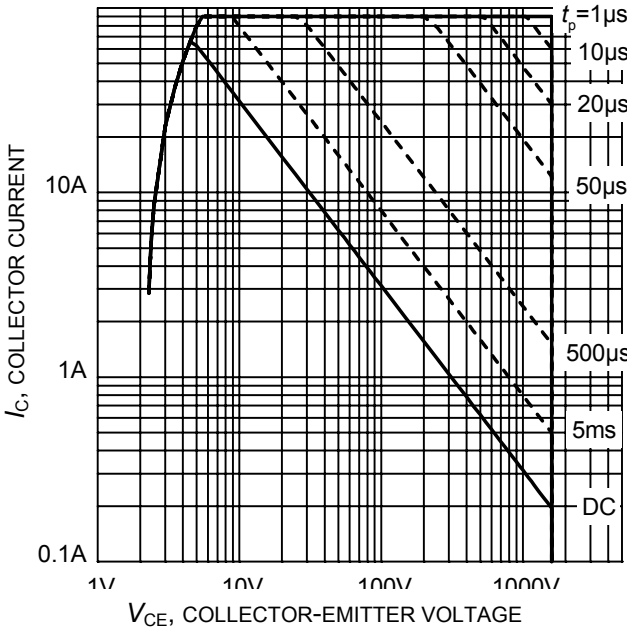

Figure 2. IGBT Safe operating area
($D = 0$, $T_C = 25°C$, $T_j \le 175°C$; V_{GE}=15V)

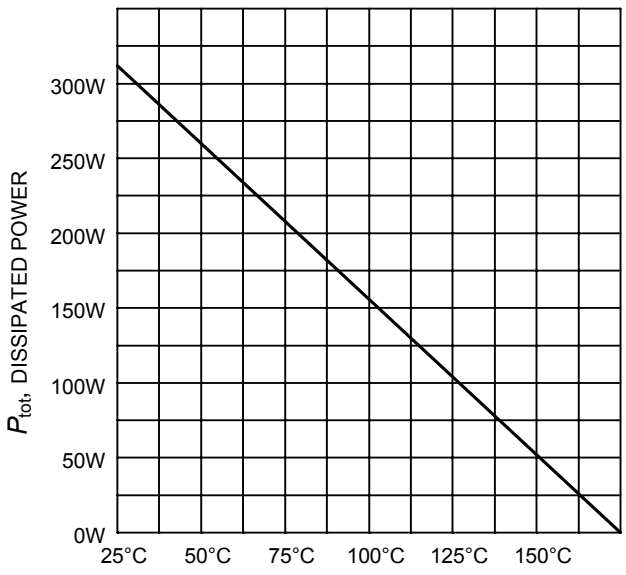

Figure 3. Power dissipation as a function of case temperature
($T_j \le 175°C$)

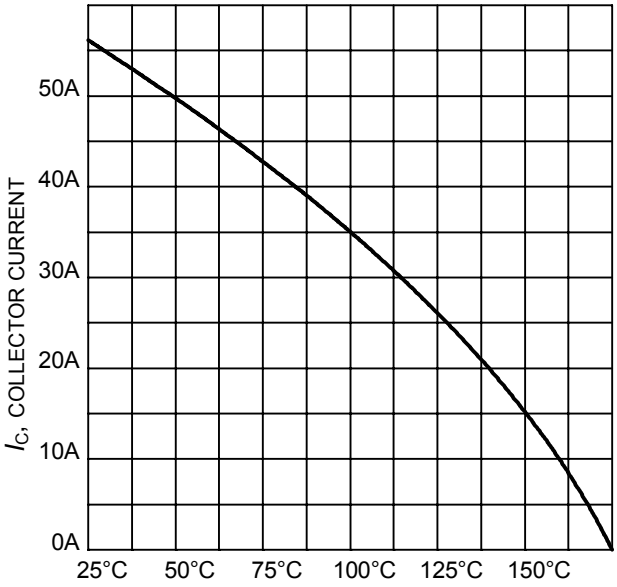

Figure 4. DC Collector current as a function of case temperature
($V_{GE} \ge 15V$, $T_j \le 175°C$)

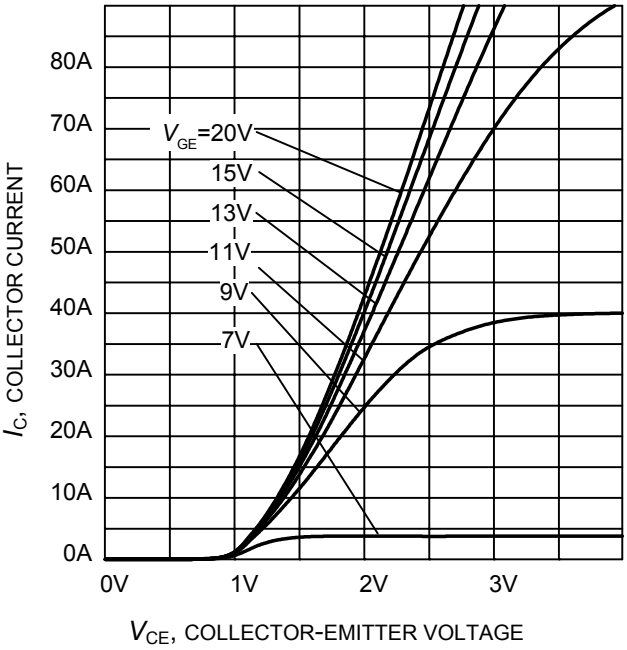

Figure 5. Typical output characteristic
(T_j = 25°C)

