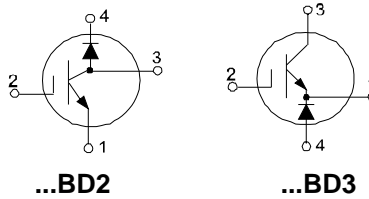


HIGH Speed IGBT with HiPerFRED

Short Circuit SOA Capability
Buck & boost configurations

Preliminary data

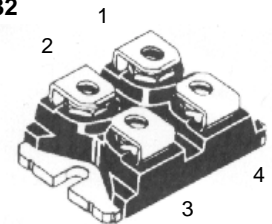
IXSN 50N60BD2 IXSN 50N60BD3



$$\begin{aligned} V_{CES} &= 600 \text{ V} \\ I_{C25} &= 75 \text{ A} \\ V_{CE(sat)} &= 2.5 \text{ V} \\ t_{fi} &= 150 \text{ ns} \end{aligned}$$

SOT-227B, miniBLOC

E 153432



IXSN50N60BD2

1 = Emitter; 2 = Gate
3 = Collector; 4 = Diode cathode

IXSN50N60BD3

1 = Emitter/Diode Cathode; 2 = Gate
3 = Collector; 4 = Diode anode

	Symbol	Test Conditions	Maximum Ratings	
IGBT	V_{CES}	$T_J = 25^\circ\text{C}$ to 150°C	600	V
	V_{CGR}	$T_J = 25^\circ\text{C}$ to 150°C ; $R_{GE} = 1 \text{ M}\Omega$	600	V
	V_{GES}	Continuous	± 20	V
	V_{GEM}	Transient	± 30	V
	I_{C25}	$T_C = 25^\circ\text{C}$	75	A
	I_{C90}	$T_C = 90^\circ\text{C}$	50	A
	I_{CM}	$T_C = 25^\circ\text{C}$, 1 ms	200	A
	SSOA (RBSOA)	$V_{GE} = 15 \text{ V}$, $T_{VJ} = 125^\circ\text{C}$, $R_G = 22 \Omega$ Clamped inductive load, $L = 30 \mu\text{H}$	$I_{CM} = 100$ @ $0.8 V_{CES}$	A
	t_{SC} (SCSOA)	$V_{GE} = 15 \text{ V}$, $V_{CE} = 360 \text{ V}$, $T_J = 125^\circ\text{C}$ $R_G = 22 \Omega$, non repetitive	10	μs
	P_C	$T_C = 25^\circ\text{C}$	250	W
Diode	V_{RRM}		600	V
	I_{FAVM}	$T_C = 70^\circ\text{C}$; rectangular, $d = 50\%$	60	A
	I_{FRM}	$t_p < 10 \text{ ms}$; pulse width limited by T_J	600	A
	P_D	$T_C = 25^\circ\text{C}$	150	W
Case	T_J		-40 ... +150	$^\circ\text{C}$
	T_{JM}		150	$^\circ\text{C}$
	T_{stg}		-40 ... +150	$^\circ\text{C}$
	M_d	Mounting torque Terminal connection torque (M4)	1.5/13 1.5/13	Nm/lb.in. Nm/lb.in.
	Weight		30	g
	Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	$^\circ\text{C}$

Features

- International standard package miniBLOC
- Aluminium nitride isolation
- high power dissipation
- Isolation voltage 3000 V~
- Very high current, fast switching IGBT & FRED diode
- MOS Gate turn-on
- drive simplicity
- Low collector-to-case capacitance
- Low package inductance (< 10 nH)
- easy to drive and to protect

Applications

- AC motor speed control
- DC servo and robot drives
- DC choppers
- Buck converters

