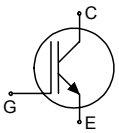
IGP30N60T
IGW30N60T

Low Loss IGBT in Trench and Fieldstop technology



- Very low $V_{CE(sat)}$ 1.5 V (typ.)
- Maximum Junction Temperature 175 °C
- Short circuit withstand time – 5µs
- Designed for :
  - Frequency Converters
  - Uninterruptible Power Supply
- Trench and Fieldstop technology for 600 V applications offers :
  - very tight parameter distribution
  - high ruggedness, temperature stable behavior
  - very high switching speed
  - low $V_{CE(sat)}$
- Positive temperature coefficient in $V_{CE(sat)}$
- Low EMI
- Low Gate Charge
- Complete product spectrum and PSpice Models : http://www.infineon.com/igbt/

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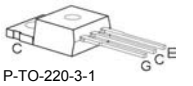
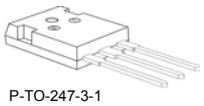


P-TO-220-3-1
(TO-220AB)



P-TO-247-3-1
(TO-220AC)

Type	V_{CE}	I_C	$V_{CE(sat),Tj=25°C}$	$T_{j,max}$	Marking Code	Package	Ordering Code
IGP30N60T	600V	30A	1.5V	175°C	G30T60	TO-220	Q67040S4722
IGW30N60T	600V	30A	1.5V	175°C	G30T60	TO-247	Q67040S4724

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CE}	600	V
DC collector current, limited by T_{jmax}	I_C		A
T_C = 25°C		60	
T_C = 100°C		30	
Pulsed collector current, t_p limited by T_{jmax}	I_{Cpuls}	90	
Turn off safe operating area ($V_{CE} \le 600V$, $T_j \le 175°C$)	-	90	
Gate-emitter voltage	V_{GE}	±20	V
Short circuit withstand time[1)]	t_{SC}	5	µs
V_{GE} = 15V, $V_{CC} \le 400V$, $T_j \le 150°C$			
Power dissipation T_C = 25°C	P_{tot}	187	W
Operating junction temperature	T_j	-40...+175	°C
Storage temperature	T_{stg}	-55...+175	
Soldering temperature, 1.6mm (0.063 in.) from case for 10s	-	260	

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

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Thermal Resistance

Parameter	Symbol	Conditions	Max. Value	Unit
Characteristic				
IGBT thermal resistance, junction – case	R_{thJC}		0.80	K/W
Thermal resistance, junction – ambient	R_{thJA}	P-TO-220-3-1 P-TO-247-3-1	62 40	

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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=0.2mA	600	-	-	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	V_{GE} = 15V, I_C=30A				
		T_j=25°C	-	1.5	2.05	
		T_j=175°C	-	1.9	-	
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C=0.43mA, V_{CE}=V_{GE}	4.1	4.9	5.7	
Zero gate voltage collector current	I_{CES}	V_{CE}=600V, V_{GE}=0V				µA
		T_j=25°C	-	-	40	
		T_j=175°C	-	-	1000	
Gate-emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V	-	-	100	nA
Transconductance	g_{fs}	V_{CE}=20V, I_C=30A	-	16.7	-	S
Integrated gate resistor	R_{Gint}			-		Ω
Dynamic Characteristic						
Input capacitance	C_{iss}	V_{CE}=25V,	-	1630	-	pF
Output capacitance	C_{oss}	V_{GE}=0V,	-	108	-	
Reverse transfer capacitance	C_{rss}	f=1MHz	-	50	-	
Gate charge	Q_{Gate}	V_{CC}=480V, I_C=30A V_{GE}=15V	-	167	-	nC
Internal emitter inductance measured 5mm (0.197 in.) from case	L_E	TO-247-3-1	-	7	-	nH
Short circuit collector current[1)]	$I_{C(SC)}$	V_{GE}=15V, t_{SC}≤5µs V_{CC} = 400V, T_j = 150°C	-	275	-	A

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

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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}=400V, I_C=30A, V_{GE}=0/15V, R_G=10.6 Ω, L_σ[1)]=136nH, C_σ[1)]=39pF Energy losses include "tail" and diode reverse recovery.[2)]	-	23	-	ns
Rise time	t_r		-	21	-	
Turn-off delay time	$t_{d(off)}$		-	254	-	
Fall time	t_f		-	46	-	
Turn-on energy	E_{on}		-	0.69	-	mJ
Turn-off energy	E_{off}		-	0.77	-	
Total switching energy	E_{ts}		-	1.46	-	

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

Parameter	Symbol	Conditions	Value			Unit
			min.	Typ.	max.	
IGBT Characteristic						
Turn-on delay time	$t_{d(on)}$	T_j=175°C, V_{CC}=400V, I_C=30A, V_{GE}=0/15V, R_G= 10.6 Ω L_σ[1)]=136nH, C_σ[1)]=39pF Energy losses include "tail" and diode reverse recovery.[2)]	-	24	-	ns
Rise time	t_r		-	26	-	
Turn-off delay time	$t_{d(off)}$		-	292	-	
Fall time	t_f		-	90	-	
Turn-on energy	E_{on}		-	1.0	-	mJ
Turn-off energy	E_{off}		-	1.1	-	
Total switching energy	E_{ts}		-	2.1	-	

[1)] Leakage inductance L_σ and Stray capacity C_σ due to dynamic test circuit in Figure E.
[2)] Includes Reverse Recovery Losses from IKW30N60T due to dynamic test circuit in Figure E.

