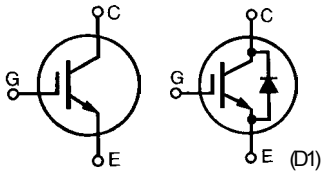
IXYS

HiPerFAST™ IGBT

IXGH39N60B
IXGH39N60BD1
IXGT39N60B
IXGT39N60BD1

V_{CES} = 600 V
I_{C25} = 76 A
$V_{CE(sat)}$ = 1.7 V
t_{fi} = 200 ns

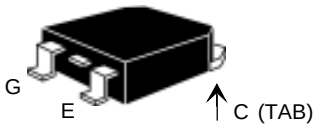
Preliminary data



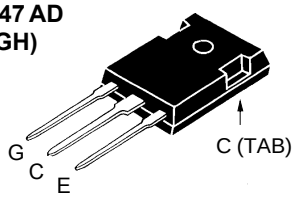
Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C	600	V
V_{CGR}	T_J = 25°C to 150°C; R_{GE} = 1 MΩ	600	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C	76	A
I_{C90}	T_C = 90°C	39	A
I_{CM}	T_C = 25°C, 1 ms	152	A
SSOA (RBSOA)	V_{GE} = 15 V, T_{VJ} = 125°C, R_G = 22 Ω Clamped inductive load	I_{CM} = 76 @ 0.8 V_{CES}	A
P_C	T_C = 25°C	200	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	°C
M_d	Mounting torque (M3) TO-247	1.13/10	Nm/lb.in.
Weight	TO-247 AD	6	g
	TO-268	4	g

Symbol	Test Conditions			Characteristic Values (T_J = 25°C, unless otherwise specified) Min.	Typ.	Max.	
BV_{CES}	I_C = 250 μA, V_{GE} = 0 V		39N60B	600			V
	I_C = 750 μA		39N60BD1	600			V
$V_{GE(th)}$	I_C = 250 μA, V_{CE} = V_{GE}		39N60B	2.5		5.0	V
	I_C = 500 μA		39N60BD1	2.5		5.0	V
I_{CES}	V_{CE} = 0.8 • V_{CES}	T_J = 25°C	39N60B			200	μA
	V_{GE} = 0 V	T_J = 125°C	39N60B			1	mA
		T_J = 125°C	39N60BD1			3	mA
I_{GES}	V_{CE} = 0 V, V_{GE} = ±20 V					±100	nA
$V_{CE(sat)}$	I_C = I_{90}, V_{GE} = 15 V					1.7	V

TO-268 (IXGT)



TO-247 AD (IXGH)



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

Features

- International standard packages JEDEC TO-247 AD & TO-268
- High current handling capability
- Newest generation HDMOS™ process
- MOS Gate turn-on
  - drive simplicity

Applications

- PFC circuits
- AC motor speed control
- DC servo and robot drives
- DC choppers
- Uninterruptible power supplies (UPS)
- Switched-mode and resonant-mode power supplies

Advantages

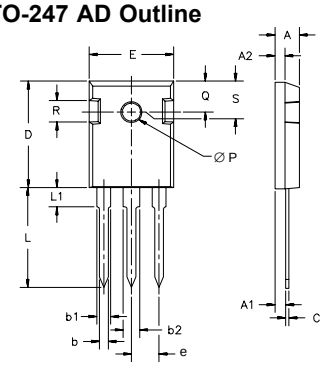
- High power density
- Very fast switching speeds for high frequency applications

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 %		19	28		S
C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz			2750		pF
C_{oes}		39N60B		200		pF
		39N60BD1		240		pF
C_{res}				50		pF
Q_G	$I_C = I_{C90}$, V_{GE} = 15 V, V_{CE} = 0.5 V_{CES}			110	150	nC
Q_{GE}				25	35	nC
Q_{GC}				40	75	nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**			25		ns
t_{ri}	$I_C = I_{C90}$, V_{GE} = 15 V			30		ns
$t_{d(off)}$	V_{CE} = 0.8 V_{CES}, $R_G = R_{off}$ = 4.7 Ω			250	500	ns
t_{fi}	Remarks: Switching times may increase for V_{CE} (Clamp) > 0.8 • V_{CES}, higher T_J or increased R_G			200	360	ns
E_{off}				4.0	6.0	mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C**			25		ns
t_{ri}	$I_C = I_{C90}$, V_{GE} = 15 V			30		ns
E_{on}	V_{CE} = 0.8 V_{CES}, $R_G = R_{off}$ = 4.7 Ω			0.3		mJ
$t_{d(off)}$	Remarks: Switching times may			360		ns
t_{fi}	increase for V_{CE} (Clamp) > 0.8 • V_{CES},			350		ns
E_{off}	higher T_J or increased R_G			6.0		mJ
R_{thJC}					0.62	K/W
R_{thCK}				0.25		K/W

