

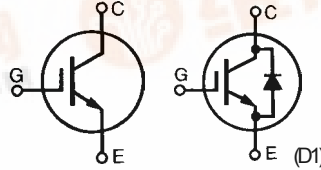


HiPerFAST™ IGBT

IXGH39N60B
IXGH39N60BD1
IXGT39N60B
IXGT39N60BD1

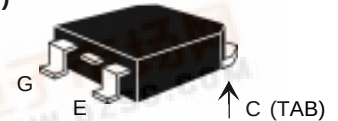
$V_{CES} = 600 \text{ V}$
 $I_{C25} = 76 \text{ A}$
 $V_{CE(sat)} = 1.7 \text{ V}$
 $t_{fi} = 200 \text{ ns}$

Preliminary data

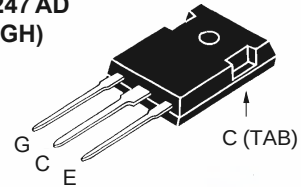


Symbol	Test Conditions	Maximum Ratings
V_{CES}	$T_J = 25^\circ\text{C to } 150^\circ\text{C}$	600 V
V_{CGR}	$T_J = 25^\circ\text{C to } 150^\circ\text{C}; R_{GE} = 1 \text{ M}\Omega$	600 V
V_{GES}	Continuous	$\pm 20 \text{ V}$
V_{GEM}	Transient	$\pm 30 \text{ V}$
I_{C25}	$T_C = 25^\circ\text{C}$	76 A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

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 ($T_J = 25^\circ\text{C}$, unless otherwise specified)		
			Min.	Typ.	Max.
BV_{CES}	$I_C = 250 \mu\text{A}, V_{GE} = 0 \text{ V}$	39N60B	600		V
	$I_C = 750 \mu\text{A}$	39N60BD1	600		
$V_{GE(th)}$	$I_C = 250 \mu\text{A}, V_{CE} = V_{GE}$	39N60B	2.5		5.0 V
	$I_C = 500 \mu\text{A}$	39N60BD1	2.5		5.0 V
I_{CES}	$V_{CE} = 0.8 \cdot V_{CES}$	$T_J = 25^\circ\text{C}$			200 μA
	$V_{GE} = 0 \text{ V}$	$T_J = 125^\circ\text{C}$			1 mA
		$T_J = 125^\circ\text{C}$			3 mA
I_{GES}	$V_{CE} = 0 \text{ V}, V_{GE} = \pm 20 \text{ V}$				$\pm 100 \text{ nA}$
$V_{CE(sat)}$	$I_C = I_{90}, V_{GE} = 15 \text{ V}$				1.7 V

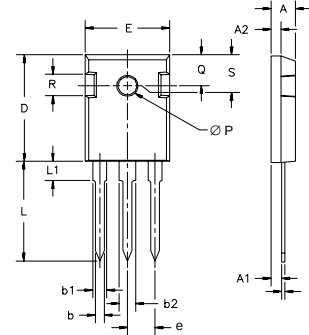


Symbol	Test Conditions	Characteristic Values ($T_J = 25^\circ\text{C}$, unless otherwise specified)		
		min.	typ.	max.
g_{fs}	$I_C = I_{C90}, V_{CE} = 10\text{ V}$, Pulse test, $t \leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$	19	28	S
C_{ies}	$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	39N60B 39N60BD1	2750	pF
C_{oes}			200	pF
C_{res}			240	pF
Q_G	$I_C = I_{C90}, V_{GE} = 15\text{ V}, V_{CE} = 0.5 V_{CES}$		110	150 nC
Q_{GE}			25	35 nC
Q_{GC}			40	75 nC
$t_{d(on)}$	Inductive load, $T_J = 25^\circ\text{C}$ $I_C = I_{C90}, V_{GE} = 15\text{ V}$ $V_{CE} = 0.8 V_{CES}, R_G = R_{off} = 4.7\text{ }\Omega$ Remarks: Switching times may increase for $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$, higher T_J or increased R_G		25	ns
t_{ri}			30	ns
$t_{d(off)}$			250	500 ns
t_{fi}			200	360 ns
E_{off}			4.0	6.0 mJ
$t_{d(on)}$	Inductive load, $T_J = 125^\circ\text{C}$ $I_C = I_{C90}, V_{GE} = 15\text{ V}$ $V_{CE} = 0.8 V_{CES}, R_G = R_{off} = 4.7\text{ }\Omega$ Remarks: Switching times may increase for $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$, higher T_J or increased R_G		25	ns
t_{ri}			30	ns
E_{on}			0.3	mJ
$t_{d(off)}$			360	ns
t_{fi}			350	ns
E_{off}			6.0	mJ
R_{thJC}				0.62 KW
R_{thCK}			0.25	KW