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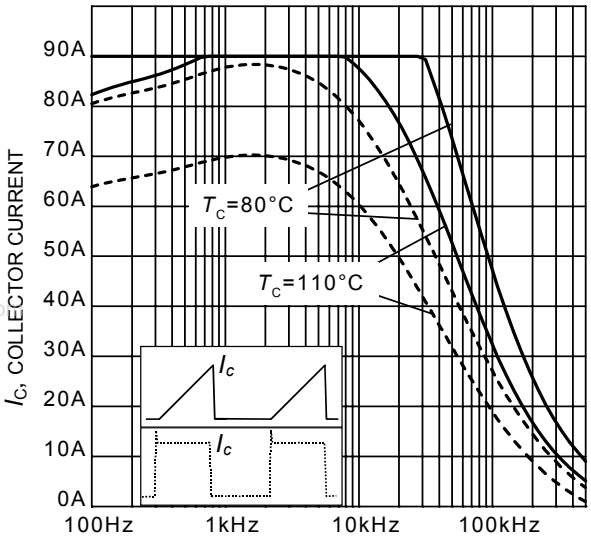

Figure 1. Collector current as a function of switching frequency
($T_j \le 175°C$, $D = 0.5$, $V_{CE} = 400V$, $V_{GE} = 0/+15V$, $R_G = 10\Omega$)

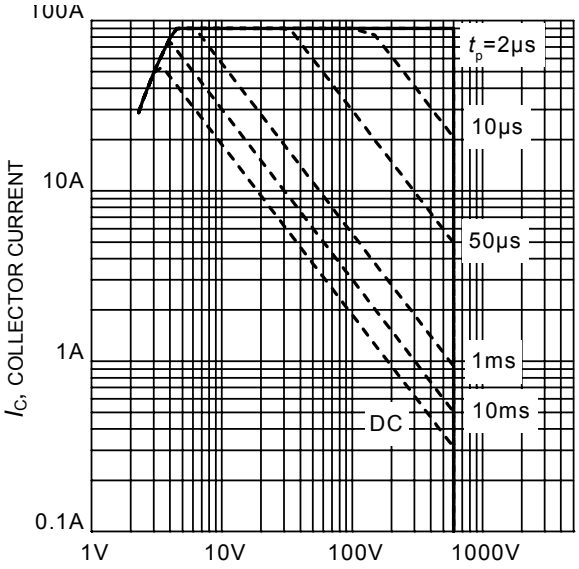

Figure 2. Safe operating area
($D = 0$, $T_C = 25°C$, $T_j \le 175°C$; $V_{GE}=15V$)

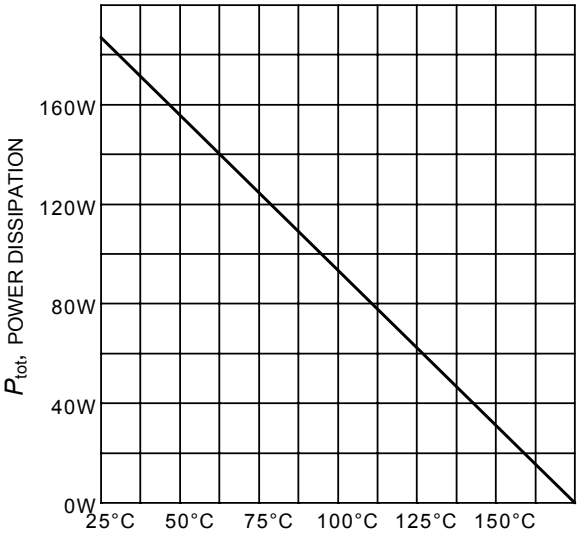

Figure 3. Power dissipation as a function of case temperature
($T_j \le 175°C$)

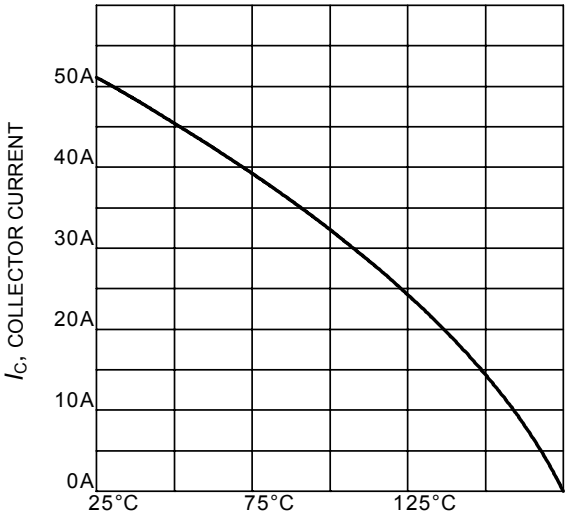

Figure 4. Collector current as a function of case temperature
($V_{GE} \ge 15V$, $T_j \le 175°C$)