Advantages

- Easy to mount with 2 screws
- Space savings
- High power density

Symbol	Test Conditions	Characteristic Values ($T_J = 25^\circ\text{C}$, unless otherwise specified)		
		min.	typ.	max.
BV_{CES}	$I_C = 3 \text{ mA}$, $V_{GE} = 0 \text{ V}$	600		V
$V_{GE(th)}$	$I_C = 4 \text{ mA}$, $V_{CE} = V_{GE}$	4		V
I_{CES}	$V_{CE} = 0.8 \cdot V_{CES}$ $V_{GE} = 0 \text{ V}$			$350 \mu\text{A}$ 5 mA
I_{GES}	$V_{CE} = 0 \text{ V}$, $V_{GE} = \pm 20 \text{ V}$			$\pm 100 \text{ nA}$
$V_{CE(sat)}$	$I_C = I_{C90}$, $V_{GE} = 15 \text{ V}$	2.2	2.5	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, $t \leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$	16	27	S	
C_{ies}	$V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$, $f = 1\text{ MHz}$		3850	pF	
C_{oes}			440	pF	
C_{res}			50	pF	
Q_g	$I_C = I_{C90}$, $V_{GE} = 15\text{ V}$, $V_{CE} = 0.5 V_{CES}$		167	nC	
Q_{ge}			45	nC	
Q_{gc}			88	nC	
$t_{d(on)}$	Inductive load, $T_J = 25^\circ\text{C}$ $I_C = I_{C90}$, $V_{GE} = 15\text{ V}$, $L = 100\ \mu\text{H}$, $V_{CE} = 0.8 V_{CES}$, $R_G = R_{off} = 2.7\ \Omega$ Remarks: Switching times may increase for V_{CE} (Clamp) $> 0.8 \cdot V_{CES}$, higher T_J or increased R_G		70	ns	
t_{ri}			70	ns	
$t_{d(off)}$			150	300	ns
t_{fi}			150	300	ns
E_{off}			3.3	6.0	mJ
R_{thJC}					0.50
R_{thCK}		0.05		K/W	

miniBLOC, SOT-227 B


M4 screws (4x) supplied

Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	31.50	31.88	1.240	1.255
B	7.80	8.20	0.307	0.323
C	4.09	4.29	0.161	0.169
D	4.09	4.29	0.161	0.169
E	4.09	4.29	0.161	0.169
F	14.91	15.11	0.587	0.595
G	30.12	30.30	1.186	1.193
H	38.00	38.23	1.496	1.505
J	11.68	12.22	0.460	0.481
K	8.92	9.60	0.351	0.378
L	0.76	0.84	0.030	0.033
M	12.60	12.85	0.496	0.506
N	25.15	25.42	0.990	1.001
O	1.98	2.13	0.078	0.084
P	4.95	5.97	0.195	0.235
Q	26.54	26.90	1.045	1.059
R	3.94	4.42	0.155	0.174
S	4.72	4.85	0.186	0.191
T	24.59	25.07	0.968	0.987
U	-0.05	0.1	-0.002	0.004

Reverse Diode (FRED)

Symbol	Test Conditions	Characteristic Values ($T_J = 25^\circ\text{C}$, unless otherwise specified)	
		typ.	max.
I_R	$T_{VJ} = 25^\circ\text{C}$ $V_R = V_{RRM}$ $T_{VJ} = 150^\circ\text{C}$		650 μA 2.5 mA
V_F	$I_F = 60\text{ A}$ Pulse test, $t \leq 300\ \mu\text{s}$, duty cycle $d \leq 2\%$		1.75 V 2.40 V
I_{RM}	$I_F = I_{C90}$, $V_{GE} = 0\text{ V}$, $-di_F/dt = 100\text{ A}/\mu\text{s}$ $V_R = 540\text{ V}$, $T_J = 100^\circ\text{C}$		8.0 A
t_{rr}	$I_F = 1\text{ A}$, $-di_F/dt = 50\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$	35	ns
R_{thJC}			0.85 K/W

