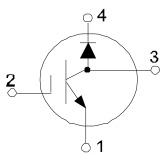
HIGH Speed IGBT with HiPerFRED

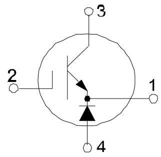
Short Circuit SOA Capability
Buck & boost configurations

Preliminary data

IXSN 50N60BD2
IXSN 50N60BD3



...BD2



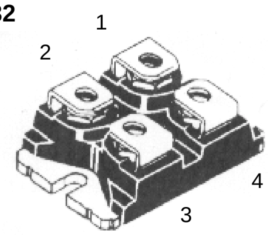
...BD3

V_{CES} = 600 V
I_{C25} = 75 A
$V_{CE(sat)}$ = 2.5 V
t_{fi} = 150 ns

	Symbol	Test Conditions	Maximum Ratings	
IGBT	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 = 22 Ω Clamped inductive load, L = 30 µH	I_{CM} = 100 @ 0.8 V_{CES}	A
	t_{SC} **(SCSOA)**	V_{GE} = 15 V, V_{CE} = 360 V, T_J = 125°C R_G = 22 Ω, non repetitive	10	µs
	P_C	T_C = 25°C	250	W
Diode	V_{RRM}		600	V
	I_{FAVM}	T_C = 70°C; rectangular, d = 50%	60	A
	I_{FRM}	t_P z<10 ms; pulse width limited by T_J	600	A
	P_D	T_C = 25°C	150	W
Case	T_J		-40 ... +150	°C
	T_{JM}		150	°C
	T_{stg}		-40 ... +150	°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	°C

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		Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
BV_{CES}	I_C = 3 mA, V_{GE} = 0 V		600			V
$V_{GE(th)}$	I_C = 4 mA, V_{CE} = V_{GE}		4		8	V
I_{CES}	V_{CE} = 0.8 • V_{CES}	T_J = 25°C			350	µA
	V_{GE} = 0 V	T_J = 125°C			5	mA
I_{GES}	V_{CE} = 0 V, V_{GE} = ±20 V				±100	nA
$V_{CE(sat)}$	I_C = I_{C90}, V_{GE} = 15 V			2.2	2.5	V

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

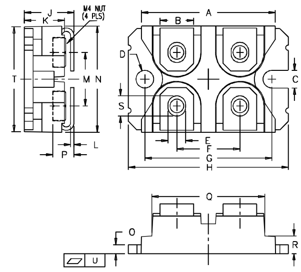
- Easy to mount with 2 screws
- Space savings
- High power density

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

98675 (4/18/2000)

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 %	16	27		S
C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz		3850		pF
C_{oes}			440		pF
C_{res}			50		pF
Q_g	I_C = I_{C90}, V_{GE} = 15 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°C**		70		ns
t_{ri}	I_C = I_{C90}, V_{GE} = 15 V, L = 100 µH, V_{CE} = 0.8 V_{CES}, R_G = R_{off} = 2.7 Ω		70		ns
$t_{d(off)}$	Remarks: Switching times may increase		150	300	ns
t_{fi}	for V_{CE} (Clamp) > 0.8 • V_{CES}, higher T_J or		150	300	ns
E_{off}	increased R_G		3.3	6.0	mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C**		70		ns
t_{ri}	I_C = I_{C90}, V_{GE} = 15 V, L = 100 µH		70		ns
E_{on}	V_{CE} = 0.8 V_{CES}, R_G = R_{off} = 2.7 Ω		2.5		mJ
$t_{d(off)}$	Remarks: Switching times may increase		230		ns
t_{fi}	for V_{CE} (Clamp) > 0.8 • V_{CES}, higher T_J or		230		ns
E_{off}	increased R_G		4.8		mJ
R_{thJC}				0.50	K/W
R_{thCK}			0.05		K/W

miniBLOC, SOT-227 B



M4 screws (4x) supplied

Dim.	Millimeter Min.	Millimeter Max.	Inches Min.	Inches 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)

Characteristic Values (T_J = 25°C, unless otherwise specified)

Symbol	Test Conditions	typ.	max.	
I_R	T_{VJ} = 25°C V_R= V_{RRM}		650	uA
	T_{VJ} = 150°C		2.5	mA
V_F	I_F = 60 A		1.75	V
	Pulse test, t ≤ 300 µs, duty cycle d ≤ 2 %		2.40	V
I_{RM}	I_F = I_{C90}, V_{GE} = 0 V, -di_F/dt = 100 A/µs, V_R = 540 V, T_J = 100°C		8.0	A
t_{rr}	I_F = 1 A, -di/dt = 50 A/µs, V_R = 30 V	35		ns
R_{thJC}			0.85	K/W

