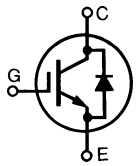
IXYS

HiPerFAST™ IGBT with Diode

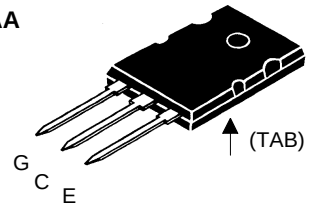
IXGK 50N60BD1
IXGX 50N60BD1

V_{CES} = 600 V
I_{C25} = 75 A
$V_{CE(sat)}$ = 2.3 V
t_{fi} = 85 ns

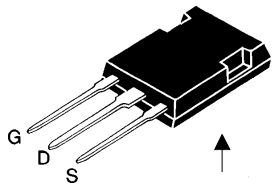


Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C	600	V
V_{CGR}	T_J = 25°C to 150°C; R_{GE} = 1 MΩ	600	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C	75	A
I_{C90}	T_C = 90°C	50	A
I_{CM}	T_C = 25°C, 1 ms	200	A
SSOA (RBSOA)	V_{GE} = 15 V, T_{VJ} = 125°C, R_G = 10 Ω Clamped inductive load, L = 30 μH	I_{CM} = 100 @ 0.8 V_{CES}	A
P_C	T_C = 25°C	300	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
M_d	Mounting torque, TO-247 AD	1.13/10	Nm/lb.in.
Weight	TO-264 TO-268	10 5	g g
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	°C

TO-264 AA (IXGK)



PLUS247 (IXGX)



G = Gate C = Collector
E = Emitter Tab = Collector

Features
- International standard packages JEDEC TO-268 and PLUS247 (hole-less TO-247)
- High frequency IGBT and antparallel FRED in one package
- New generation HDMOS™ process
- High current handling capability
- MOS Gate turn-on fordrive simplicity
- Fast Recovery Epitaxial Diode (FRED) with soft recovery and low I_{RM}

Symbol	Test Conditions		Characteristic Values (T_J = 25°C, unless otherwise specified) Min.	Typ.	Max.	
BV_{CES}	I_C = 1 mA, V_{GE} = 0 V		500			V
$V_{GE(th)}$	I_C = 500 μA, V_{CE} = V_{GE}		2.5		5.5	V
I_{CES}	V_{CE} = V_{CES} V_{GE} = 0 V	T_J = 25°C T_J = 125°C			650 5	μA mA
I_{GES}	V_{CE} = 0 V, V_{GE} = ±20 V				±100	nA
$V_{CE(sat)}$	I_C = I_{C90}, V_{GE} = 15 V				2.3	V

Applications
- AC motor speed control
- DC servo and robot drives
- DC choppers
- Uninterruptible power supplies (UPS)
- Switch-mode and resonant-mode power supplies

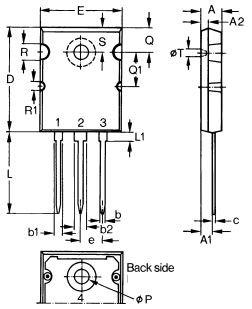
Advantages
- Space savings (two devices on one package
- Easy to mount with 1 screw

Symbol	Test Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) Min.	Typ.	Max.	
g_{fs}	$I_C = I_{C90}$; V_{CE} = 10 V, Pulse test, t ≤ 300 µs, duty cycle ≤ 2 %	25	35		S
C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz		4000		pF
C_{oes}			340		pF
C_{res}			100		pF
Q_g	$I_C = I_{C90}$, V_{GE} = 15 V, V_{CE} = 0.5 V_{CES}		110		nC
Q_{ge}			30		nC
Q_{gc}			35		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C** $I_C = I_{C90}$, V_{GE} = 15 V, L = 100 µH, V_{CE} = 0.8 V_{CES}, $R_G = R_{off}$ = 2.7 Ω Remarks: Switching times may increase for V_{CE} (Clamp) > 0.8 • V_{CES}, higher T_J or increased R_G		50		ns
t_{ri}			50		ns
$t_{d(off)}$			200		ns
t_{fi}			85	150	ns
			150		ns
E_{off}			1.5		mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C** $I_C = I_{C90}$, V_{GE} = 15 V, L = 100 µH V_{CE} = 0.8 V_{CES}, $R_G = R_{off}$ = 2.7 Ω Remarks: Switching times may increase for V_{CE} (Clamp) > 0.8 • V_{CES}, higher T_J or increased R_G		50		ns
t_{ri}			60		ns
E_{on}			3		mJ
$t_{d(off)}$			200		ns
t_{fi}			175		ns
E_{off}			2.5		mJ
R_{thJC}				0.42	K/W
R_{thCK}	TO-264 package		0.15		K/W

