# SKW07N120

Fast IGBT in NPT-technology with soft, fast recovery anti-parallel EmCon diode

- Lower E_{off} compared to previous generation
- Short circuit withstand time – 10 μs
- Designed for:
    - Motor controls
    - Inverter
    - SMPS
- NPT-Technology offers:
    - very tight parameter distribution
    - high ruggedness, temperature stable behaviour
    - parallel switching capability
- 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/
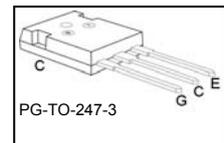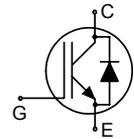
PG-TO-247-3

Type	V_{CE}	I_C	E_{off}	T_j	Marking	Package
SKW07N120	1200V	8A	0.7mJ	150°C	K07N120	PG-TO-247-3

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CE}	1200	V
DC collector current	I_C		A
$T_C = 25°C$		16.5	
$T_C = 100°C$		7.9	
Pulsed collector current, t_p limited by T_{jmax}	I_{Cpuls}	27	
Turn off safe operating area $V_{CE} \leq 1200V$, $T_j \leq 150°C$	-	27	
Diode forward current	I_F		
$T_C = 25°C$		13	
$T_C = 100°C$		7	
Diode pulsed current, t_p limited by T_{jmax}	I_{Fpuls}	27	
Gate-emitter voltage	V_{GE}	±20	V
Short circuit withstand time[2] V_{GE} = 15V, 100V $\leq V_{CC} \leq$ 1200V, $T_j \leq 150°C$	t_{SC}	10	μs
Power dissipation $T_C = 25°C$	P_{tot}	125	W
Operating junction and storage temperature	T_j , T_{stg}	-55...+150	°C
Soldering temperature, wavesoldering, 1.6mm (0.063 in.) from case for 10s	T_s	260	

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

Thermal Resistance

Parameter	Symbol	Conditions	Max. Value	Unit
Characteristic				
IGBT thermal resistance, junction – case	R_{thJC}		1	K/W
Diode thermal resistance, junction – case	R_{thJCD}		2.5	
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	1200	-	-	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	V_{GE} = 15V, I_C=8A				
		T_j=25°C	2.5	3.1	3.6	
		T_j=150°C	-	3.7	4.3	
Diode forward voltage	V_F	V_{GE}=0V, I_F=7A				
		T_j=25°C		2.0	2.4	
		T_j=150°C	-	1.75		
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C=350µA, V_{CE}=V_{GE}	3	4	5	
Zero gate voltage collector current	I_{CES}	V_{CE}=1200V, V_{GE}=0V				µA
		T_j=25°C	-	-	100	
		T_j=150°C	-	-	400	
Gate-emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V	-	-	100	nA
Transconductance	g_{fs}	V_{CE}=20V, I_C=8A		6	-	S
Dynamic Characteristic						
Input capacitance	C_{iss}	V_{CE}=25V,	-	720	870	pF
Output capacitance	C_{oss}	V_{GE}=0V,	-	90	110	
Reverse transfer capacitance	C_{rss}	f=1MHz	-	40	50	
Gate charge	Q_{Gate}	V_{CC}=960V, I_C=8A V_{GE}=15V	-	70	90	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 100V≤V_{CC}≤1200V, T_j ≤ 150°C	-	75	-	A

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

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,	-	27	35	ns
Rise time	t_r	V_{CC}=800V, I_C=8A,	-	29	38	
Turn-off delay time	$t_{d(off)}$	V_{GE}=15V/0V,	-	440	570	
Fall time	t_f	R_G=47Ω,	-	21	27	
Turn-on energy	E_{on}	$L_\sigma{}^{1)}$=180nH,	-	0.6	0.8	mJ
Turn-off energy	E_{off}	$C_\sigma{}^{1)}$=40pF	-	0.4	0.55	
Total switching energy	E_{ts}	Energy losses include "tail" and diode reverse recovery.	-	1.0	1.35	
Anti-Parallel Diode Characteristic						
Diode reverse recovery time	t_{rr}	T_j=25°C,	-	60		ns
	t_S	V_R=800V, I_F=8A,	-			
	t_F	di_F/dt=400A/µs	-			
Diode reverse recovery charge	Q_{rr}		-	0.3		µC
Diode peak reverse recovery current	I_{rrm}		-	9		A
Diode peak rate of fall of reverse recovery current during t_F	di_{rr}/dt		-	400		A/µs

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	-	30	36	ns
Rise time	t_r	V_{CC}=800V,	-	26	31	
Turn-off delay time	$t_{d(off)}$	I_C=8A,	-	490	590	
Fall time	t_f	V_{GE}=15V/0V,	-	30	36	
Turn-on energy	E_{on}	R_G=47Ω, $L_\sigma{}^{1)}$=180nH,	-	1.0	1.2	mJ
Turn-off energy	E_{off}	$C_\sigma{}^{1)}$=40pF	-	0.7	0.9	
Total switching energy	E_{ts}	Energy losses include "tail" and diode reverse recovery.	-	1.7	2.1	
Anti-Parallel Diode Characteristic						
Diode reverse recovery time	t_{rr}	T_j=150°C	-	170		ns
	t_S	V_R=800V, I_F=8A,	-			
	t_F	di_F/dt=500A/µs	-			
Diode reverse recovery charge	Q_{rr}		-	1.1		µC
Diode peak reverse recovery current	I_{rrm}		-	15		A
Diode peak rate of fall of reverse recovery current during t_F	di_{rr}/dt		-	110		A/µs

