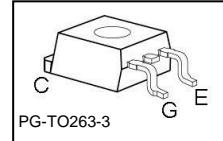
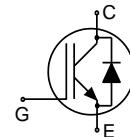


Low Loss DuoPack : IGBT in TRENCHSTOP™ and Fieldstop technology with soft, fast recovery anti-parallel Emitter Controlled HE diode


Features:

- Very low $V_{CE(sat)}$ 1.5V (typ.)
- Maximum Junction Temperature 175°C
- Short circuit withstand time 5μs
- Designed for frequency inverters for washing machines, fans, pumps and vacuum cleaners
- TRENCHSTOP™ and Fieldstop technology for 600V applications offers :
 - very tight parameter distribution
 - high ruggedness, temperature stable behavior
 - very high switching speed
- Positive temperature coefficient in $V_{CE(sat)}$
- Low EMI
- Low Gate Charge
- Qualified according to JEDEC¹ 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	$V_{CE(sat), T_j=25^\circ C}$	$T_{j,max}$	Marking	Package
IKB20N60T	600V	20A	1.5V	175°C	K20T60	PG-T0263-3

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage, $T_j \geq 25^\circ C$	V_{CE}	600	V
DC collector current, limited by $T_{j,max}$			
$T_C = 25^\circ C$	I_C	41	A
$T_C = 100^\circ C$		28	
Pulsed collector current, t_p limited by $T_{j,max}$	I_{CPuls}	60	
Turn off safe operating area, $V_{CE} = 600V$, $T_j = 175^\circ C$, $t_p = 1\mu s$	-	60	
Diode forward current, limited by $T_{j,max}$			
$T_C = 25^\circ C$	I_F	41	
$T_C = 100^\circ C$		28	
Diode pulsed current, t_p limited by $T_{j,max}$	I_{FPuls}	60	
Gate-emitter voltage	V_{GE}	± 20	V
Short circuit withstand time ²⁾	t_{SC}	5	μs
$V_{GE} = 15V$, $V_{CC} \leq 400V$, $T_j \leq 150^\circ C$			
Power dissipation $T_C = 25^\circ C$	P_{tot}	166	W
Operating junction temperature	T_j	-40...+175	
Storage temperature	T_{stg}	-55...+150	$^\circ C$
Soldering temperature (reflow soldering, MSL1)	-	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}		0.9	K/W
Diode thermal resistance, junction – case	R_{thJCD}		1.5	
Thermal resistance, junction – ambient	R_{thJA}	6cm ² Cu	40	

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

Parameter	Symbol	Conditions	Value			Unit
			min.	Typ.	max.	
Static Characteristic						
Collector-emitter breakdown voltage	$V_{(BR)CES}$	$V_{GE}=0\text{V}, I_C=0.2\text{mA}$	600	-	-	V
Collector-emitter saturation voltage	$V_{CE(\text{sat})}$	$V_{GE} = 15\text{V}, I_C=20\text{A}$ $T_j=25^\circ\text{C}$ $T_j=175^\circ\text{C}$	-	1.5	2.05	
Diode forward voltage	V_F	$V_{GE}=0\text{V}, I_F=20\text{A}$ $T_j=25^\circ\text{C}$ $T_j=175^\circ\text{C}$	-	1.65	2.05	
Gate-emitter threshold voltage	$V_{GE(\text{th})}$	$I_C=290\mu\text{A}, V_{CE}=V_{GE}$	4.1	4.9	5.7	
Zero gate voltage collector current	I_{CES}	$V_{CE}=600\text{V}, V_{GE}=0\text{V}$ $T_j=25^\circ\text{C}$ $T_j=175^\circ\text{C}$	-	-	40	μA
-			-	-	1500	
Gate-emitter leakage current	I_{GES}	$V_{CE}=0\text{V}, V_{GE}=20\text{V}$	-	-	100	nA
Transconductance	g_{fs}	$V_{CE}=20\text{V}, I_C=20\text{A}$	-	11	-	S
Integrated gate resistor	R_{Gint}			-		Ω

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}		-	71	-	
Reverse transfer capacitance	C_{rss}		-	32	-	
Gate charge	Q_{Gate}	$V_{CC}=480\text{V}, I_C=20\text{A}$ $V_{GE}=15\text{V}$	-	120	-	nC
Internal emitter inductance measured 5mm (0.197 in.) from case	L_E		-	7	-	nH
Short circuit collector current ¹⁾	$I_{C(SC)}$	$V_{GE}=15\text{V}, t_{sc}\leq 5\mu\text{s}$ $V_{CC} = 400\text{V}, T_j \leq 150^\circ\text{C}$	-	183.3	-	A

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

Switching Characteristic, Inductive Load, at $T_j=25\text{ °C}$

Parameter	Symbol	Conditions	Value			Unit
			min.	Typ.	max.	
IGBT Characteristic						
Turn-on delay time	$t_{d(on)}$	$T_j=25\text{ °C}, V_{CC}=400V, I_C=20A, V_{GE}=0/15V, r_G=12\Omega, L_\sigma=131\text{nH}, C_\sigma=31\text{pF}$ L_σ, C_σ from Fig. E Energy losses include "tail" and diode reverse recovery.	-	18	-	ns
Rise time	t_r		-	14	-	
Turn-off delay time	$t_{d(off)}$		-	199	-	
Fall time	t_f		-	42	-	
Turn-on energy	E_{on}		-	0.31	-	mJ
Turn-off energy	E_{off}		-	0.46	-	
Total switching energy	E_{ts}		-	0.77	-	

Anti-Parallel Diode Characteristic

Diode reverse recovery time	t_{rr}	$T_j=25\text{ °C}, V_R=400V, I_F=20A, di_F/dt=880A/\mu s$	-	41	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.31	-	μC
Diode peak reverse recovery current	I_{rrm}		-	13.3	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	711	-	$A/\mu s$

Switching Characteristic, Inductive Load, at $T_j=175\text{ °C}$

Parameter	Symbol	Conditions	Value			Unit
			min.	Typ.	max.	
IGBT Characteristic						
Turn-on delay time	$t_{d(on)}$	$T_j=175\text{ °C}, V_{CC}=400V, I_C=20A, V_{GE}=0/15V, r_G=12\Omega, L_\sigma=131\text{nH}, C_\sigma=31\text{pF}$ L_σ, C_σ from Fig. E Energy losses include "tail" and diode reverse recovery.	-	18	-	ns
Rise time	t_r		-	18	-	
Turn-off delay time	$t_{d(off)}$		-	223	-	
Fall time	t_f		-	76	-	
Turn-on energy	E_{on}		-	0.51	-	mJ
Turn-off energy	E_{off}		-	0.64	-	
Total switching energy	E_{ts}		-	1.15	-	

Anti-Parallel Diode Characteristic

Diode reverse recovery time	t_{rr}	$T_j=175\text{ °C}, V_R=400V, I_F=20A, di_F/dt=880A/\mu s$	-	176	-	ns
Diode reverse recovery charge	Q_{rr}		-	1.46	-	μC
Diode peak reverse recovery current	I_{rrm}		-	18.9	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	467	-	$A/\mu s$