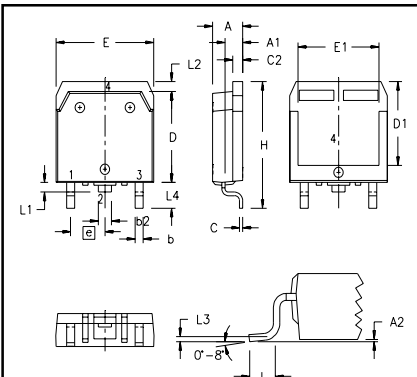
Reverse Diode (FRED) **Characteristic Values**
($T_J = 25^\circ\text{C}$, unless otherwise specified)

Symbol	Test Conditions	min.	typ.	max.
V_F	$I_F = I_{C90}, V_{GE} = 0\text{ V}$, Pulse test $t \leq 300\text{ }\mu\text{s}$, duty cycle $d \leq 2\%$	$T_J = 150^\circ\text{C}$		1.6 V
		$T_J = 25^\circ\text{C}$		2.5 V
I_{RM}	$I_F = I_{C90}, V_{GE} = 0\text{ V}, -di_F/dt = 100\text{ A}/\mu\text{s}$ $V_R = 100\text{ V}$	$T_J = 100^\circ\text{C}$	6	A
t_{rr}			100	ns
			25	ns
R_{thJC}				0.9 KW

TO-247 AD Outline



Dim.	Millimeter Min.	Millimeter Max.	Inches Min.	Inches Max.
A	4.7	5.3	.185	.209
A1	2.2	2.54	.087	.102
A2	2.2	2.6	.059	.098
b	1.0	1.4	.040	.055
b1	1.65	2.13	.065	.084
b2	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		MILLIMETERS	
	MIN	MAX	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

