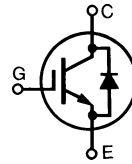


HiPerFAST™ IGBT with Diode

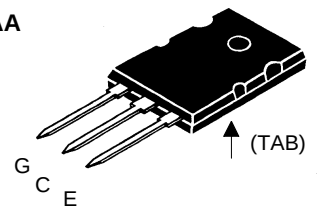
IXGK 50N60BD1
IXGX 50N60BD1

$V_{CES} = 600 \text{ V}$
 $I_{C25} = 75 \text{ A}$
 $V_{CE(sat)} = 2.3 \text{ V}$
 $t_{fi} = 85 \text{ ns}$

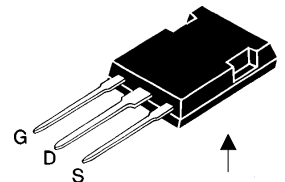


Symbol	Test Conditions	Maximum Ratings	
V_{CES}	$T_J = 25^\circ\text{C to } 150^\circ\text{C}$	600	V
V_{CGR}	$T_J = 25^\circ\text{C to } 150^\circ\text{C}; R_{GE} = 1 \text{ M}\Omega$	600	V
V_{GES}	Continuous	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	$T_C = 25^\circ\text{C}$	75	A
I_{C90}	$T_C = 90^\circ\text{C}$	50	A
I_{CM}	$T_C = 25^\circ\text{C}, 1 \text{ ms}$	200	A
SSOA (RBSOA)	$V_{GE} = 15 \text{ V}, T_{VJ} = 125^\circ\text{C}, R_G = 10 \Omega$ Clamped inductive load, $L = 30 \mu\text{H}$	$I_{CM} = 100$ @ $0.8 V_{CES}$	A
P_C	$T_C = 25^\circ\text{C}$	300	W
T_J		-55 ... +150	$^\circ\text{C}$
T_{JM}		150	$^\circ\text{C}$
T_{stg}		-55 ... +150	$^\circ\text{C}$
M_d	Mounting torque, TO-247 AD	1.13/10	Nm/lb.in.
Weight	TO-264	10	g
	TO-268	5	g
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	$^\circ\text{C}$

TO-264 AA
(IXGK)



PLUS247
(IXGX)



G = Gate C = Collector
E = Emitter Tab = Collector

Features

- International standard packages JEDEC TO-268 and PLUS247 (hole-less TO-247)
- High frequency IGBT and antiparallel FRED in one package
- New generation HDMOS™ process
- High current handling capability
- MOS Gate turn-on for drive simplicity
- Fast Recovery Epitaxial Diode (FRED) with soft recovery and low I_{RM}

Applications

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

Advantages

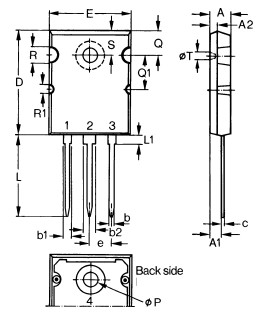
- Space savings (two devices on one package)
- Easy to mount with 1 screw

Symbol	Test Conditions	Characteristic Values ($T_J = 25^\circ\text{C}$, unless otherwise specified)		
		Min.	Typ.	Max.
BV_{CES}	$I_C = 1 \text{ mA}, V_{GE} = 0 \text{ V}$	500		V
$V_{GE(th)}$	$I_C = 500 \mu\text{A}, V_{CE} = V_{GE}$	2.5		5.5 V
I_{CES}	$V_{CE} = V_{CES}$ $V_{GE} = 0 \text{ V}$			650 μA 5 mA
I_{GES}	$V_{CE} = 0 \text{ V}, V_{GE} = \pm 20 \text{ V}$			$\pm 100 \text{ nA}$
$V_{CE(sat)}$	$I_C = I_{C90}, V_{GE} = 15 \text{ V}$			2.3 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 $\leq 2\%$	25	35	S
C_{ies}	$V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$, $f = 1\text{ MHz}$		4000	pF
C_{oes}			340	pF
C_{res}			100	pF
Q_g	$I_C = I_{C90}$, $V_{GE} = 15\text{ V}$, $V_{CE} = 0.5 V_{CES}$		110	nC
Q_{ge}			30	nC
Q_{gc}			35	nC
$t_{d(on)}$	Inductive load, $T_J = 25^\circ\text{C}$ $I_C = I_{C90}$, $V_{GE} = 15\text{ V}$, $L = 100\text{ }\mu\text{H}$, $V_{CE} = 0.8 V_{CES}$, $R_G = R_{off} = 2.7\text{ }\Omega$ Remarks: Switching times may increase for V_{CE} (Clamp) $> 0.8 \cdot V_{CES}$, higher T_J or increased R_G		50	ns
t_{ri}			50	ns
$t_{d(off)}$			200	ns
t_{fi}			85	ns
E_{off}			150	ns
			1.5	mJ
$t_{d(on)}$	Inductive load, $T_J = 125^\circ\text{C}$ $I_C = I_{C90}$, $V_{GE} = 15\text{ V}$, $L = 100\text{ }\mu\text{H}$, $V_{CE} = 0.8 V_{CES}$, $R_G = R_{off} = 2.7\text{ }\Omega$ Remarks: Switching times may increase for V_{CE} (Clamp) $> 0.8 \cdot V_{CES}$, higher T_J or increased R_G		50	ns
t_{ri}			60	ns
E_{on}			3	mJ
$t_{d(off)}$			200	ns
t_{fi}			175	ns
E_{off}			2.5	mJ
R_{thJC}	TO-264 package			0.42 K/W
R_{thCK}			0.15	K/W