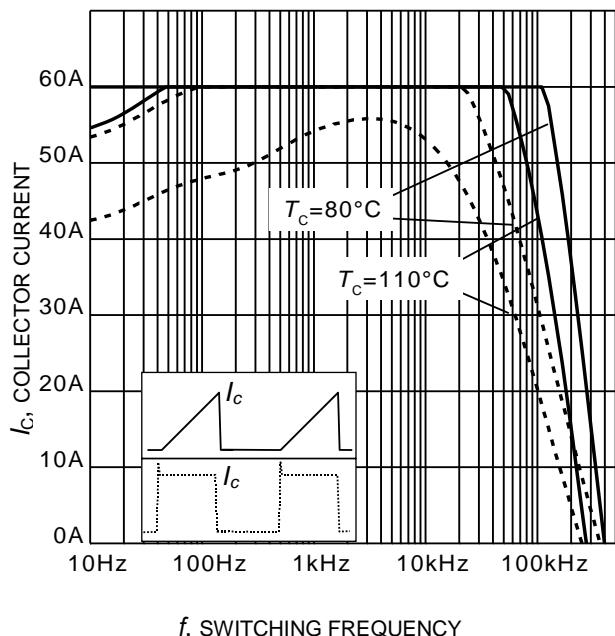


Figure 1. Collector current as a function of switching frequency
 $(T_j \leq 175^\circ\text{C}, D = 0.5, V_{CE} = 400\text{V}, V_{GE} = 0/15\text{V}, r_G = 12\Omega)$

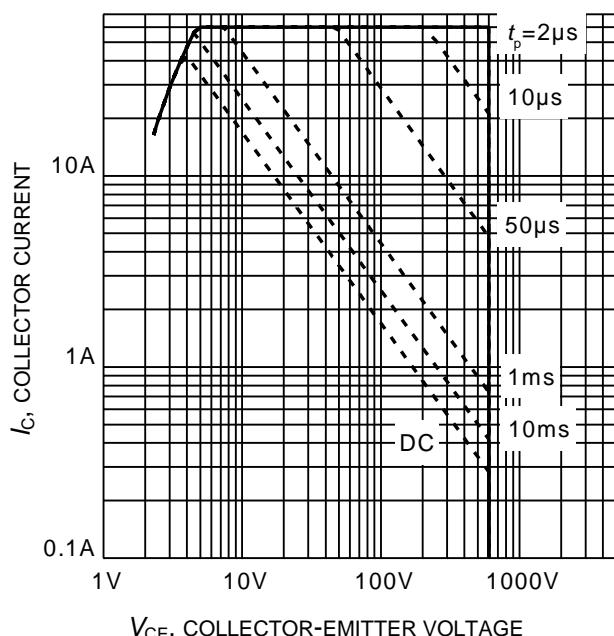


Figure 2. Safe operating area
 $(D = 0, T_C = 25^\circ\text{C}, T_j \leq 175^\circ\text{C}; V_{GE}=0/15\text{V})$

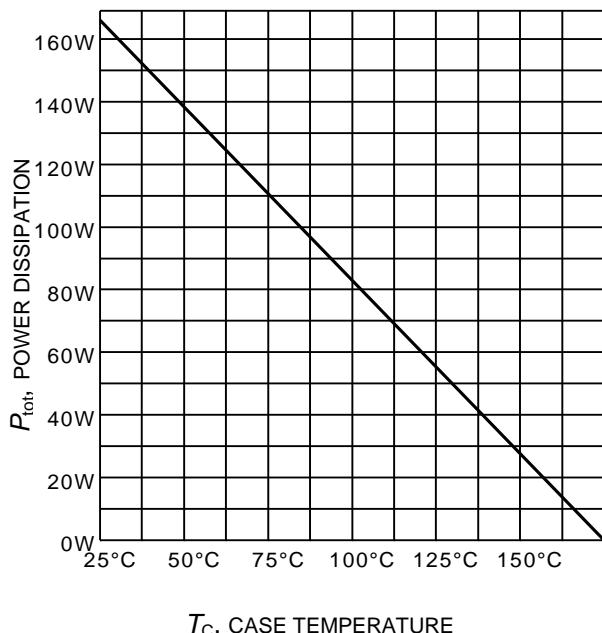


Figure 3. Power dissipation as a function of case temperature
 $(T_j \leq 175^\circ\text{C})$

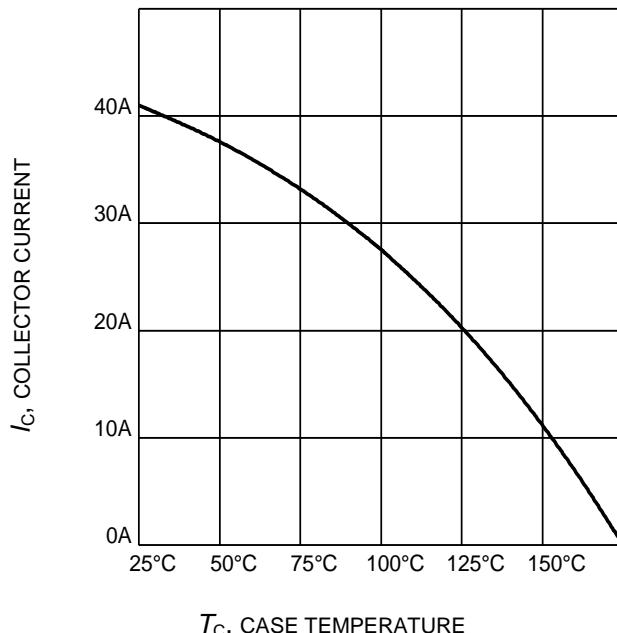


Figure 4. Collector current as a function of case temperature
 $(V_{GE} \geq 15\text{V}, T_j \leq 175^\circ\text{C})$

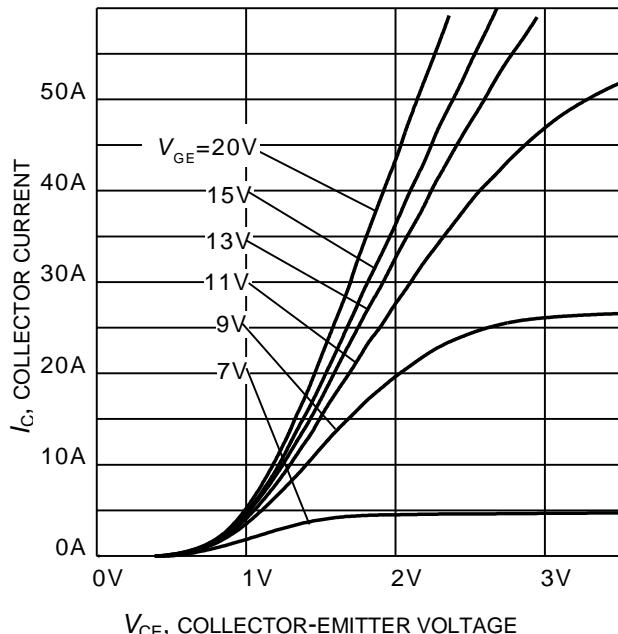


Figure 5. Typical output characteristic
($T_j = 25^\circ\text{C}$)