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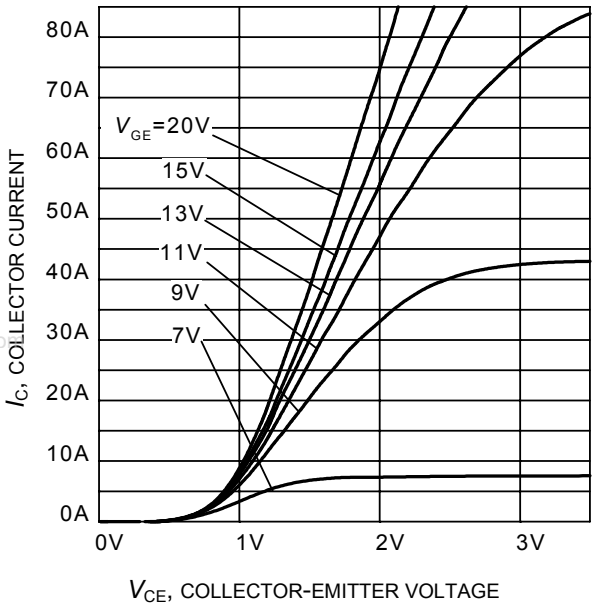

Figure 5. Typical output characteristic
(T_j = 25°C)

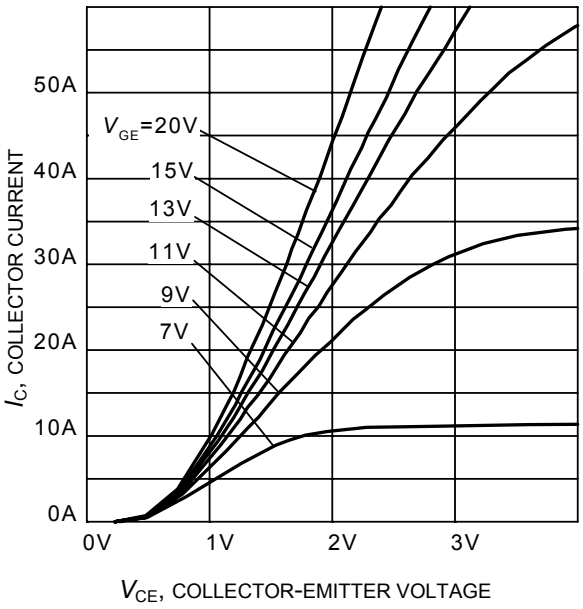

Figure 6. Typical output characteristic
(T_j = 175°C)

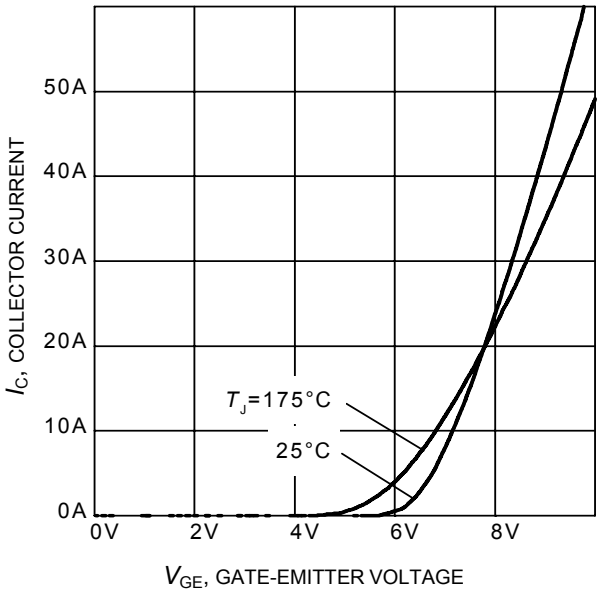

Figure 7. Typical transfer characteristic
(V_{CE}=20V)

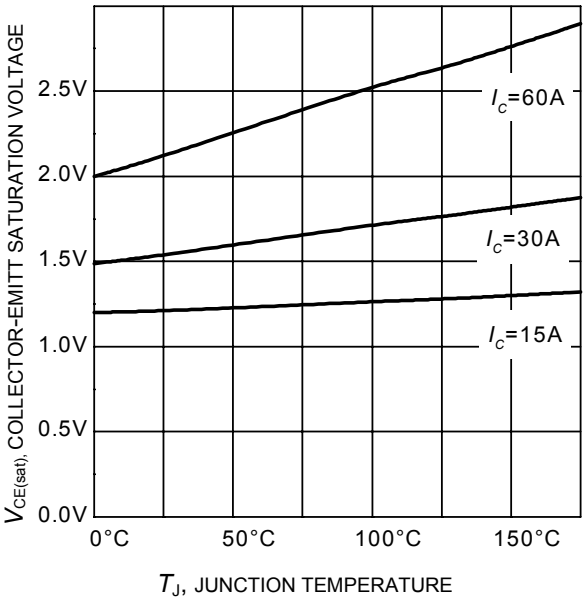

Figure 8. Typical collector-emitter saturation voltage as a function of junction temperature
(V_{GE} = 15V)