IXYS MOSFETS and IGBTs are covered by one or more of the following U.S. patents:
4,835,592 4,881,106 5,017,508 5,049,961 5,187,117 5,486,715
4,850,072 4,931,844 5,034,796 5,063,307 5,237,481 5,381,025

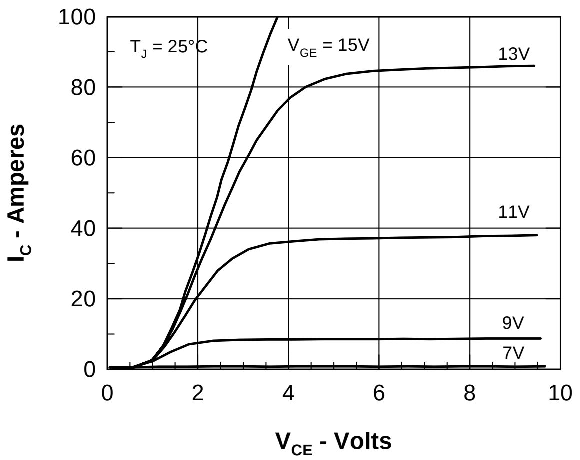


Figure 1. Saturation Voltage Characteristics

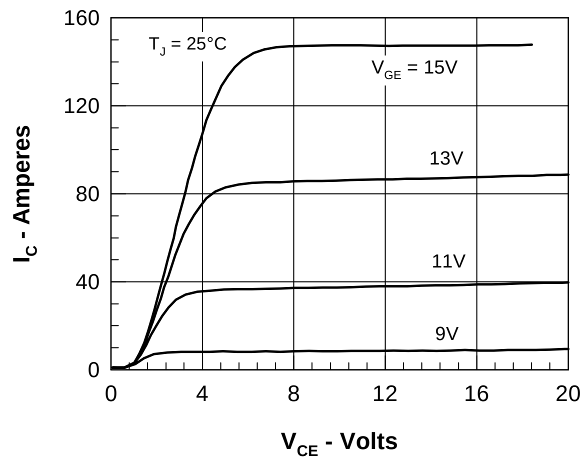


Figure 2. Extended Output Characteristics

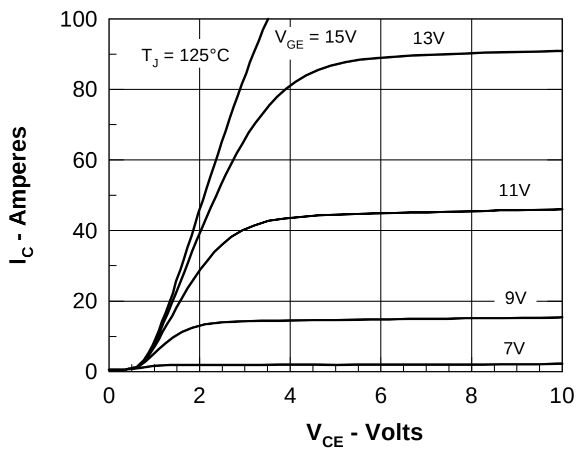


Figure 3. Saturation Voltage Characteristics