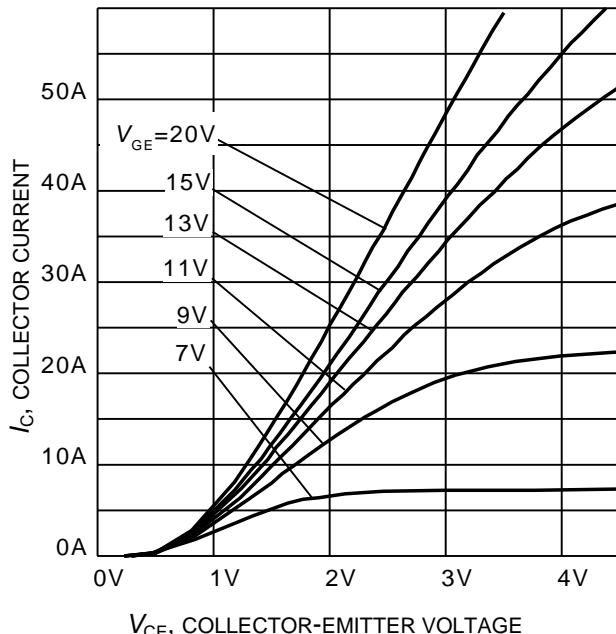


Figure 6. Typical output characteristic
($T_j = 175^\circ\text{C}$)

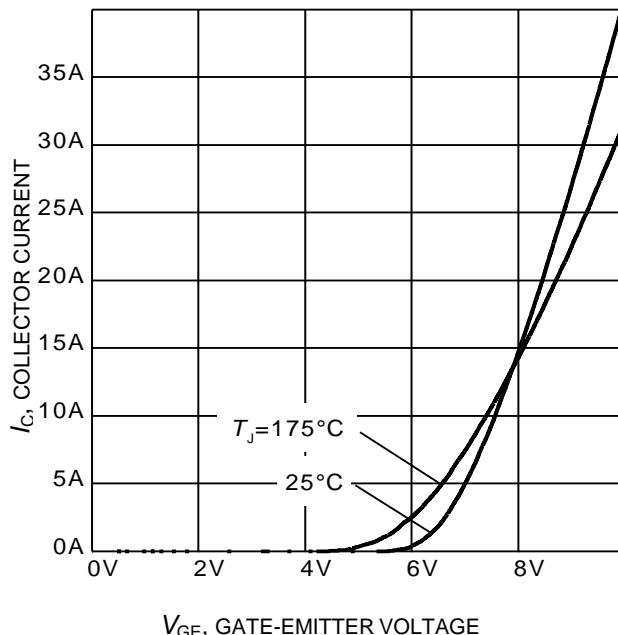


Figure 7. Typical transfer characteristic
($V_{CE} = 10\text{V}$)

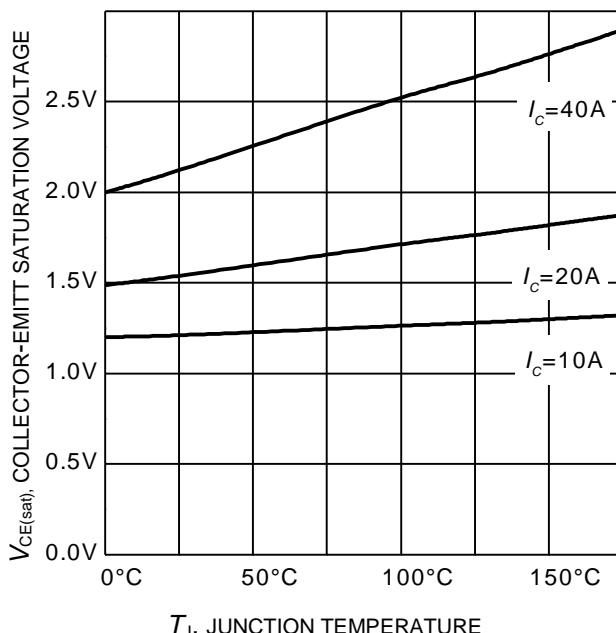


Figure 8. Typical collector-emitter saturation voltage as a function of junction temperature
($V_{GE} = 15\text{V}$)

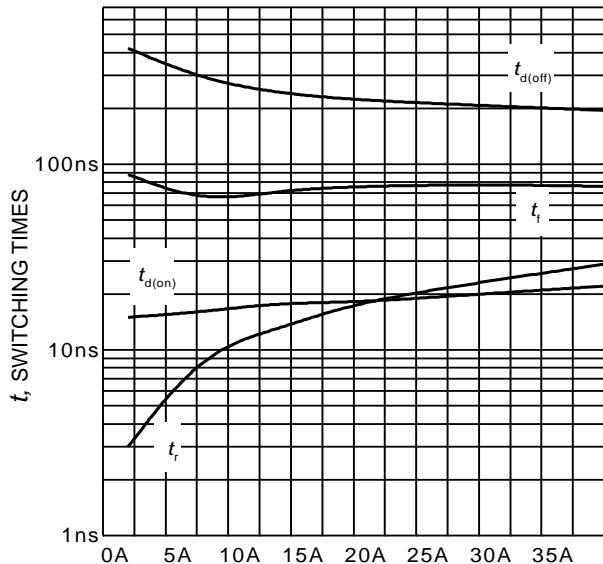

 I_C , COLLECTOR CURRENT

Figure 9. Typical switching times as a function of collector current
(inductive load, $T_J=175^\circ\text{C}$,
 $V_{CE} = 400\text{V}$, $V_{GE} = 0/15\text{V}$, $r_G = 12\Omega$,
Dynamic test circuit in Figure E)

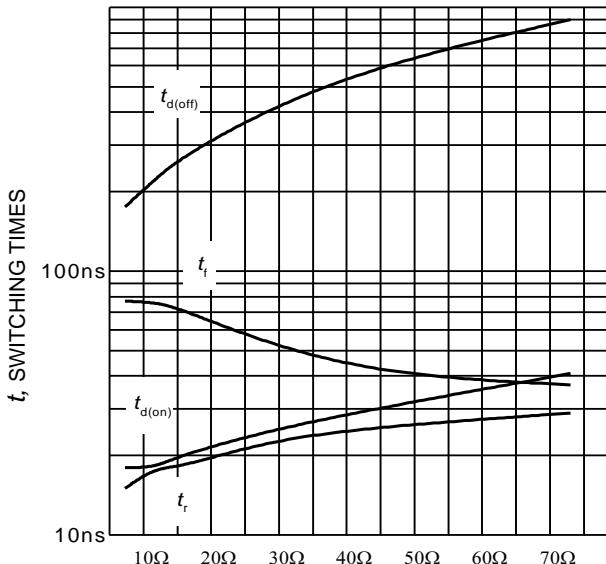

 R_G , GATE RESISTOR

Figure 10. Typical switching times as a function of gate resistor
(inductive load, $T_J = 175^\circ\text{C}$,
 $V_{CE} = 400\text{V}$, $V_{GE} = 0/15\text{V}$, $I_C = 20\text{A}$,
Dynamic test circuit in Figure E)