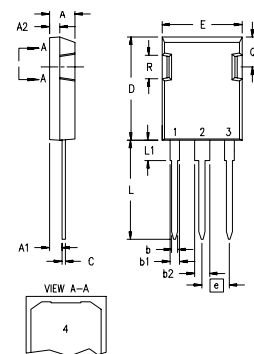
Symbol	Test Conditions	Characteristic Values ($T_J = 25^\circ\text{C}$, unless otherwise specified)		
		min.	typ.	max.
V_F	$I_F = I_{C90}$, $V_{GE} = 0\text{ V}$, Pulse test, $t \leq 300\text{ ms}$, duty cycle $\leq 22\%$			2.5 V
I_{RM}	$I_F = I_{C90}$, $V_{GE} = 0\text{ V}$, $-di_F/dt = 100\text{ A/ms}$, $V_R = 100\text{ V}$	2	2.5	A
t_{rr}	$I_F = 1\text{ A}$; $-di_F/dt = 200\text{ A/ms}$; $V_R = 30\text{ V}$	35	50	ns
R_{thJC}				0.65 K/W

TO-264 AA Outline



Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.82	5.13	.190	.202
A1	2.54	2.89	.100	.114
A2	2.00	2.10	.079	.083
b	1.12	1.42	.044	.056
b1	2.39	2.69	.094	.106
b2	2.90	3.09	.114	.122
c	0.53	0.83	.021	.033
D	25.91	26.16	1.020	1.030
E	19.81	19.96	.780	.786
e	5.46 BSC		.215 BSC	
J	0.00	0.25	.000	.010
K	0.00	0.25	.000	.010
L	20.32	20.83	.800	.820
L1	2.29	2.59	.090	.102
P	3.17	3.66	.125	.144
Q	6.07	6.27	.239	.247
Q1	8.38	8.69	.330	.342
R	3.81	4.32	.150	.170
R1	1.78	2.29	.070	.090
S	6.04	6.30	.238	.248
T	1.57	1.83	.062	.072

PLUS247™ (IXGX)



Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.83	5.21	.190	.205
A1	2.29	2.54	.090	.100
A2	1.91	2.16	.075	.085
b	1.14	1.40	.045	.055
b1	1.91	2.13	.075	.084
b2	2.92	3.12	.115	.123
C	0.61	0.80	.024	.031
D	20.80	21.34	.819	.840
E	15.75	16.13	.620	.635
e	5.45 BSC		.215 BSC	
L	19.81	20.32	.780	.800
L1	3.81	4.32	.150	.170
Q	5.59	6.20	.220	.244
R	4.32	4.83	.170	.190