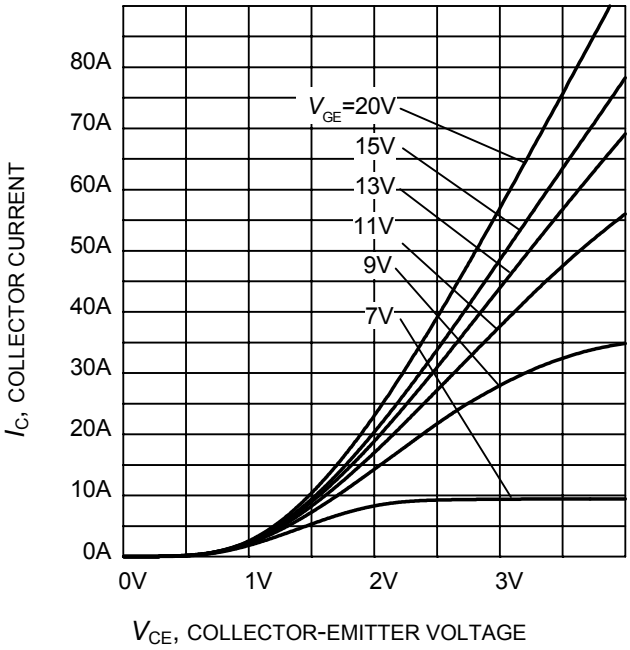

Figure 6. Typical output characteristic
(T_j = 175°C)

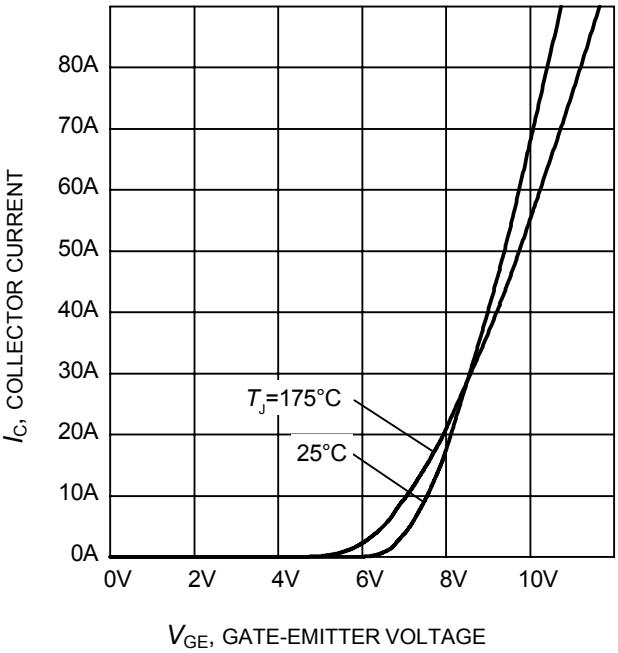

Figure 7. Typical transfer characteristic
(V_{CE}=20V)

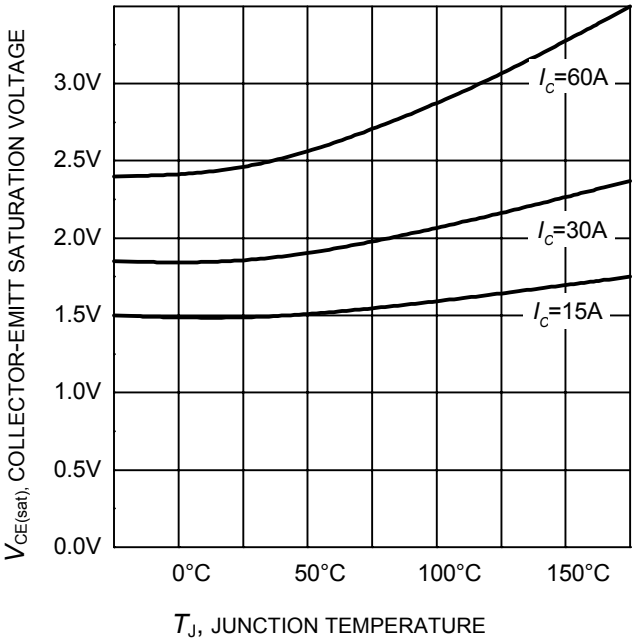

Figure 8. Typical collector-emitter saturation voltage as a function of junction temperature
(V_{GE} =15V)