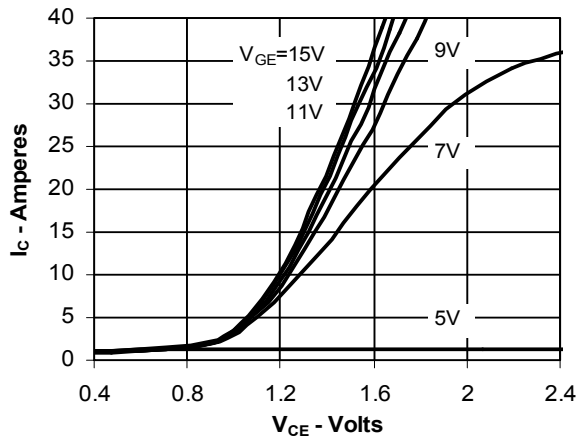


Fig. 2. Extended Output Characteristics @ 25 Deg. C

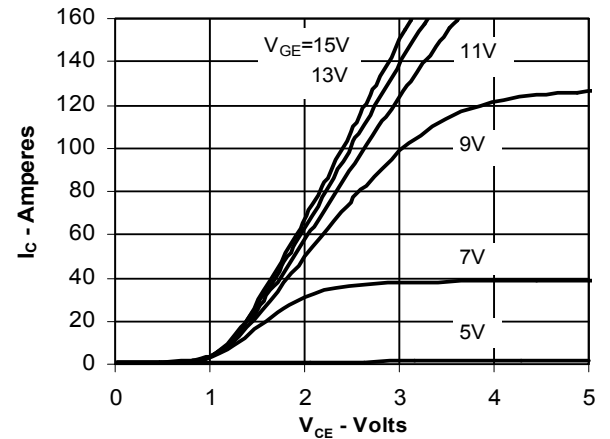


Fig. 3. Saturation Voltage Characteristics @ 125 Deg. C

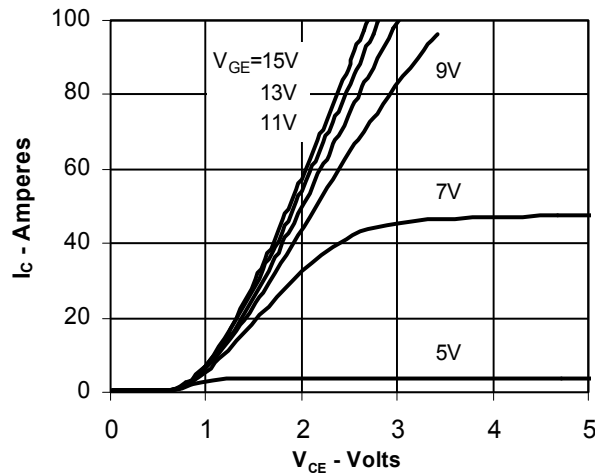


Fig. 4. Temperature Dependence of $V_{CE(SAT)}$

