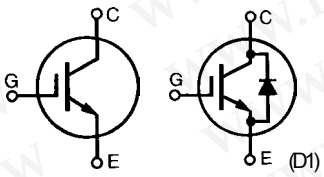
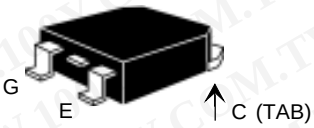
HiPerFAST™ IGBT

Preliminary data

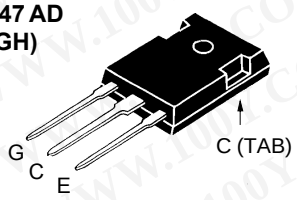
IXGH39N60B	V_{CES}	= 600 V
IXGH39N60BD1	I_{C25}	= 76 A
IXGT39N60B	$V_{CE(sat)}$	= 1.7 V
IXGT39N60BD1	t_{fi}	= 200 ns



TO-268 (IXGT)



TO-247 AD (IXGH)



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

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

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

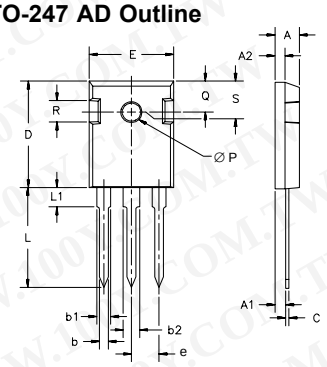
- High power density
- Very fast switching speeds for high frequency applications

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

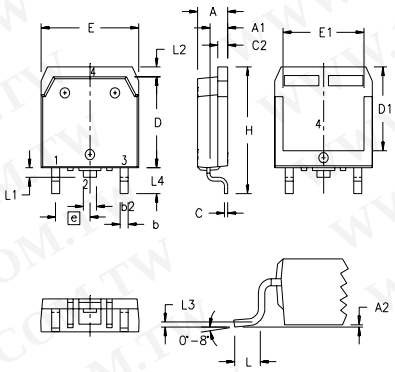
Reverse Diode (FRED) — Characteristic Values (T_J = 25°C, unless otherwise specified)