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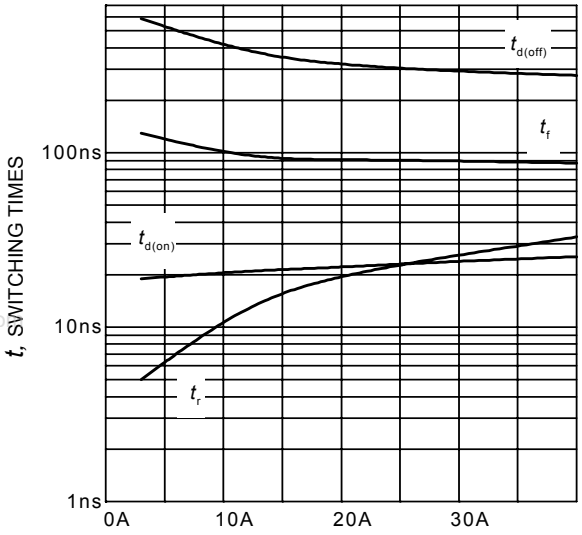

Figure 9. Typical switching times as a function of collector current
(inductive load, T_J=175°C, V_{CE} = 400V, V_{GE} = 0/15V, R_G = 10Ω, Dynamic test circuit in Figure E)

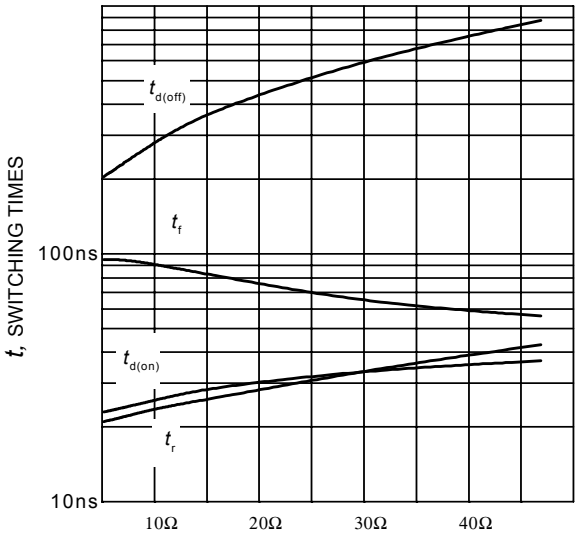

Figure 10. Typical switching times as a function of gate resistor
(inductive load, T_J = 175°C, V_{CE}= 400V, V_{GE} = 0/15V, I_C = 30A, Dynamic test circuit in Figure E)

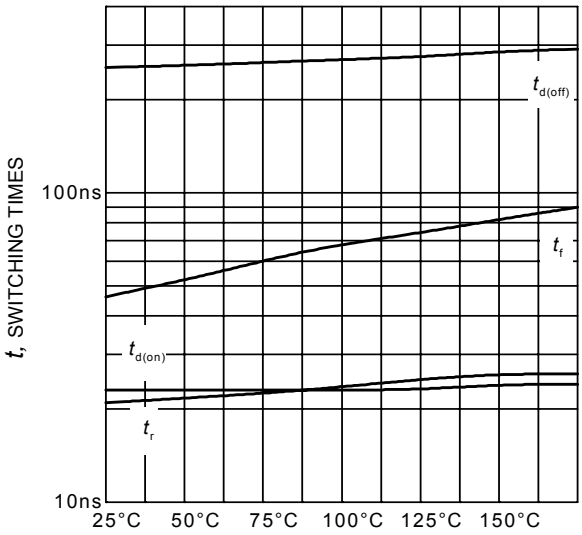

Figure 11. Typical switching times as a function of junction temperature
(inductive load, V_{CE} = 400V, V_{GE} = 0/15V, I_C = 30A, R_G=10Ω, Dynamic test circuit in Figure E)

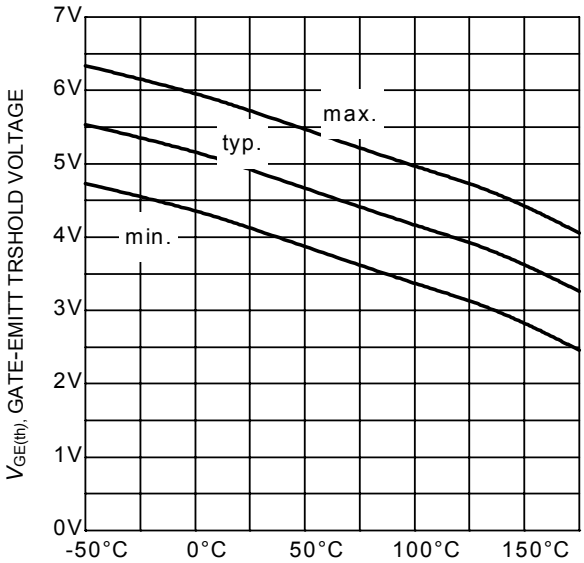

Figure 12. Gate-emitter threshold voltage as a function of junction temperature
(I_C = 0.43mA)

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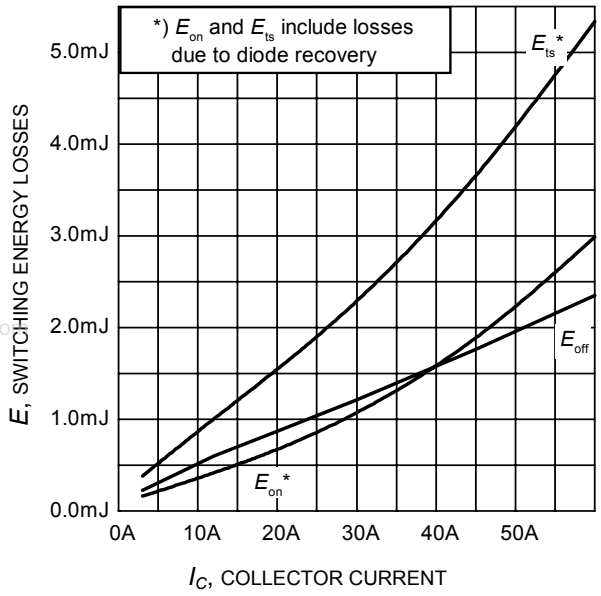

