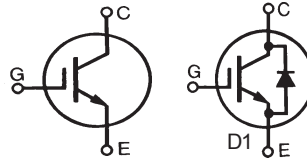


High Voltage IGBT with Diode

IXGP 20N120B IXGP 20N120BD1

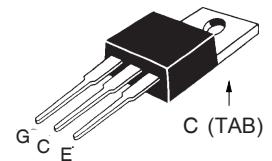
Preliminary Data Sheet



$V_{CES} = 1200 \text{ V}$
 $I_{C25} = 40 \text{ A}$
 $V_{CE(sat)} = 3.4 \text{ V}$
 $t_{fi(typ)} = 160 \text{ ns}$

Symbol	Test Conditions	Maximum Ratings	
V_{CES}	$T_J = 25^\circ\text{C to } 150^\circ\text{C}$	1200	V
V_{CGR}	$T_J = 25^\circ\text{C to } 150^\circ\text{C}; R_{GE} = 1 \text{ M}\Omega$	1200	V
V_{GES}	Continuous	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	$T_C = 25^\circ\text{C}$	40	A
I_{C110}	$T_C = 110^\circ\text{C}$	20	A
I_{CM}	$T_C = 25^\circ\text{C}, 1 \text{ ms}$	100	A
SSOA (RBSOA)	$V_{GE} = 15 \text{ V}, T_J = 125^\circ\text{C}, R_G = 10 \Omega$ Clamped inductive load	$I_{CM} = 40$ @ $0.8 V_{CES}$	A
P_C	$T_C = 25^\circ\text{C}$	190	W
T_J		-55 ... +150	$^\circ\text{C}$
T_{JM}		150	$^\circ\text{C}$
T_{stg}		-55 ... +150	$^\circ\text{C}$
M_d	Mounting torque (M3.5 screw)	0.55/5 Nm/lb.in.	
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	$^\circ\text{C}$
Maximum tab temperature soldering SMD devices for 10s		260	$^\circ\text{C}$
Weight		4	g

TO-220 (IXGP)



G = Gate C = Collector
E = Emitter TAB = Collector

Features

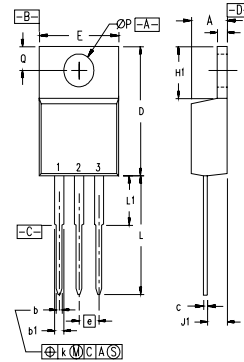
- International standard package
- IGBT and anti-parallel FRED for resonant power supplies
 - Induction heating
 - Rice cookers
- MOS Gate turn-on
 - drive simplicity
- Fast Recovery Epitaxial Diode (FRED)
 - soft recovery with low I_{RM}

Advantages

- Saves space (two devices in one package)
- Easy to mount with 1 screw
- Reduces assembly time and cost

Symbol	Test Conditions	Characteristic Values ($T_J = 25^\circ\text{C}$, unless otherwise specified)		
		min.	typ.	max.
$V_{GE(th)}$	$I_C = 250 \mu\text{A}, V_{CE} = V_{GE}$	2.5		5.0 V
I_{CES}	$V_{CE} = V_{CES}$ $V_{GE} = 0 \text{ V}$			50 μA 150 μA
I_{GES}	$V_{CE} = 0 \text{ V}, V_{GE} = \pm 20 \text{ V}$			$\pm 100 \text{ nA}$
$V_{CE(sat)}$	$I_C = 20 \text{ A}, V_{GE} = 15 \text{ V}$ Note 2		2.9 2.8	3.4 V V

Symbol	Test Conditions	Characteristic Values		
		(T _J = 25°C, unless otherwise specified)		
		min.	typ.	max.
g_{fs}	I _C = 20A; V _{CE} = 10 V, Note 2.	12	18	S
C_{ies}			1700	pF
			20N120B 95	pF
C_{oes}	V _{CE} = 25 V, V _{GE} = 0 V, f = 1 MHz		20N120BD1 105	pF
C_{res}			39	pF
Q_g			72	nC
Q_{ge}	I _C = 20A, V _{GE} = 15 V, V _{CE} = 0.5 V _{CES}		12	nC
Q_{gc}			27	nC
t_{d(on)}	Inductive load, T_J = 25°C		25	ns
t_{ri}	I _C = 20 A; V _{GE} = 15 V		15	ns
t_{d(off)}	V _{CE} = 0.8 V _{CES} ; R _G = R _{off} = 10 Ω		150	280 ns
t_{fi}	Note 1.		160	320 ns
E_{off}			2.1	3.5 mJ
t_{d(on)}	Inductive load, T_J = 125°C		25	ns
t_{ri}			18	ns
E_{on}	I _C = 20A; V _{GE} = 15 V		1.4	mJ
t_{d(off)}	V _{CE} = 0.8 V _{CES} ; R _G = R _{off} = 10 Ω		270	ns
t_{fi}	Note 1		360	ns
E_{off}			3.5	mJ
R_{thJC}				0.65 K/W
R_{thCK}			0.25	K/W