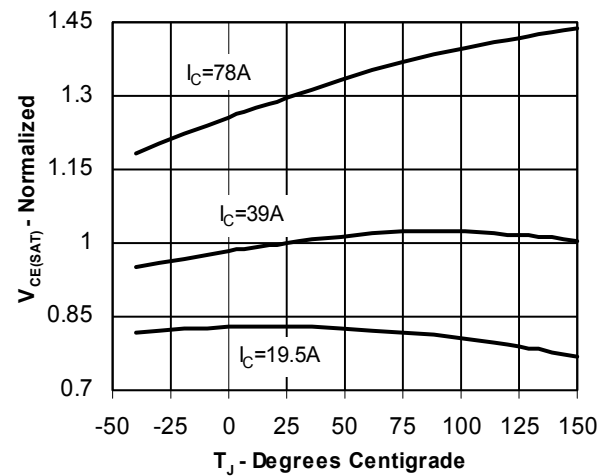


Fig. 5. BV_{CES} & $V_{(GE)TH}$ vs. Junction Temperature

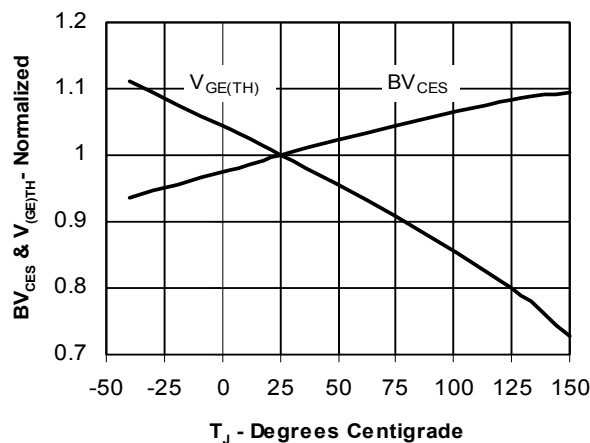


Fig. 6. Admittance

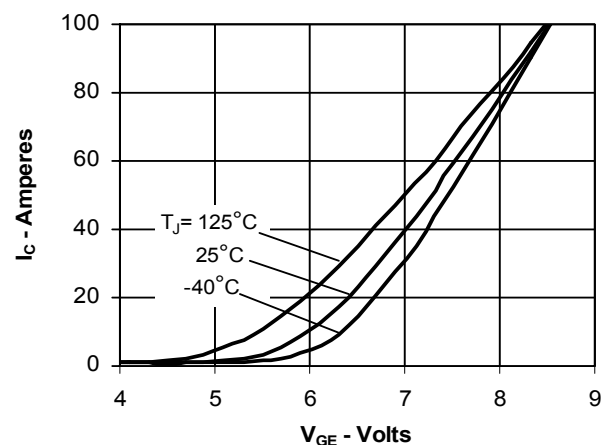


Fig. 7. Transconductance

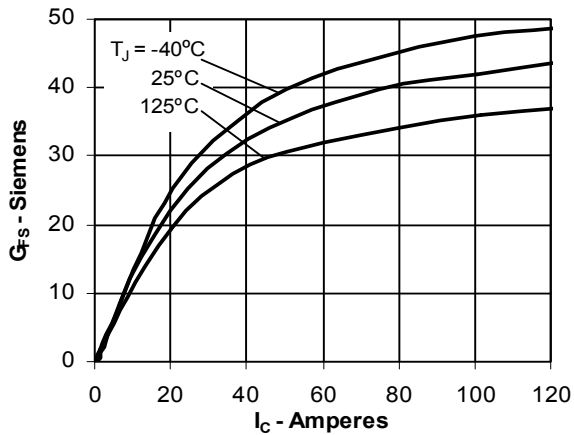


Fig. 8. Dependence of E_{OFF} on I_c