Figure 13. Typical switching energy losses as a function of collector current
(inductive load, T_J = 175°C, V_{CE} = 400V, V_{GE} = 0/15V, R_G = 10Ω, Dynamic test circuit in Figure E)

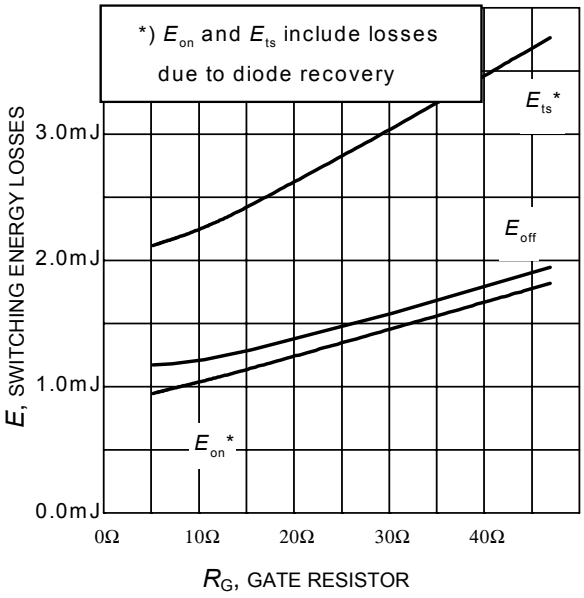

Figure 14. Typical switching energy losses as a function of gate resistor
(inductive load, T_J = 175°C, V_{CE} = 400V, V_{GE} = 0/15V, I_C = 30A, Dynamic test circuit in Figure E)

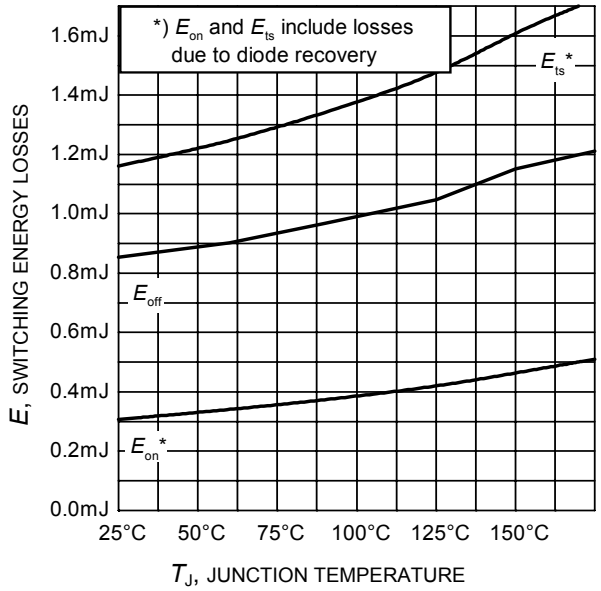

Figure 15. Typical switching energy losses as a function of junction temperature
(inductive load, V_{CE} = 400V, V_{GE} = 0/15V, I_C = 30A, R_G = 10Ω, Dynamic test circuit in Figure E)

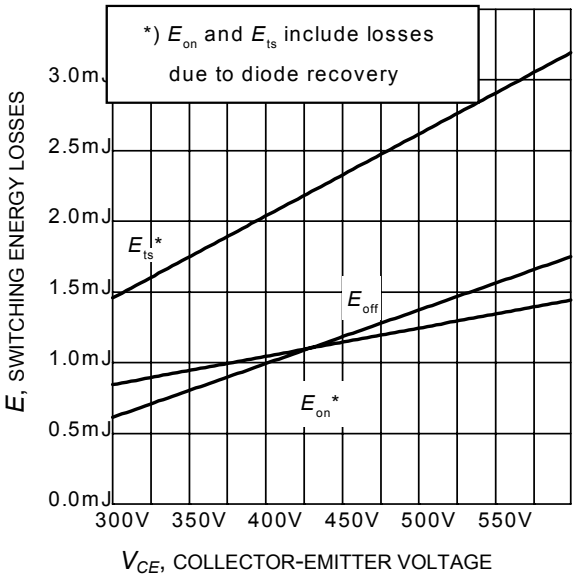

Figure 16. Typical switching energy losses as a function of collector emitter voltage
(inductive load, T_J = 175°C, V_{GE} = 0/15V, I_C = 30A, R_G = 10Ω, Dynamic test circuit in Figure E)