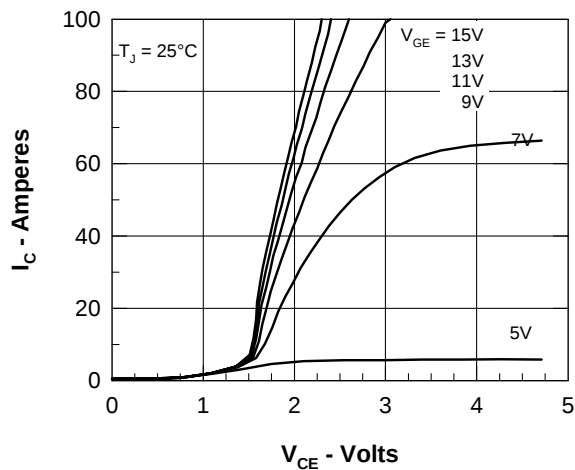


Figure 1. Saturation Voltage Characteristics

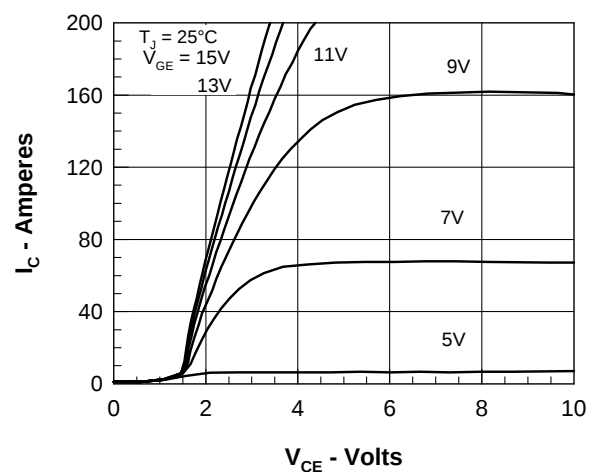


Figure 2. Extended Output Characteristics

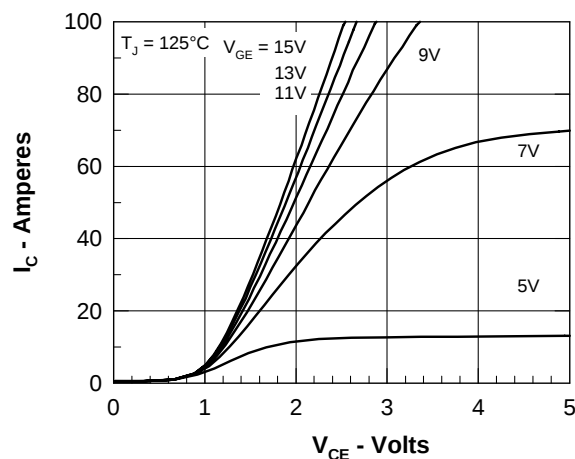


Figure 3. Saturation Voltage Characteristics

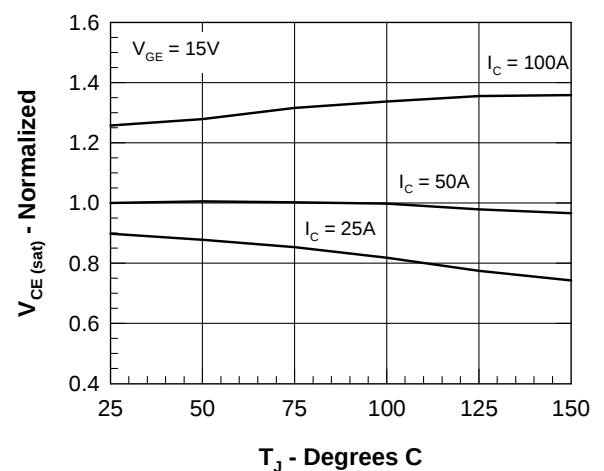


Figure 4. Temperature Dependence of $V_{CE(sat)}$