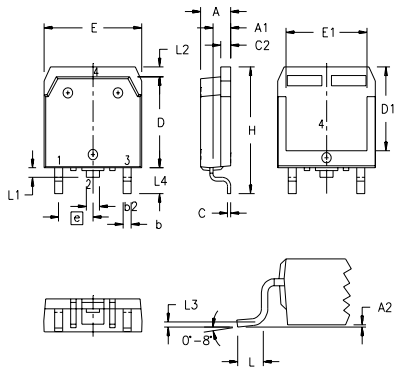
Reverse Diode (FRED)

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_J = 150°C			1.6	V
	t ≤ 300 µs, duty cycle d ≤ 2 %	T_J = 25°C			2.5	V
I_{RM}	$I_F = I_{C90}$, V_{GE} = 0 V, $-di_F/dt$ = 100 A/µs			6		A
t_{rr}	V_R = 100 V	T_J = 100°C		100		ns
	I_F = 1 A; -di/dt = 100 A/µs; V_R = 30 V	T_J = 25°C		25		ns
R_{thJC}					0.9	K/W

TO-247 AD Outline



Dim.	Millimeter Min.	Max.	Inches Min.	Max.
A	4.7	5.3	.185	.209
A_1	2.2	2.54	.087	.102
A_2	2.2	2.6	.059	.098
b	1.0	1.4	.040	.055
b_1	1.65	2.13	.065	.084
b_2	2.87	3.12	.113	.123
C	.4	.8	.016	.031
D	20.80	21.46	.819	.845
E	15.75	16.26	.610	.640
e	5.20	5.72	0.205	0.225
L	19.81	20.32	.780	.800
L1		4.50		.177
ØP	3.55	3.65	.140	.144
Q	5.89	6.40	0.232	0.252
R	4.32	5.49	.170	.216
S	6.15 BSC		242 BSC	



SYM	INCHES MIN	MAX	MILLIMETERS MIN	MAX
A	.193	.201	4.90	5.10
A1	.106	.114	2.70	2.90
A2	.001	.010	0.02	0.25
b	.045	.057	1.15	1.45
b2	.075	.083	1.90	2.10
C	.016	.026	0.40	0.65
C2	.057	.063	1.45	1.60
D	.543	.551	13.80	14.00
D1	.488	.500	12.40	12.70
E	.624	.632	15.85	16.05
E1	.524	.535	13.30	13.60
e	.215 BSC		5.45 BSC	
H	.736	.752	18.70	19.10
L	.094	.106	2.40	2.70
L1	.047	.055	1.20	1.40
L2	.039	.045	1.00	1.15
L3	.010 BSC		0.25 BSC	
L4	.150	.161	3.80	4.10