Symbol	Test Conditions		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

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

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

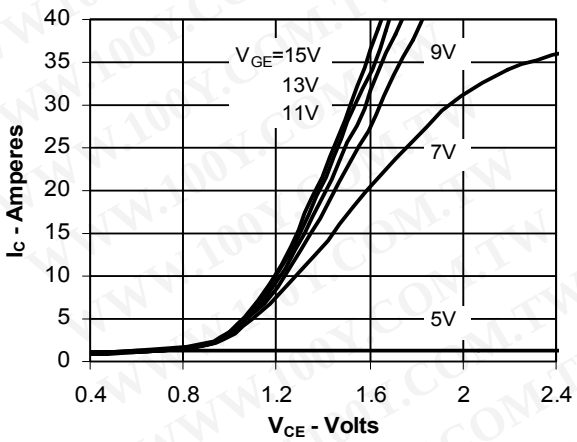


Fig. 2. Extended Output Characteristics @ 25 Deg. C

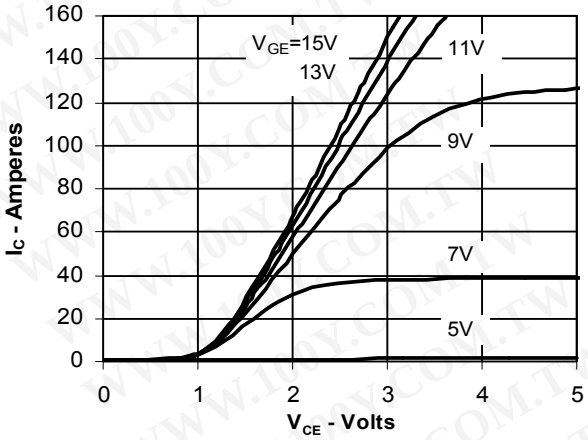


Fig. 3. Saturation Voltage Characteristics @ 125 Deg. C

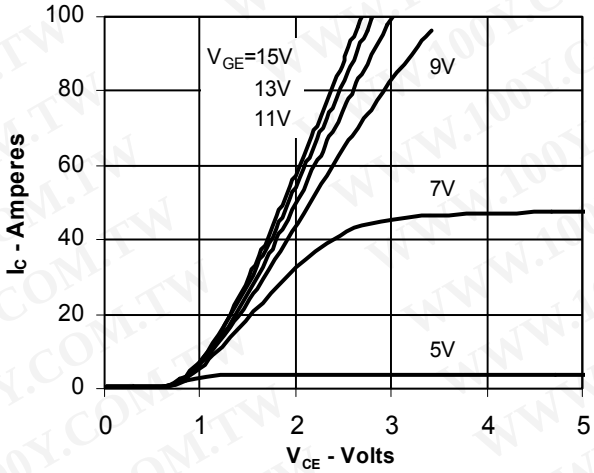