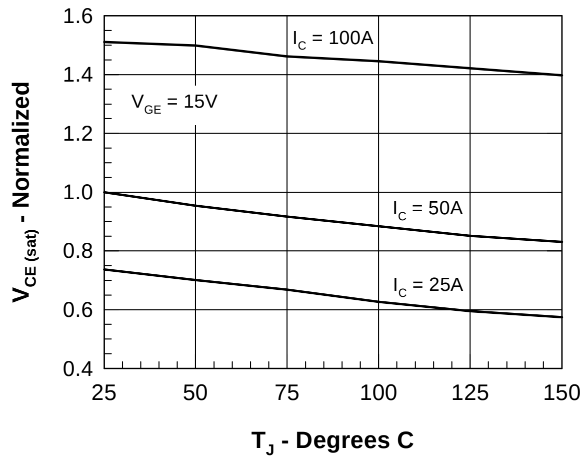


Figure 4. Temperature Dependence of $V_{CE(sat)}$

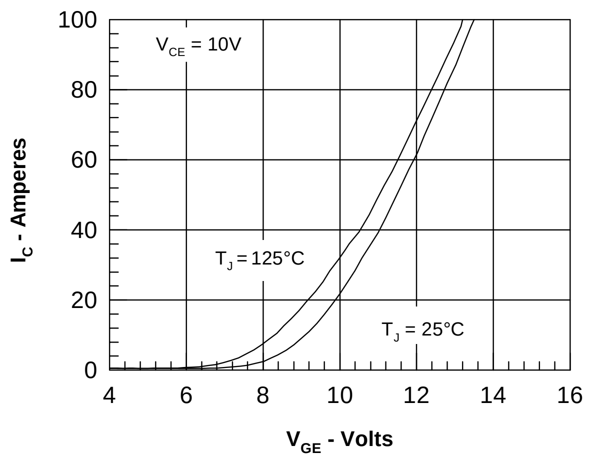


Figure 5. Admittance Curves

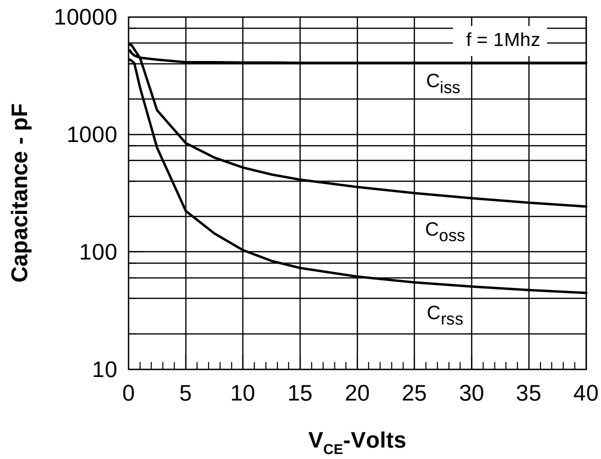


Figure 6. Capacitance Curves

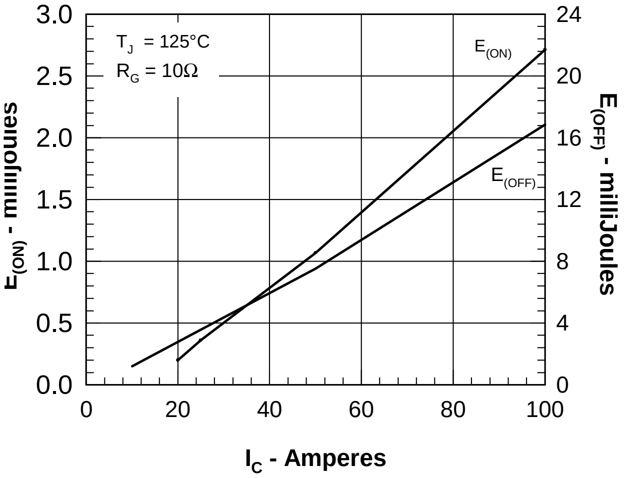


Figure 7. Dependence of E_{ON} and E_{OFF} on I_C.

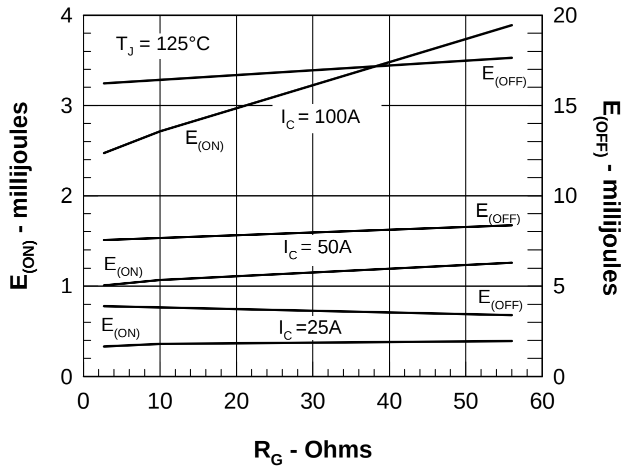


Figure 8. Dependence of E_{ON} and E_{OFF} on R_G.