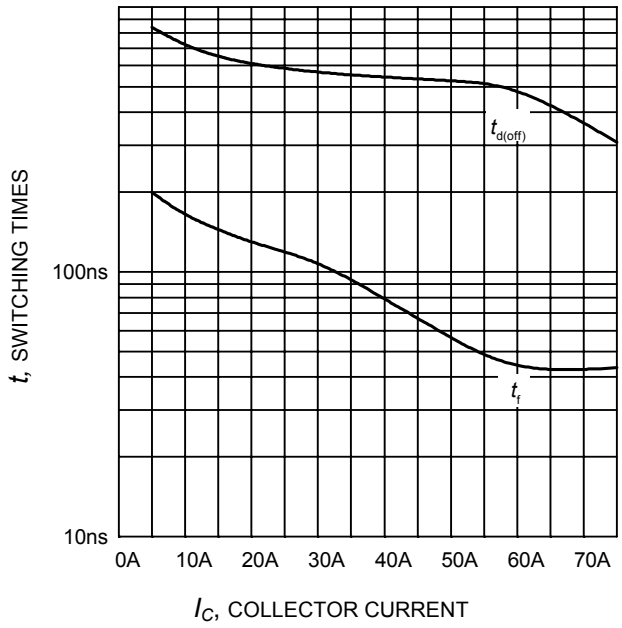

Figure 9. Typical switching times as a function of collector current
(inductive load, T_J=175°C, V_{CE}=600V, V_{GE}=0/15V, R_G=10Ω, Dynamic test circuit in Figure E)

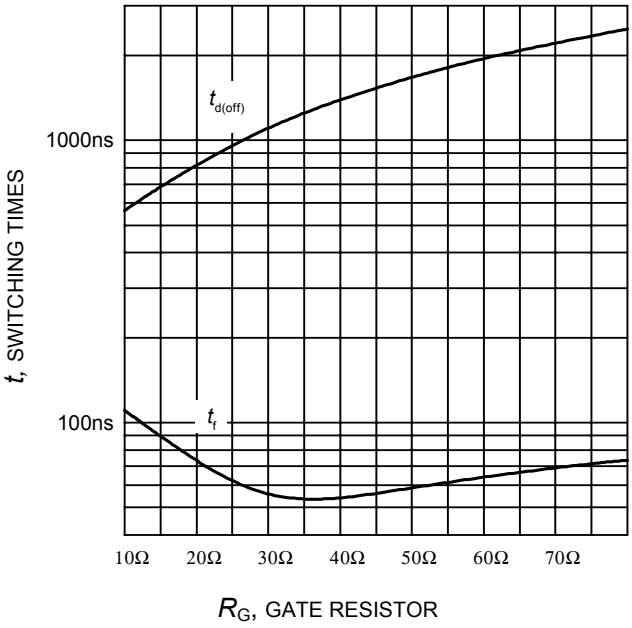

Figure 10. Typical switching times as a function of gate resistor
(inductive load, T_J=175°C, V_{CE}=600V, V_{GE}=0/15V, I_C=30A, Dynamic test circuit in Figure E)

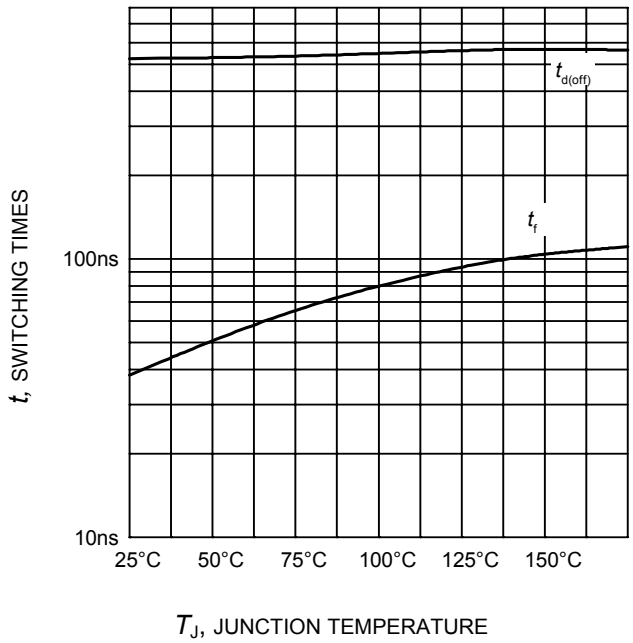

Figure 11. Typical switching times as a function of junction temperature
(inductive load, V_{CE}=600V, V_{GE}=0/15V, I_C=30A, R_G=10Ω, Dynamic test circuit in Figure E)

