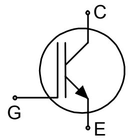
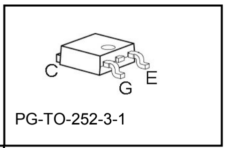
IGP01N120H2
IGD01N120H2

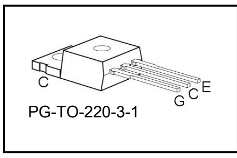
HighSpeed 2-Technology



- **Designed for:**
  - SMPS
  - Lamp Ballast
  - ZVS-Converter
  - optimised for soft-switching / resonant topologies



- **2nd generation HighSpeed-Technology for 1200V applications offers:**
  - loss reduction in resonant circuits
  - temperature stable behavior
  - parallel switching capability
  - tight parameter distribution
  - E_{off} optimized for I_C =1A



- Qualified according to JEDEC[2] 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	E_{off}	T_j	Marking	Package
IGP01N120H2	1200V	1A	0.09mJ	150°C	G01H1202	PG-TO-220-3-1
IGD01N120H2	1200V	1A	0.09mJ	150°C	G1H1202	PG-TO-252-3-11

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CE}	1200	V
Triangular collector current T_C = 25°C, f = 140kHz T_C = 100°C, f = 140kHz	I_C	 3.2 1.3	A
Pulsed collector current, t_p limited by T_{jmax}	I_{Cpuls}	3.5	
Turn off safe operating area $V_{CE} \leq$ 1200V, $T_j \leq$ 150°C	-	3.5	
Gate-emitter voltage	V_{GE}	±20	V
Power dissipation T_C = 25°C	P_{tot}	28	W
Operating junction and storage temperature	T_j , T_{stg}	-40...+150	°C
Soldering temperature PG-TO-252: Reflow soldering, MSL3 Others: wavesoldering, 1.6 mm (0.063 in.) from case for 10s	-	 260 260	

[2] J-STD-020 and JESD-022

Thermal Resistance

Parameter	Symbol	Conditions	Max. Value	Unit
Characteristic				
IGBT thermal resistance, junction – case	R_{thJC}		4.5	K/W
Thermal resistance, junction – ambient	R_{thJA}	PG-TO-220-3-1	62	
SMD version, device on PCB[1)]	R_{thJA}	PG-TO-252-3-1	50	

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=300µA	1200	-	-	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	V_{GE} = 15V, I_C=1A T_j=25°C T_j=150°C V_{GE} = 10V, I_C=1A, T_j=25°C	 - - -	 2.2 2.5 2.4	 2.8 - -	
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C=30µA, V_{CE}=V_{GE}	2.1	3	3.9	
Zero gate voltage collector current	I_{CES}	V_{CE}=1200V, V_{GE}=0V T_j=25°C T_j=150°C	 - -	 - -	 20 80	µA
Gate-emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V	-	-	40	nA
Transconductance	g_{fs}	V_{CE}=20V, I_C=1A	-	0.75	-	S
Dynamic Characteristic						
Input capacitance	C_{iss}	V_{CE}=25V, V_{GE}=0V, f=1MHz	-	91.6	-	pF
Output capacitance	C_{oss}		-	9.8	-	
Reverse transfer capacitance	C_{rss}		-	3.4	-	
Gate charge	Q_{Gate}	V_{CC}=960V, I_C=1A V_{GE}=15V	-	8.6	-	nC
Internal emitter inductance measured 5mm (0.197 in.) from case	L_E		-	7	-	nH

[1)] Device on 50mm*50mm*1.5mm epoxy PCB FR4 with 6cm^2 (one layer, 70µm thick) copper area for collector connection. PCB is vertical without blown air.

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

Parameter	Symbol	Conditions	Value min.	Value Typ.	Value max.	Unit
IGBT Characteristic						
Turn-on delay time	$t_{d(on)}$	T_j=25°C, V_{CC}=800V, I_C=1A, V_{GE}=15V/0V, R_G=241Ω, L_σ[2)]=180nH, C_σ[2)]=40pF Energy losses include "tail" and diode [3)] reverse recovery.	-	13	-	ns
Rise time	t_r		-	6.3	-	
Turn-off delay time	$t_{d(off)}$		-	370	-	
Fall time	t_f		-	28	-	
Turn-on energy	E_{on}		-	0.08	-	mJ
Turn-off energy	E_{off}		-	0.06	-	
Total switching energy	E_{ts}		-	0.14	-	

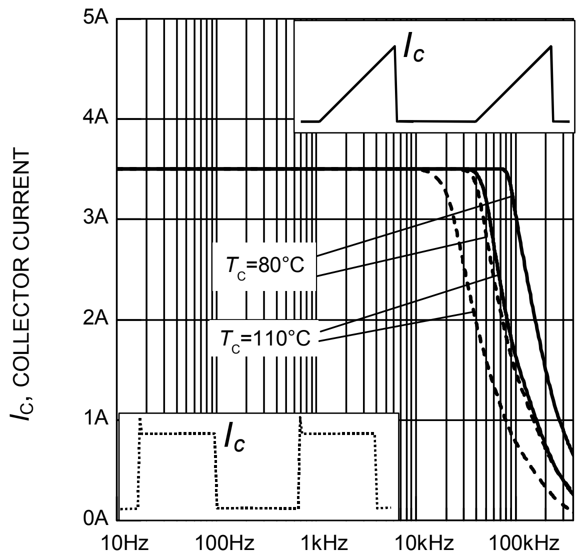
Switching Characteristic, Inductive Load, at T_j=150 °C

Parameter	Symbol	Conditions	Value min.	Value Typ.	Value max.	Unit
IGBT Characteristic						
Turn-on delay time	$t_{d(on)}$	T_j=150°C V_{CC}=800V, I_C=1A, V_{GE}=15V/0V, R_G=241Ω, L_σ[2)]=180nH, C_σ[2)]=40pF Energy losses include "tail" and diode [4)] reverse recovery.	-	12	-	ns
Rise time	t_r		-	8.9	-	
Turn-off delay time	$t_{d(off)}$		-	450	-	
Fall time	t_f		-	43	-	
Turn-on energy	E_{on}		-	0.11	-	mJ
Turn-off energy	E_{off}		-	0.09	-	
Total switching energy	E_{ts}		-	0.2	-	