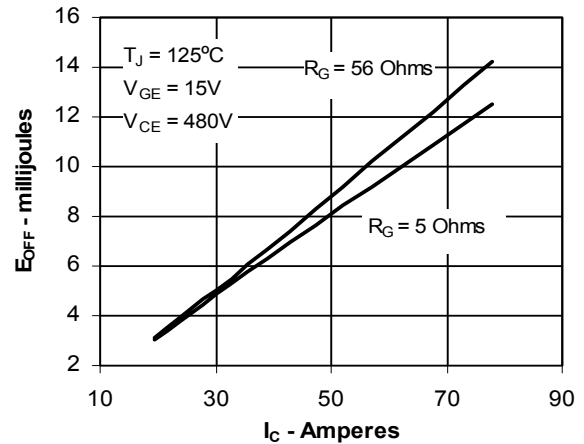


Fig. 9. Dependence of E_{OFF} on R_G

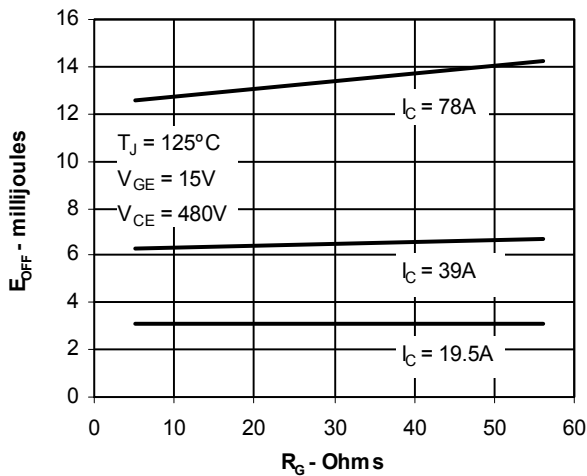


Fig. 10. Dependence of E_{OFF} on Temperature

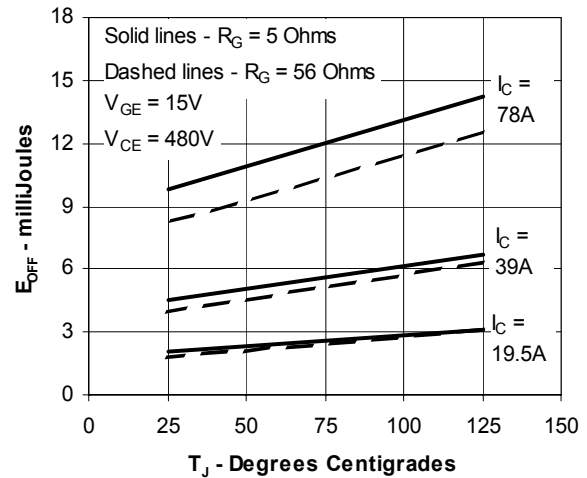


Fig. 11. Gate Charge

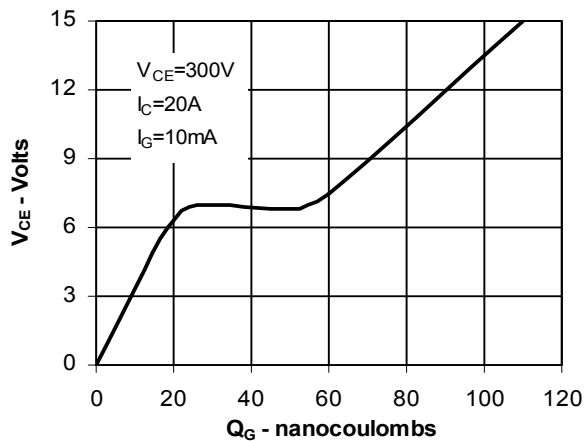
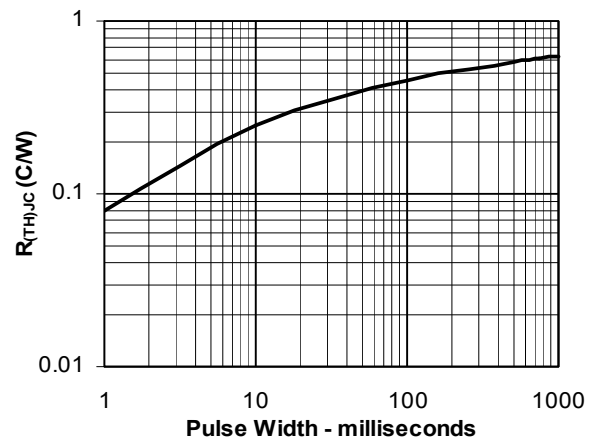