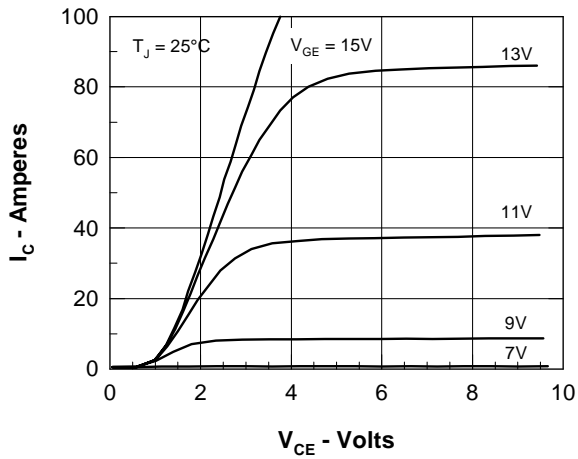


Figure 1. Saturation Voltage Characteristics

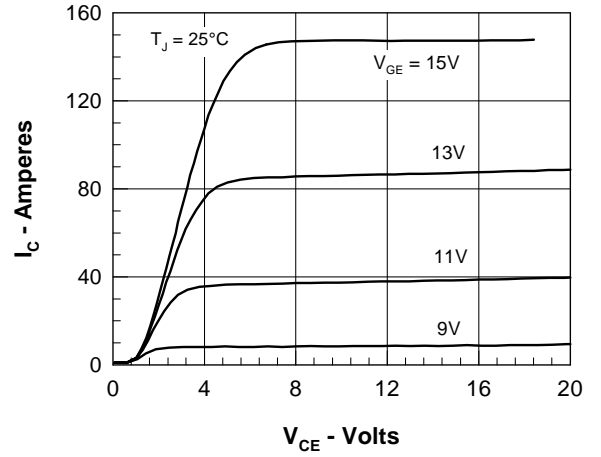


Figure 2. Extended Output Characteristics

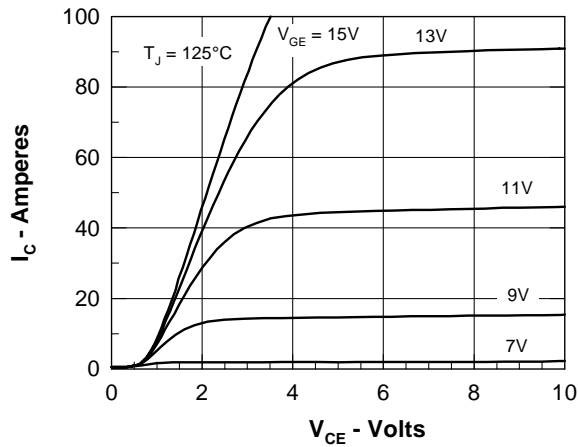


Figure 3. Saturation Voltage Characteristics

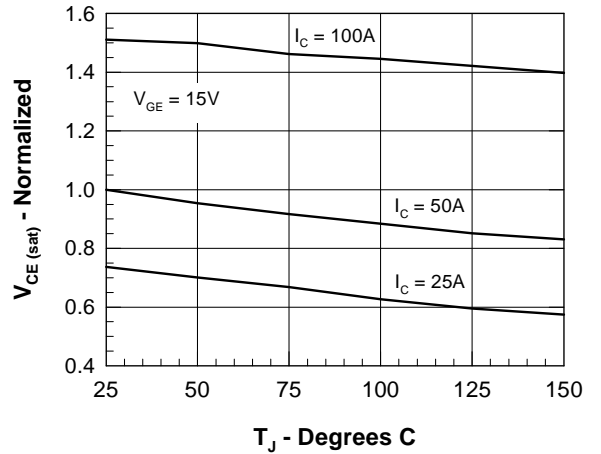


Figure 4. Temperature Dependence of $V_{CE(sat)}$