Fig. 1. Saturation Voltage Characteristics @ 25 Deg. C

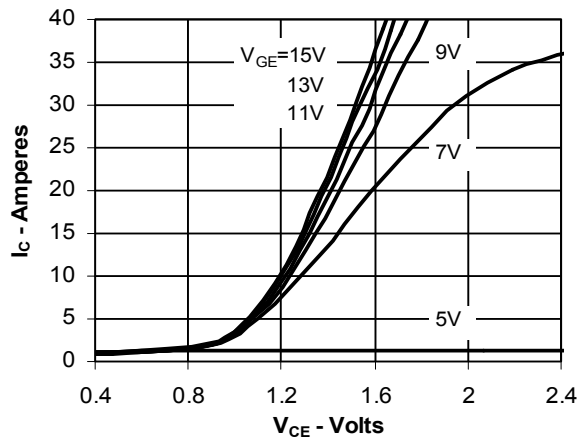


Fig. 2. Extended Output Characteristics @ 25 Deg. C

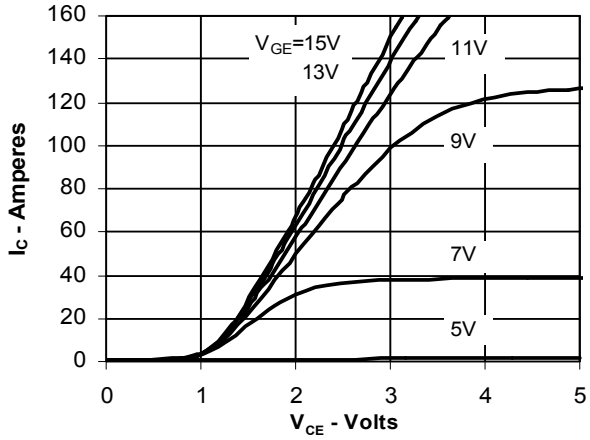


Fig. 3. Saturation Voltage Characteristics @ 125 Deg. C

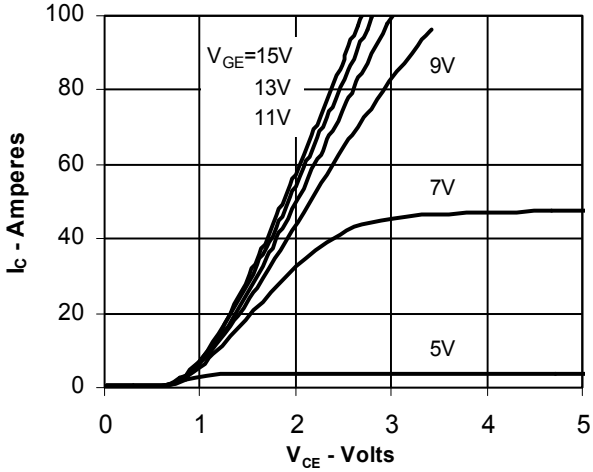


Fig. 4. Temperature Dependence of $V_{CE(SAT)}$