TO-220 Outline


Pins: 1 - Gate 2 - Collector
 3 - Emitter 4 - Collector

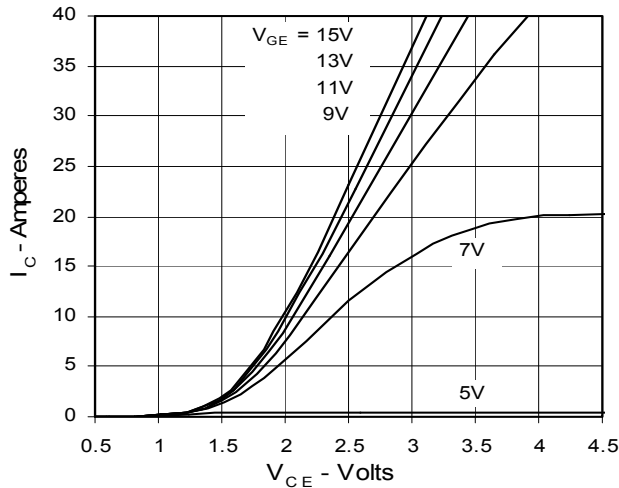
SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.170	.190	4.32	4.83
b	.025	.040	0.64	1.02
b1	.045	.065	1.15	1.65
c	.014	.022	0.35	0.56
D	.580	.630	14.73	16.00
E	.390	.420	9.91	10.66
e	.100 BSC		2.54 BSC	
F	.045	.055	1.14	1.40
H1	.230	.270	5.85	6.85
J1	.090	.110	2.29	2.79
k	0	.015	0	0.38
L	.500	.550	12.70	13.97
L1	.110	.230	2.79	5.84
ØP	.139	.161	3.53	4.08
Q	.100	.125	2.54	3.18

Reverse Diode (FRED)		Characteristic Values		
		(T _J = 25°C, unless otherwise specified)		
Symbol	Test Conditions	min.	typ.	max.
V_F	I _F = 10 A, V _{GE} = 0 V			3.3 V
I_F	T _C = 90°C			10 A
I_{RM}	I _F = 10 A; -di _F /dt = 400 A/μs, V _R = 600 V		14	A
t_{rr}	V _{GE} = 0 V; T _J = 125°C		120	ns
t_{rr}	I _F = 1 A; -di _F /dt = 100 A/μs; V _R = 30 V, V _{GE} = 0 V		40	ns
R_{thJC}				2.5 K/W

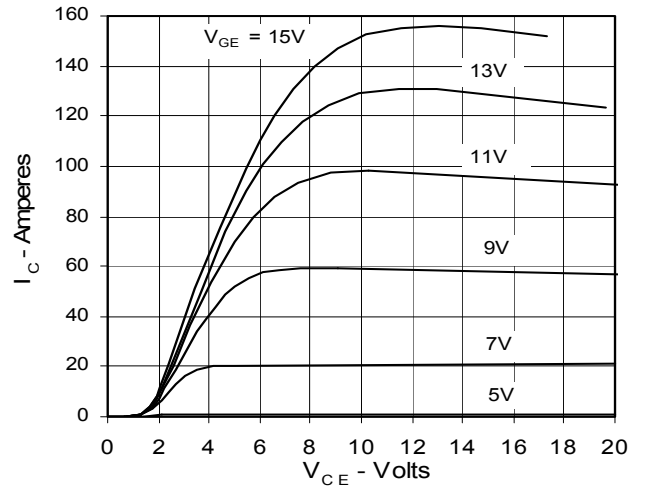
- Notes:
- Switching times may increase for V_{CE} (Clamp) > 0.8 • V_{CES}, higher T_J or increased R_G.
 - Pulse test, t ≤ 300 μs, duty cycle d ≤ 2 %

IXYS reserves the right to change limits, test conditions, and dimensions.