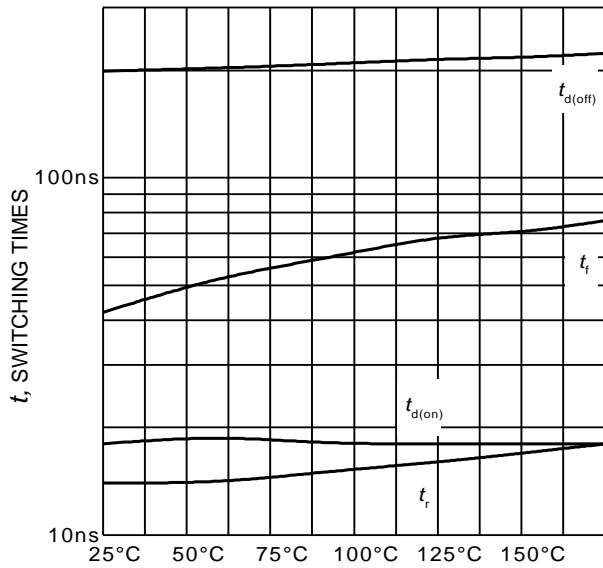

 T_J , JUNCTION TEMPERATURE

Figure 11. Typical switching times as a function of junction temperature
(inductive load, $V_{CE} = 400\text{V}$,
 $V_{GE} = 0/15\text{V}$, $I_C = 20\text{A}$, $r_G = 12\Omega$,
Dynamic test circuit in Figure E)

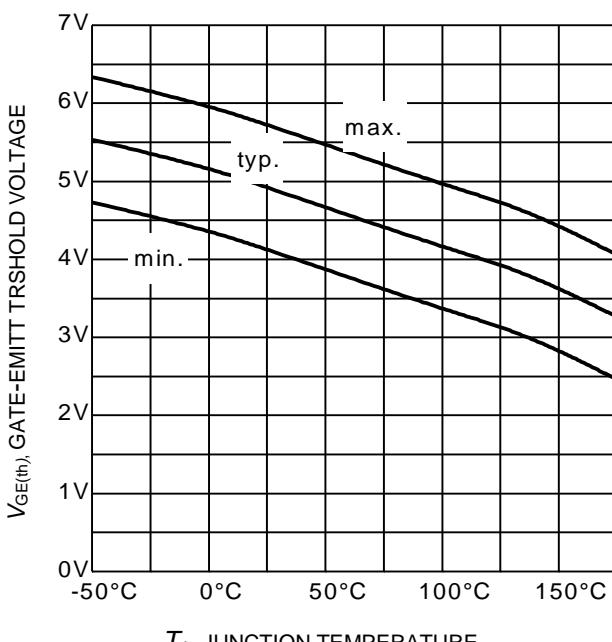

 T_J , JUNCTION TEMPERATURE

Figure 12. Gate-emitter threshold voltage as a function of junction temperature
($I_C = 0.29\text{mA}$)

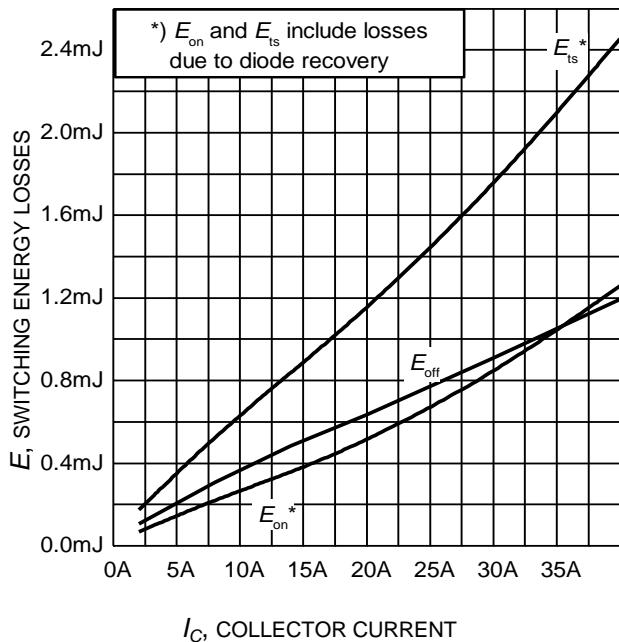


Figure 13. Typical switching energy losses as a function of collector current
(inductive load, $T_J = 175^\circ\text{C}$,
 $V_{CE} = 400\text{V}$, $V_{GE} = 0/15\text{V}$, $r_G = 12\Omega$,
Dynamic test circuit in Figure E)

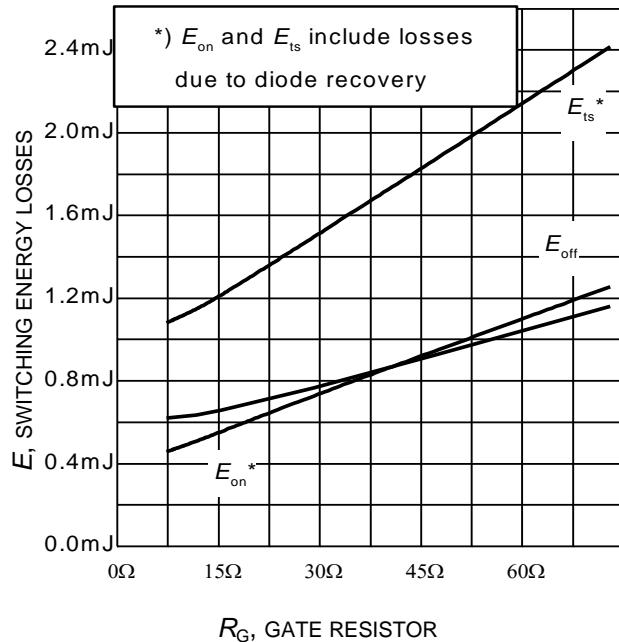


Figure 14. Typical switching energy losses as a function of gate resistor
(inductive load, $T_J = 175^\circ\text{C}$,
 $V_{CE} = 400\text{V}$, $V_{GE} = 0/15\text{V}$, $I_C = 20\text{A}$,
Dynamic test circuit in Figure E)

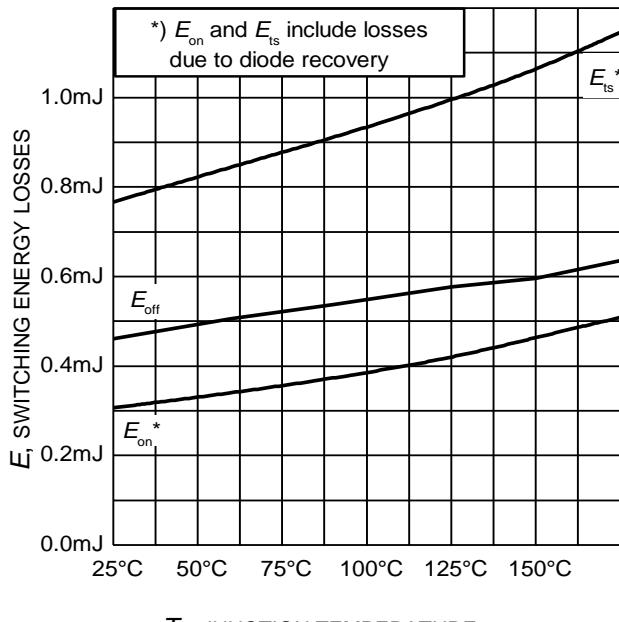


Figure 15. Typical switching energy losses as a function of junction temperature
(inductive load, $V_{CE} = 400\text{V}$,
 $V_{GE} = 0/15\text{V}$, $I_C = 20\text{A}$, $r_G = 12\Omega$,
Dynamic test circuit in Figure E)