[1] Leakage inductance L_σ and stray capacity C_σ due to dynamic test circuit in figure E.
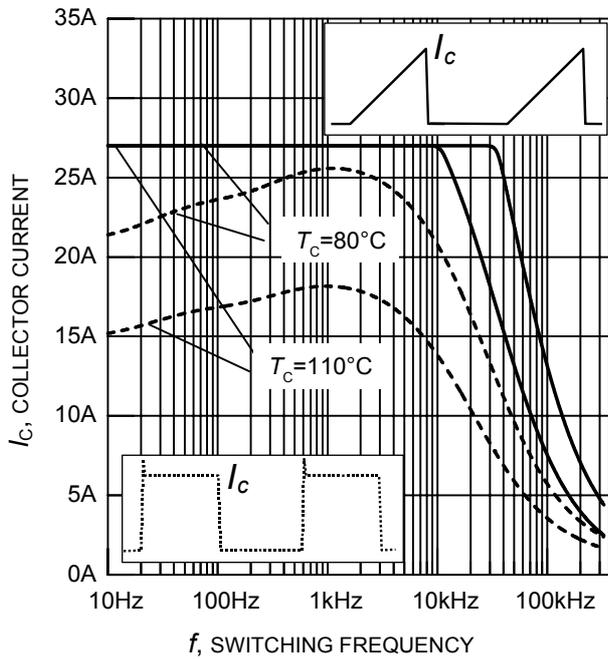
Figure 1. Collector current as a function of switching frequency
($T_j \leq 150°C$, $D = 0.5$, $V_{CE} = 800V$, $V_{GE} = +15V/0V$, $R_G = 47\Omega$)
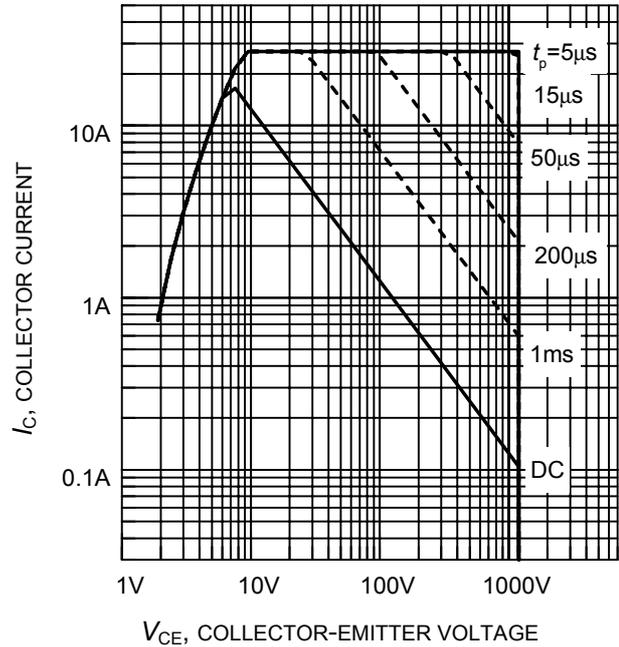
**Figure 2. Safe operating area**
($D = 0$, $T_C = 25°C$, $T_j \leq 150°C$)
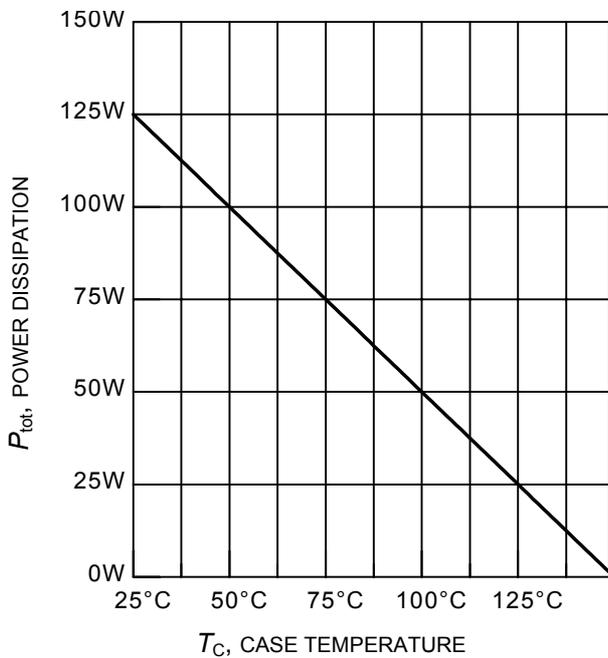
**Figure 3. Power dissipation as a function of case temperature**
($T_j \leq 150°C$)
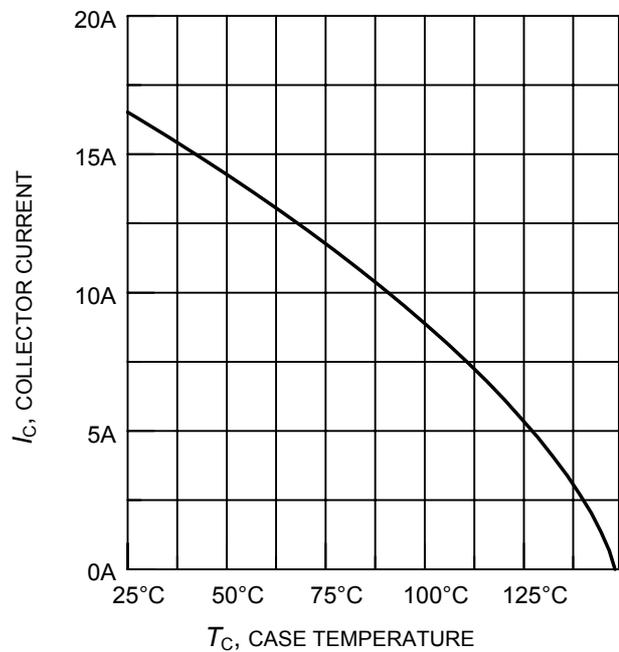
Figure 4. Collector current as a function of case temperature
($V_{GE} \leq 15V$, $T_j \leq 150°C$)
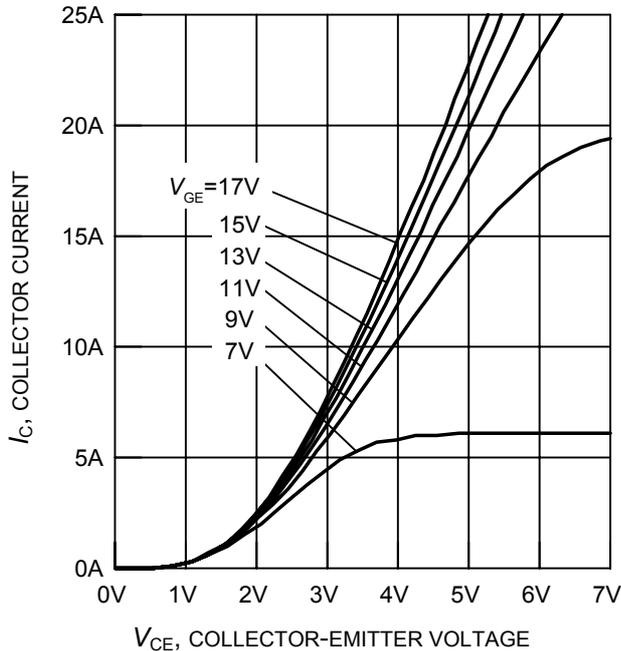
Figure 5. Typical output characteristics
(T_j = 25°C)
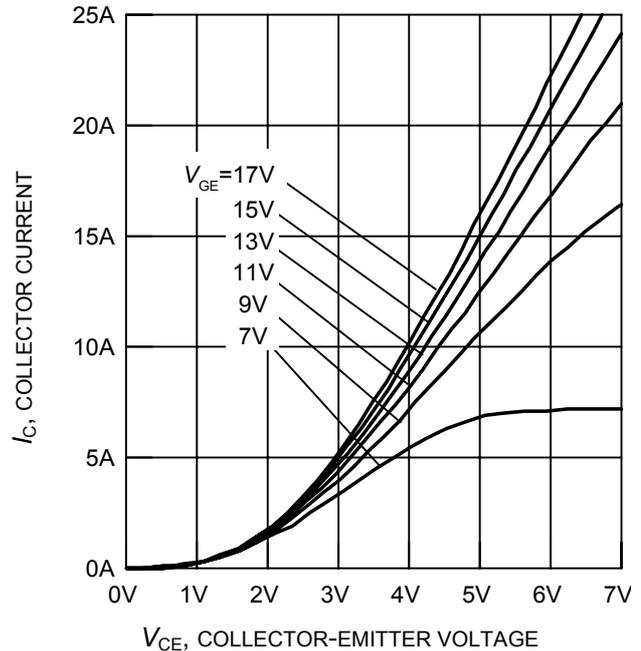
Figure 6. Typical output characteristics
(T_j = 150°C)
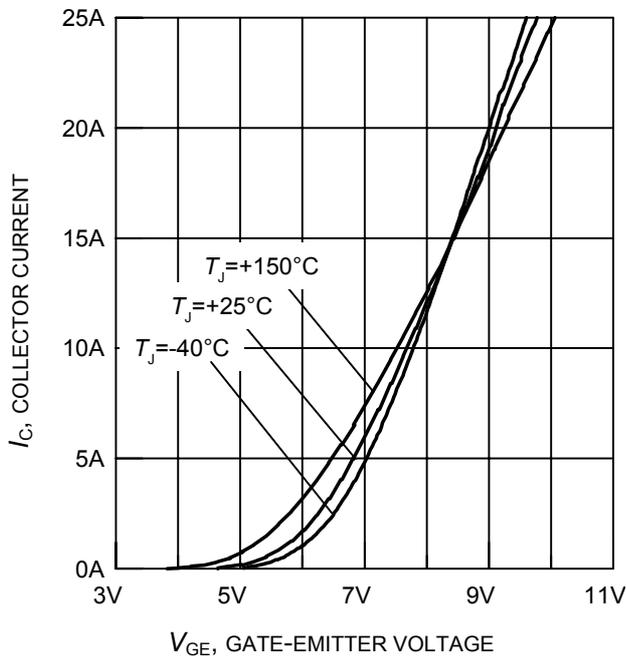
Figure 7. Typical transfer characteristics
(V_{CE} = 20V)
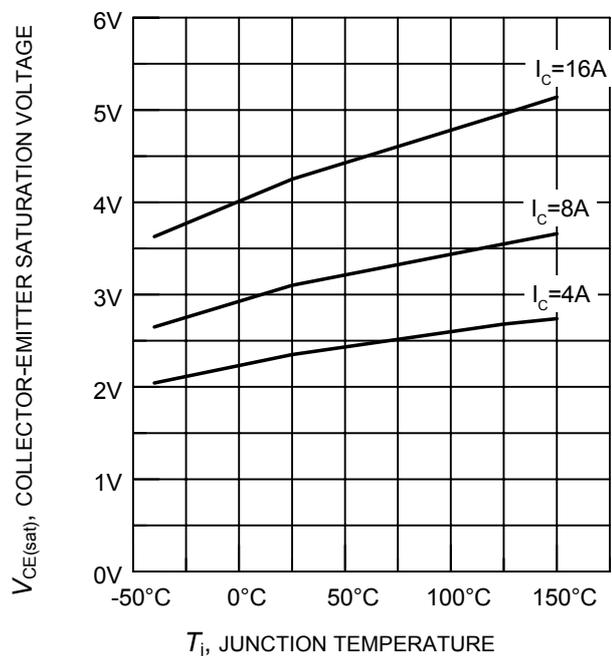
Figure 8. Typical collector-emitter saturation voltage as a function of junction temperature
(V_{GE} = 15V)
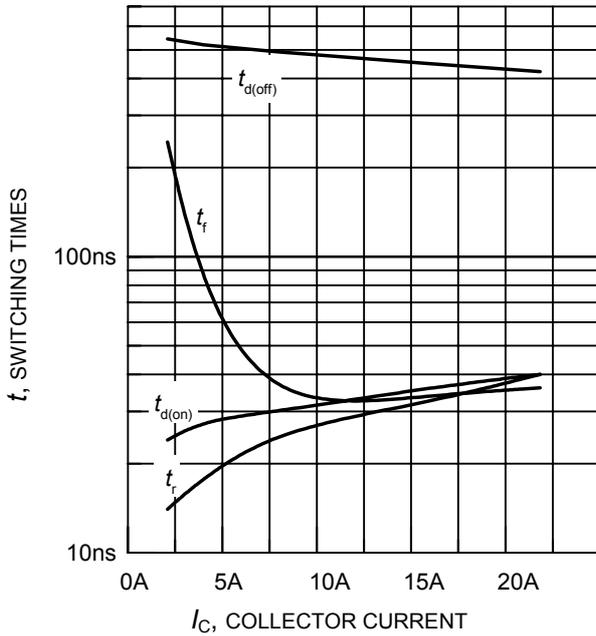
Figure 9. Typical switching times as a function of collector current
(inductive load, T_j = 150°C,
V_{CE} = 800V, V_{GE} = +15V/0V, R_G = 47 Ω,
dynamic test circuit in Fig.E)
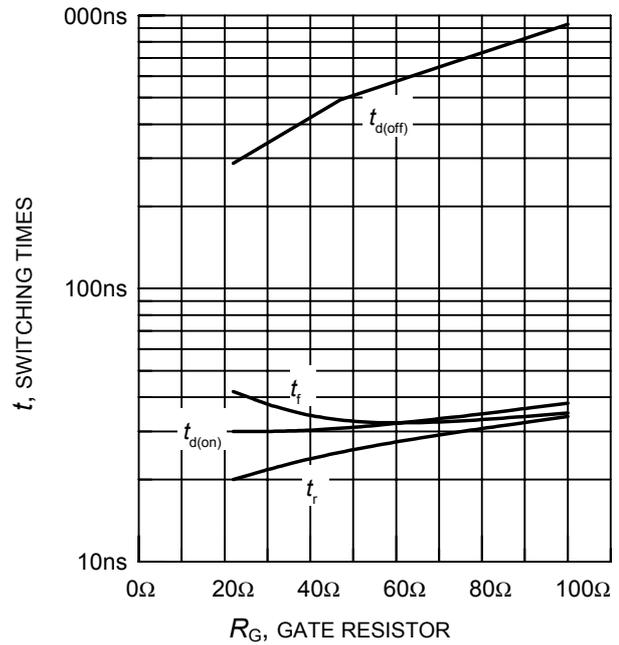
Figure 10. Typical switching times as a function of gate resistor
(inductive load, T_j = 150°C,
V_{CE} = 800V, V_{GE} = +15V/0V, I_C = 8A,
dynamic test circuit in Fig.E)
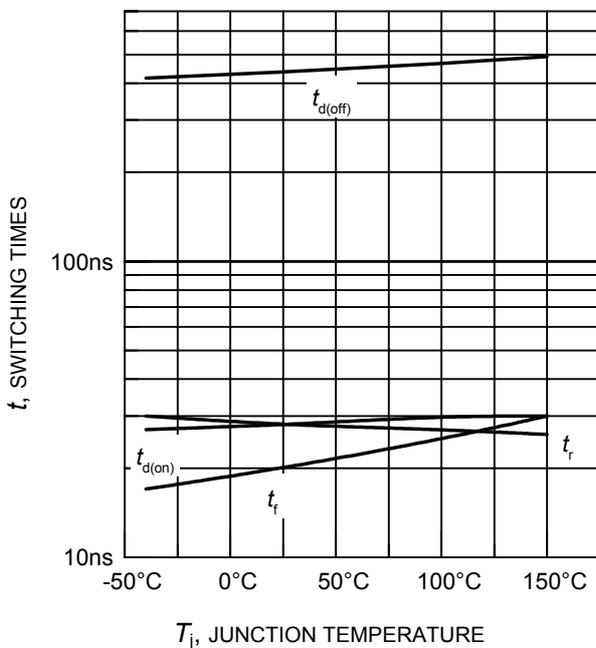
**Figure 11. Typical switching times as a function of junction temperature**
(inductive load, V_{CE} = 800V,
V_{GE} = +15V/0V, I_C = 8A, R_G = 47 Ω,
dynamic test circuit in Fig.E)
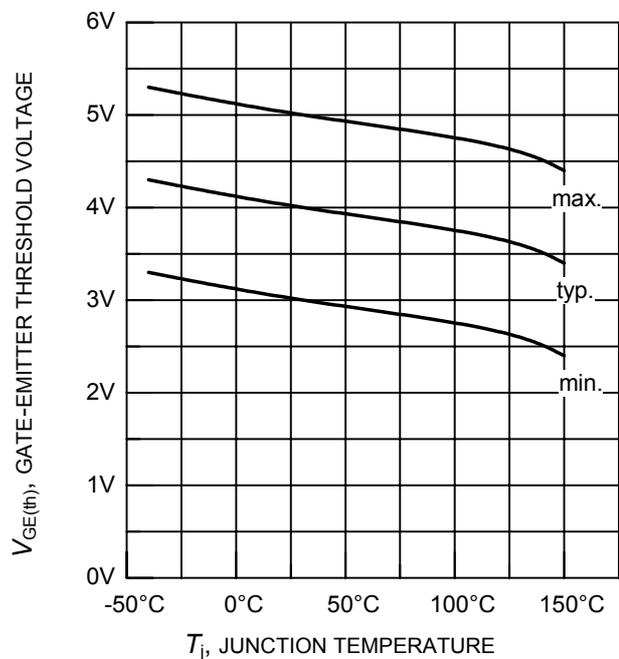
Figure 12. Gate-emitter threshold voltage as a function of junction temperature
(I_C = 0.3mA)