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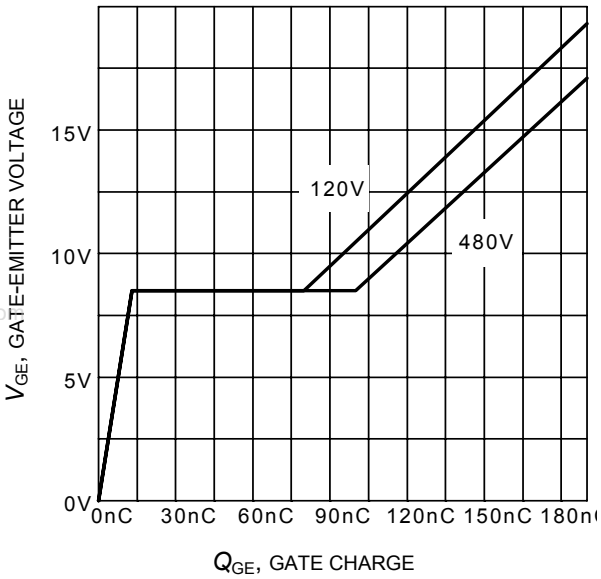

Figure 17. Typical gate charge
(I_C=30 A)

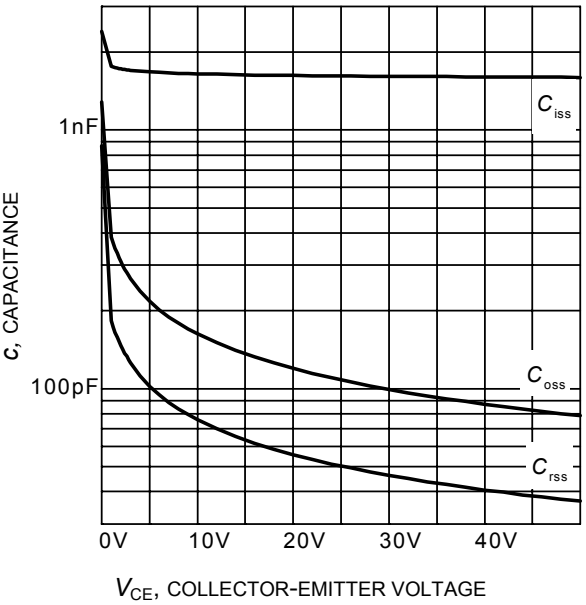

Figure 18. Typical capacitance as a function of collector-emitter voltage
(V_{GE}=0V, f = 1 MHz)

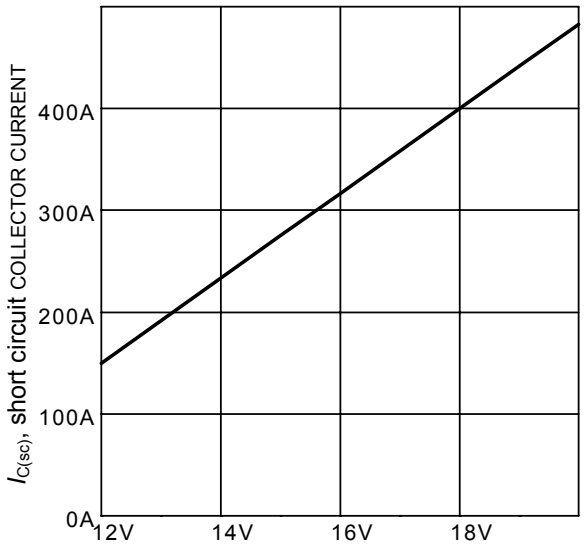

Figure 19. Typical short circuit collector current as a function of gate-emitter voltage
($V_{CE} \le 400V$, $T_j \le 150°C$)

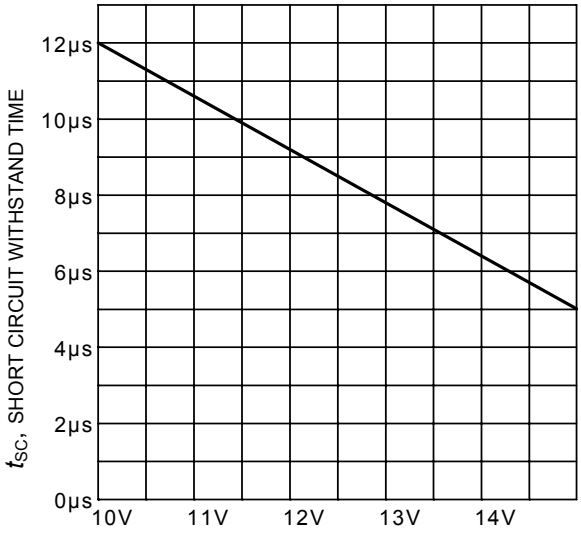

Figure 20. Short circuit withstand time as a function of gate-emitter voltage
(V_{CE}=600V, start at T_J=25°C, T_{Jmax}<150°C)

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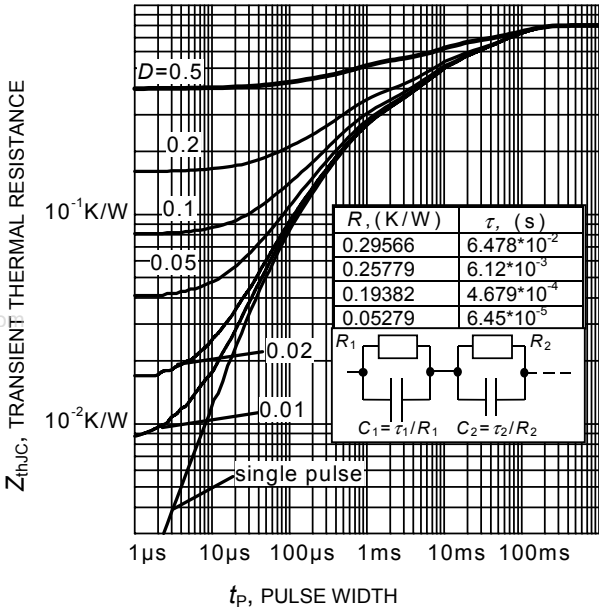