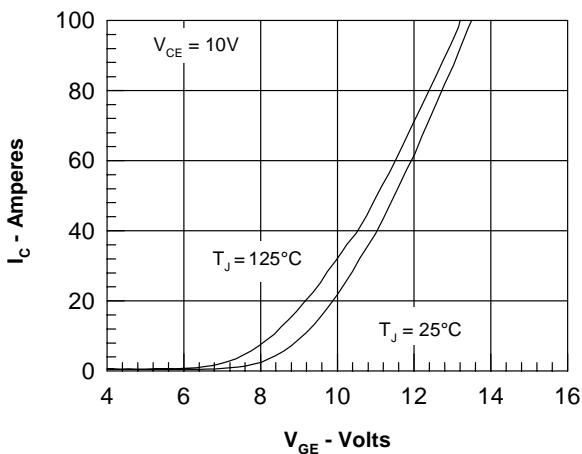


Figure 5. Admittance Curves

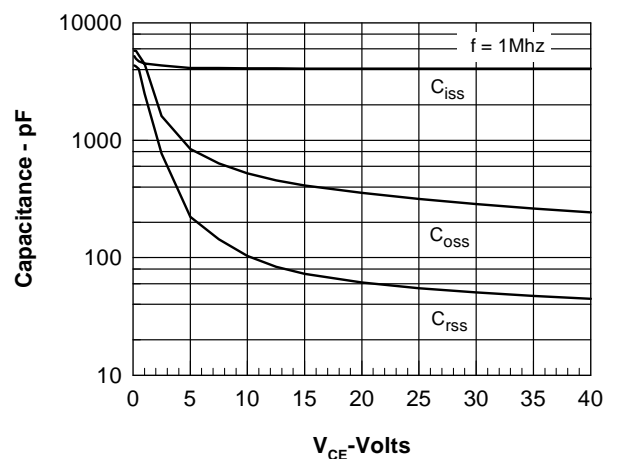


Figure 6. Capacitance Curves

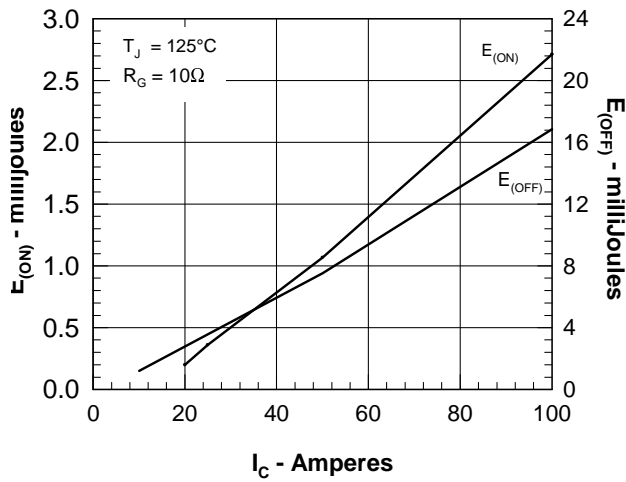


Figure 7. Dependence of E_{ON} and E_{OFF} on I_C .

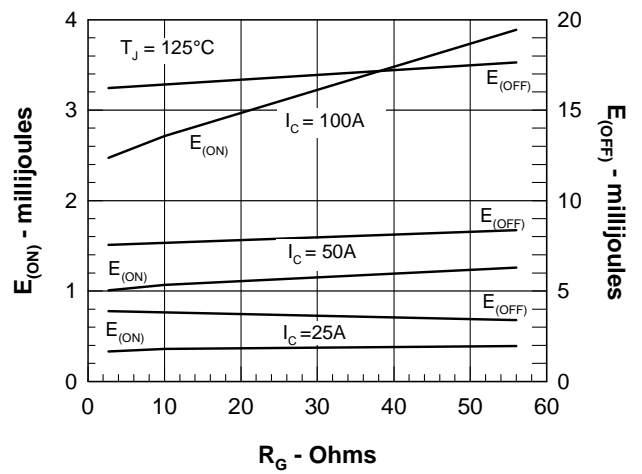


Figure 8. Dependence of E_{ON} and E_{OFF} on R_G .