Fig. 12. Transient Thermal Response



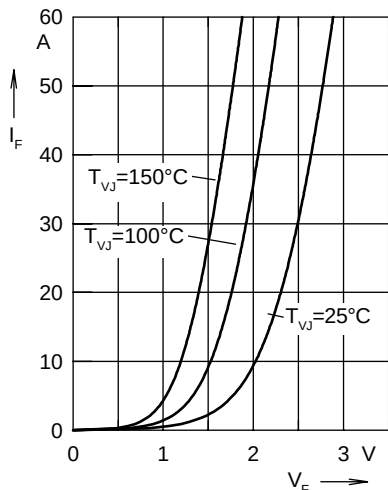


Fig. 12 Forward current I_F versus V_F

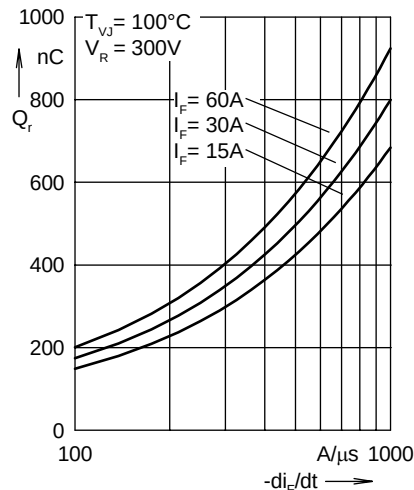


Fig. 13 Reverse recovery charge Q_r versus $-di_F/dt$

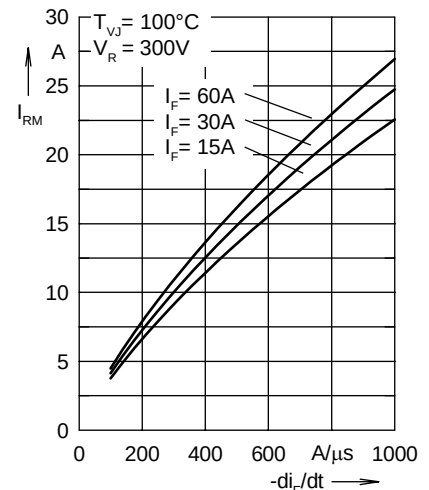


Fig. 14 Peak reverse current I_{RM} versus $-di_F/dt$

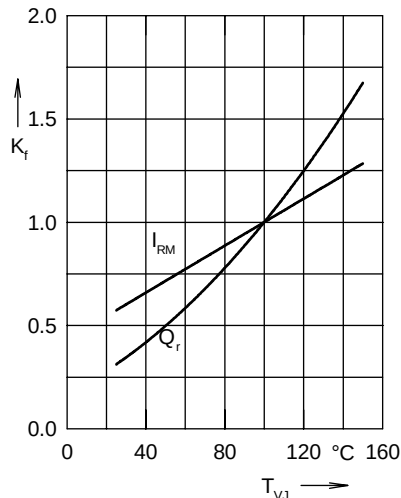


Fig. 15 Dynamic parameters Q_r , I_{RM} versus T_{VJ}

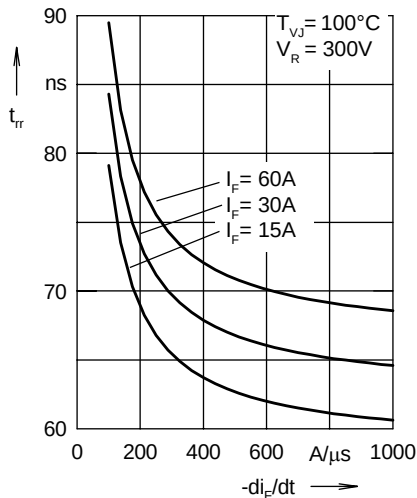


Fig. 16 Recovery time t_{rr} versus $-di_F/dt$

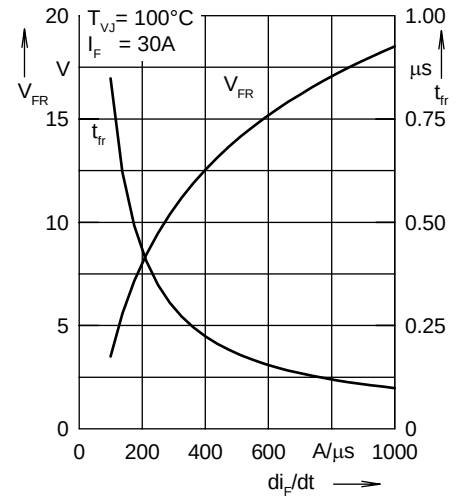


Fig. 17 Peak forward voltage V_{FR} and t_{fr} versus di_F/dt

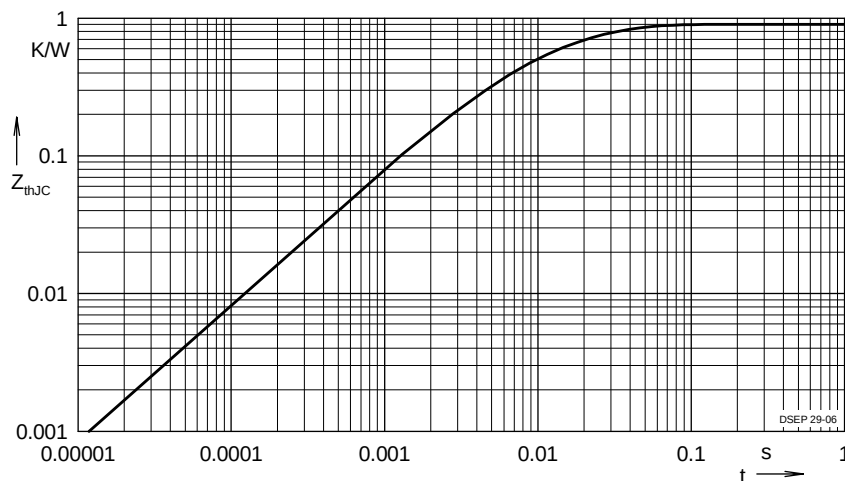


Fig. 18 Transient thermal resistance junction to case

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