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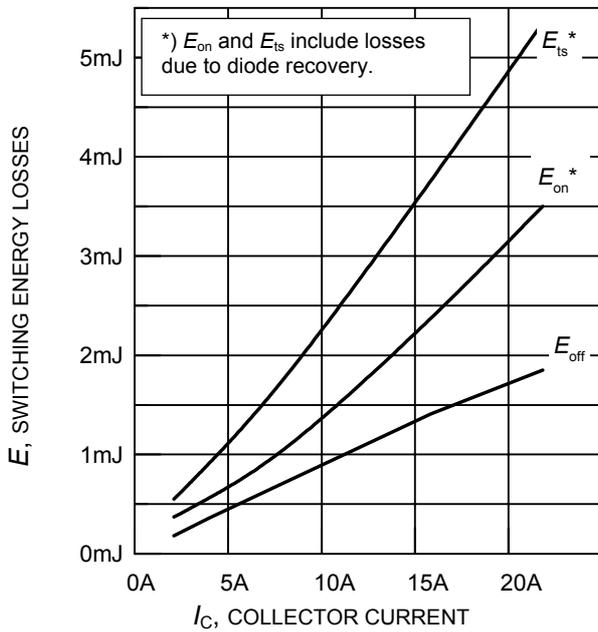
Figure 13. Typical switching energy losses as a function of collector current
(inductive load, T_j = 150°C, V_{CE} = 800V, V_{GE} = +15V/0V, R_G = 47 Ω, dynamic test circuit in Fig.E)
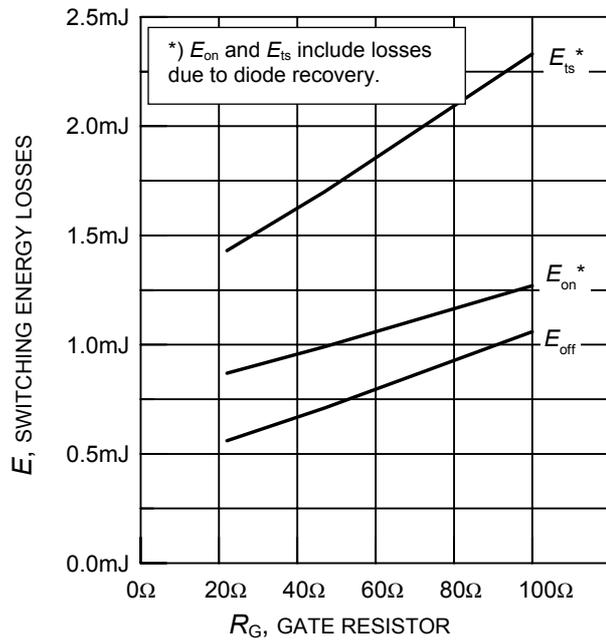
Figure 14. Typical switching energy losses as a function of gate resistor
(inductive load, T_j = 150°C, V_{CE} = 800V, V_{GE} = +15V/0V, I_C = 8A, dynamic test circuit in Fig.E)
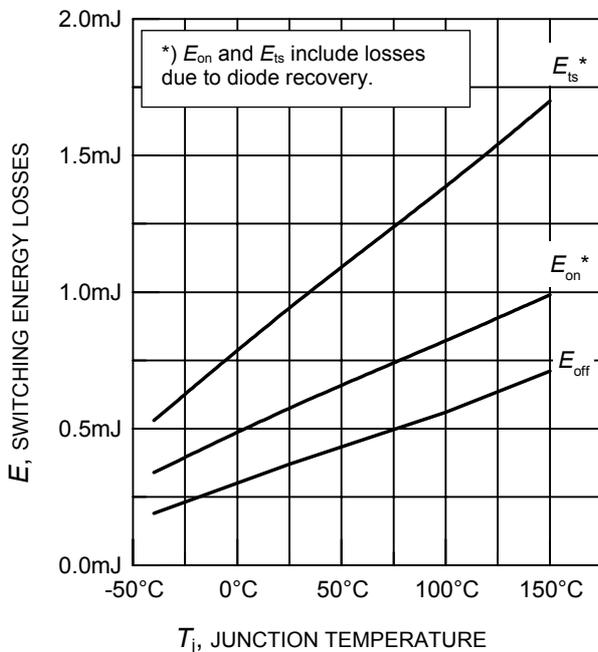
Figure 15. Typical switching energy losses as a function of junction temperature
(inductive load, V_{CE} = 800V, V_{GE} = +15V/0V, I_C = 8A, R_G = 47 Ω, dynamic test circuit in Fig.E)