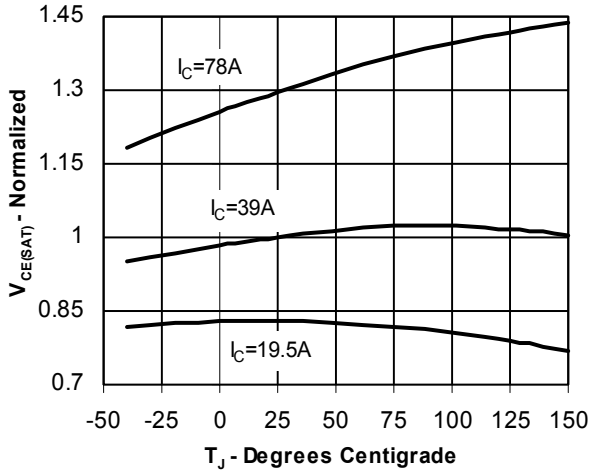


Fig. 5. BV_{CES} & $V_{(GE)TH}$ vs. Junction Temperature

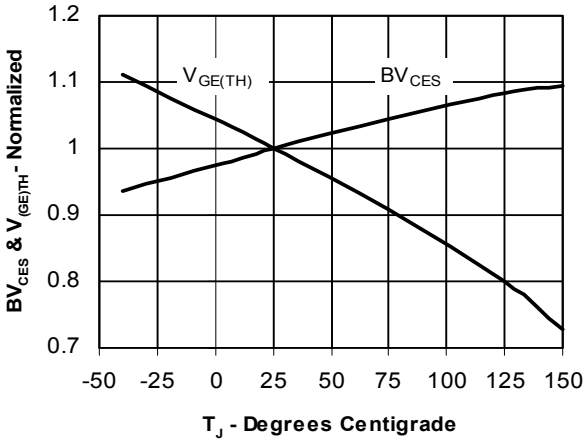


Fig. 6. Admittance

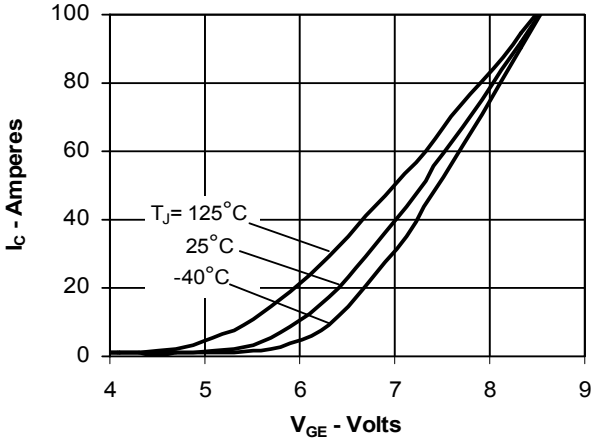


Fig. 7. Transconductance

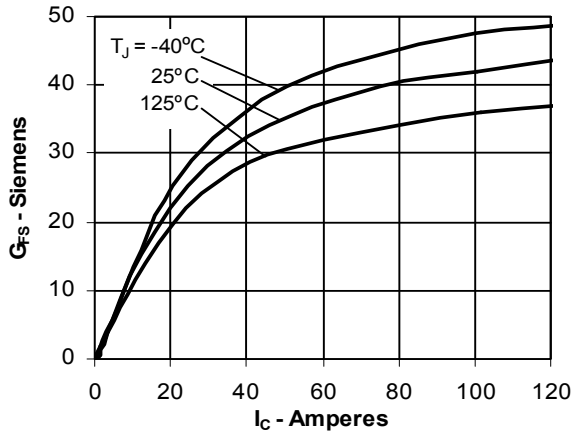


Fig. 8. Dependence of E_{OFF} on I_C