Switching Energy ZVT, Inductive Load

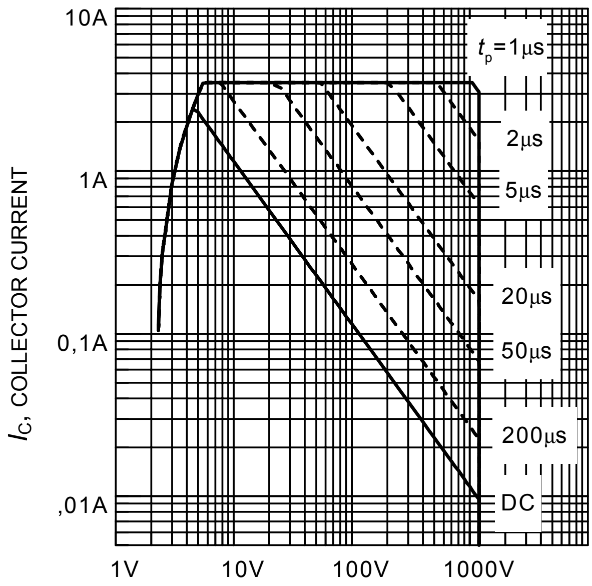
Parameter	Symbol	Conditions	Value min.	Value Typ.	Value max.	Unit
IGBT Characteristic						
Turn-off energy	E_{off}	V_{CC}=800V, I_C=1A, V_{GE}=15V/0V, R_G=241Ω, C_r[2)]=1nF				mJ
		T_j=25°C	-	0.02	-	
		T_j=150°C	-	0.044	-	

[2)] Leakage inductance L_σ and stray capacity C_σ due to dynamic test circuit in figure E
[4)] Commutation diode from device IKP01N120H2



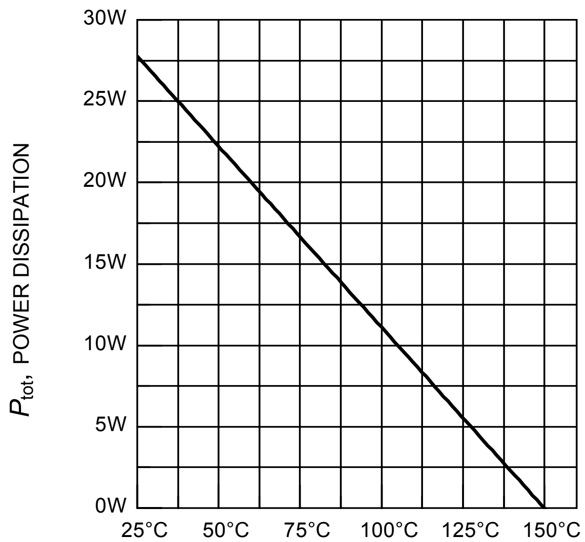
f, SWITCHING FREQUENCY

Figure 1. Collector current as a function of switching frequency
($T_j \leq 150°C$, $D = 0.5$, $V_{CE} = 800V$, $V_{GE} = +15V/0V$, $R_G = 241\Omega$)



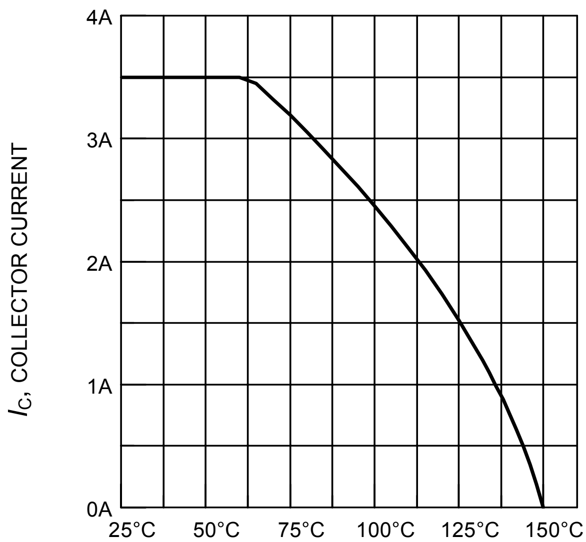
V_{CE}, COLLECTOR-EMITTER VOLTAGE

Figure 2. Safe operating area
($D = 0$, $T_C = 25°C$, $T_j \leq 150°C$)



T_C, CASE TEMPERATURE

Figure 3. Power dissipation as a function of case temperature
($T_j \leq 150°C$)



T_C, CASE TEMPERATURE

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

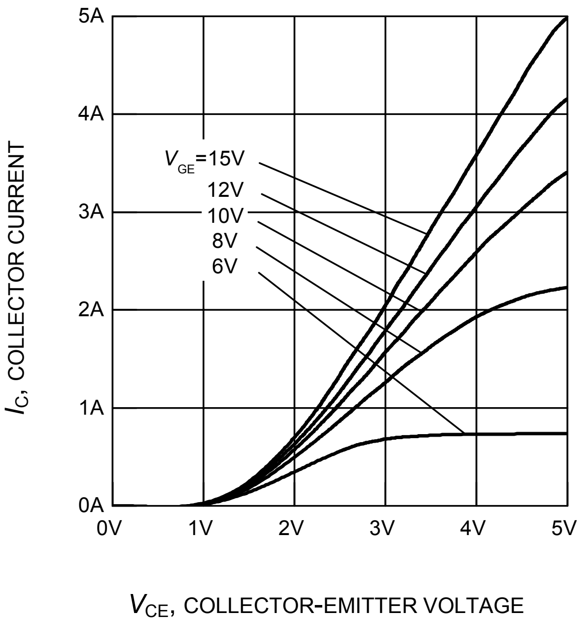


Figure 5. Typical output characteristics
(T_j = 25°C)