Figure 21. IGBT transient thermal resistance
($D = t_p / T$)

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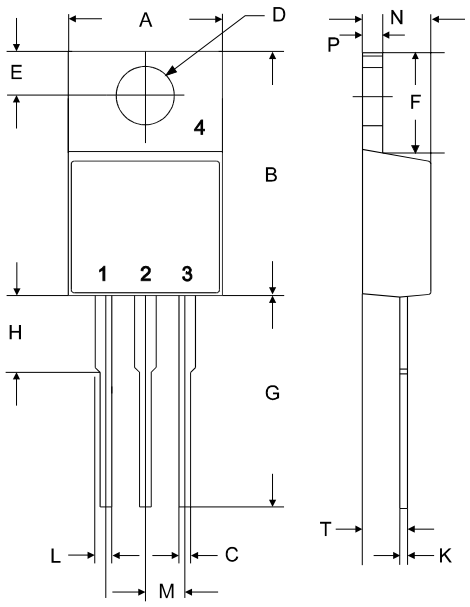
TO-220AB



symbol	Dimensions			
	[mm]		[inch]	
	min	max	min	max
A	9.70	10.30	0.3819	0.4055
B	14.88	15.95	0.5858	0.6280
C	0.65	0.86	0.0256	0.0339
D	3.55	3.7	0.1398	0.1457
E	2.60	3.00	0.1024	0.1181
F	6.00	6.80	0.2362	0.2677
G	13.00	14.00	0.5118	0.5512
H	4.35	4.75	0.1713	0.1870
K	0.38	0.65	0.0150	0.0256
L	0.95	1.32	0.0374	0.0520
M	2.54 typ.		0.1 typ.	
N	4.30	4.50	0.1693	0.1772
P	1.17	1.40	0.0461	0.0551
T	2.30	2.72	0.0906	0.1071

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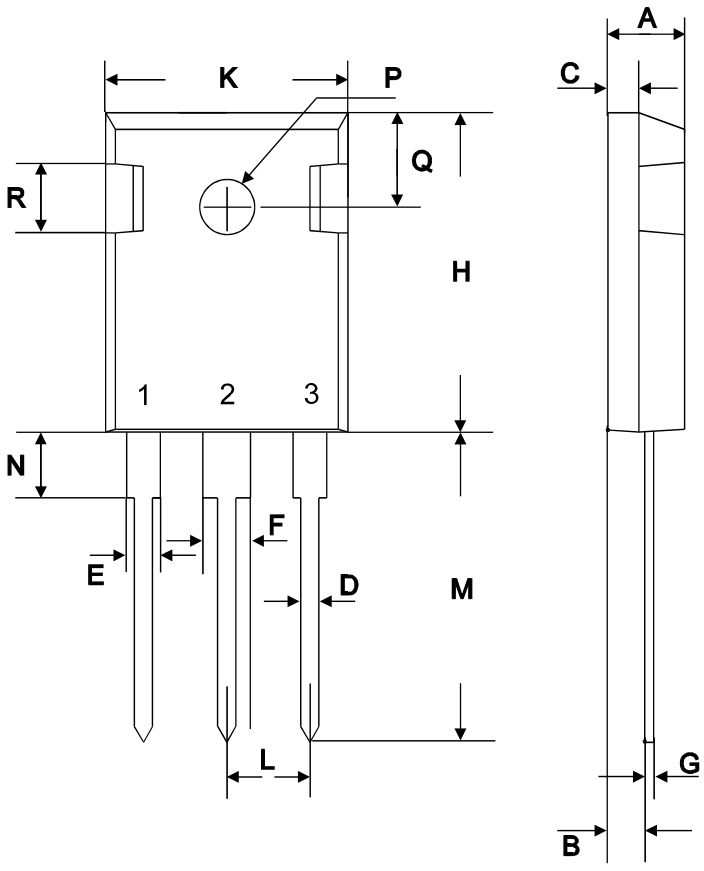
TO-247AC



symbol	dimensions			
	[mm]		[inch]	
	min	max	min	max
A	4.78	5.28	0.1882	0.2079
B	2.29	2.51	0.0902	0.0988
C	1.78	2.29	0.0701	0.0902
D	1.09	1.32	0.0429	0.0520
E	1.73	2.06	0.0681	0.0811
F	2.67	3.18	0.1051	0.1252
G	0.76 max		0.0299 max	
H	20.80	21.16	0.8189	0.8331
K	15.65	16.15	0.6161	0.6358
L	5.21	5.72	0.2051	0.2252
M	19.81	20.68	0.7799	0.8142
N	3.560	4.930	0.1402	0.1941
∅P	3.61		0.1421	
Q	6.12	6.22	0.2409	0.2449