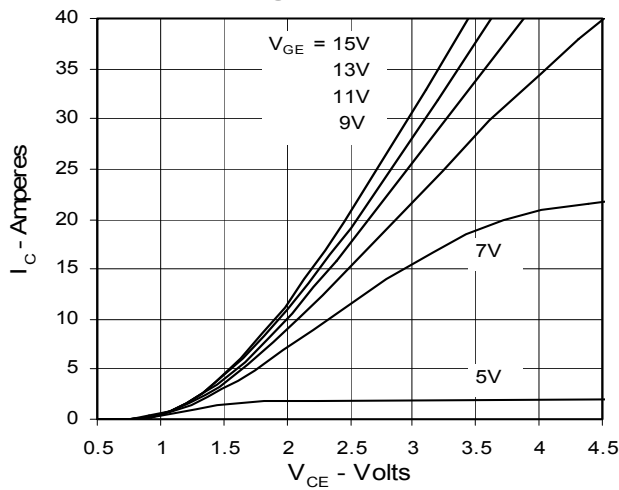
**Fig. 1. Output Characteristics
@ 25 Deg. C**



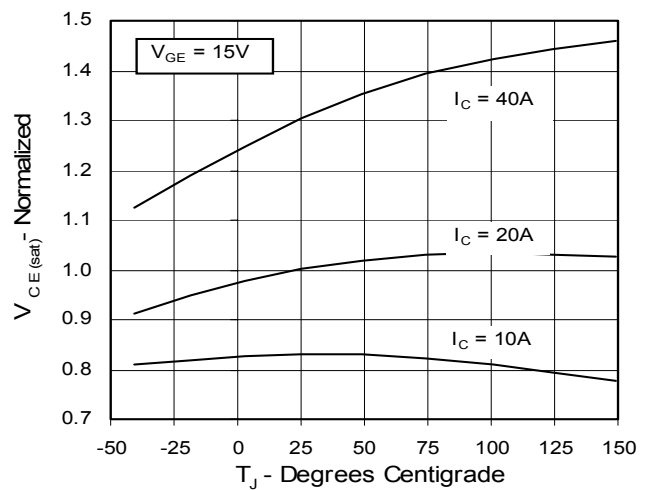
**Fig. 2. Extended Output Characteristics
@ 25 deg. C**