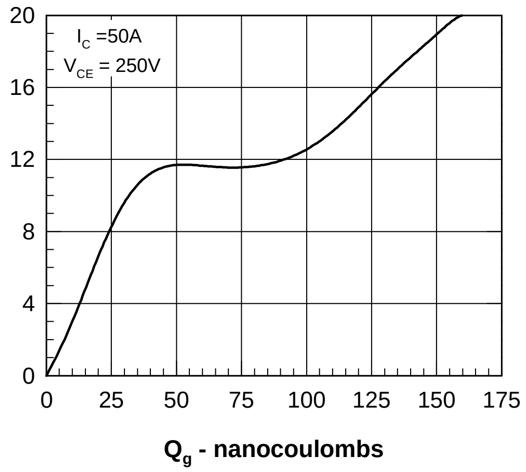


Figure 9. Gate Charge

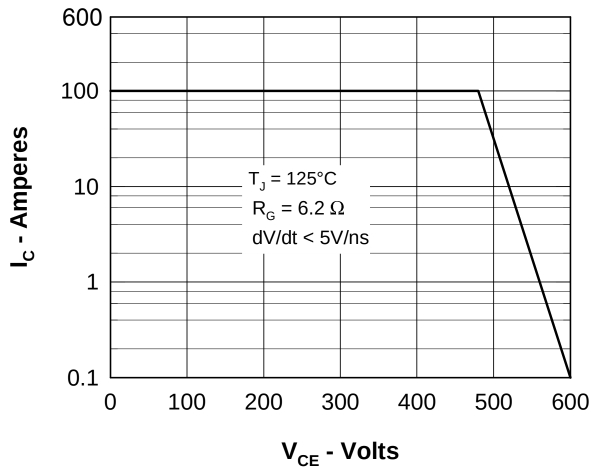


Figure 10. Turn-off Safe Operating Area

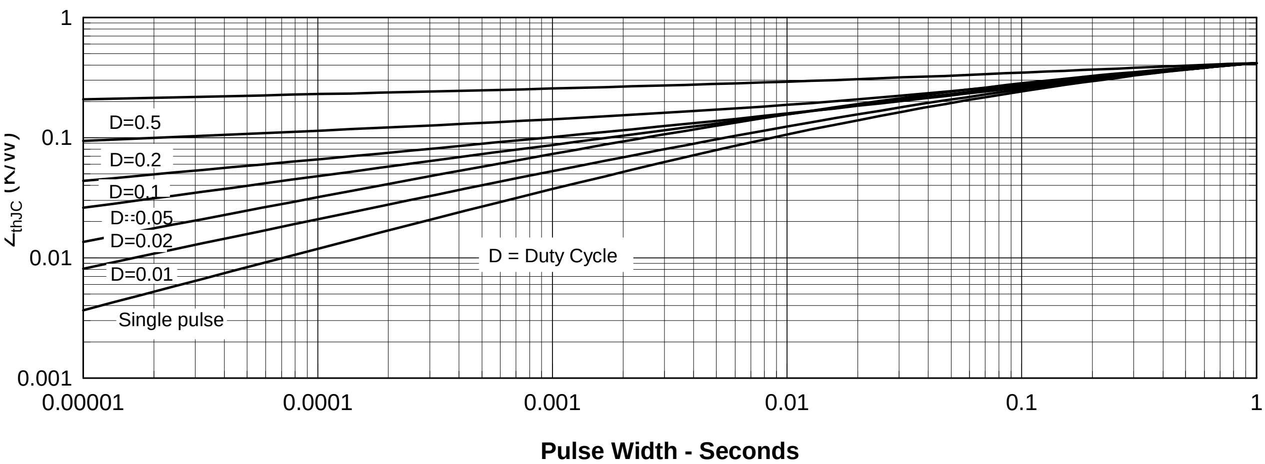


Figure 11. Transient Thermal Resistance

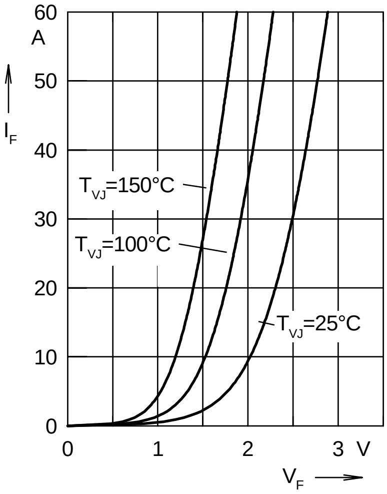


Fig. 12 Forward current I_F versus V_F

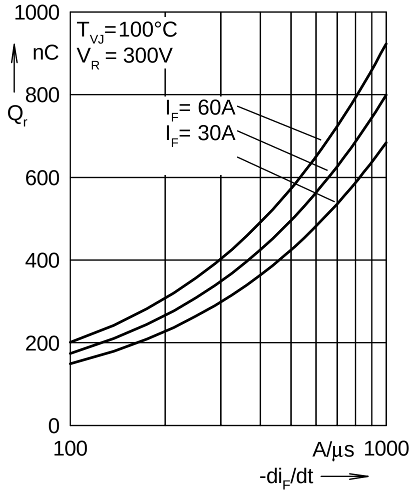


Fig. 13 Reverse recovery charge Q_r versus $-di_F/dt$

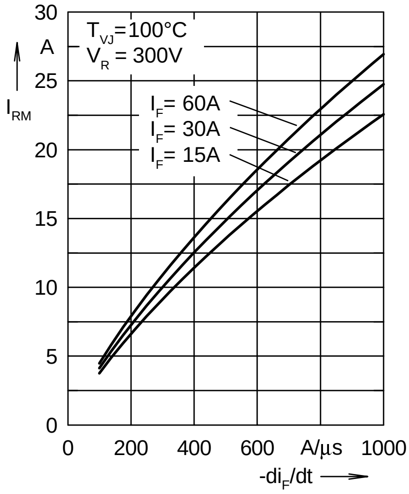