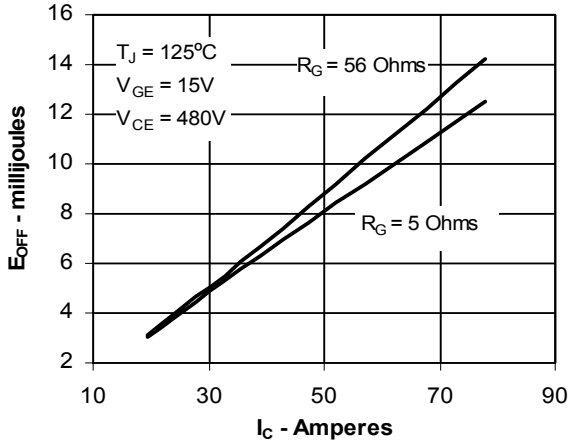


Fig. 9. Dependence of E_{OFF} on R_G

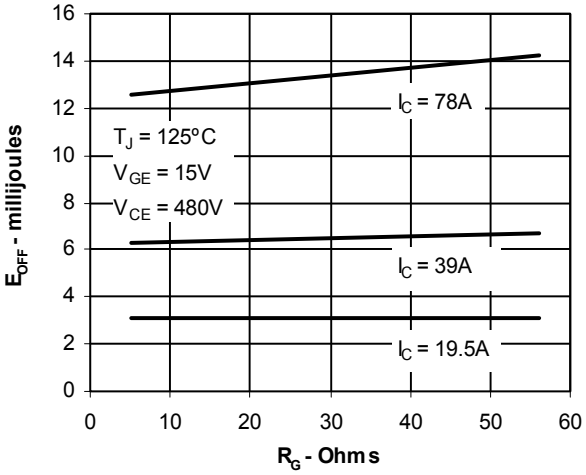


Fig. 10. Dependence of E_{OFF} on Temperature

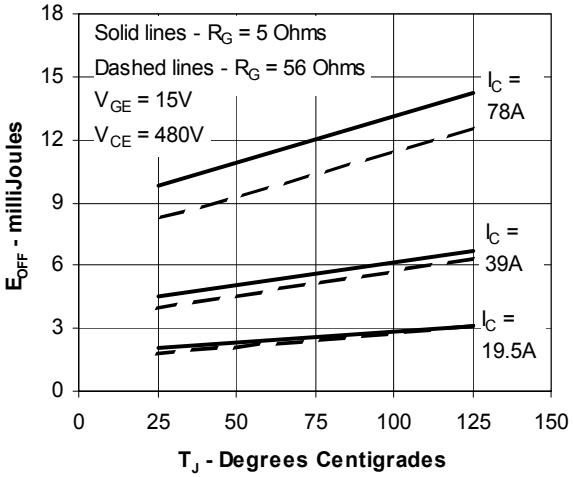


Fig. 11. Gate Charge

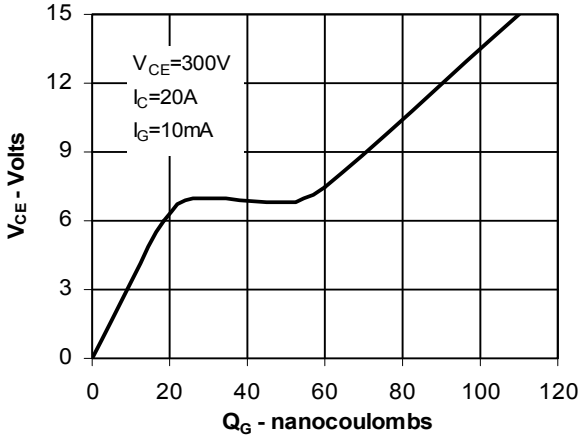
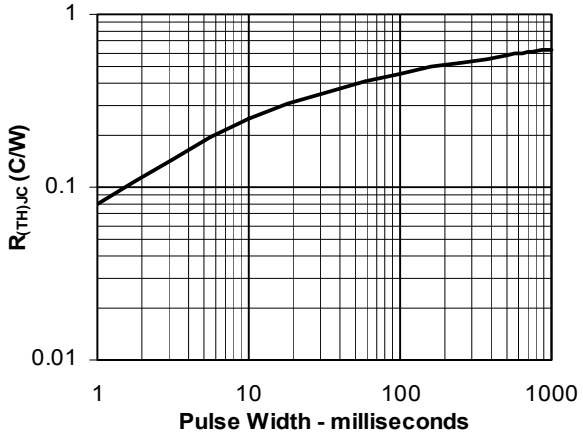