Reverse Diode (FRED)

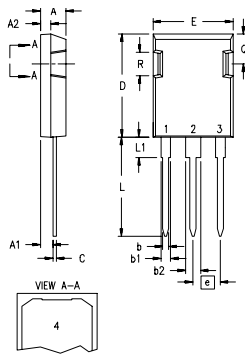
Symbol	Test Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
V_F	$I_F = I_{C90}$, V_{GE} = 0 V, Pulse test, t £ 300 ms, duty cycle d 22 %			2.5	V
I_{RM}	$I_F = I_{C90}$, V_{GE} = 0 V, -di_F/dt = 100 A/ms		2	2.5	A
	V_R = 100 V			175	ns
t_{rr}	I_F = 1 A; -di/dt = 200 A/ms; V_R = 30 V		35	50	ns
R_{thJC}				0.65	K/W

TO-264 AA Outline



Dim.	Millimeter Min.	Max.	Inches Min.	Max.
A	4.82	5.13	.190	.202
A1	2.54	2.89	.100	.114
A2	2.00	2.10	.079	.083
b	1.12	1.42	.044	.056
b1	2.39	2.69	.094	.106
b2	2.90	3.09	.114	.122
c	0.53	0.83	.021	.033
D	25.91	26.16	1.020	1.030
E	19.81	19.96	.780	.786
e	5.46 BSC		.215 BSC	
J	0.00	0.25	.000	.010
K	0.00	0.25	.000	.010
L	20.32	20.83	.800	.820
L1	2.29	2.59	.090	.102
P	3.17	3.66	.125	.144
Q	6.07	6.27	.239	.247
Q1	8.38	8.69	.330	.342
R	3.81	4.32	.150	.170
R1	1.78	2.29	.070	.090
S	6.04	6.30	.238	.248
T	1.57	1.83	.062	.072

PLUS247™ (IXGX)



Dim.	Millimeter Min.	Max.	Inches Min.	Max.
A	4.83	5.21	.190	.205
A_1	2.29	2.54	.090	.100
A_2	1.91	2.16	.075	.085
b	1.14	1.40	.045	.055
b_1	1.91	2.13	.075	.084
b_2	2.92	3.12	.115	.123
C	0.61	0.80	.024	.031
D	20.80	21.34	.819	.840
E	15.75	16.13	.620	.635
e	5.45 BSC		.215 BSC	
L	19.81	20.32	.780	.800
L1	3.81	4.32	.150	.170
Q	5.59	6.20	.220	.244
R	4.32	4.83	.170	.190