**Fig. 3. Output Characteristics
@ 125 Deg. C**



**Fig. 4. Dependence of $V_{CE(sat)}$ on
Temperature**



**Fig. 5. Collector-to-Emitter Voltage
vs. Gate-to-Emitter voltage**

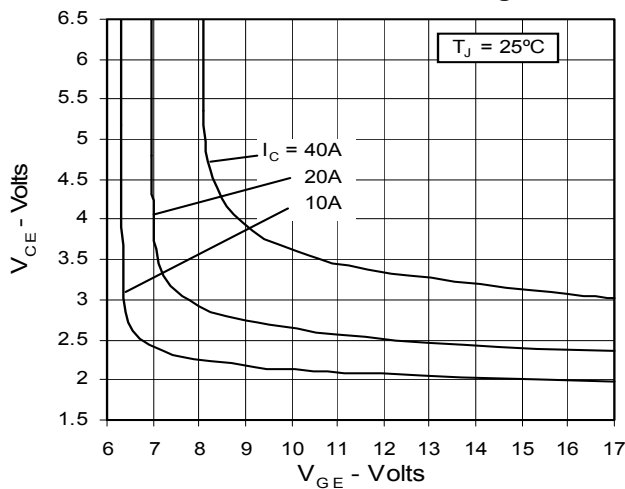


Fig. 6. Input Admittance

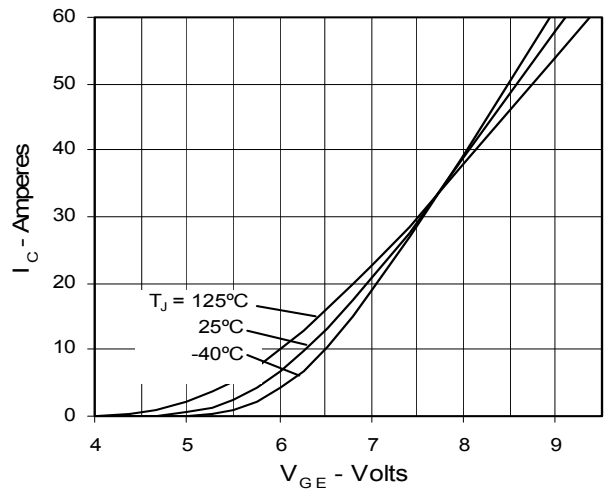


Fig. 7. Transconductance

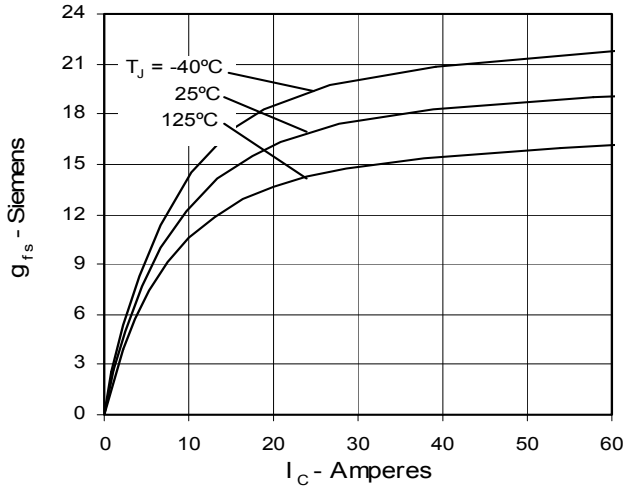


Fig. 8. Dependence of Turn-off Energy Loss on R_G

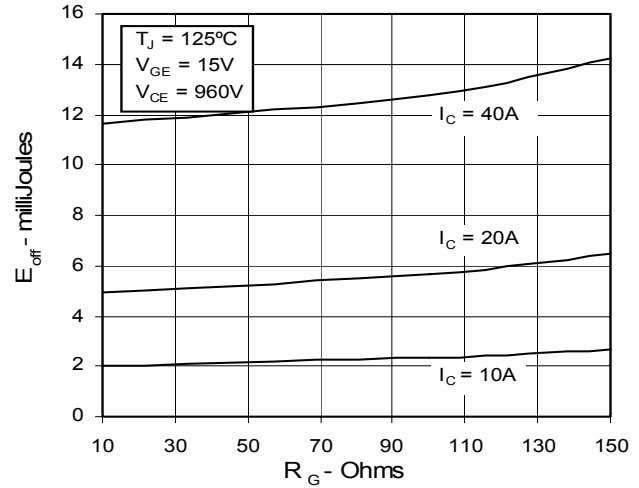


Fig. 9. Dependence of Turn-Off Energy Loss on I_C

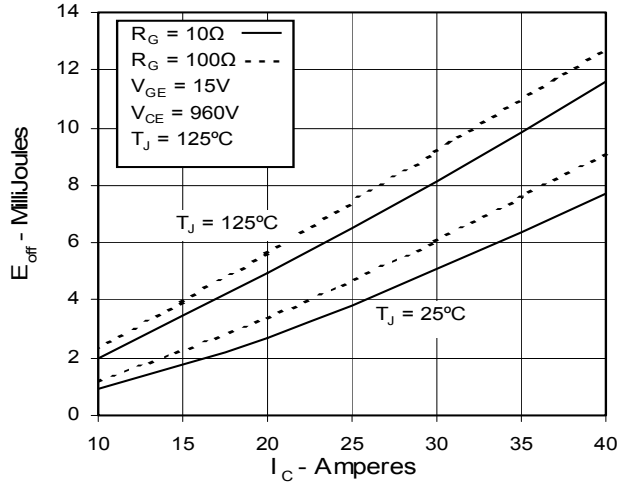


Fig. 10. Dependence of Turn-off Energy Loss on Temperature