Fig. 4. Temperature Dependence of $V_{CE(SAT)}$

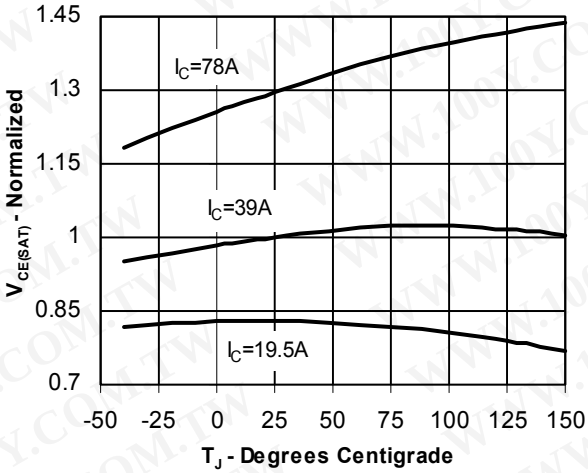


Fig. 5. BV_{CES} & $V_{(GE)TH}$ vs. Junction Temperature

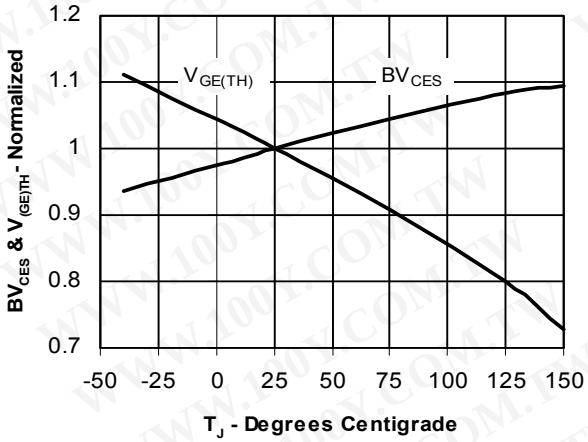


Fig. 6. Admittance

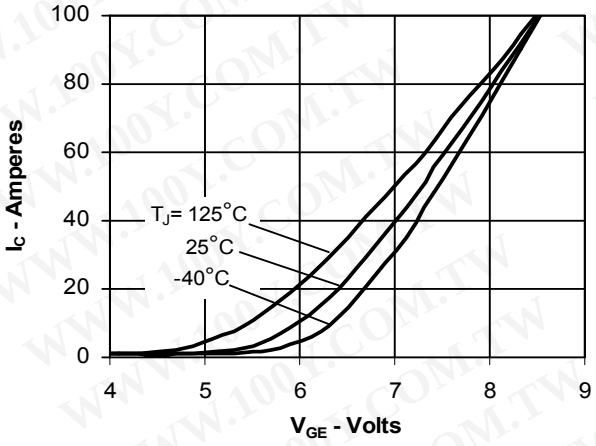


Fig. 7. Transconductance

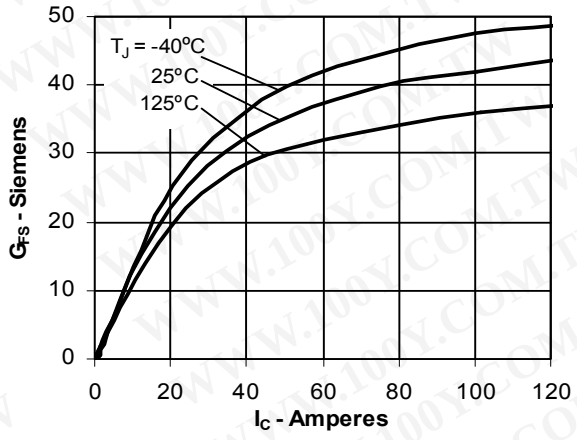


Fig. 8. Dependence of E_{OFF} on I_C

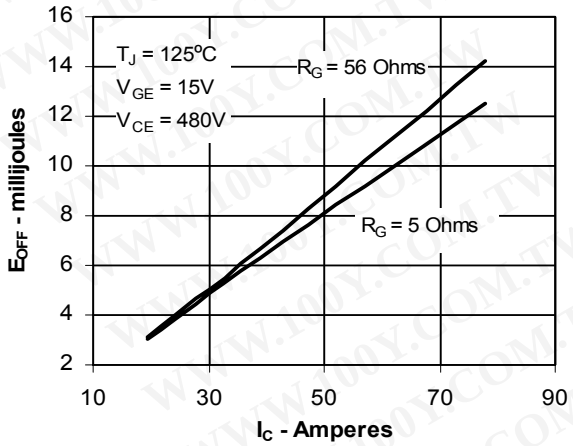