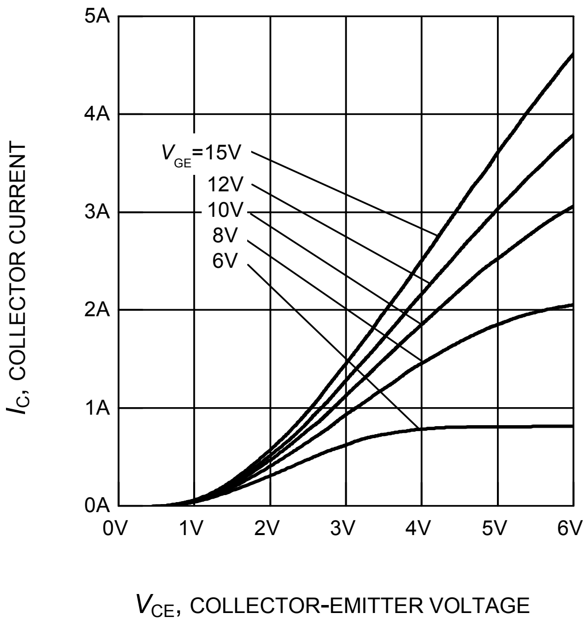


Figure 6. Typical output characteristics
(T_j = 150°C)

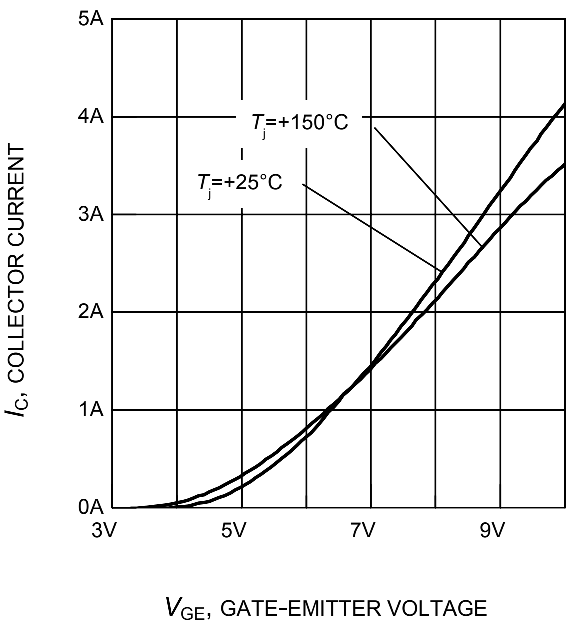


Figure 7. Typical transfer characteristics
(V_{CE} = 20V)

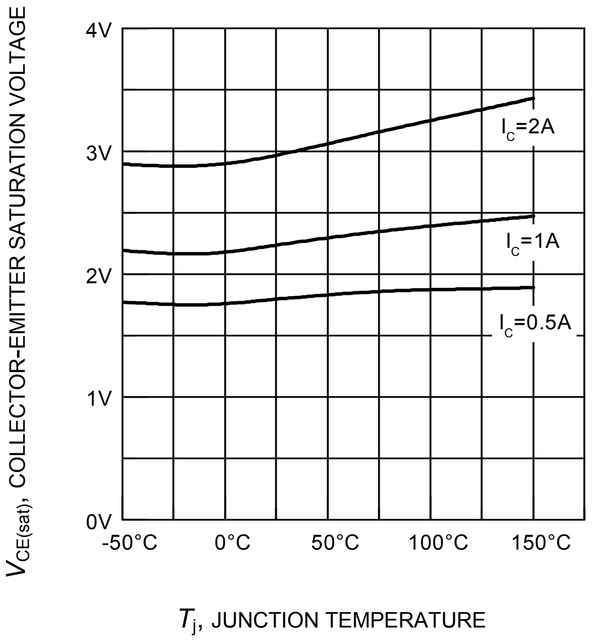


Figure 8. Typical collector-emitter saturation voltage as a function of junction temperature
(V_{GE} = 15V)

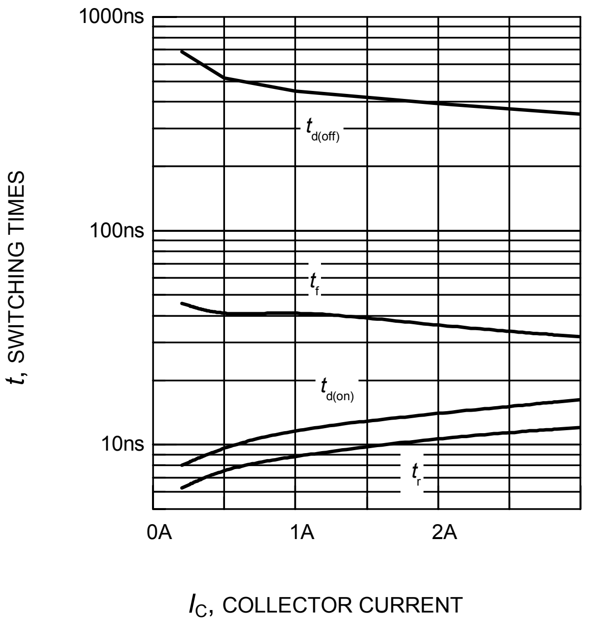


Figure 9. Typical switching times as a function of collector current
(inductive load, T_j = 150°C, V_{CE} = 800V, V_{GE} = +15V/0V, R_G = 241Ω, dynamic test circuit in Fig.E)