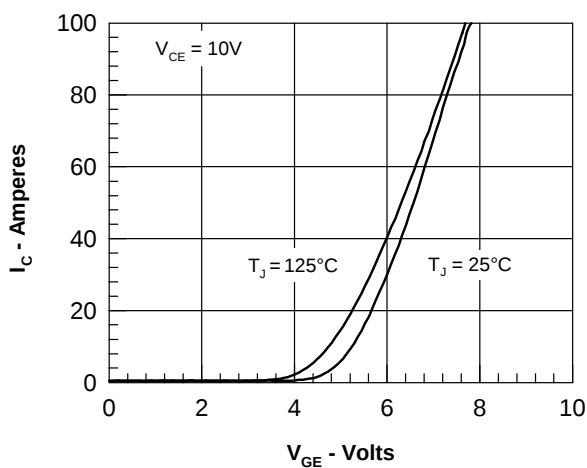


Figure 5. Admittance Curves

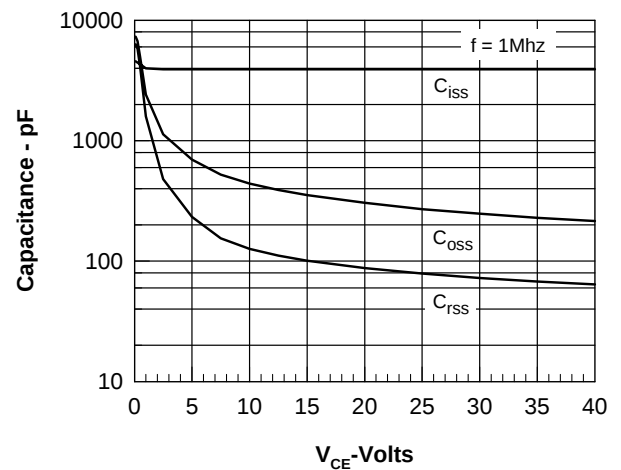


Figure 6. Capacitance Curves

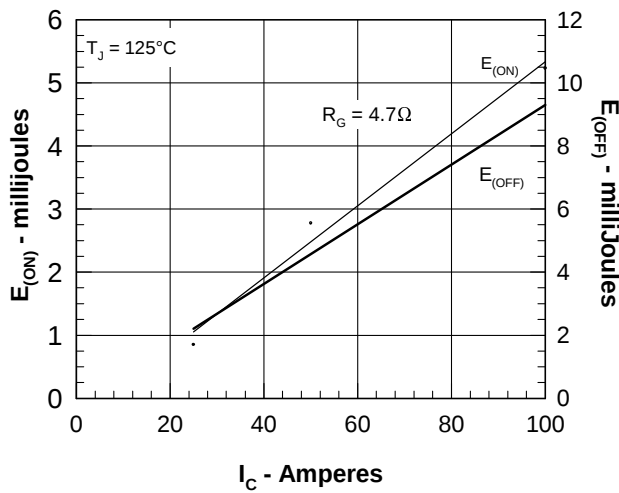


Figure 7. Dependence of E_{ON} and E_{OFF} on I_C .

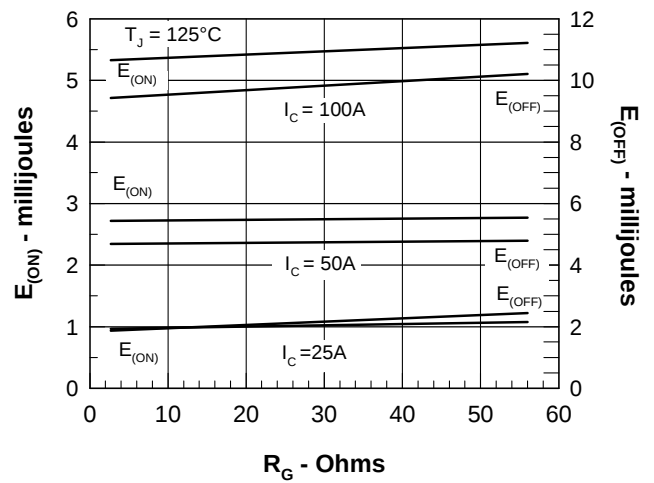


Figure 8. Dependence of E_{ON} and E_{OFF} on R_G .