Fig. 14 Peak reverse current I_{RM} versus $-di_F/dt$

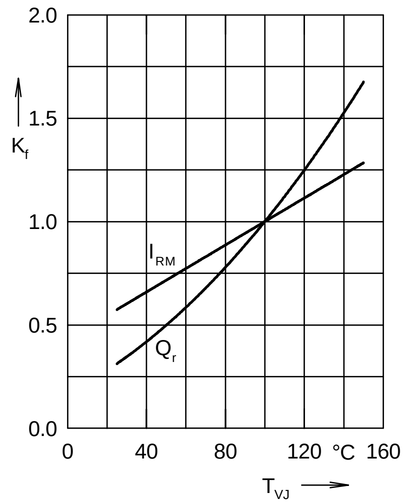


Fig. 15 Dynamic parameters Q_r, I_{RM} versus T_{VJ}

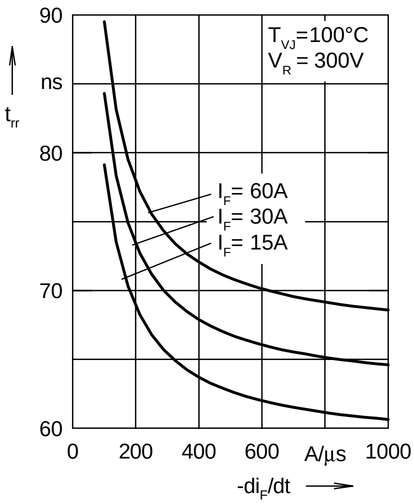


Fig. 16 Recovery time t_{rr} versus $-di_F/dt$

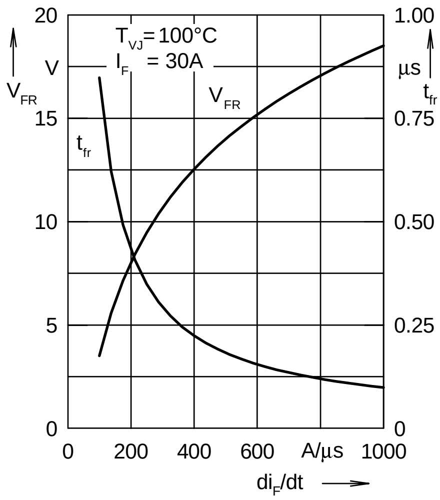
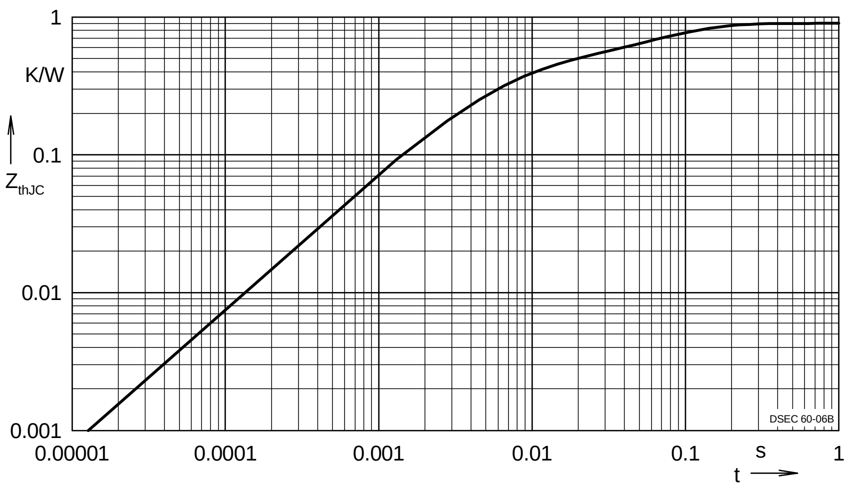


Fig. 17 Peak forward voltage V_{FR} and t_{fr} versus di_F/dt



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