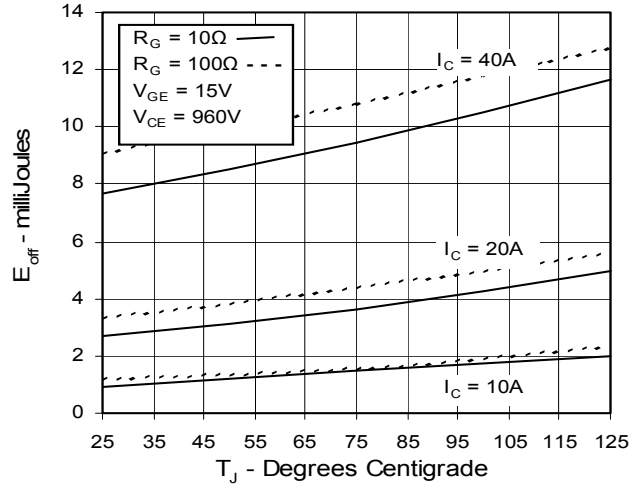


Fig. 11. Dependence of Turn-off Switching Time on R_G

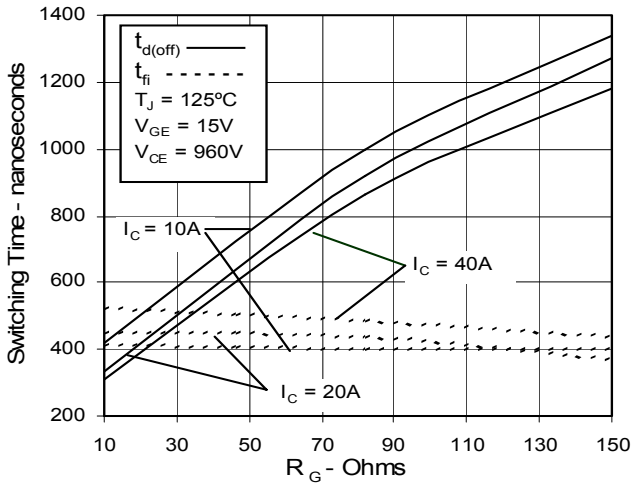
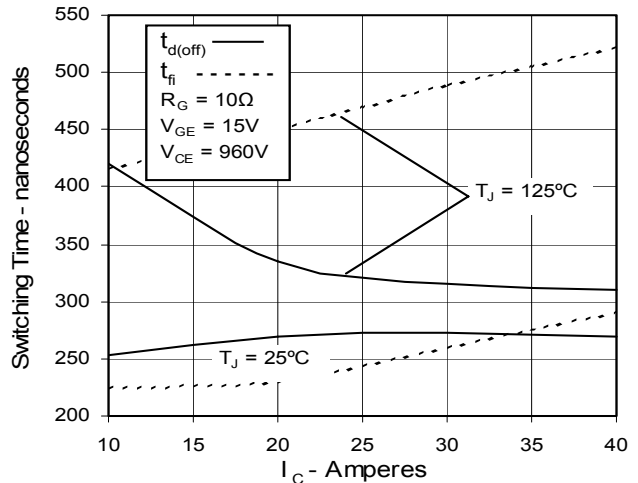


Fig. 12. Dependence of Turn-off Switching Time on I_C



IXYS reserves the right to change limits, test conditions, and dimensions.

IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

4,835,592 4,881,106 5,017,508 5,049,961 5,187,117 5,486,715 6,306,728B1 6,259,123B1 6,306,728B1
4,850,072 4,931,844 5,034,796 5,063,307 5,237,481 5,381,025 6,404,065B1 6,162,665 6,534,343