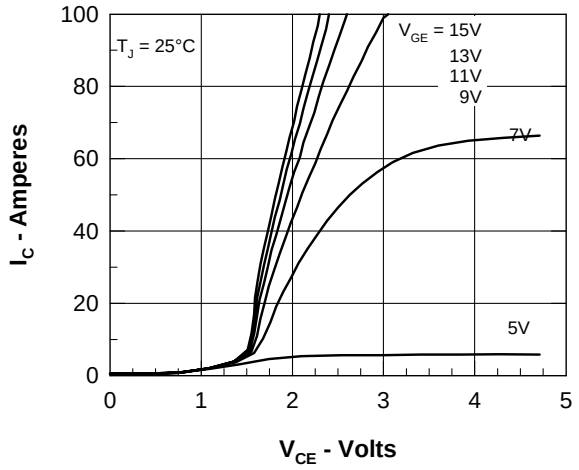


Figure 1. Saturation Voltage Characteristics

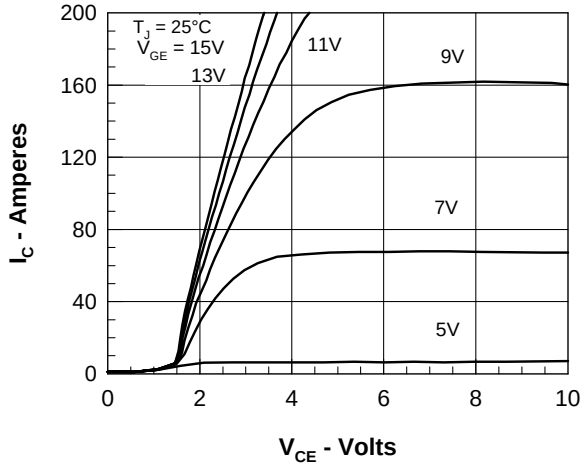


Figure 2. Extended Output Characteristics

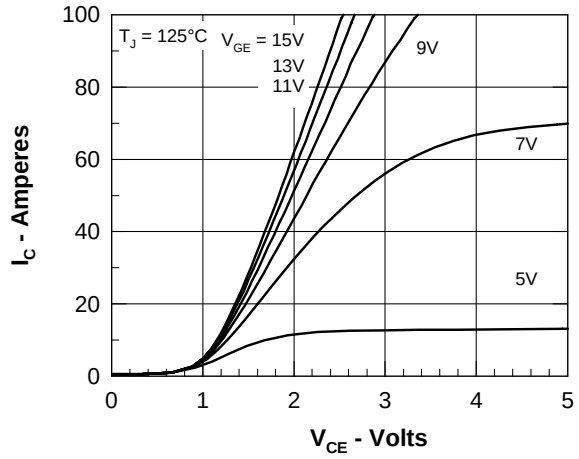


Figure 3. Saturation Voltage Characteristics

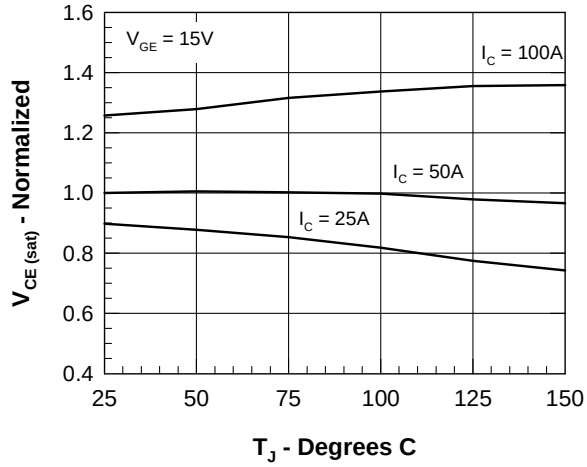


Figure 4. Temperature Dependence of $V_{CE(sat)}$