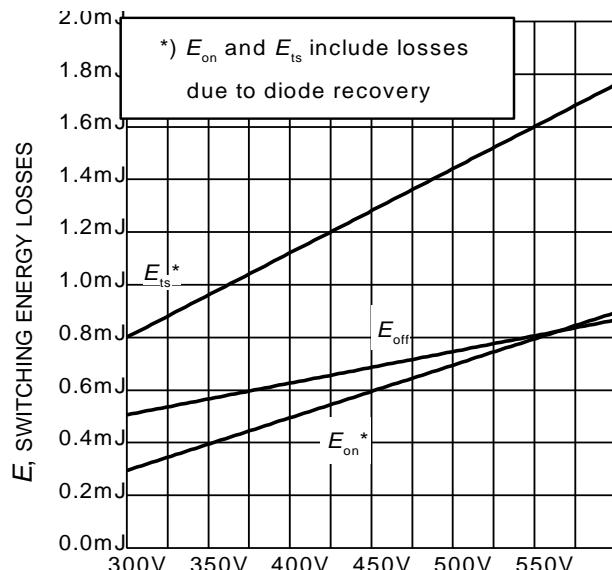


Figure 16. Typical switching energy losses as a function of collector-emitter voltage
(inductive load, $T_J = 175^\circ\text{C}$,
 $V_{GE} = 0/15\text{V}$, $I_C = 20\text{A}$, $r_G = 12\Omega$,
Dynamic test circuit in Figure E)

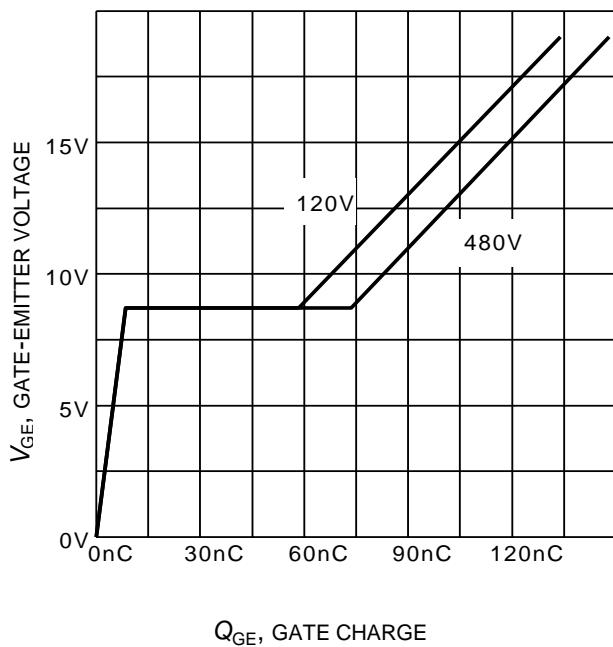


Figure 17. Typical gate charge
($I_C=20$ A)

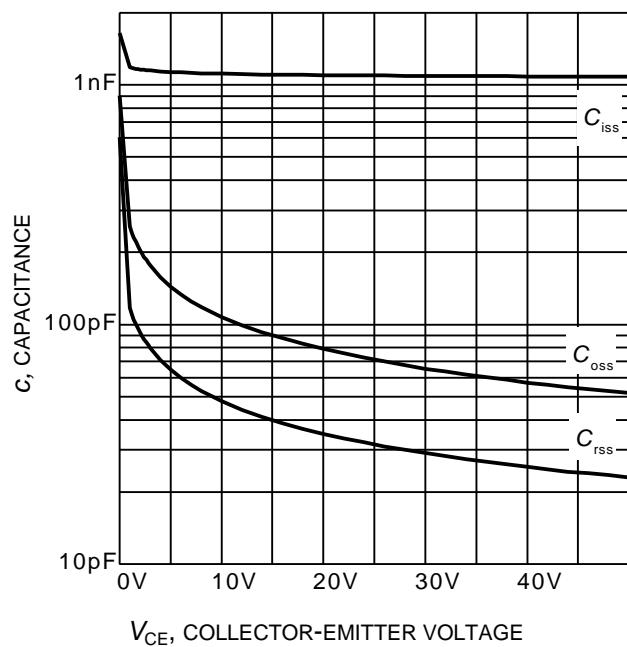


Figure 18. Typical capacitance as a function
of collector-emitter voltage
($V_{GE}=0$ V, $f = 1$ MHz)

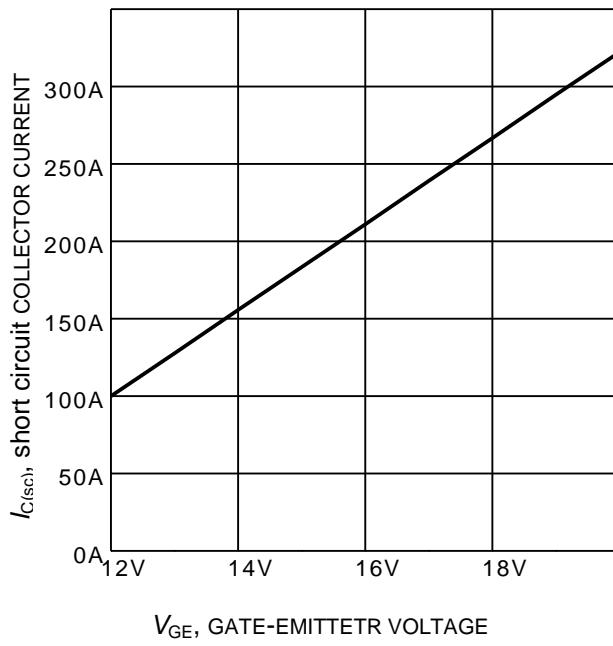


Figure 19. Typical short circuit collector
current as a function of gate-
emitter voltage
($V_{CE} \leq 400$ V, $T_j \leq 150^\circ$ C)