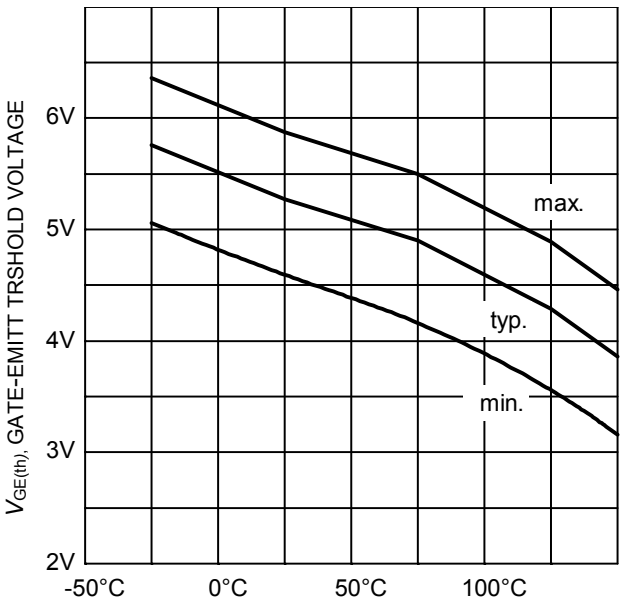

Figure 12. Gate-emitter threshold voltage as a function of junction temperature
(I_C = 0.15mA)

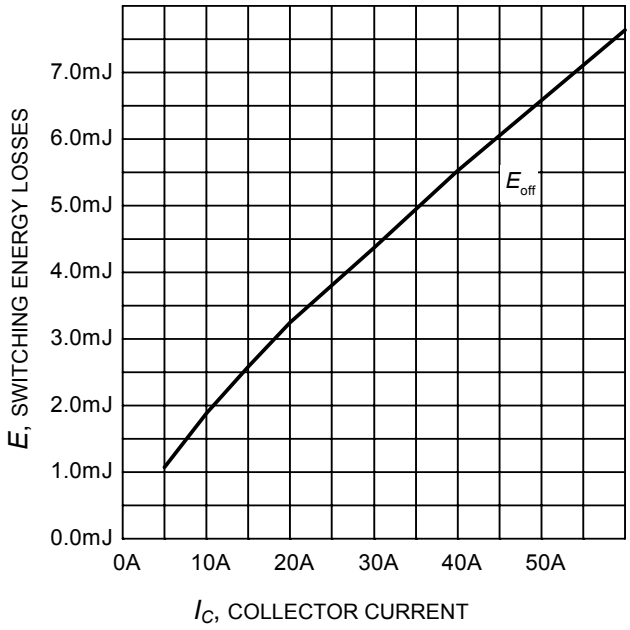

Figure 13. Typical turn-off energy as a function of collector current
(inductive load, T_J=175°C, V_{CE}=600V, V_{GE}=0/15V, R_G=10Ω, Dynamic test circuit in Figure E)

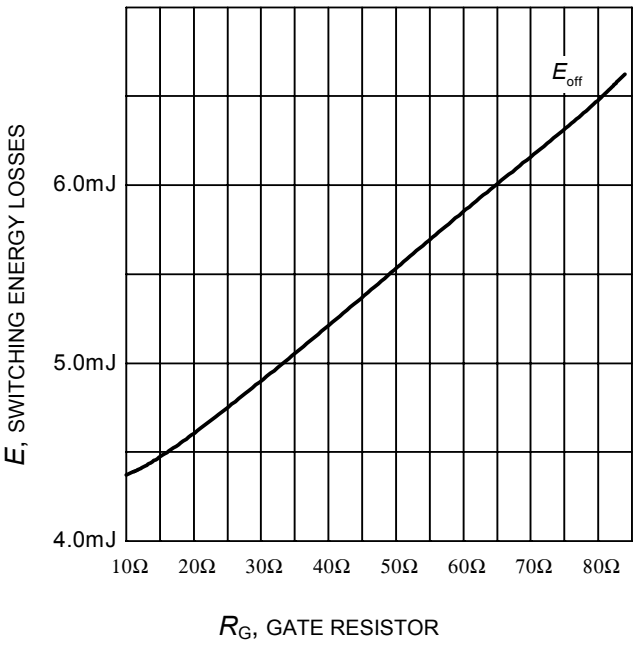

Figure 14. Typical turn-off energy as a function of gate resistor
(inductive load, T_J=175°C, V_{CE}=600V, V_{GE}=0/15V, I_C=30A, Dynamic test circuit in Figure E)

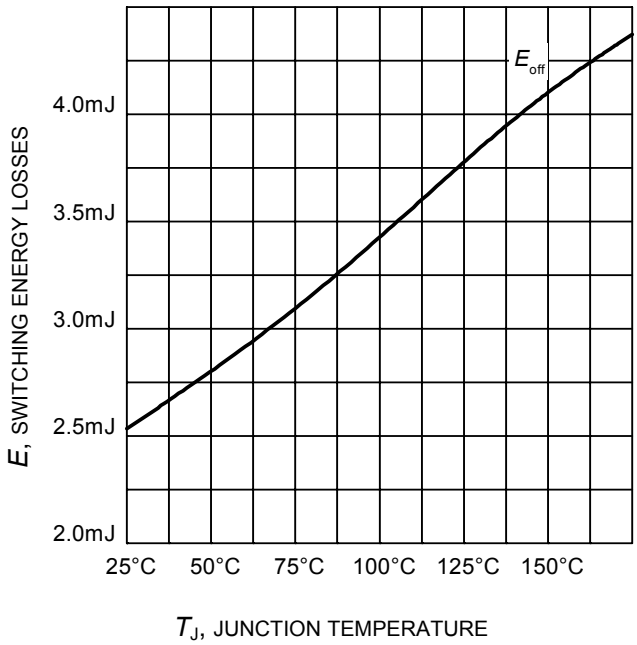

Figure 15. Typical turn-off energy as a function of junction temperature
(inductive load, V_{CE}=600V, V_{GE}=0/15V, I_C=30A, R_G=10Ω, Dynamic test circuit in Figure E)