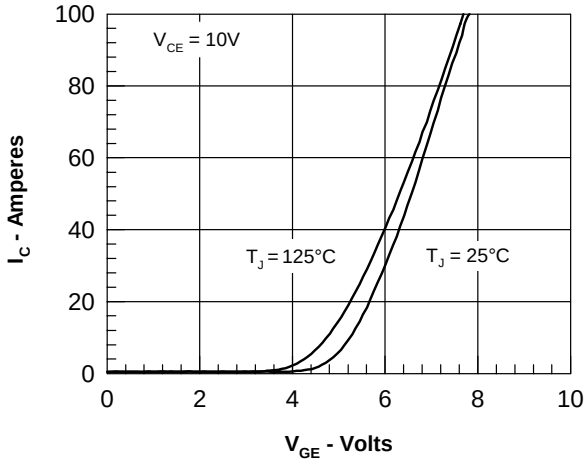


Figure 5. Admittance Curves

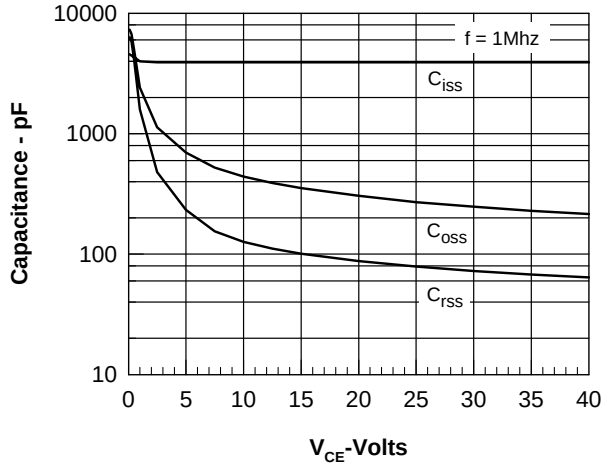


Figure 6. Capacitance Curves

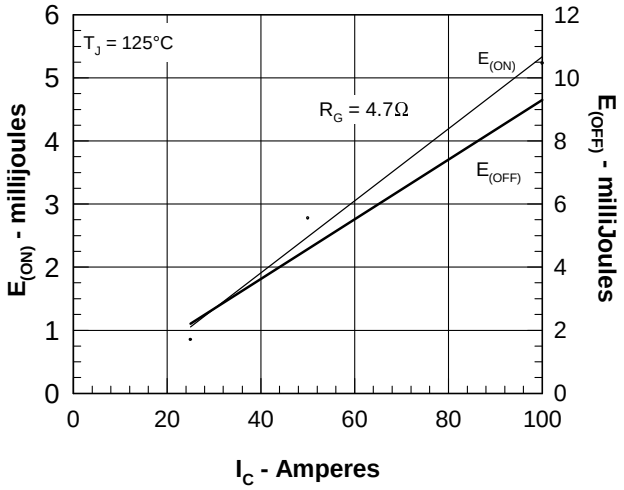


Figure 7. Dependence of E_{ON} and E_{OFF} on I_C.

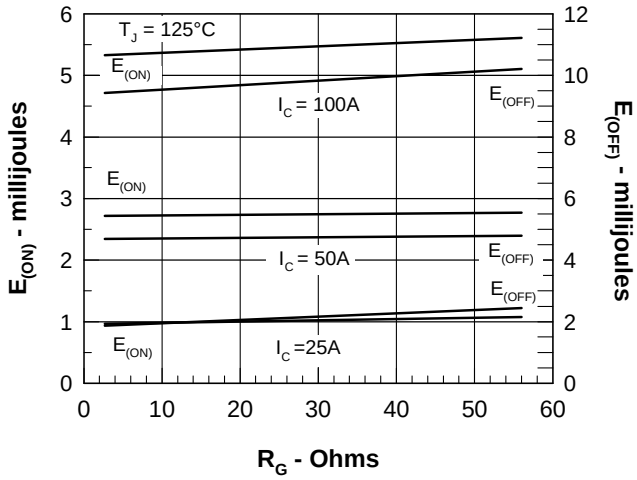


Figure 8. Dependence of E_{ON} and E_{OFF} on R_G.