R, (K / W)	τ, (s)
0.1020	0.77957
0.40493	0.21098
0.26391	0.01247
0.22904	0.00092
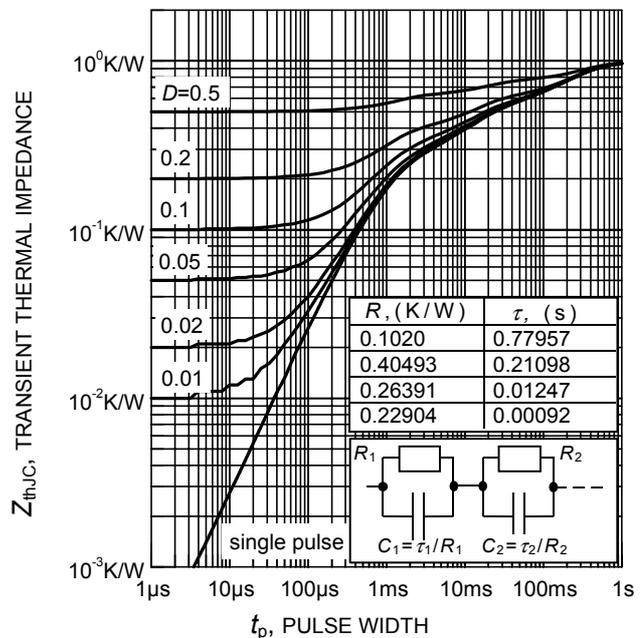
Figure 16. IGBT transient thermal impedance as a function of pulse width
($D = t_p / T$)