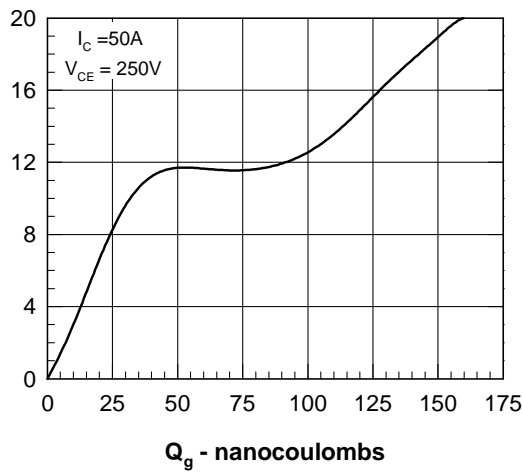


Figure 9. Gate Charge

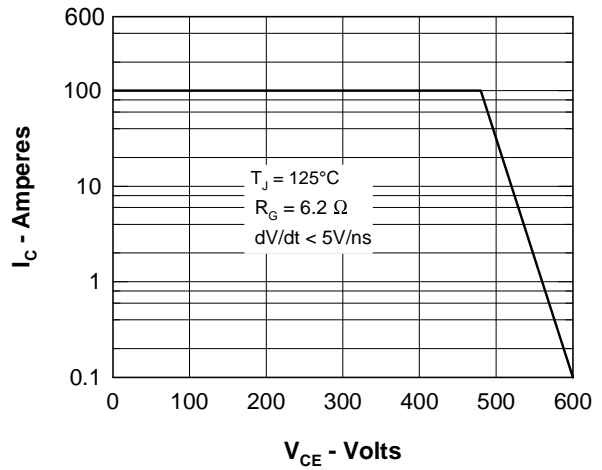


Figure 10. Turn-off Safe Operating Area

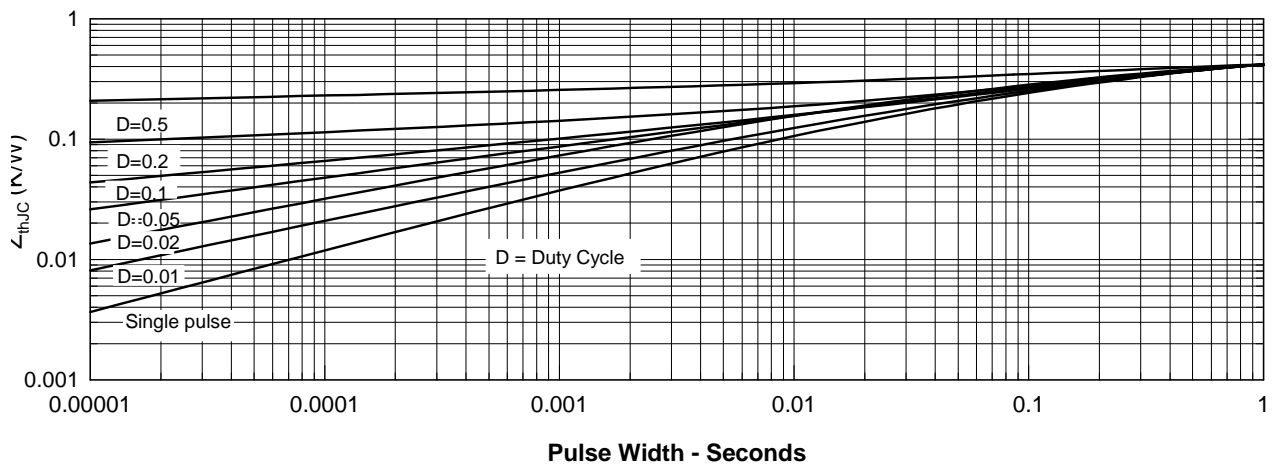


Figure 11. Transient Thermal Resistance

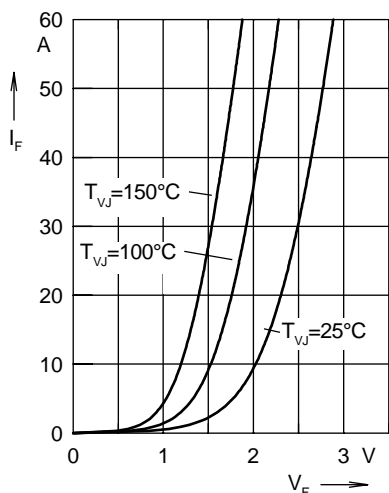


Fig. 12 Forward current I_F versus V_F

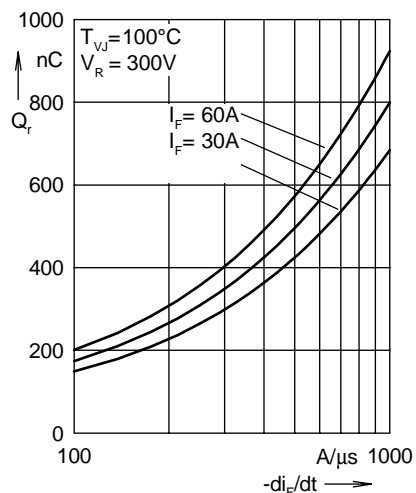


Fig. 13 Reverse recovery charge Q_r versus $-di_F/dt$

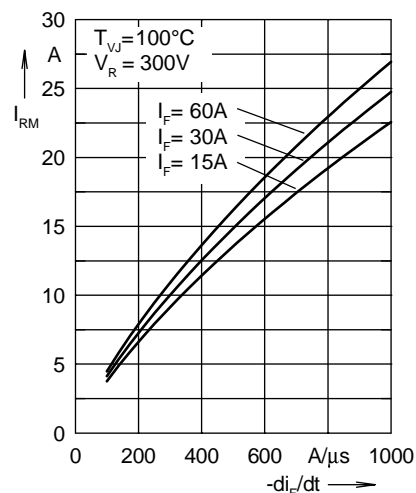