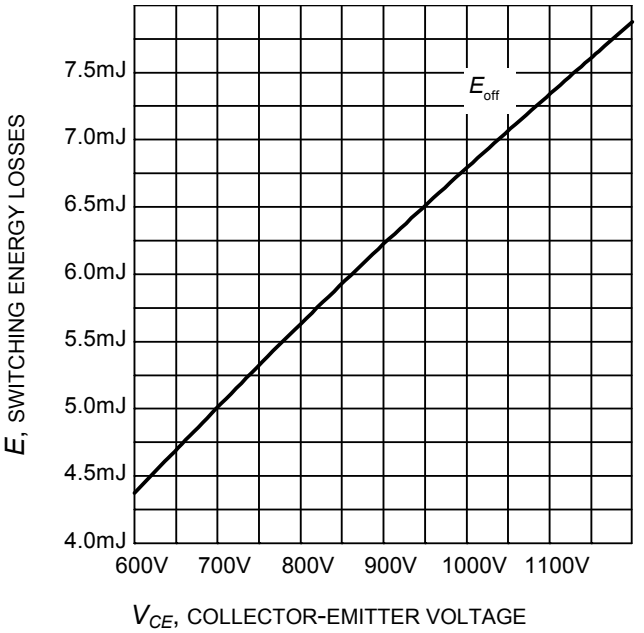

Figure 16. Typical turn-off energy as a function of collector emitter voltage
(inductive load, T_J=175°C, V_{GE}=0/15V, I_C=30A, R_G=10Ω, Dynamic test circuit in Figure E)

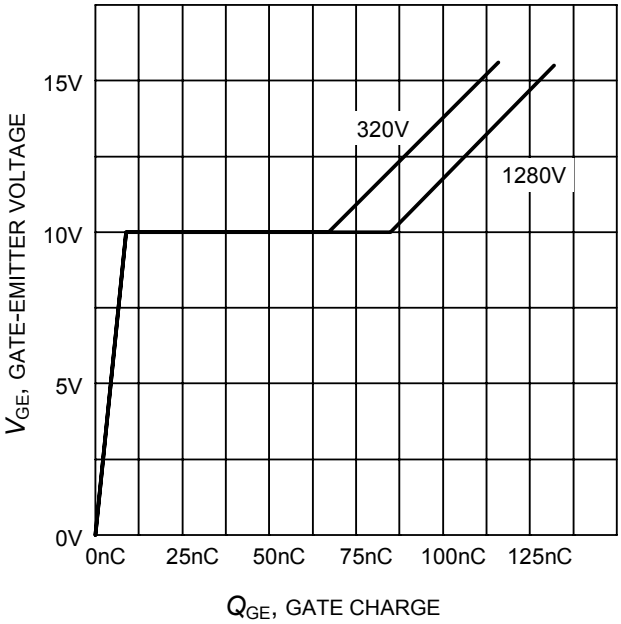

Figure 17. Typical gate charge
(I_C=30 A)

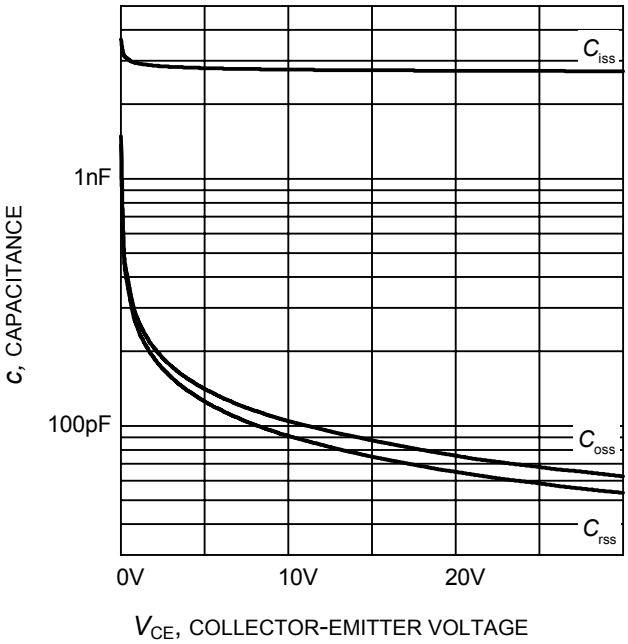

Figure 18. Typical capacitance as a function of collector-emitter voltage
(V_{GE}=0V, f = 1 MHz)