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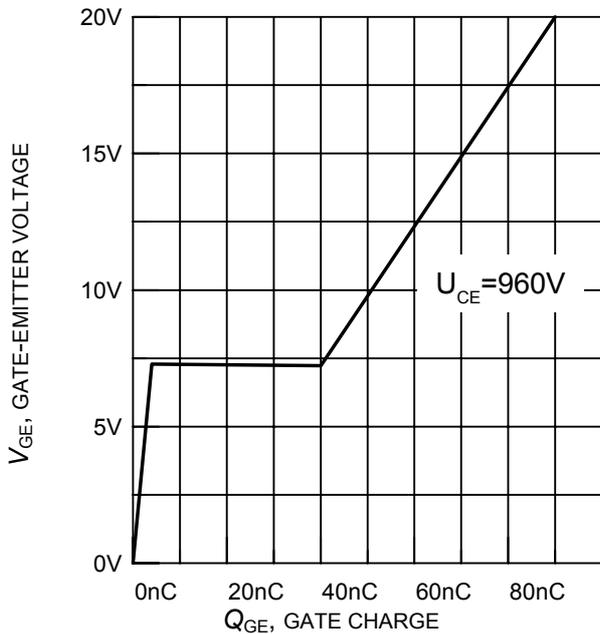
**Figure 17. Typical gate charge**
(I_C = 8A)
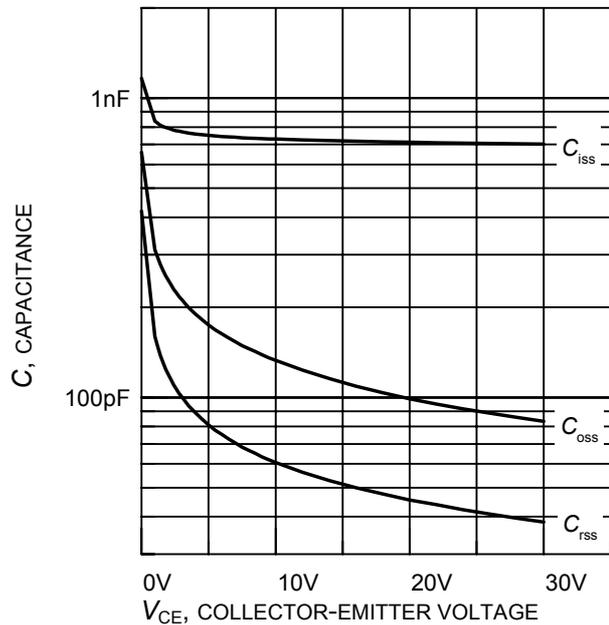
Figure 18. Typical capacitance as a function of collector-emitter voltage
(V_{GE} = 0V, f = 1MHz)
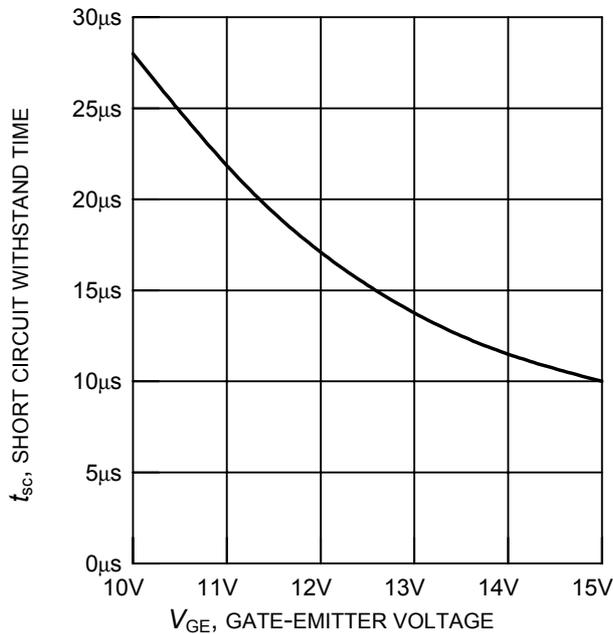
Figure 19. Short circuit withstand time as a function of gate-emitter voltage
(V_{CE} = 1200V, start at T_j = 25°C)
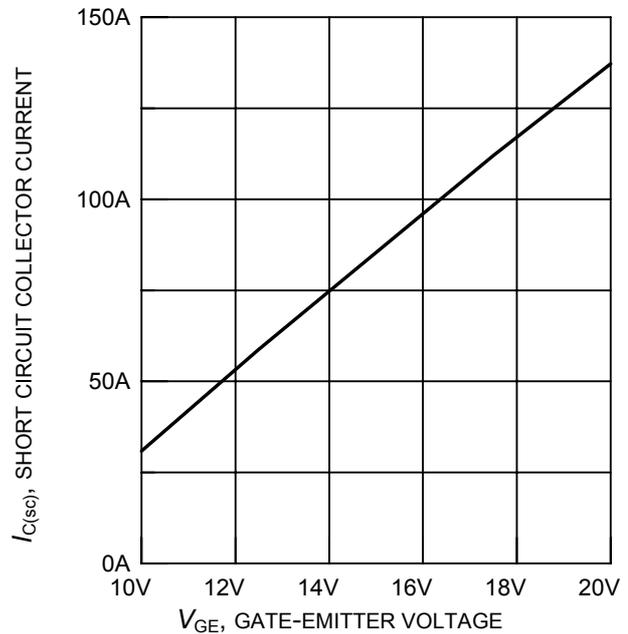
Figure 20. Typical short circuit collector current as a function of gate-emitter voltage
(100V ≤ V_{CE} ≤ 1200V, T_C = 25°C, T_j ≤ 150°C)
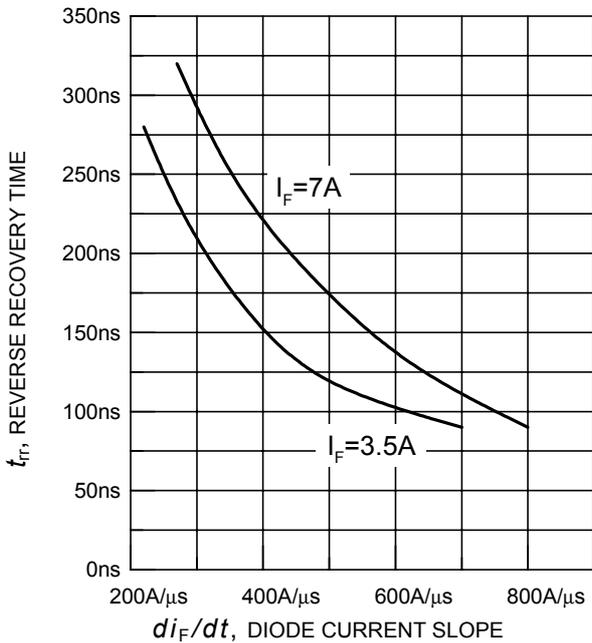
Figure 21. Typical reverse recovery time as a function of diode current slope (V_R = 800V, T_j = 150°C, dynamic test circuit in Fig.E)
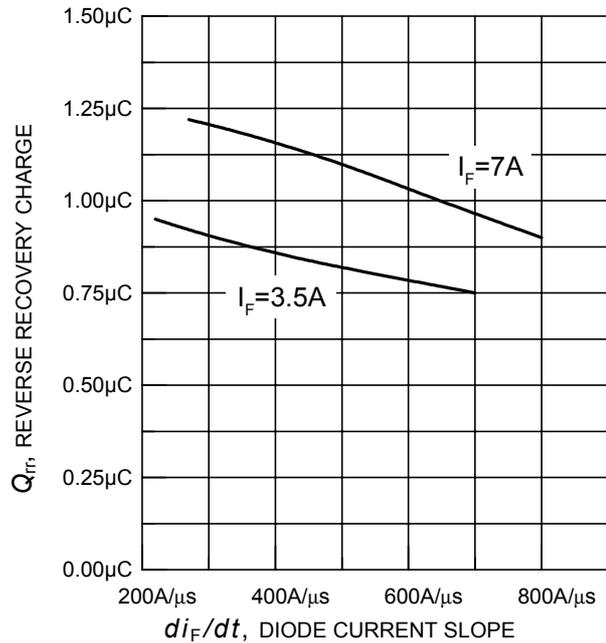