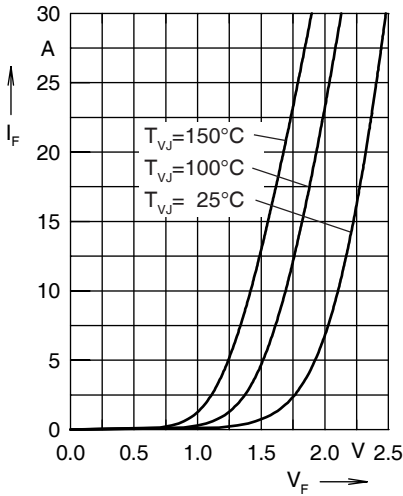


Fig. 13. Forward current I_F versus V_F

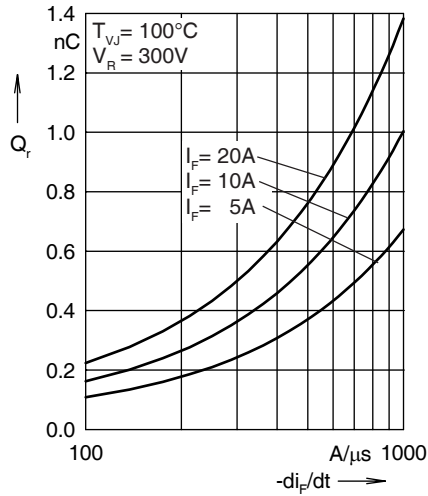


Fig. 14. Reverse recovery charge Q_r versus $-di_F/dt$

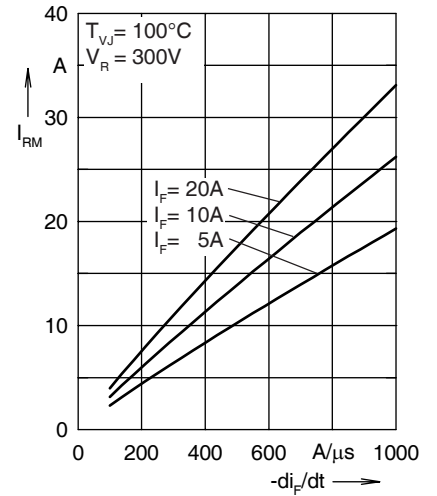


Fig. 15. Peak reverse current I_{RM} versus $-di_F/dt$

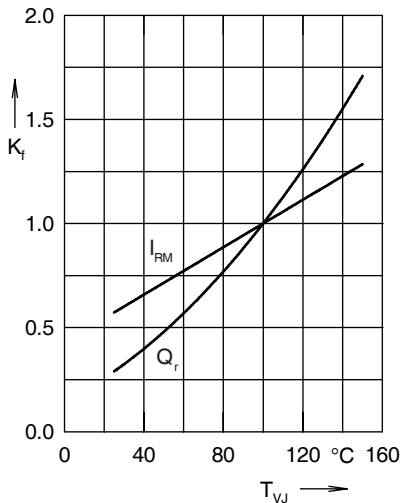


Fig. 16. Dynamic parameters Q_r , I_{RM} versus T_{VJ}

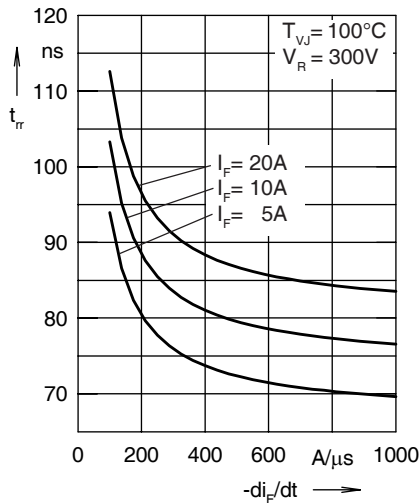


Fig. 17. Recovery time t_{rr} versus $-di_F/dt$

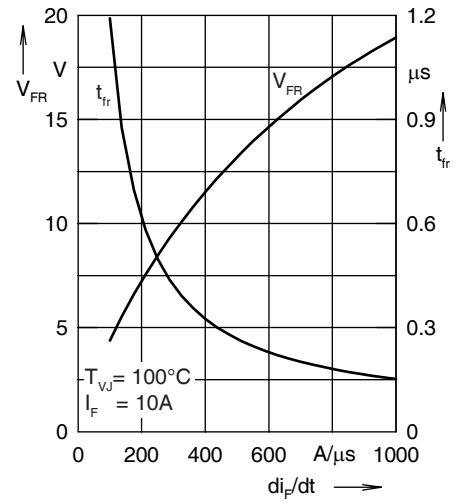


Fig. 18. Peak forward voltage V_{FR} and t_{tr} versus di_F/dt

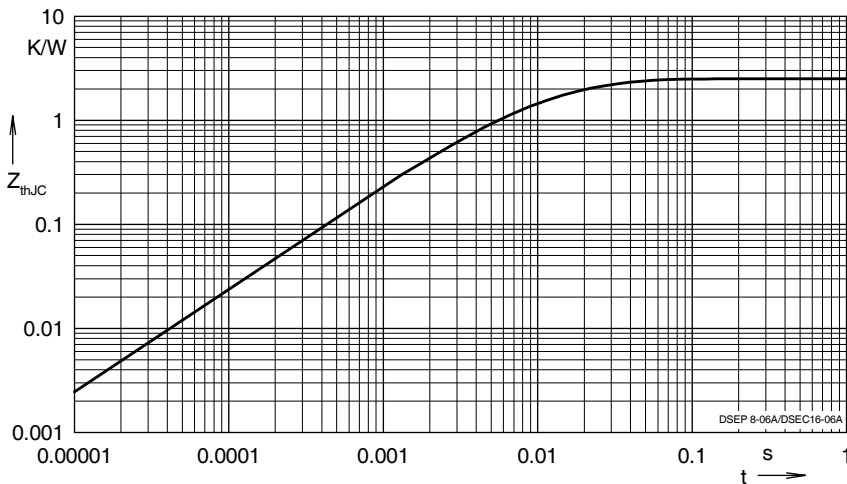


Fig. 19. Transient thermal resistance junction to case

Constants for Z_{thJC} calculation:

i	R_{thi} (K/W)	t_i (s)
1	1.449	0.0052
2	0.5578	0.0003
3	0.4931	0.0169