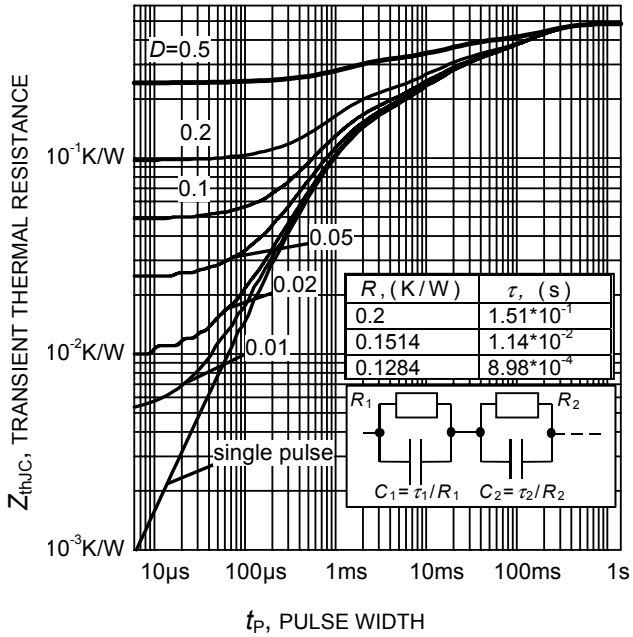

Figure 19. IGBT transient thermal resistance
($D = t_p / T$)

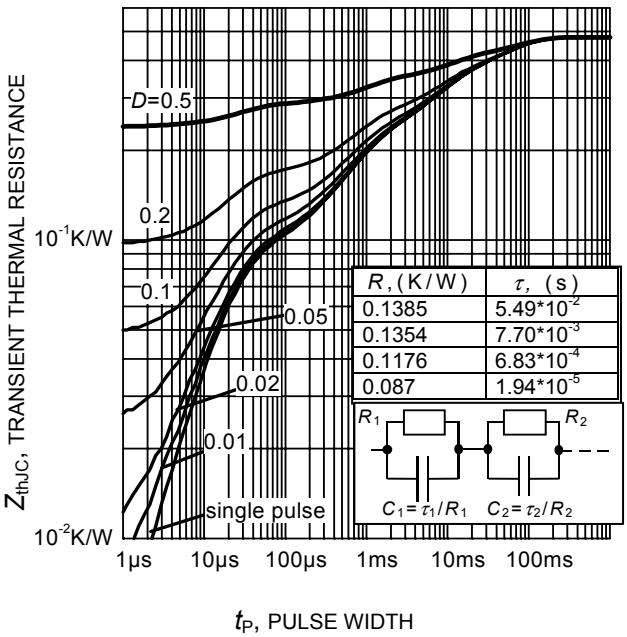

Figure 20. Diode transient thermal impedance as a function of pulse width
($D=t_P/T$)