Figure 22. Typical reverse recovery charge as a function of diode current slope (V_R = 800V, T_j = 150°C, dynamic test circuit in Fig.E)
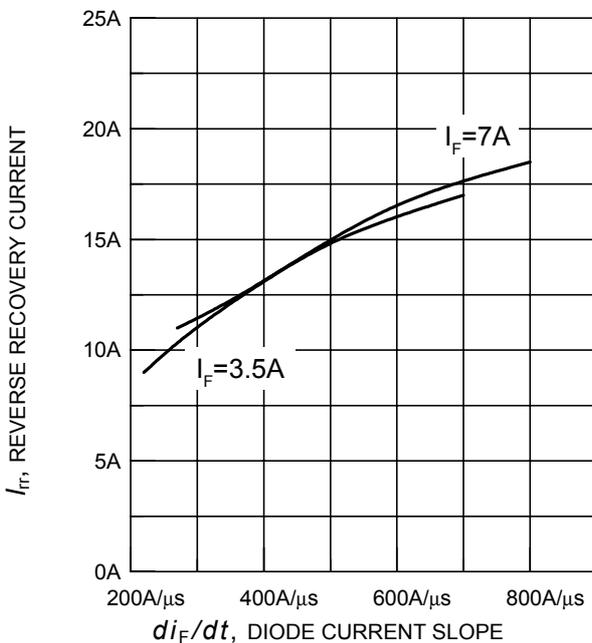

Figure 23. Typical reverse recovery current as a function of diode current slope (V_R = 800V, T_j = 150°C, dynamic test circuit in Fig.E)
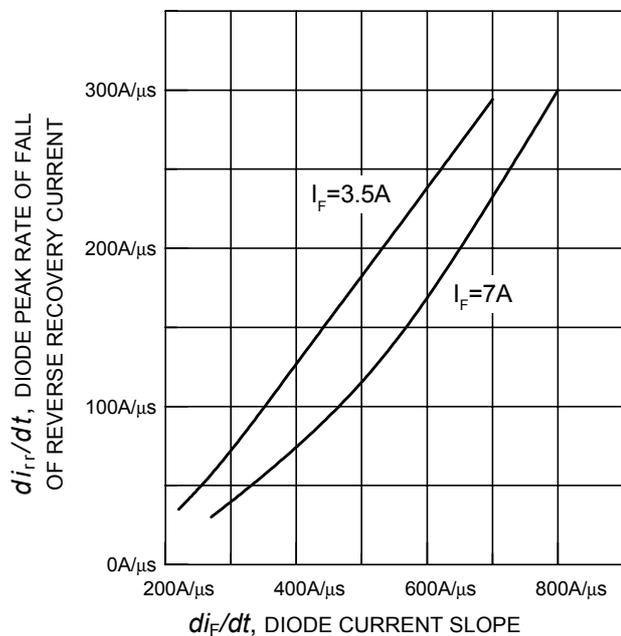