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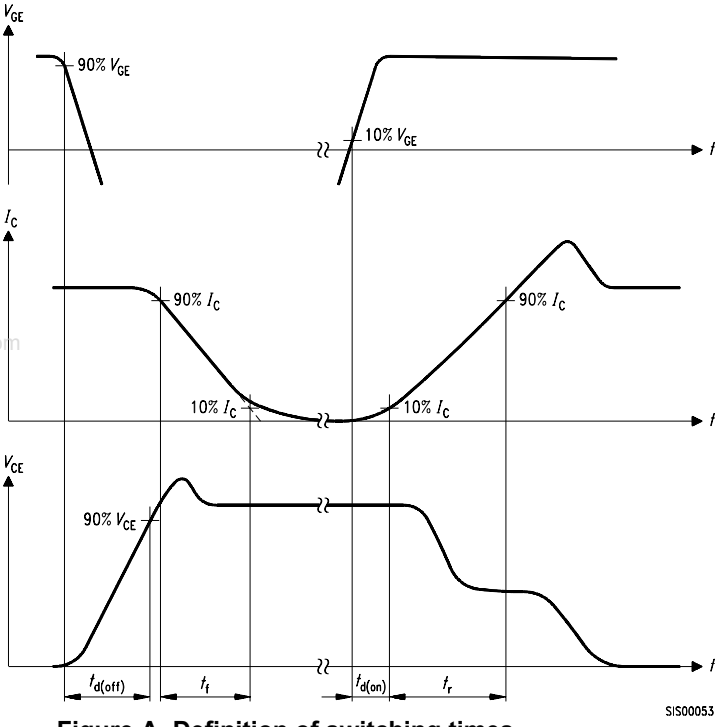

Figure A. Definition of switching times

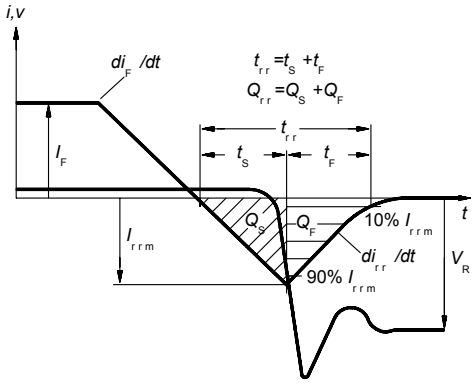

Figure C. Definition of diodes switching characteristics

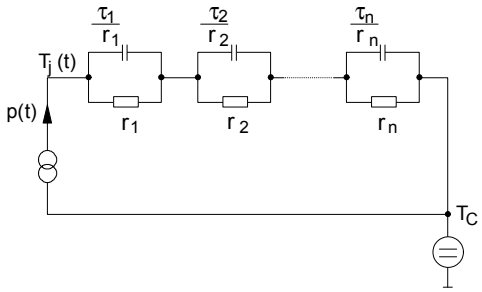

Figure D. Thermal equivalent circuit

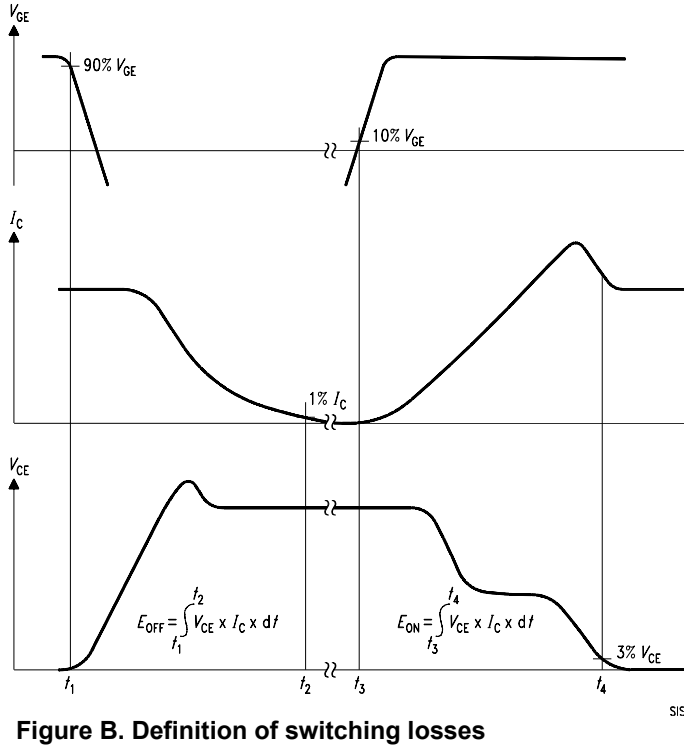

Figure B. Definition of switching losses

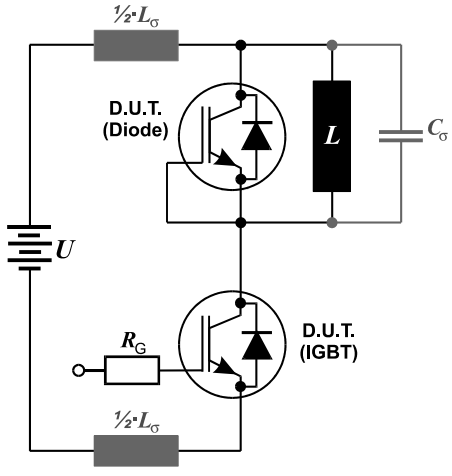

Figure E. Dynamic test circuit

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