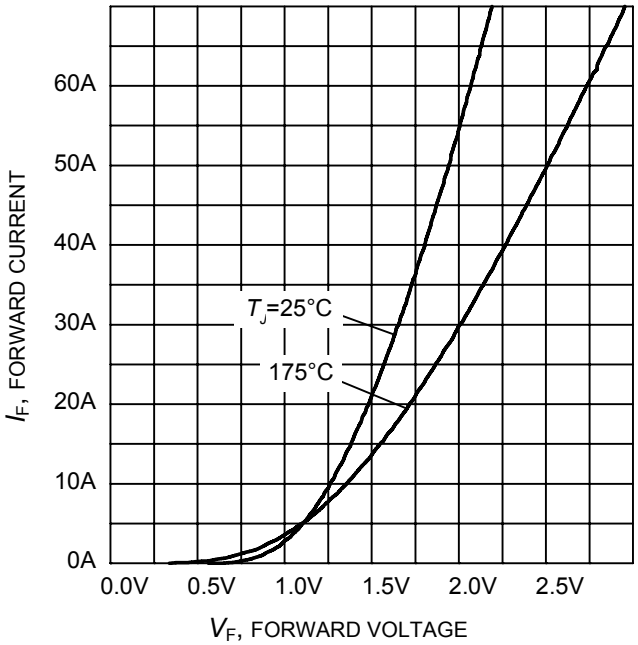

Figure 21. Typical diode forward current as a function of forward voltage

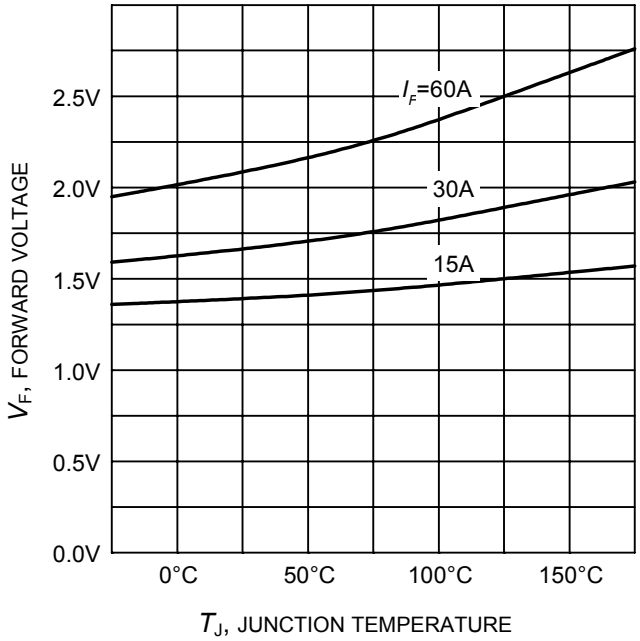

Figure 22. Typical diode forward voltage as a function of junction temperature

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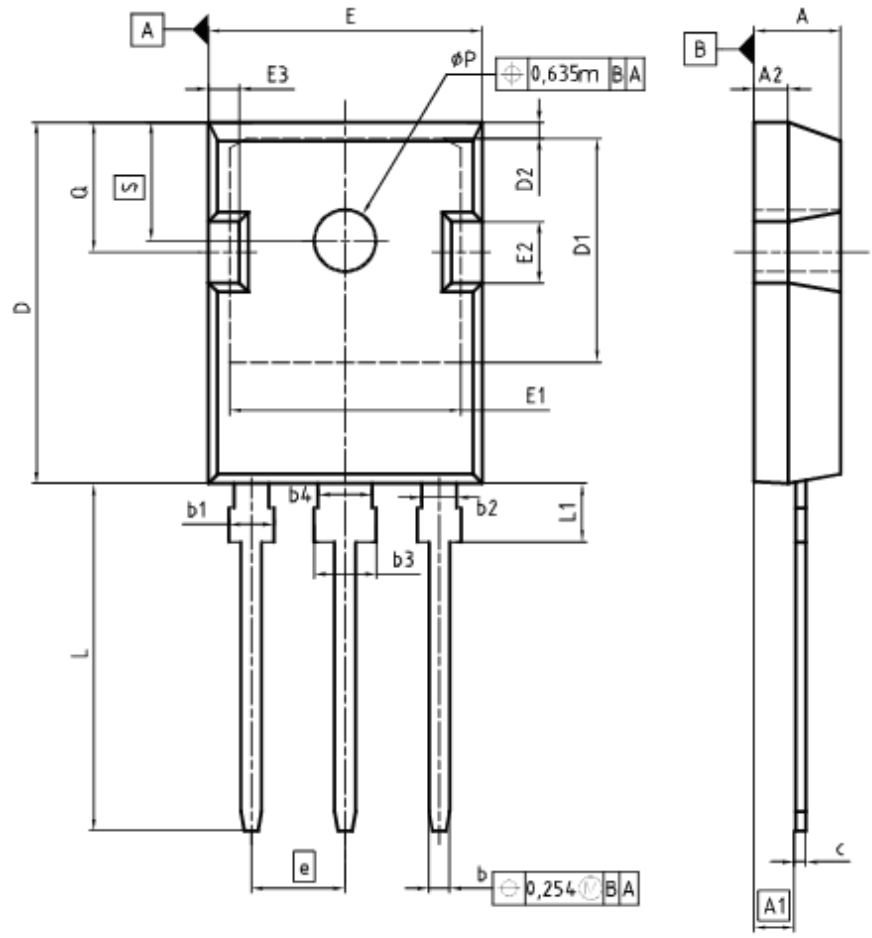

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.83	5.21	0.190	0.205
A1	2.27	2.54	0.089	0.100
A2	1.85	2.16	0.073	0.085
b	1.07	1.33	0.042	0.052
b1	1.90	2.41	0.075	0.095
b2	1.90	2.16	0.075	0.085
b3	2.87	3.38	0.113	0.133
b4	2.87	3.13	0.113	0.123
c	0.55	0.68	0.022	0.027
D	20.80	21.10	0.819	0.831
D1	16.25	17.65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