Fig. 9. Dependence of E_{OFF} on R_G

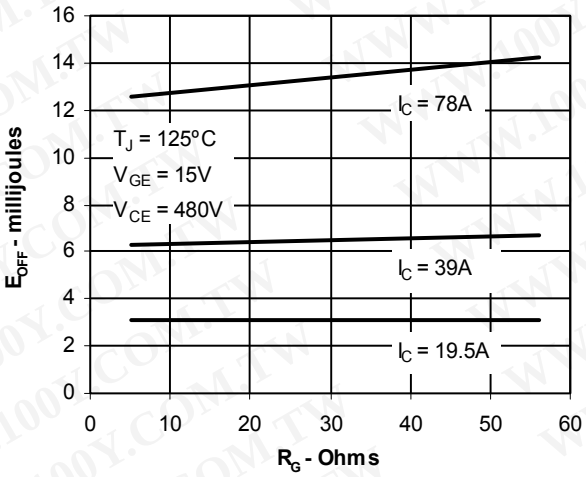


Fig. 10. Dependence of E_{OFF} on Temperature

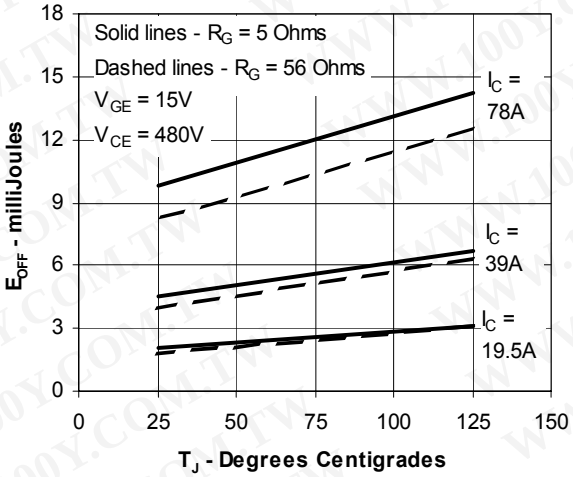


Fig. 11. Gate Charge

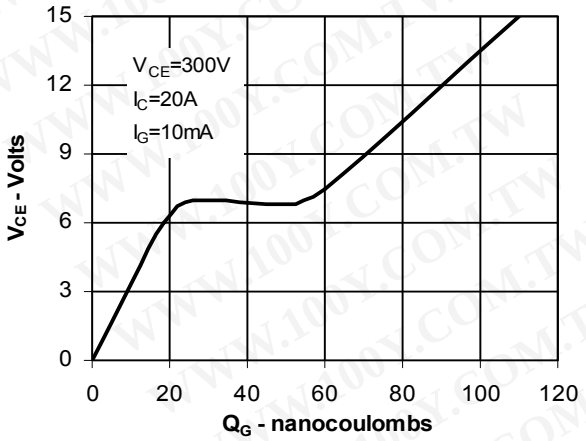
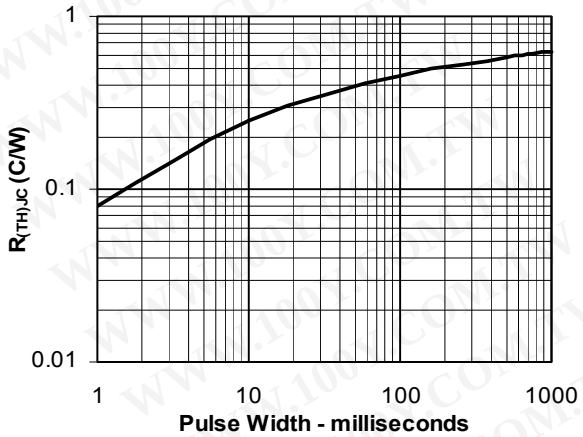


Fig. 12. Transient Thermal Response



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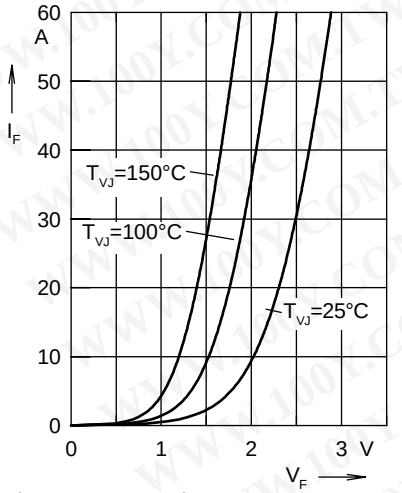