Fig. 12. Transient Thermal Response



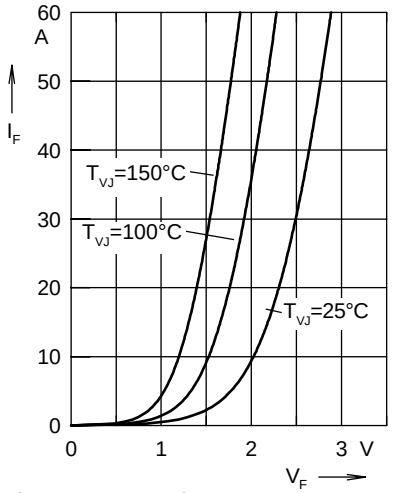


Fig. 12 Forward current I_F versus V_F

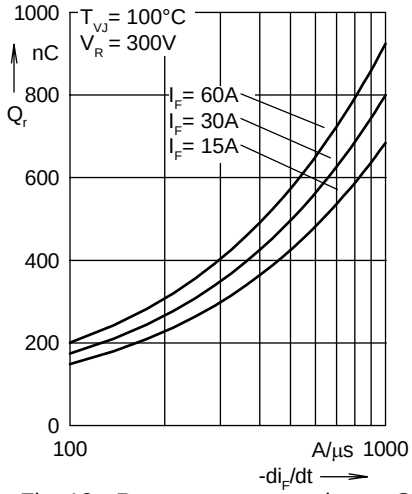


Fig. 13 Reverse recovery charge Q_r versus -di$_F$/dt

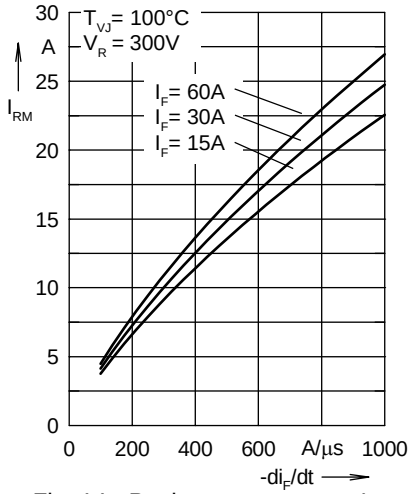


Fig. 14 Peak reverse current I_{RM} versus -di$_F$/dt

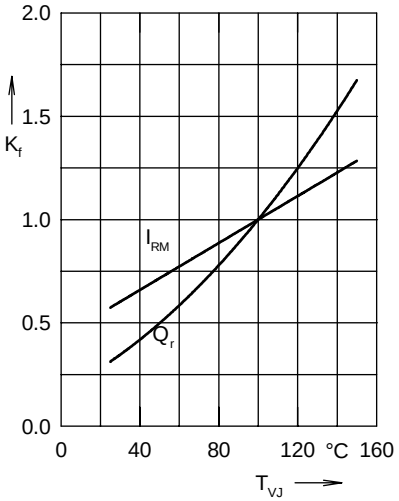


Fig. 15 Dynamic parameters Q_r, I_{RM} versus T_{VJ}

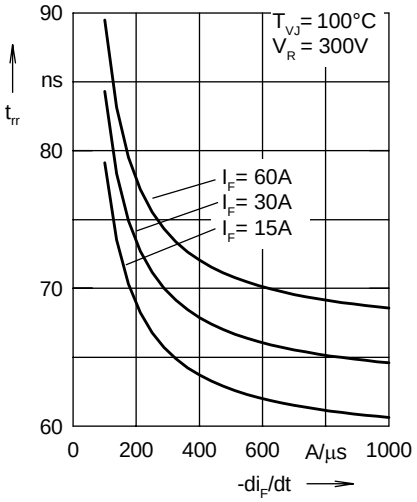


Fig. 16 Recovery time t_{rr} versus -di$_F$/dt

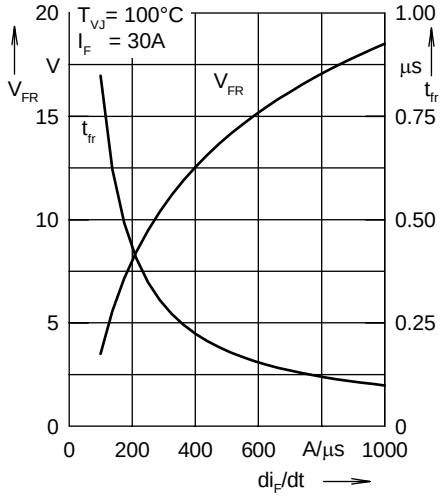


Fig. 17 Peak forward voltage V_{FR} and t_{fr} versus di$_F$/dt

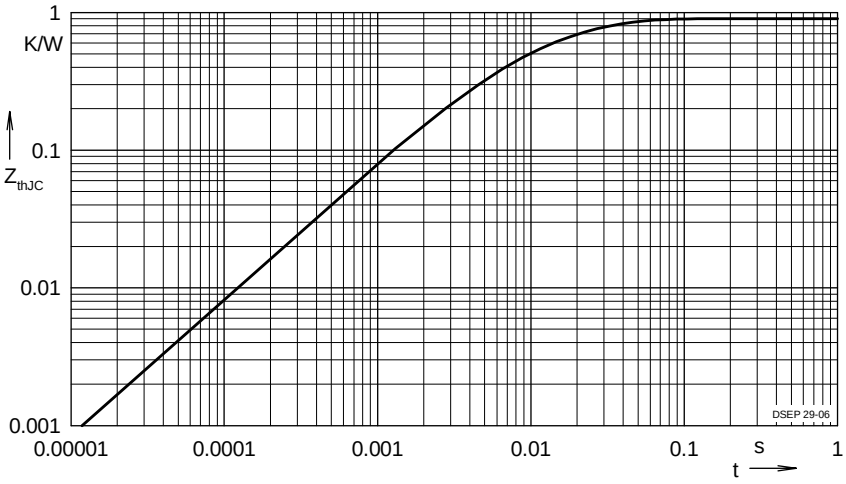


Fig. 18 Transient thermal resistance junction to case

Constants for Z_{thJC} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.502	0.0052
2	0.193	0.0003
3	0.205	0.0162