DOCUMENT NO.
Z8B00003327

SCALE 0 5 5 7.5mm

EUROPEAN PROJECTION

ISSUE DATE
01-10-2009

REVISION
04

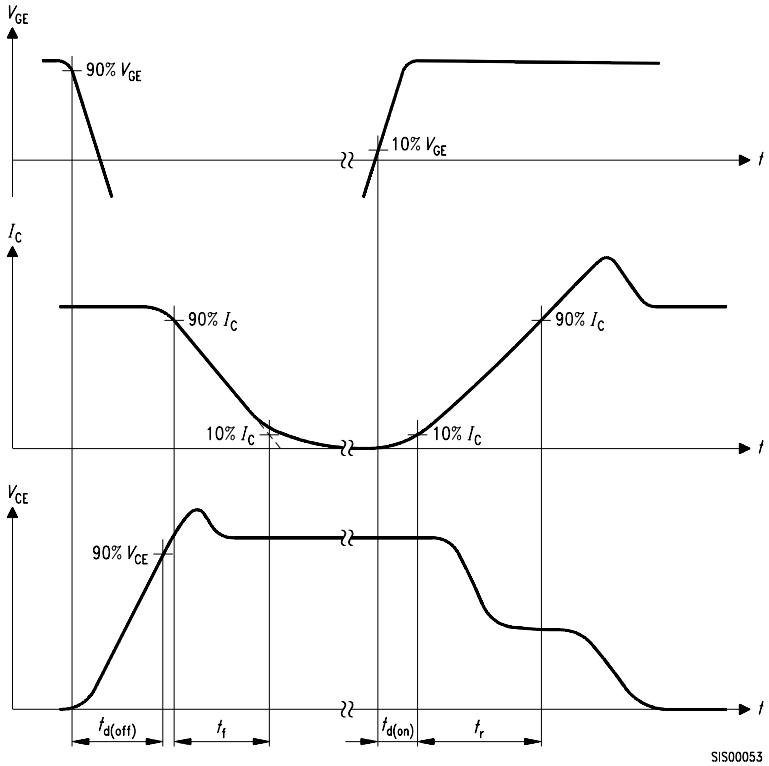

Figure A. Definition of switching times

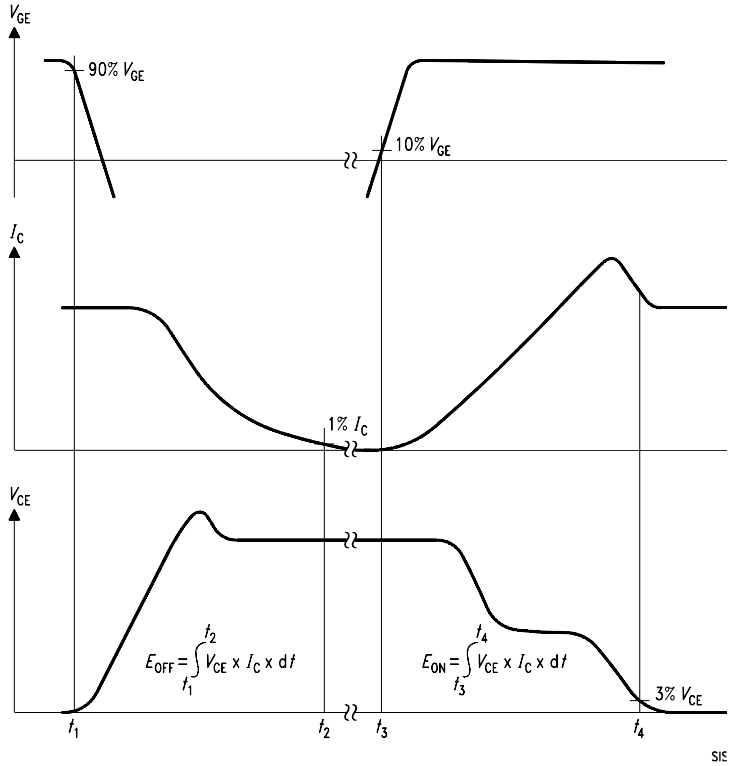

Figure B. Definition of switching losses

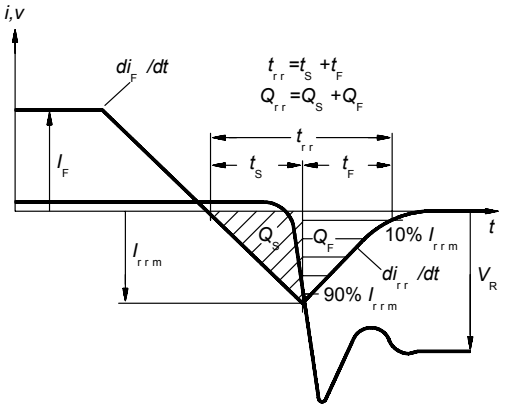

Figure C. Definition of diodes switching characteristics

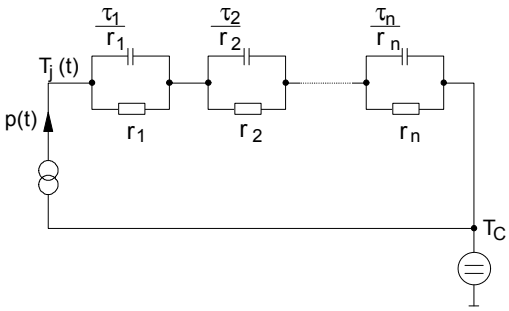

Figure D. Thermal equivalent circuit

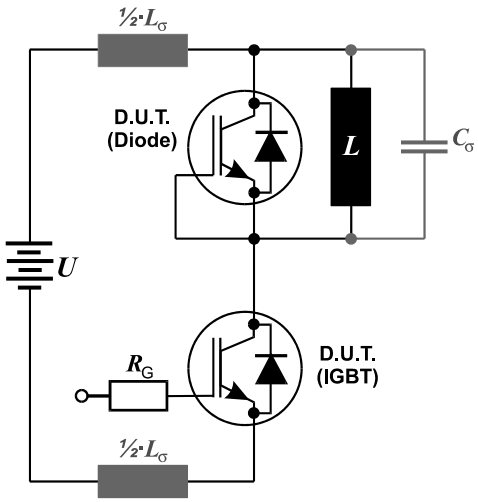

Figure E. Dynamic test circuit

Published by
Infineon Technologies AG
81726 Munich, Germany

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