Figure 24. Typical diode peak rate of fall of reverse recovery current as a function of diode current slope (V_R = 800V, T_j = 150°C, dynamic test circuit in Fig.E)
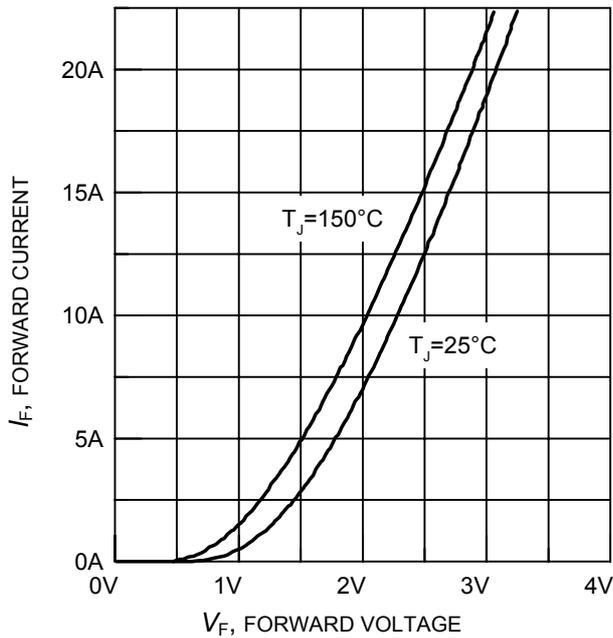
**Figure 25. Typical diode forward current as a function of forward voltage**
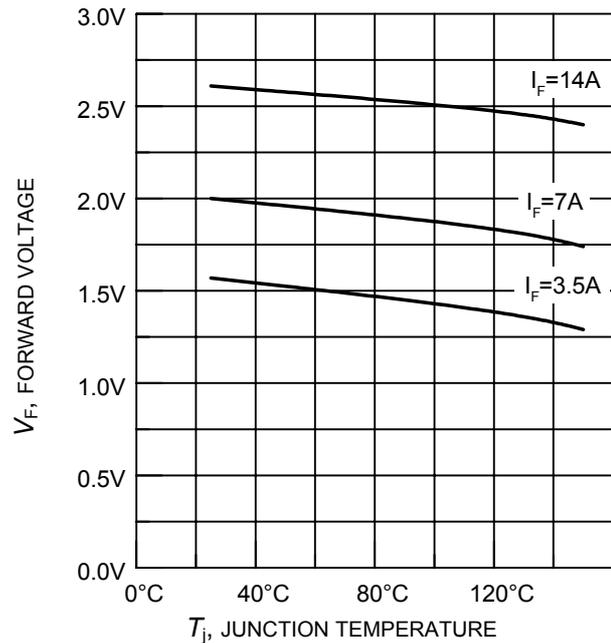
**Figure 26. Typical diode forward voltage as a function of junction temperature**

$R,(K/W)$	$\tau,\ (s)$
0.75885	0.09354
0.88470	0.00543
0.85670	0.00042

$C_1=\tau_1/R_1$ $C_2=\tau_2/R_2$
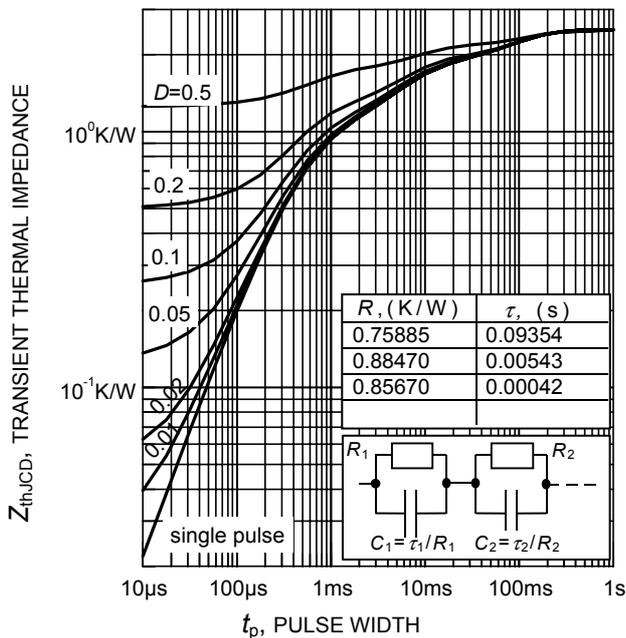
Figure 27. Diode transient thermal impedance as a function of pulse width
($D = t_p / T$)