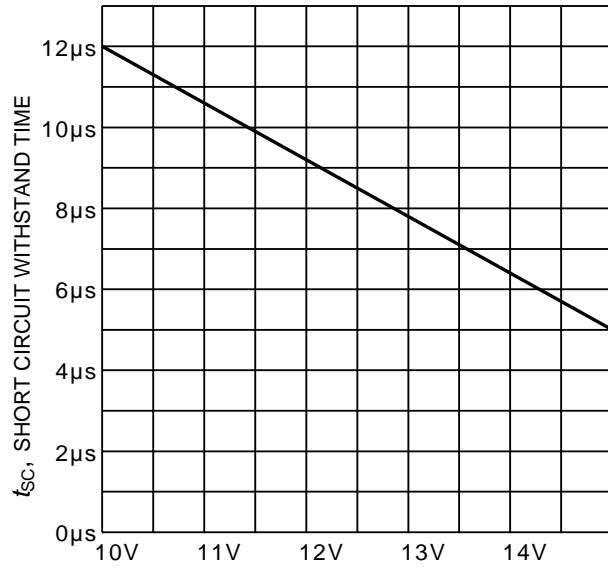


Figure 20. Short circuit withstand time as a
function of gate-emitter voltage
($V_{CE}=400$ V, start at $T_j=25^\circ$ C,
 $T_{jmax}<150^\circ$ C)

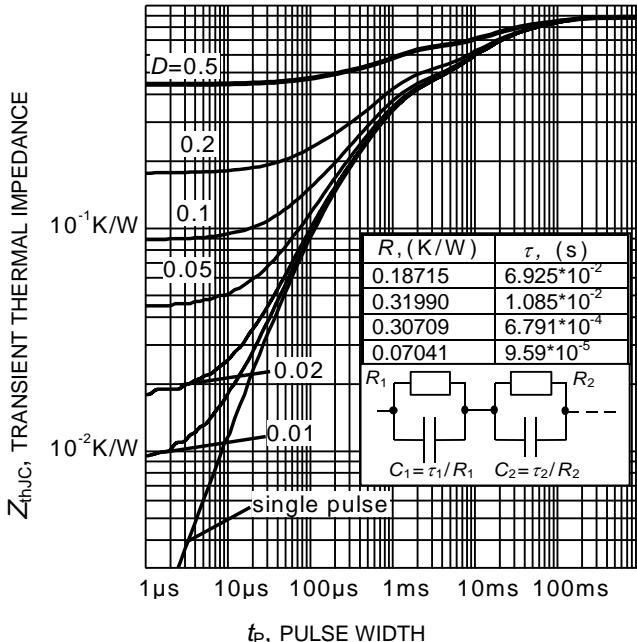


Figure 21. IGBT transient thermal impedance
 $(D = t_p / T)$

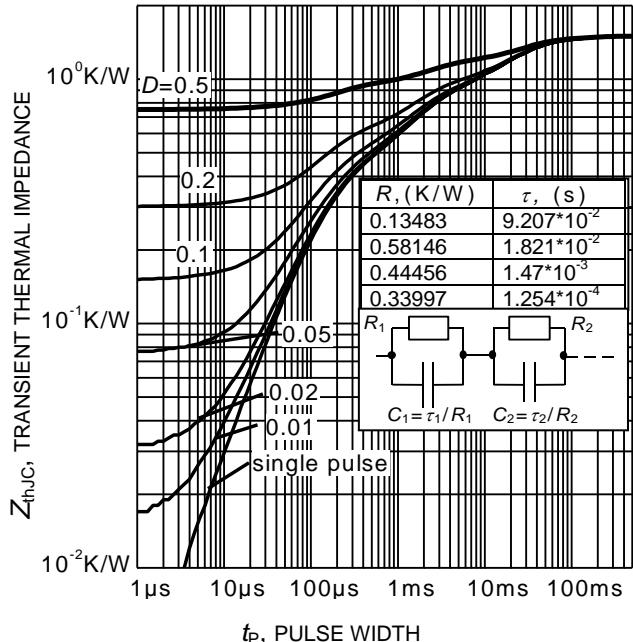
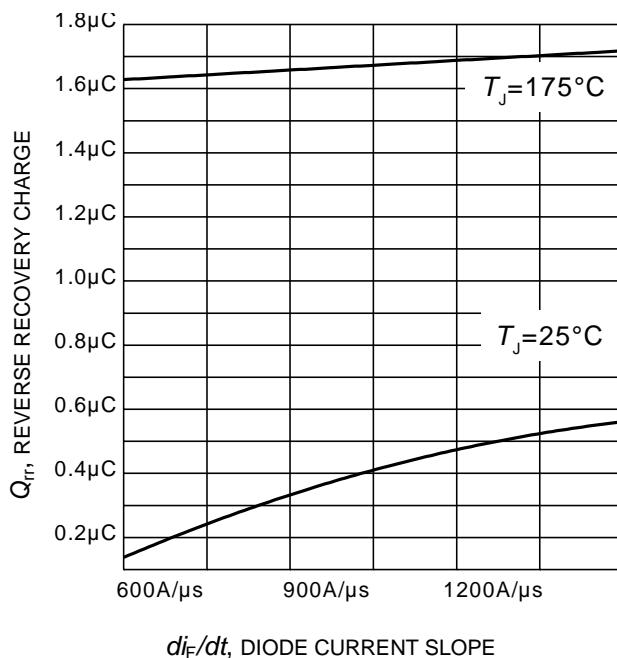
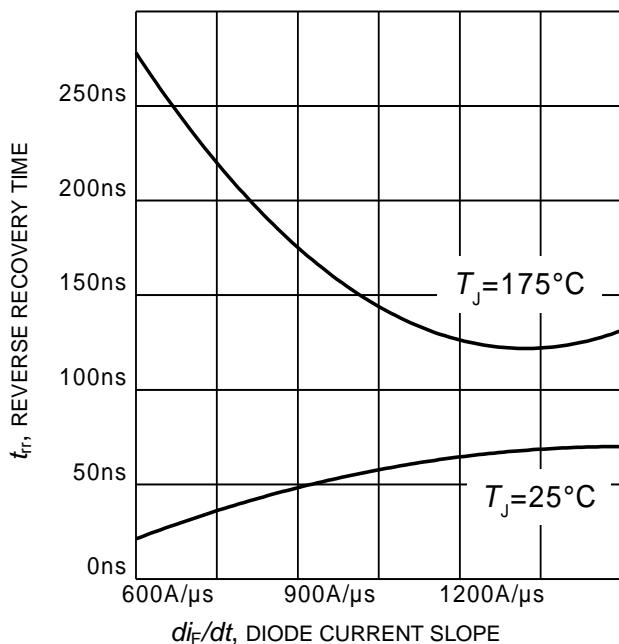
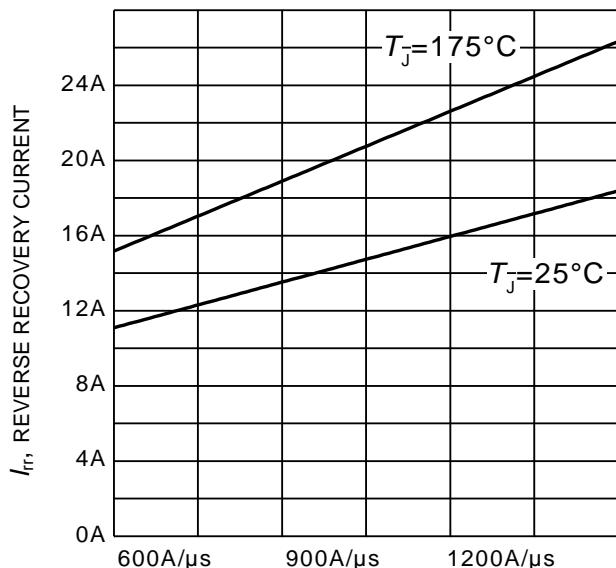