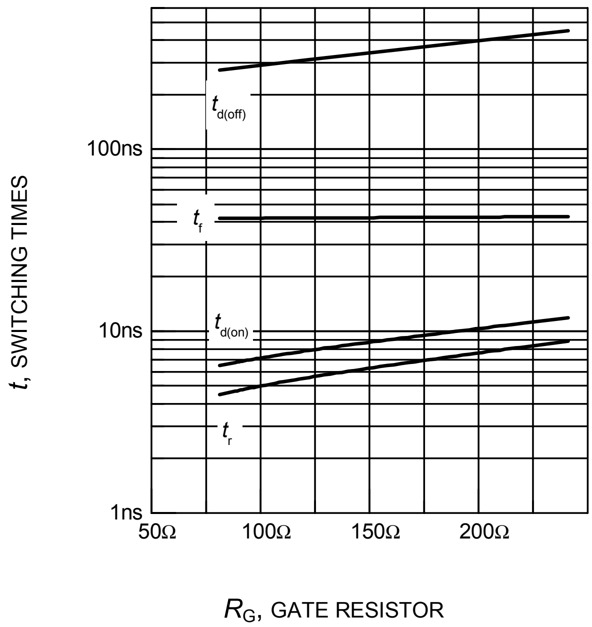


Figure 10. Typical switching times as a function of gate resistor
(inductive load, T_j = 150°C, V_{CE} = 800V, V_{GE} = +15V/0V, I_C = 1A, dynamic test circuit in Fig.E)

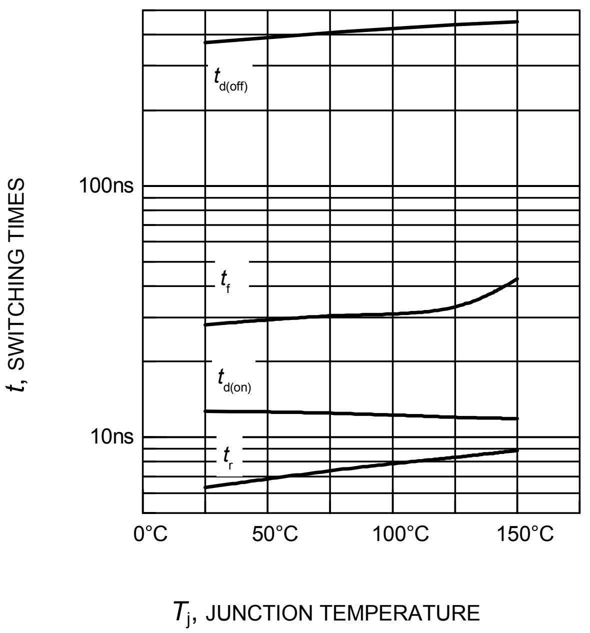


Figure 11. Typical switching times as a function of junction temperature
(inductive load, V_{CE} = 800V, V_{GE} = +15V/0V, I_C = 1A, R_G = 241Ω, dynamic test circuit in Fig.E)

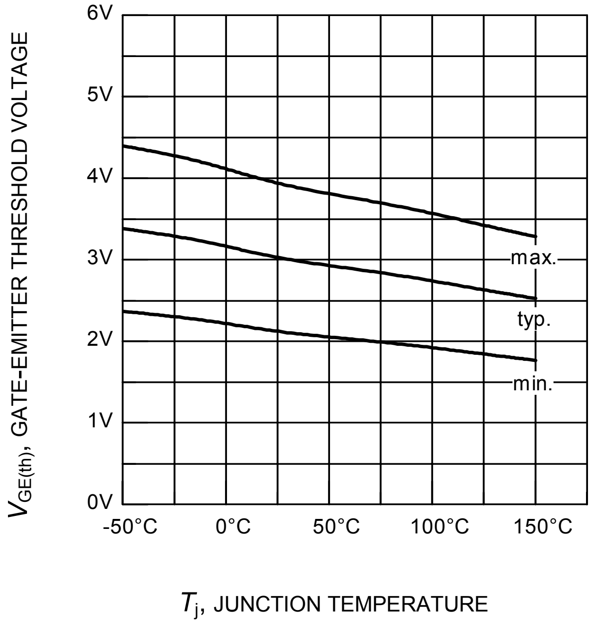


Figure 12. Gate-emitter threshold voltage as a function of junction temperature
(I_C = 0.03mA)

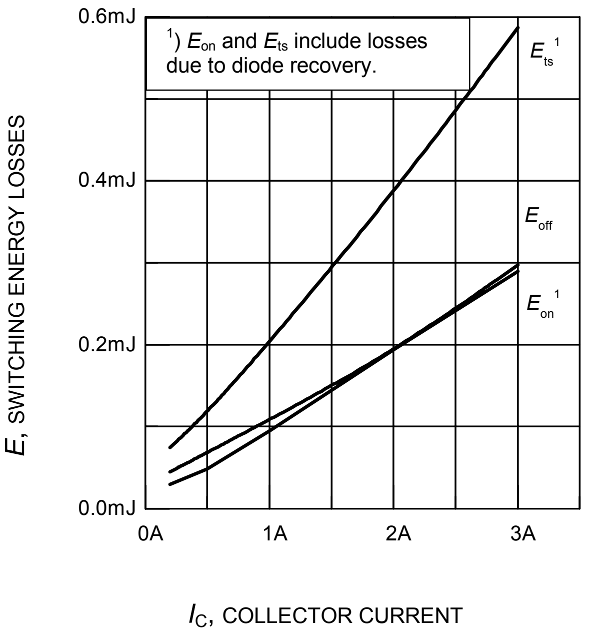


Figure 13. Typical switching energy losses as a function of collector current
(inductive load, T_j = 150°C,
V_{CE} = 800V, V_{GE} = +15V/0V, R_G = 241Ω,
dynamic test circuit in Fig.E)