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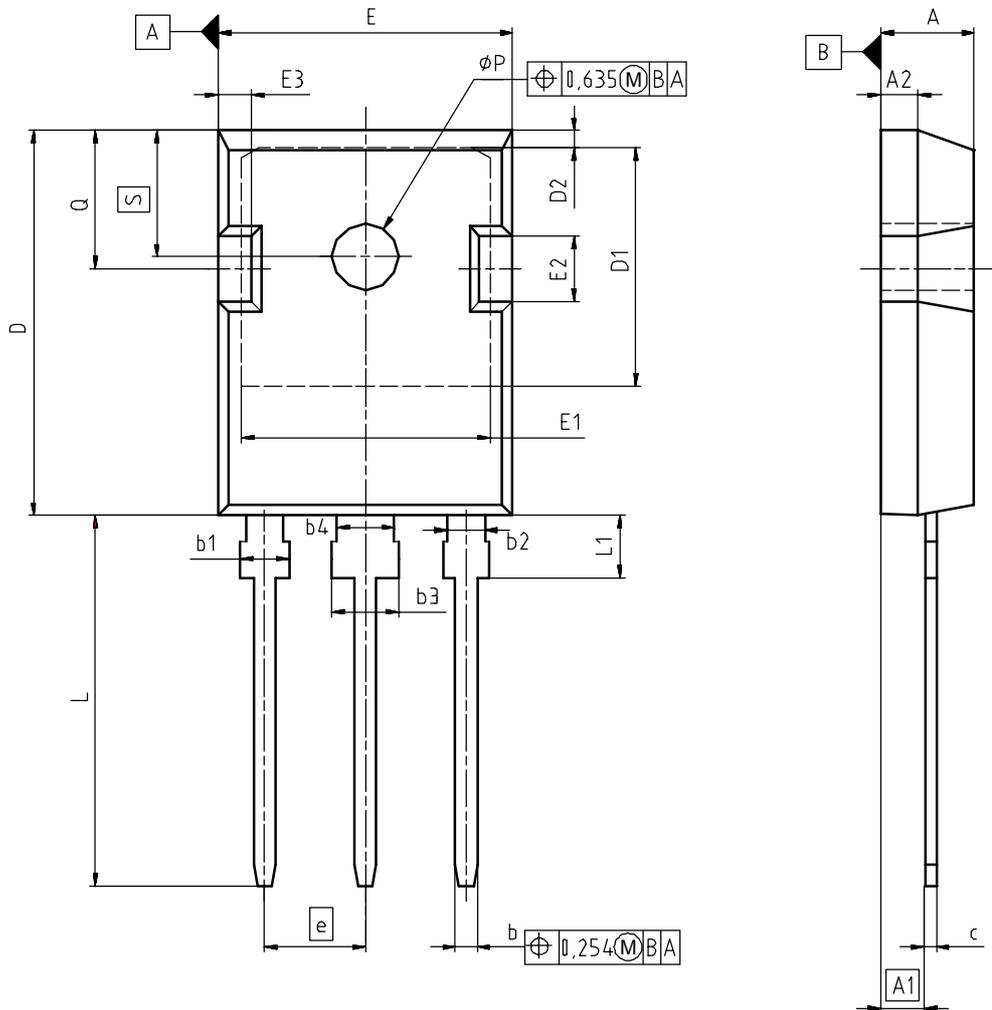
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.90	5.16	0.193	0.203
A1	2.27	2.53	0.089	0.099
A2	1.85	2.11	0.073	0.083
b	1.07	1.33	0.042	0.052
b1	1.90	2.41	0.075	0.095
b2	1.90	2.16	0.075	0.085
b3	2.87	3.38	0.113	0.133
b4	2.87	3.13	0.113	0.123
c	0.55	0.68	0.022	0.027
D	20.82	21.10	0.820	0.831
D1	16.25	17.65	0.640	0.695
D2	1.05	1.35	0.041	0.053
E	15.70	16.03	0.618	0.631
E1	13.10	14.15	0.516	0.557
E2	3.68	5.10	0.145	0.201
E3	1.68	2.60	0.066	0.102
e	5.44		0.214	
N	3		3	
L	19.80	20.31	0.780	0.799
L1	4.17	4.47	0.164	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.
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SCALE

EUROPEAN PROJECTION

ISSUE DATE
17-12-2007

REVISION
03
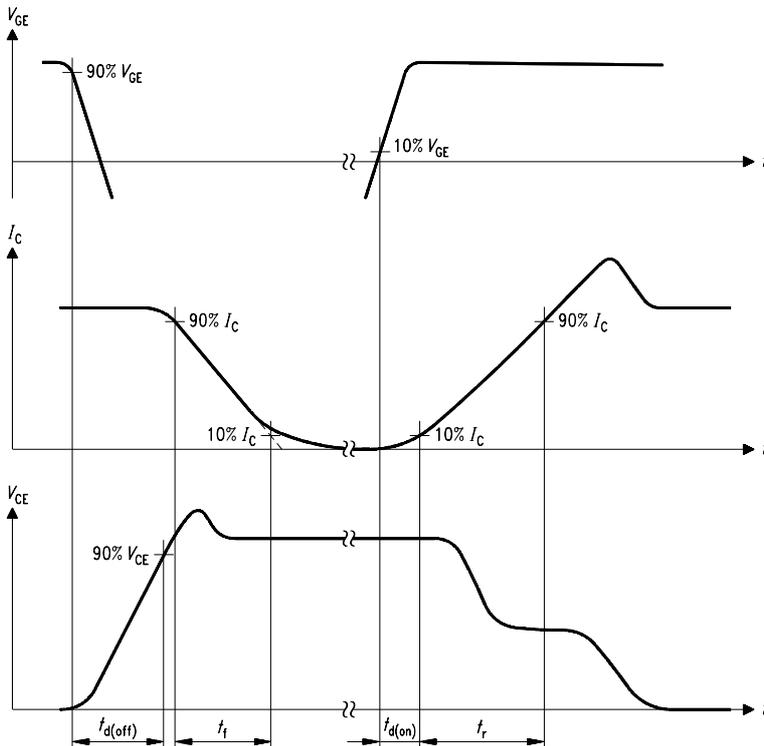
Figure A. Definition of switching times


Figure B. Definition of switching losses

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

$$E_{ON} = \int_{t_3}^{t_4} V_{CE} \times I_C \times dt$$
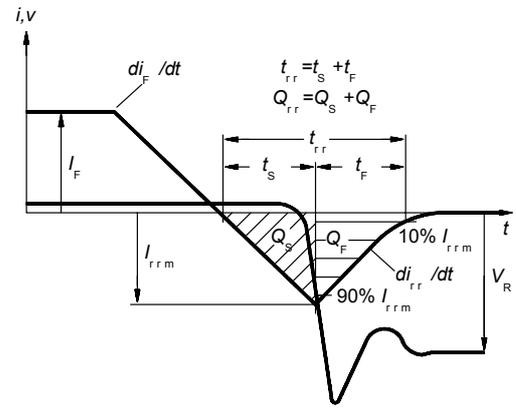
Figure C. Definition of diodes switching characteristics

$$t_{rr} = t_S + t_F$$
$$Q_{rr} = Q_S + Q_F$$
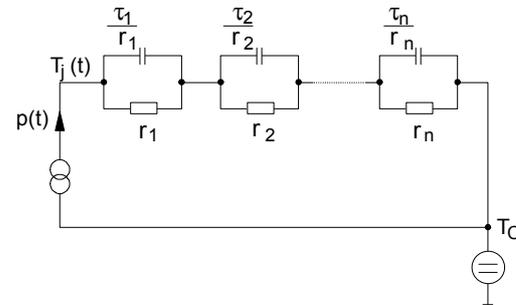
Figure D. Thermal equivalent circuit
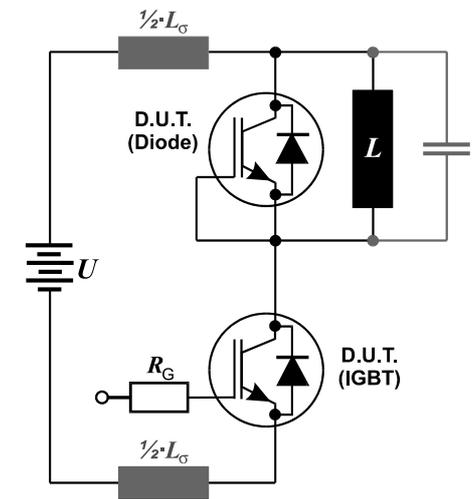
Figure E. Dynamic test circuit
Leakage inductance L_σ=180nH, and stray capacity C_σ =40pF.

SKW07N120

Legal Disclaimer

Information

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Warnings

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