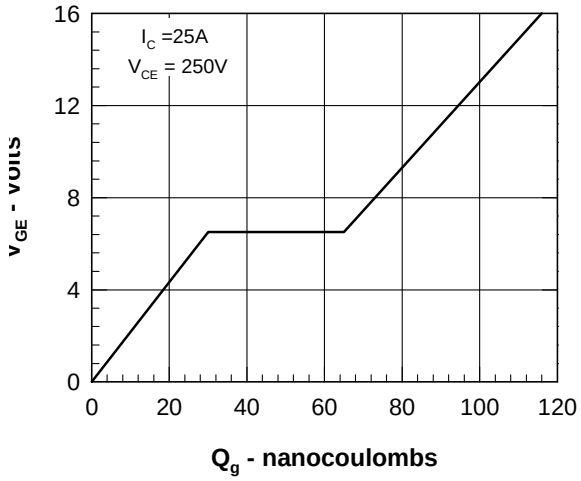


Figure 9. Gate Charge

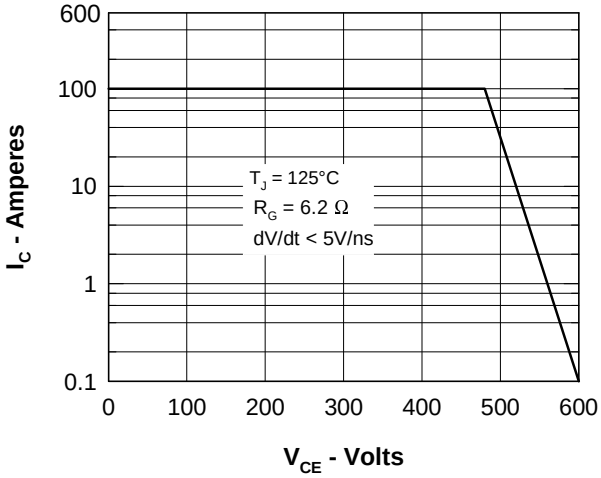


Figure 10. Turn-off Safe Operating Area

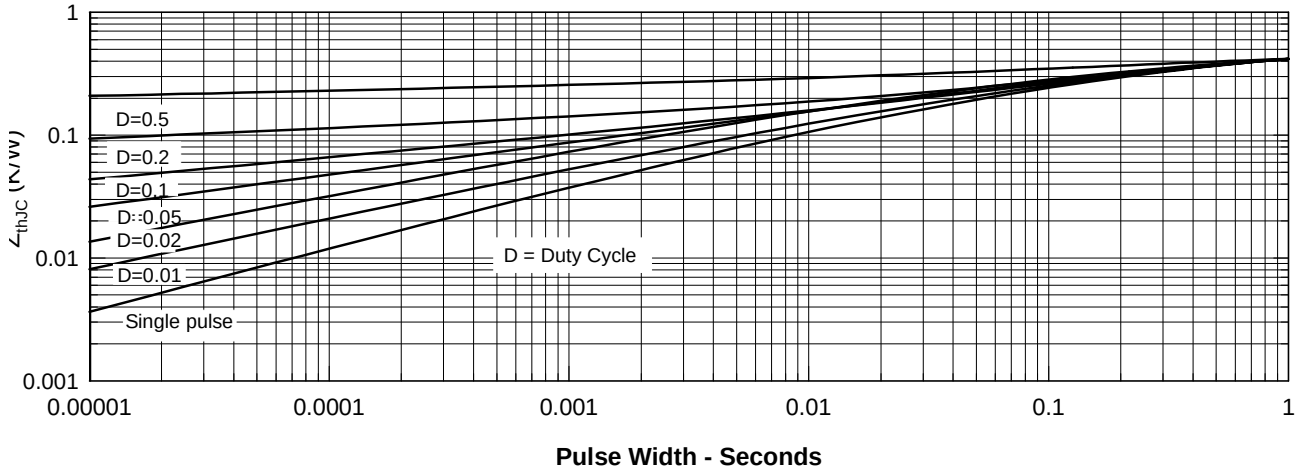


Figure 11. IGBT Transient Thermal Resistance

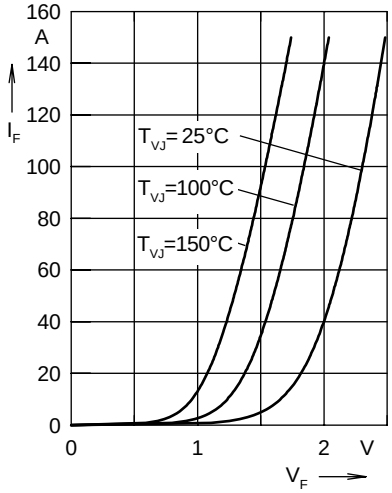


Fig. 12. Forward current I_F versus V_F

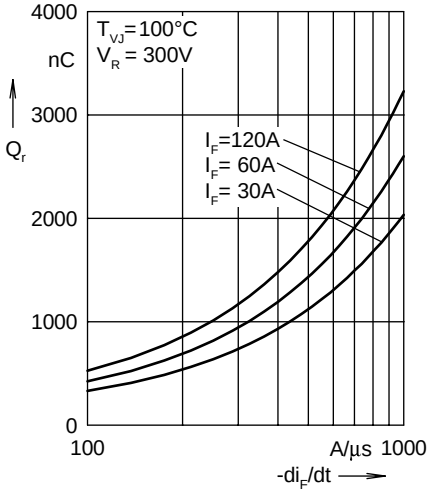


Fig. 13. Reverse recovery charge Q_r versus $-di_F/dt$

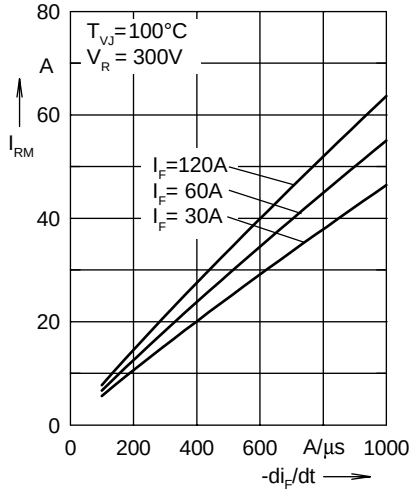


Fig.14. Peak reverse current I_{RM} versus $-di_F/dt$