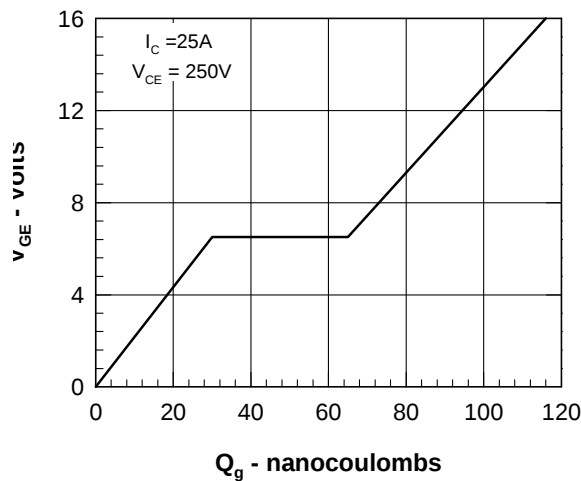


Figure 9. Gate Charge

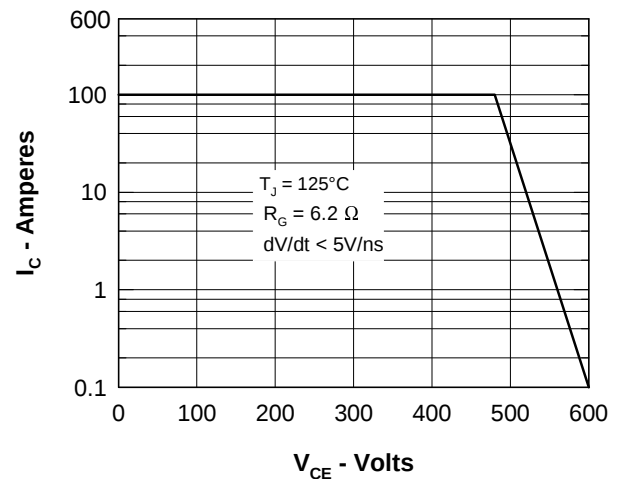


Figure 10. Turn-off Safe Operating Area

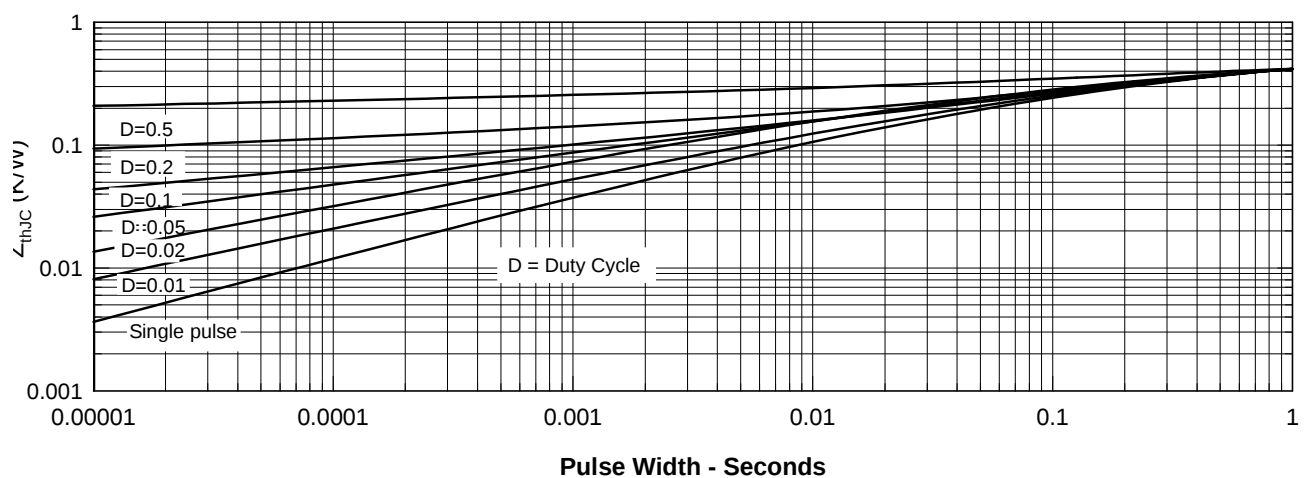


Figure 11. IGBT Transient Thermal Resistance

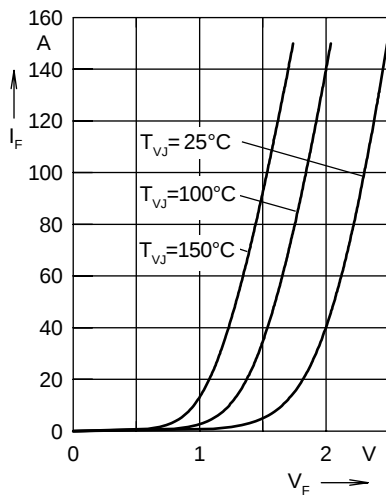


Fig. 12. Forward current I_F versus V_F

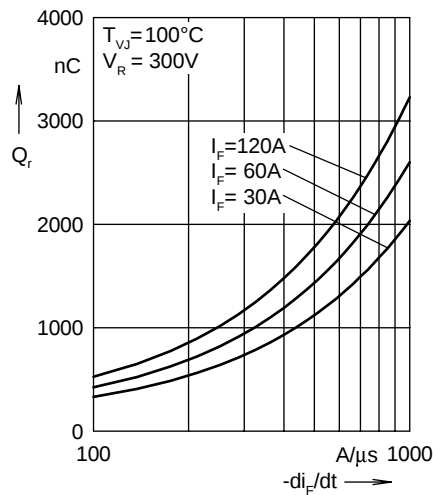


Fig. 13. Reverse recovery charge Q_r versus $-di_F/dt$

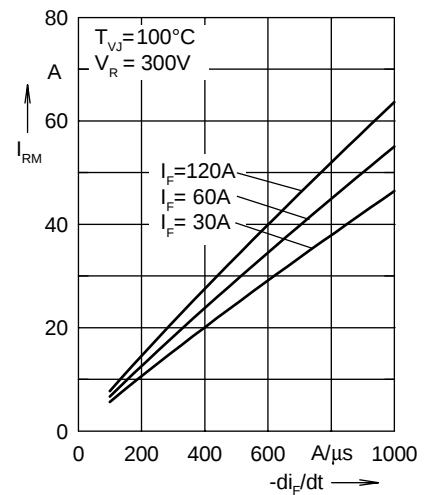


Fig. 14. Peak reverse current I_{RM} versus $-di_F/dt$