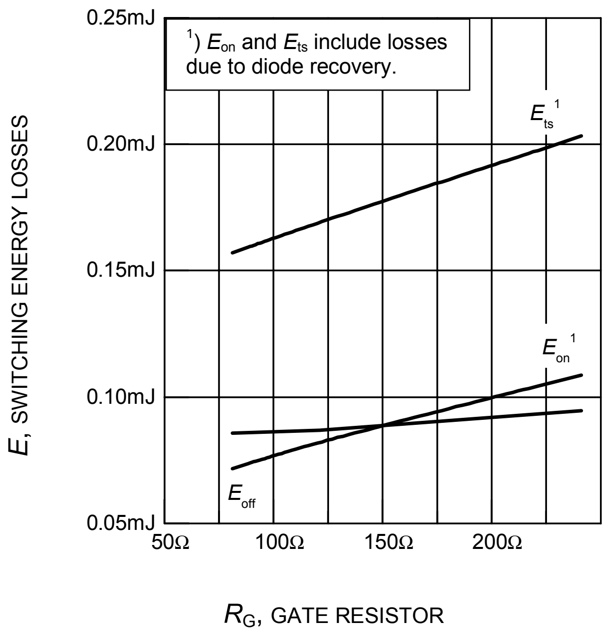


Figure 14. Typical switching energy losses as a function of gate resistor
(inductive load, T_j = 150°C,
V_{CE} = 800V, V_{GE} = +15V/0V, I_C = 1A,
dynamic test circuit in Fig.E)

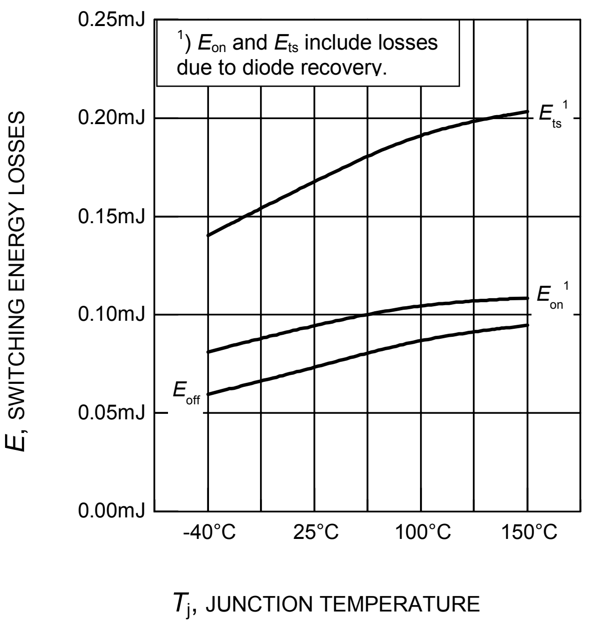


Figure 15. Typical switching energy losses as a function of junction temperature
(inductive load, V_{CE} = 800V,
V_{GE} = +15V/0V, I_C = 1A, R_G = 241Ω,
dynamic test circuit in Fig.E)

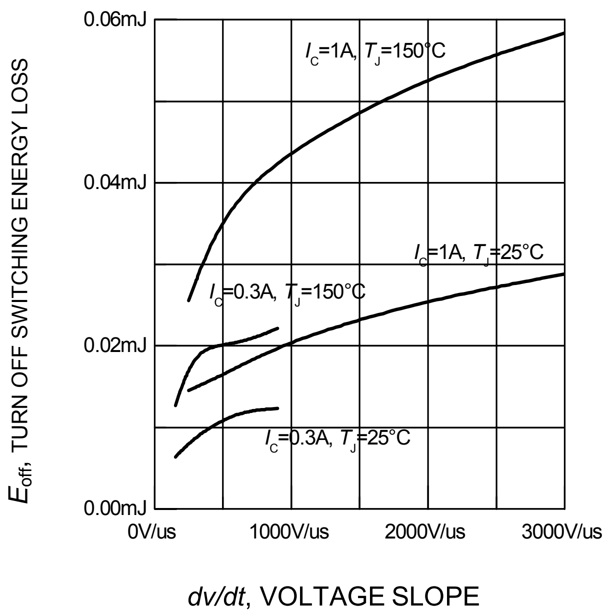


Figure 16. Typical turn off switching energy loss for soft switching
(*dynamic test circuit in Fig. E*)

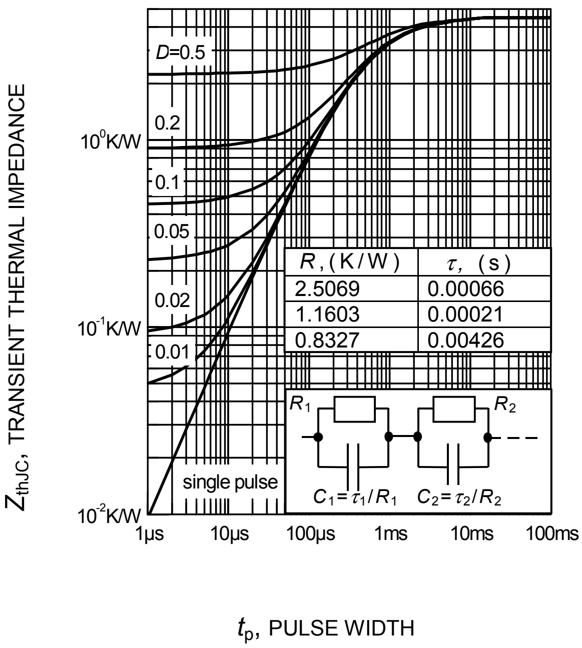


Figure 17. IGBT transient thermal impedance as a function of pulse width
($D = t_p / T$)