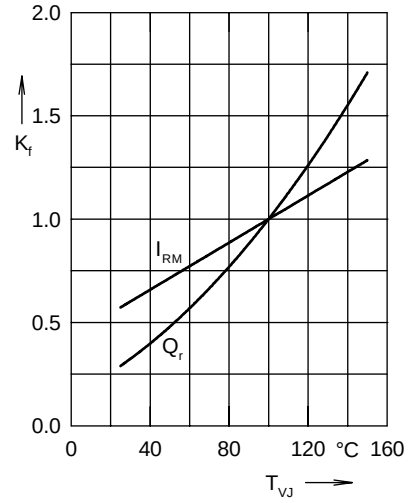


Fig. 15. Dynamic parameters Q_r, I_{RM} versus T_{VJ}

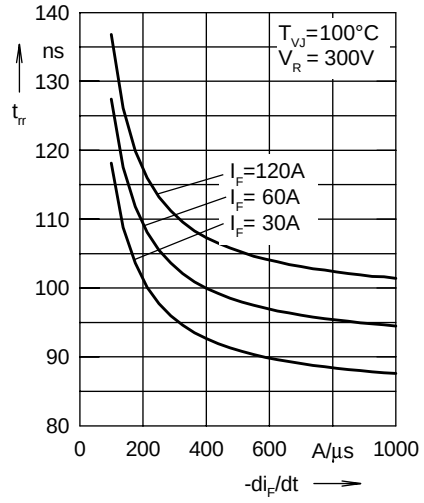


Fig. 16. Recovery time t_{rr} versus $-di_F/dt$

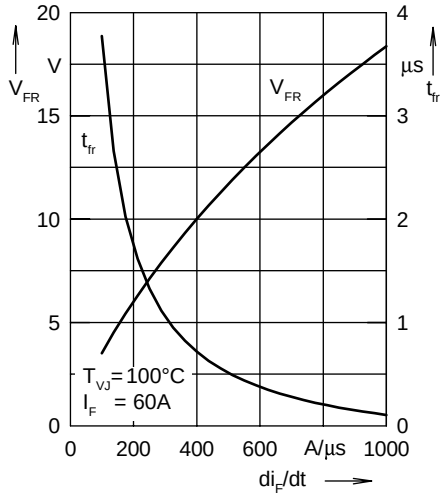


Fig. 17. Peak forward voltage V_{FR} and t_{fr} versus di_F/dt

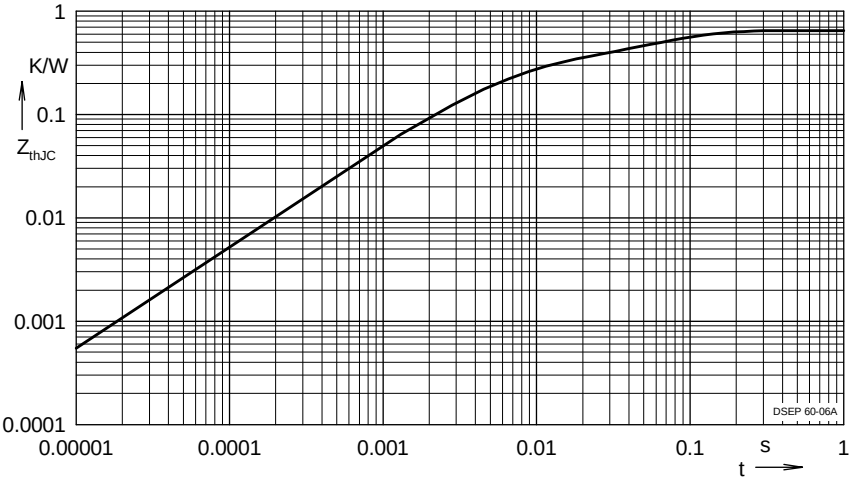


Fig. 18. Transient thermal resistance junction to case

Constants for Z_{thJC} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.324	0.0052
2	0.125	0.0003
3	0.201	0.0385