Fig. 12 Forward current I_F versus V_F

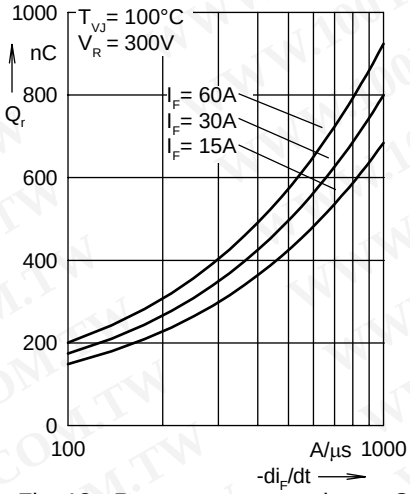

Fig. 13 Reverse recovery charge Q_r versus -di$_F$/dt

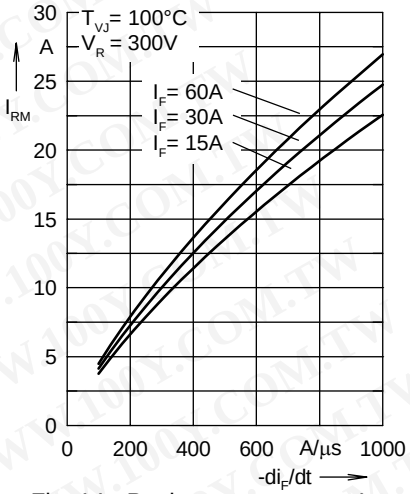

Fig. 14 Peak reverse current I_{RM} versus -di$_F$/dt

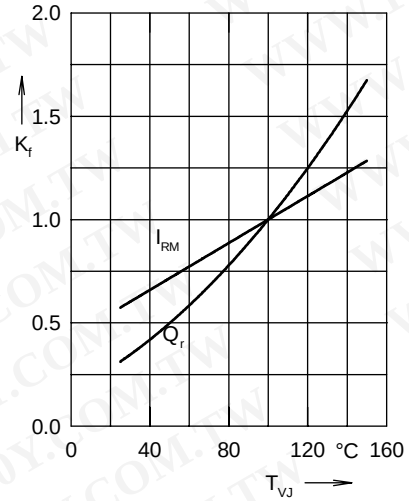

Fig. 15 Dynamic parameters Q_r, I_{RM} versus T_{VJ}

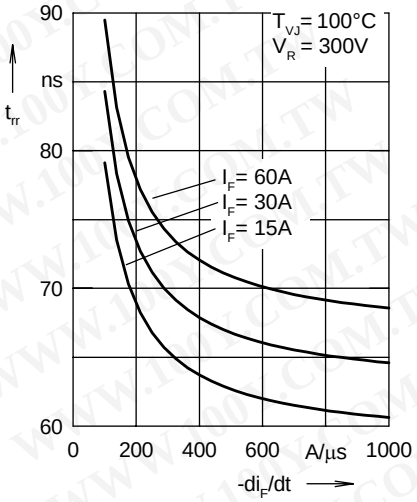

Fig. 16 Recovery time t_{rr} versus -di$_F$/dt

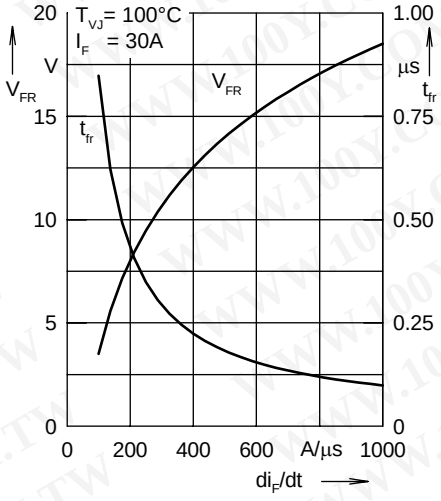

Fig. 17 Peak forward voltage V_{FR} and t_{fr} versus di$_F$/dt

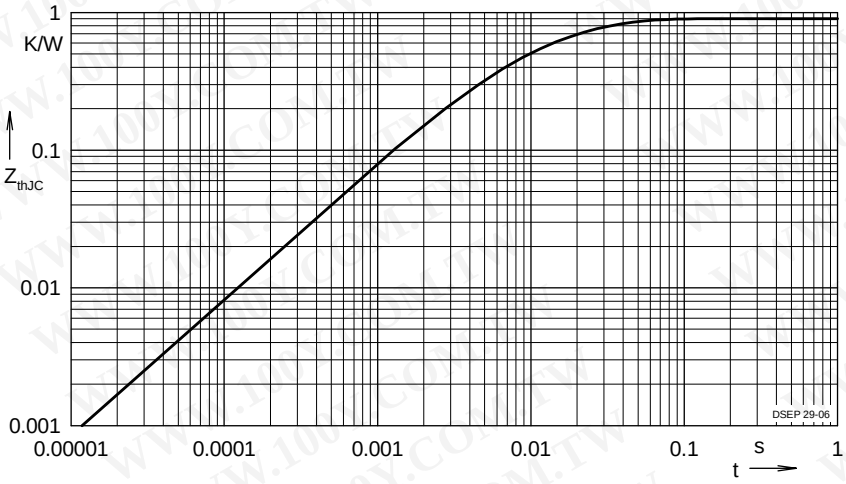

Fig. 18 Transient thermal resistance junction to case

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