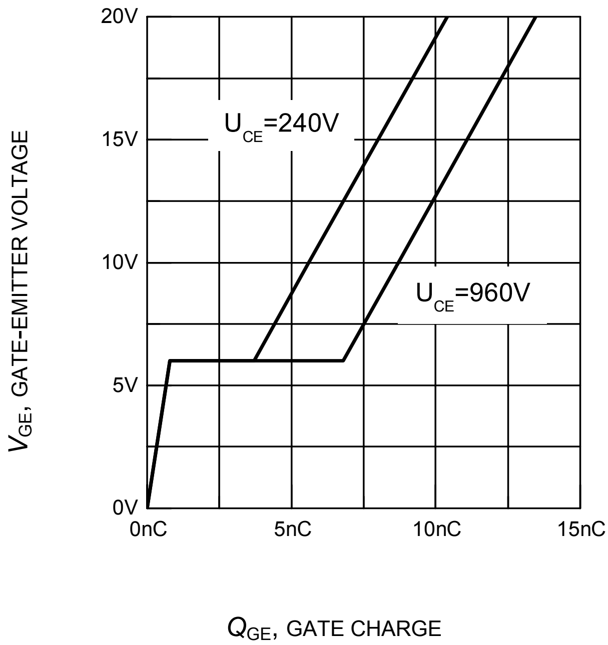


Figure 18. Typical gate charge
(I_C = 1A)

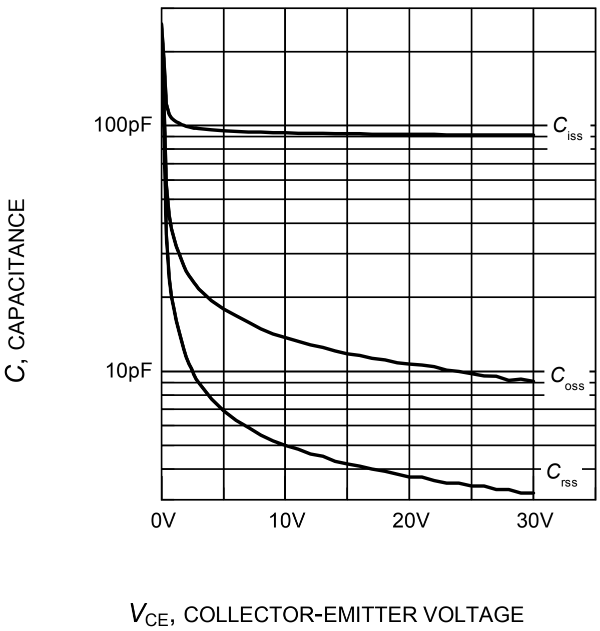


Figure 19. Typical capacitance as a function of collector-emitter voltage
(V_{GE} = 0V, f = 1MHz)

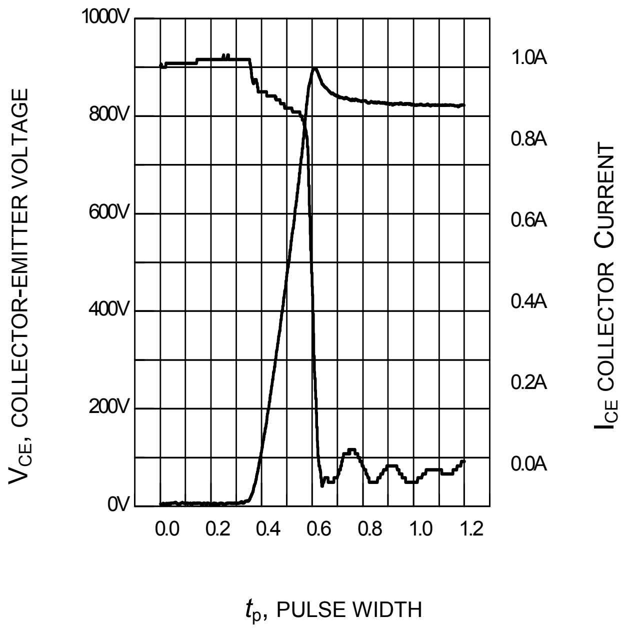


Figure 20. Typical turn off behavior, hard switching
(V_{GE}=15/0V, R_G=220Ω, T_j = 150°C, Dynamic test circuit in Figure E)

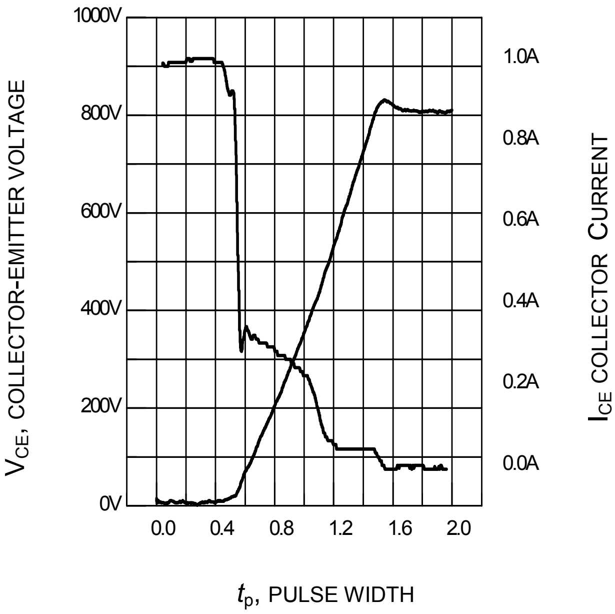
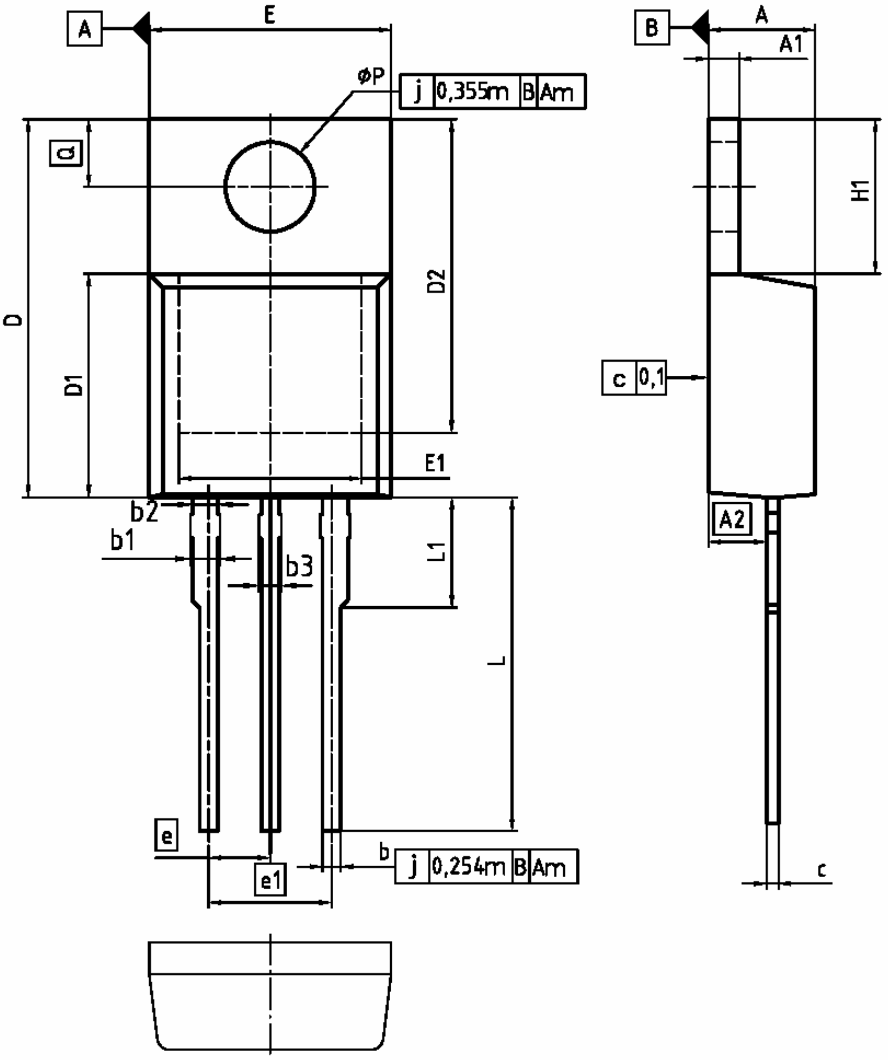