Figure 22. Diode transient thermal impedance as a function of pulse width
 $(D=t_p/T)$

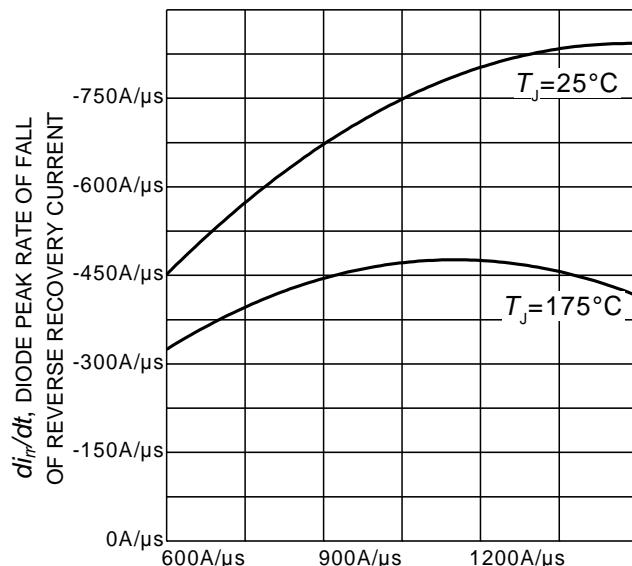




di/dt , DIODE CURRENT SLOPE

Figure 25. Typical reverse recovery current as a function of diode current slope

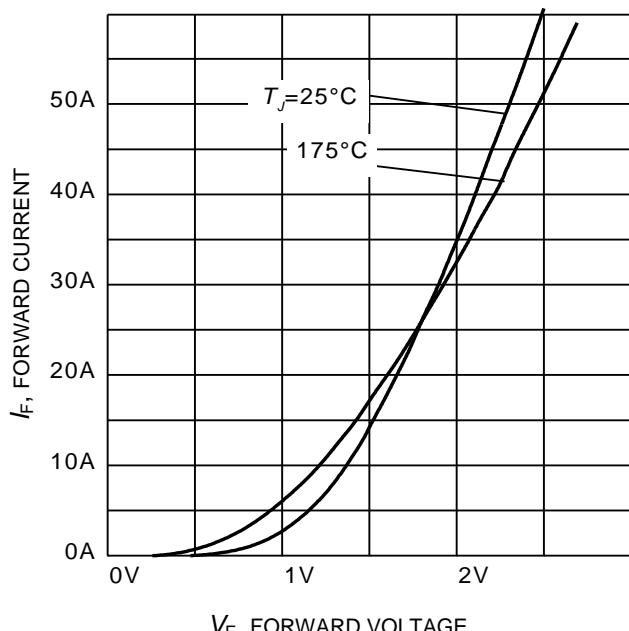
($V_R = 400\text{V}$, $I_F = 20\text{A}$,
Dynamic test circuit in Figure E)



di/dt , DIODE CURRENT SLOPE

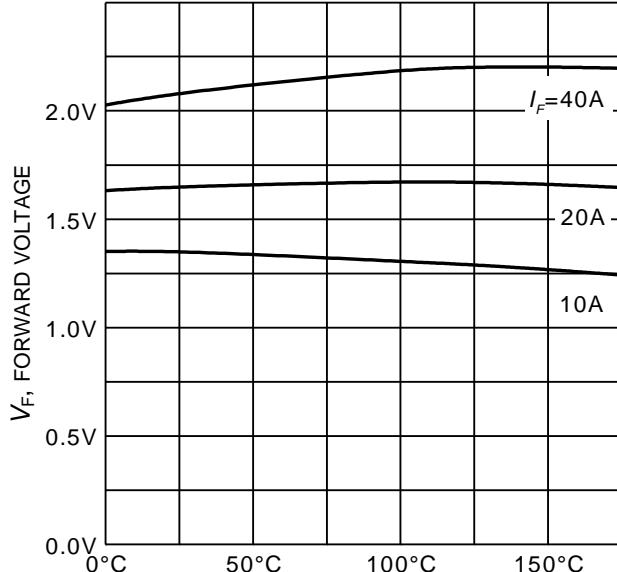
Figure 26. Typical diode peak rate of fall of reverse recovery current as a function of diode current slope

($V_R=400\text{V}$, $I_F=20\text{A}$,
Dynamic test circuit in Figure E)



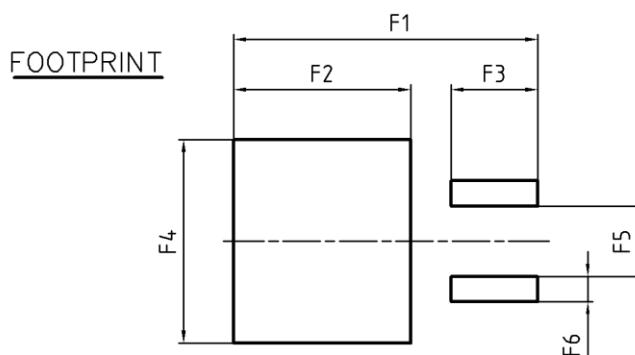
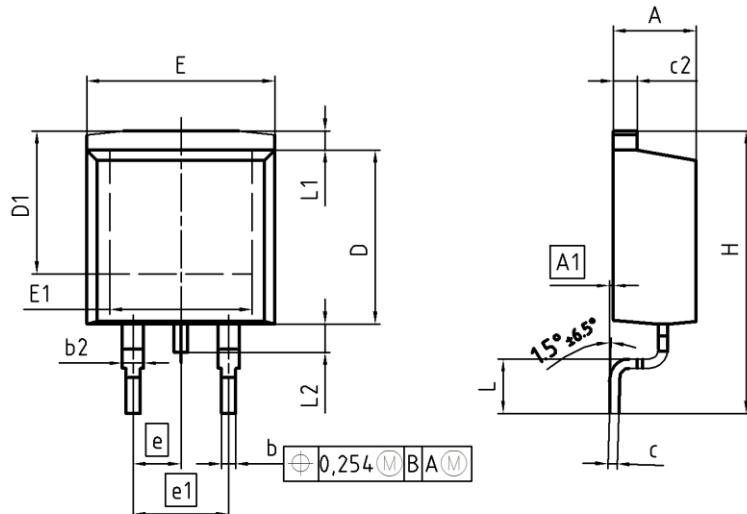
V_F , FORWARD VOLTAGE