Fig. 14 Peak reverse current I_{RM} versus $-di_F/dt$

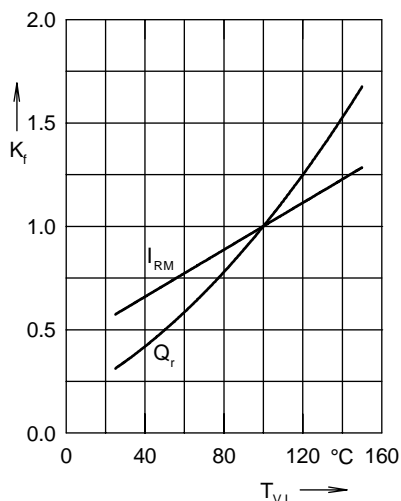


Fig. 15 Dynamic parameters Q_r , I_{RM} versus T_{VJ}

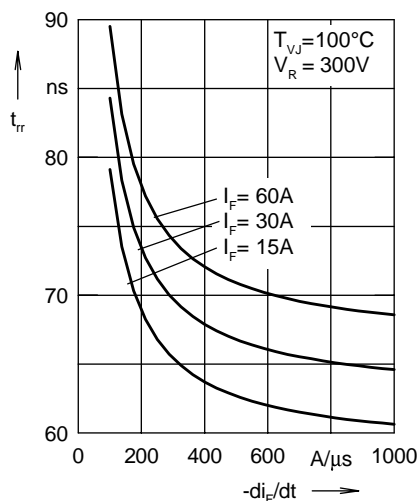


Fig. 16 Recovery time t_{rr} versus $-di_F/dt$

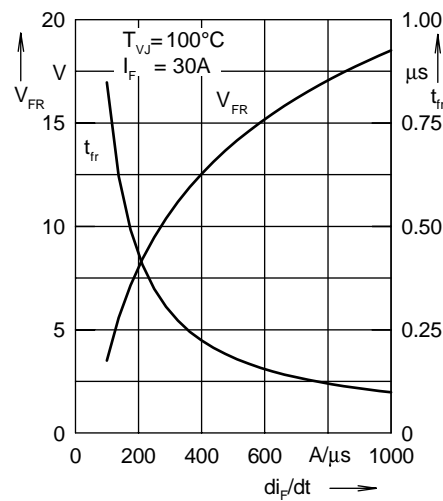
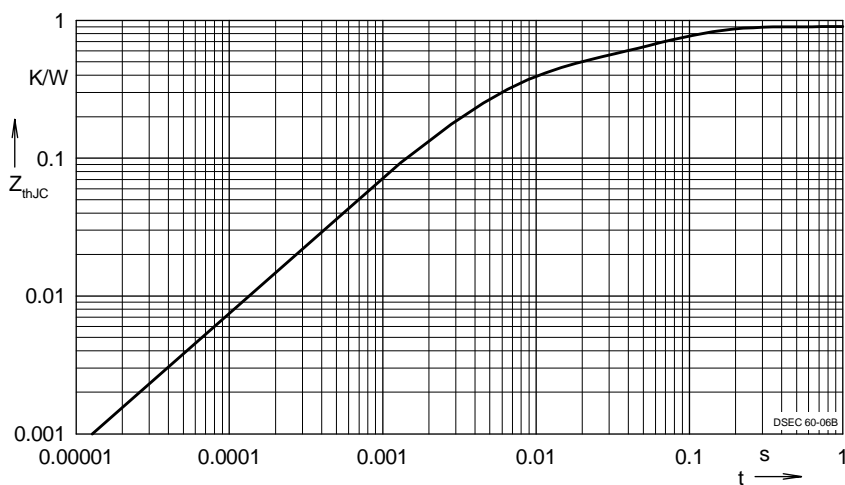


Fig. 17 Peak forward voltage V_{FR} and t_{fr} versus di_F/dt



Constants for Z_{thJC} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.465	0.0052
2	0.179	0.0003
3	0.256	0.0396