Figure 21. Typical turn off behavior, soft switching
(V_{GE}=15/0V, R_G=220Ω, T_j = 150°C, Dynamic test circuit in Figure E)

PG-TO220-3-1



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.30	4.57	0.169	0.180
A1	1.17	1.40	0.046	0.055
A2	2.15	2.72	0.085	0.107
b	0.65	0.86	0.026	0.034
b1	0.95	1.40	0.037	0.055
b2	0.95	1.15	0.037	0.045
b3	0.65	1.15	0.026	0.045
c	0.33	0.60	0.013	0.024
D	14.81	15.95	0.583	0.628
D1	8.51	9.45	0.335	0.372
D2	12.19	13.10	0.480	0.516
E	9.70	10.36	0.382	0.408
E1	6.50	8.60	0.256	0.339
e	2.54		0.100	
e1	5.08		0.200	
N	3		3	
H1	5.90	6.90	0.232	0.272
L	13.00	14.00	0.512	0.551
L1	-	4.80	-	0.189
øP	3.60	3.89	0.142	0.153
Q	2.60	3.00	0.102	0.118

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SCALE 0 2.5 5mm

EUROPEAN PROJECTION

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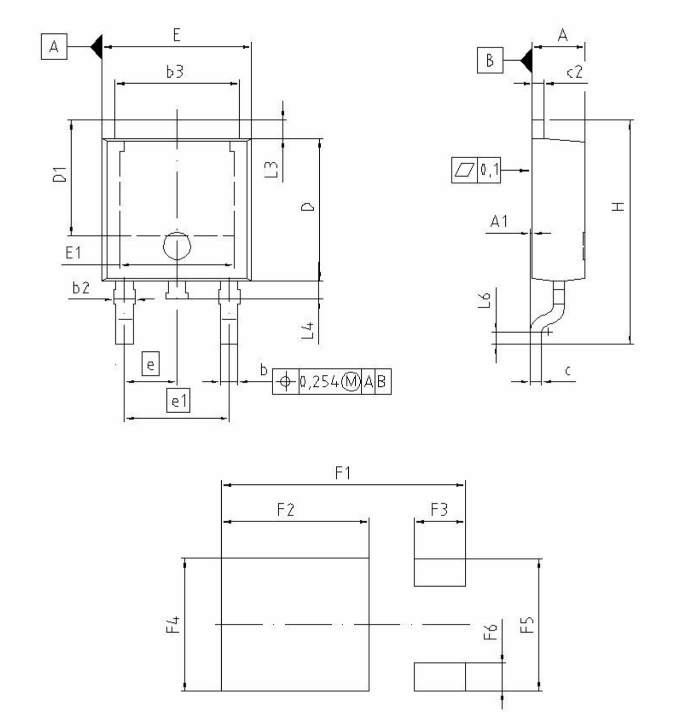

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.184	2.388	0.086	0.094
A1	0.000	0.150	0.000	0.006
b	0.635	0.889	0.025	0.035
b2	0.650	1.150	0.025	0.045
b3	5.004	5.500	0.197	0.217
c	0.460	0.580	0.018	0.023
c2	0.460	0.980	0.018	0.039
D	5.969	6.223	0.235	0.245
D1	5.020	5.320	0.198	0.209
E	6.400	6.731	0.252	0.265
E1	4.900	5.100	0.193	0.201
e	2.286		0.090	
e1	4,572		0.180	
N	3		3	
H	9.400	10.084	0.370	0.397
L3	0.900	1.118	0.035	0.044
L4	0.650	1.016	0.026	0.040
L6	0.510	0.686	0.020	0.027
F1	10.500	10.700	0.413	0.421
F2	6.300	6.500	0.248	0.256
F3	2.100	2.300	0.083	0.091
F4	5.700	5.900	0.224	0.232
F5	5.660	5.860	0.222	0.231
F6	1.100	1.300	0.043	0.051