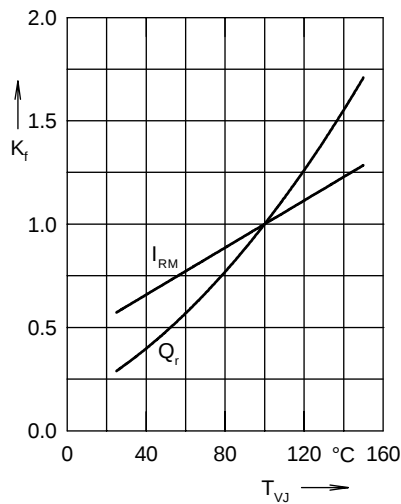


Fig. 15. Dynamic parameters Q_r , I_{RM} versus T_{VJ}

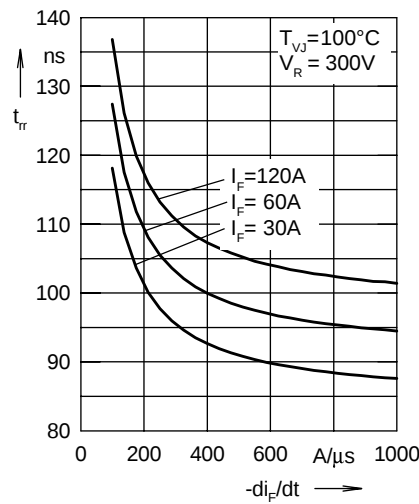


Fig. 16. Recovery time t_{rr} versus $-di_F/dt$

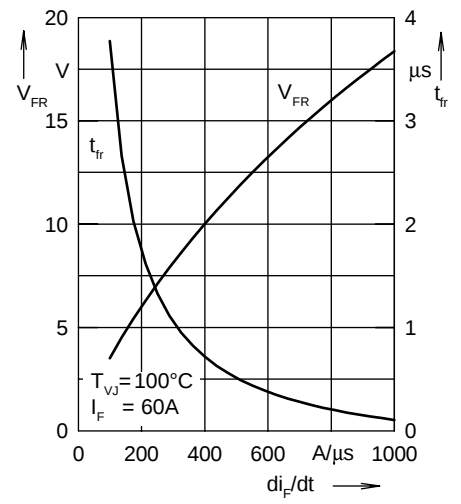


Fig. 17. Peak forward voltage V_{FR} and t_{rr} versus di_F/dt

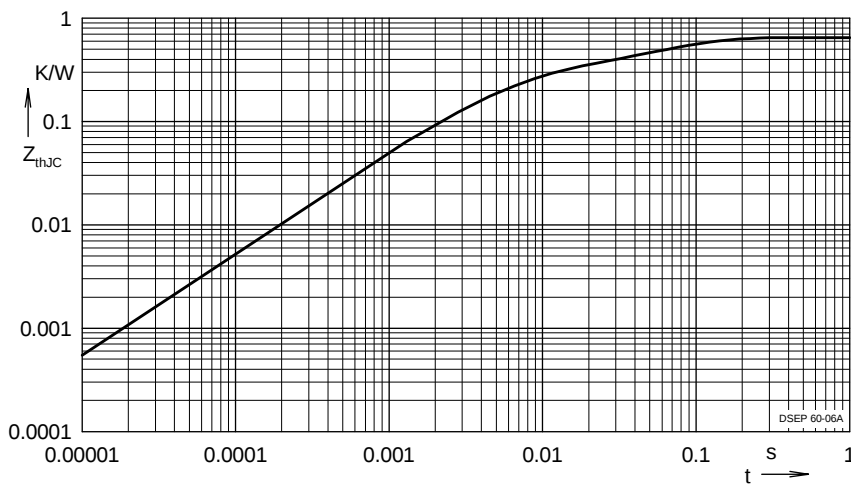


Fig. 18. Transient thermal resistance junction to case

Constants for Z_{thJC} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.324	0.0052
2	0.125	0.0003
3	0.201	0.0385