Figure 27. Typical diode forward current as a function of forward voltage



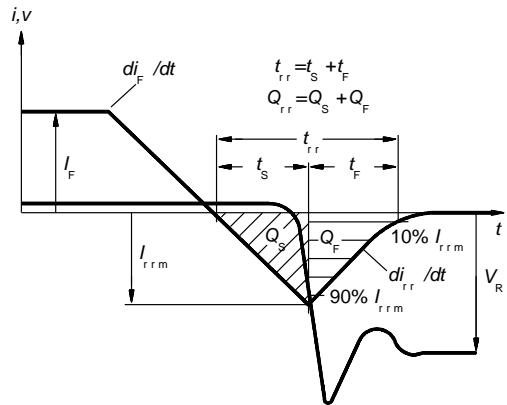
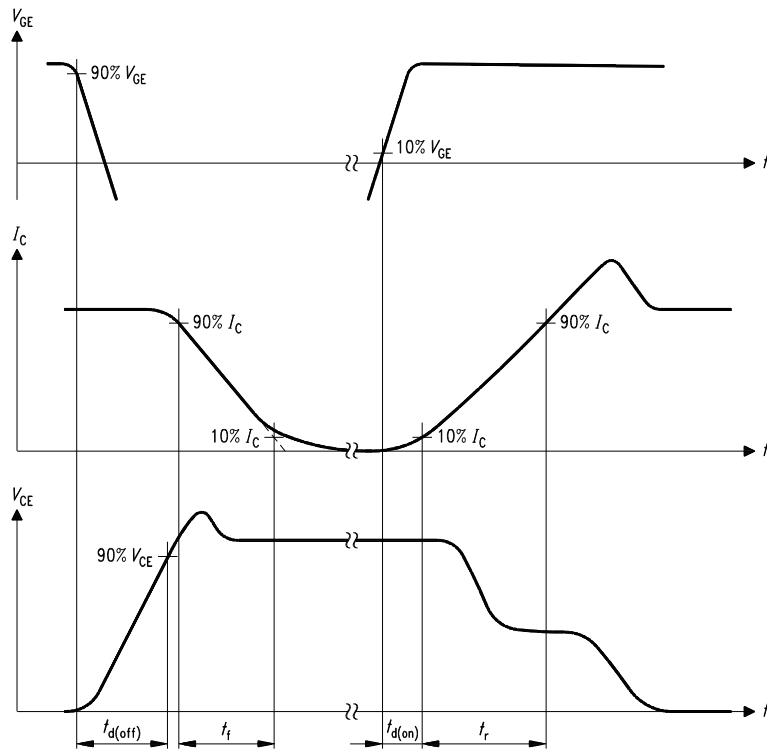
T_J , JUNCTION TEMPERATURE

Figure 28. Typical diode forward voltage as a function of junction temperature

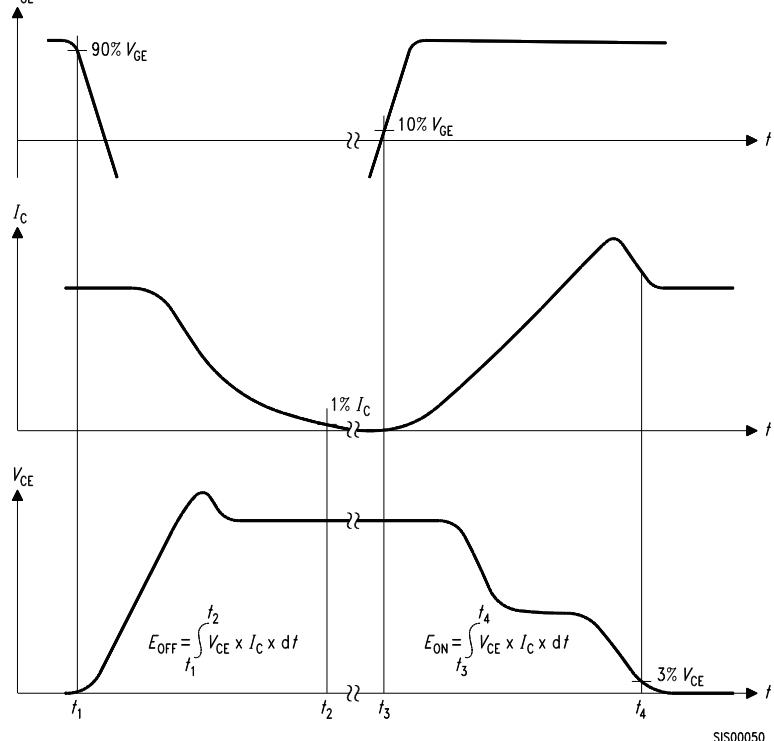
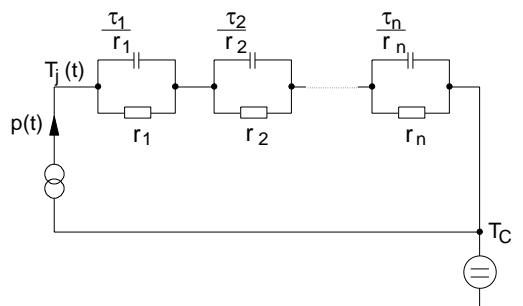
PG-T0263-3


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.30	4.57	0.169	0.180
A1	0.00	0.25	0.000	0.010
b	0.65	0.85	0.026	0.033
b2	0.95	1.15	0.037	0.045
c	0.33	0.65	0.013	0.026
c2	1.17	1.40	0.046	0.055
D	8.51	9.45	0.335	0.372
D1	7.10	7.90	0.280	0.311
E	9.80	10.31	0.386	0.406
E1	6.50	8.60	0.256	0.339
e	2.54		0.100	
e1	5.08		0.200	
N	2		2	
H	14.61	15.88	0.575	0.625
L	2.29	3.00	0.090	0.118
L1	0.70	1.60	0.028	0.063
L2	1.00	1.78	0.039	0.070
F1	16.05	16.25	0.632	0.640
F2	9.30	9.50	0.366	0.374
F3	4.50	4.70	0.177	0.185
F4	10.70	10.90	0.421	0.429
F5	3.65	3.85	0.144	0.152
F6	1.25	1.45	0.049	0.057

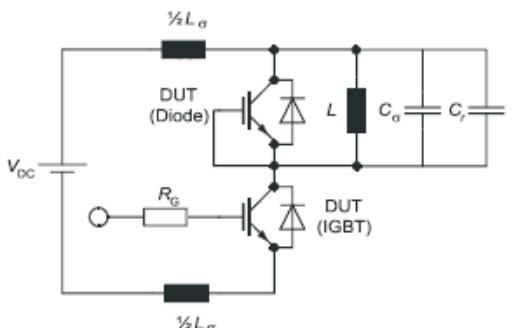
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EUROPEAN PROJECTION
ISSUE DATE 30-08-2007
REVISION 01



SIS00053



SIS00050

Figure D. Thermal equivalent circuit

Figure E. Dynamic test circuit
 Parasitic inductance L_α ,
 Parasitic capacitor C_α ,
 Relief capacitor C_r
 (only for ZVT switching)

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Электрон
Связь**

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию .

Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

Минимальные сроки поставки, гибкие цены, неограниченный ассортимент и индивидуальный подход к клиентам являются основой для выстраивания долгосрочного и эффективного сотрудничества с предприятиями радиоэлектронной промышленности, предприятиями ВПК и научно-исследовательскими институтами России.

С нами вы становитесь еще успешнее!

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