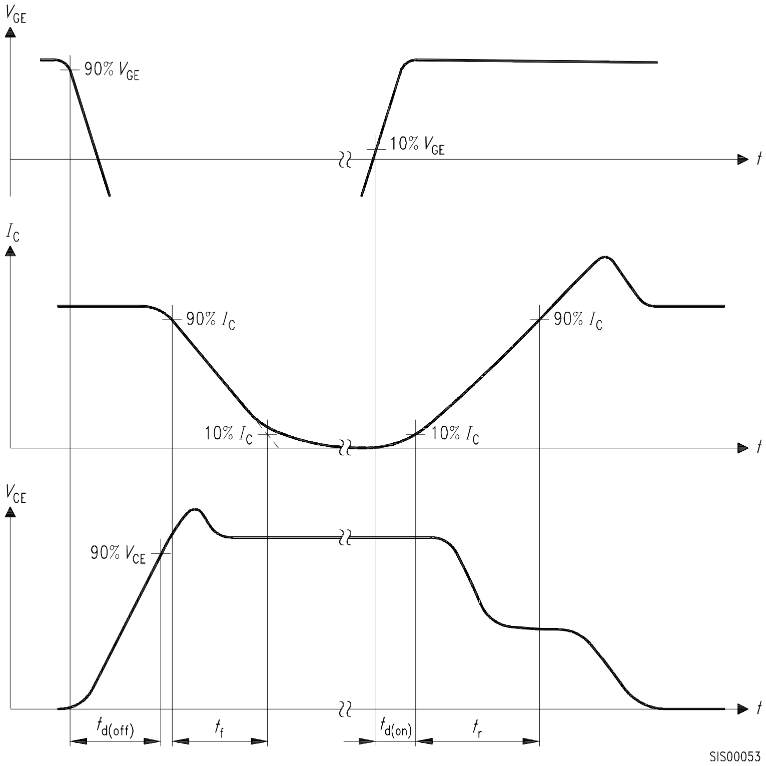

Figure A. Definition of switching times

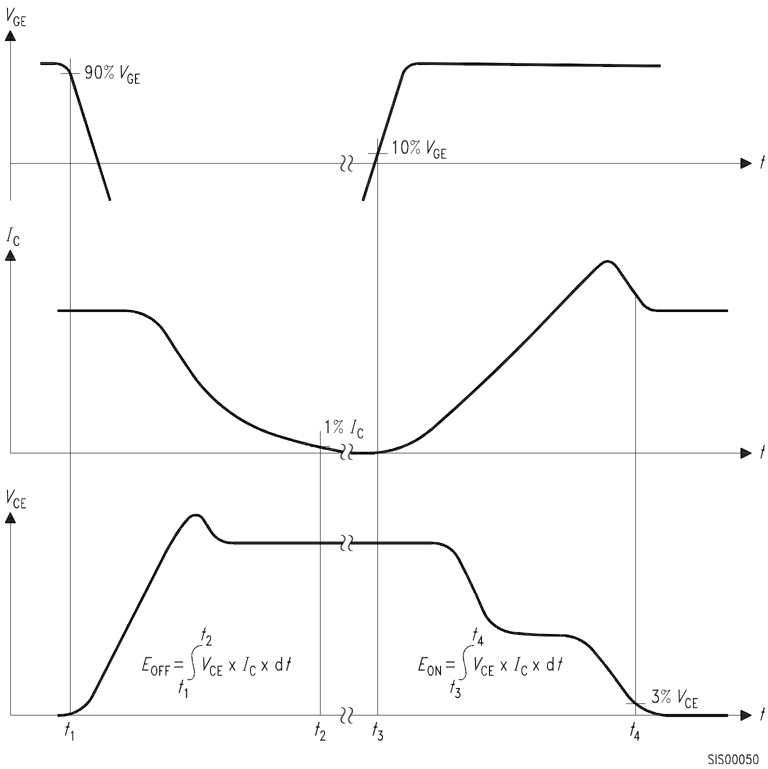

Figure B. Definition of switching losses

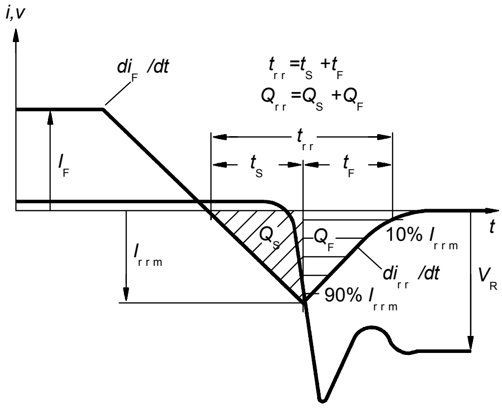

Figure C. Definition of diodes switching characteristics

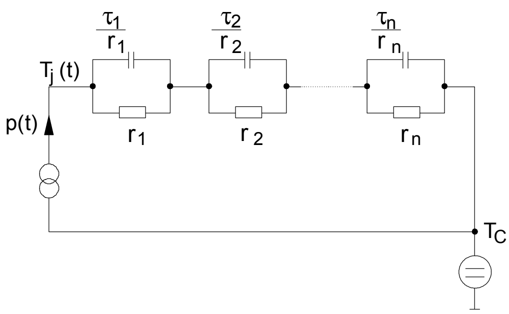

Figure D. Thermal equivalent circuit

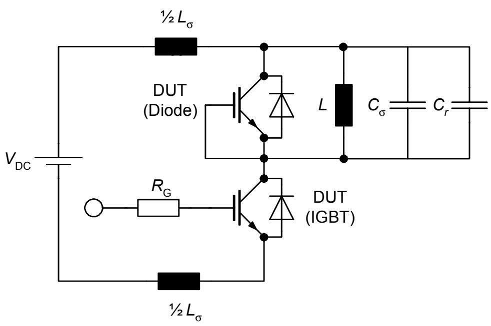

Figure E. Dynamic test circuit
Leakage inductance L_σ= 180nH,
Stray capacitor C_σ = 40pF,
Relief capacitor C_r = 1nF (only for ZVT switching)

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