



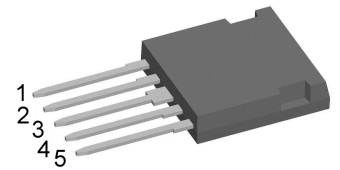
# HiPerFRED

$V_{RRM} = 600\text{ V}$   
 $I_{DAV} = 22\text{ A}$   
 $t_{rr} = 30\text{ ns}$

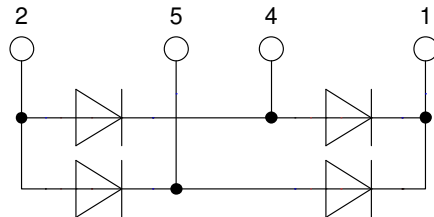
High Performance Fast Recovery Diode  
 Low Loss and Soft Recovery  
 1~ Rectifier Bridge

Part number

**FBE22-06N1**



Backside: isolated



### Features / Advantages:

- Planar passivated chips
- Very low leakage current
- Very short recovery time
- Improved thermal behaviour
- Very low  $I_{rm}$ -values
- Very soft recovery behaviour
- Avalanche voltage rated for reliable operation
- Soft reverse recovery for low EMI/RFI
- Low  $I_{rm}$  reduces:
  - Power dissipation within the diode
  - Turn-on loss in the commutating switch

### Applications:

- Rectifiers in switch mode power supplies (SMPS)

### Package: i4-Pac

- Isolation Voltage: 3000 V~
- Industry convenient outline
- RoHS compliant
- Epoxy meets UL 94V-0
- Soldering pins for PCB mounting
- Backside: DCB ceramic
- Reduced weight
- Advanced power cycling

### Disclaimer Notice

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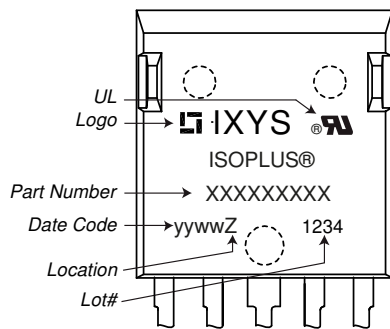


Fast Diode				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
$V_{RSM}$	max. non-repetitive reverse blocking voltage					600	V
$V_{RRM}$	max. repetitive reverse blocking voltage					600	V
$I_R$	reverse current, drain current	$V_R = 600\text{ V}$		$T_{VJ} = 25^\circ\text{C}$		60	$\mu\text{A}$
		$V_R = 600\text{ V}$		$T_{VJ} = 150^\circ\text{C}$		0.25	mA
$V_F$	forward voltage drop	$I_F = 11\text{ A}$		$T_{VJ} = 25^\circ\text{C}$		2.13	V
		$I_F = 22\text{ A}$				2.35	V
		$I_F = 11\text{ A}$		$T_{VJ} = 150^\circ\text{C}$		1.44	V
		$I_F = 22\text{ A}$				1.71	V
$I_{DAV}$	bridge output current	$T_C = 115^\circ\text{C}$	rectangular	$T_{VJ} = 175^\circ\text{C}$		22	A
$V_{FO}$	threshold voltage	} for power loss calculation only		$T_{VJ} = 175^\circ\text{C}$		1.04	V
$r_F$	slope resistance					24	m $\Omega$
$R_{thJC}$	thermal resistance junction to case					3	K/W
$R_{thCH}$	thermal resistance case to heatsink				0.2		K/W
$P_{tot}$	total power dissipation			$T_C = 25^\circ\text{C}$		50	W
$I_{FSM}$	max. forward surge current	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}; V_R = 0\text{ V}$		$T_{VJ} = 45^\circ\text{C}$		50	A
$C_J$	junction capacitance	$V_R = 400\text{ V}$ $f = 1\text{ MHz}$		$T_{VJ} = 25^\circ\text{C}$		6	pF
$I_{RM}$	max. reverse recovery current	} $I_F = 10\text{ A}; V_R = 300\text{ V}$		$T_{VJ} = 25^\circ\text{C}$		3.5	A
				$T_{VJ} = 100^\circ\text{C}$		6	A
$t_{rr}$	reverse recovery time	} $-di_F/dt = 200\text{ A}/\mu\text{s}$		$T_{VJ} = 25^\circ\text{C}$		30	ns
				$T_{VJ} = 100^\circ\text{C}$		90	ns



Package i4-Pac		Ratings				
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$I_{RMS}$	RMS current	per terminal			35	A
$T_{VJ}$	virtual junction temperature		-55		175	°C
$T_{op}$	operation temperature		-55		150	°C
$T_{stg}$	storage temperature		-55		150	°C
<b>Weight</b>				6		g
$F_C$	mounting force with clip		20		120	N
$d_{Spp/ App}$	creepage distance on surface / striking distance through air	terminal to terminal	1.7			mm
$d_{Spb/ Apb}$		terminal to backside	5.1			mm
$V_{ISOL}$	isolation voltage	t = 1 second	3000			V
		t = 1 minute	2500			V

**Product Marking**



Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	FBE22-06N1	FBE22-06N1	Tube	25	484954

**Equivalent Circuits for Simulation**

*\* on die level*

$T_{VJ} = 175^{\circ}C$



**Fast Diode**

$V_{0\ max}$	threshold voltage	1.04	V
$R_{0\ max}$	slope resistance *	21	mΩ

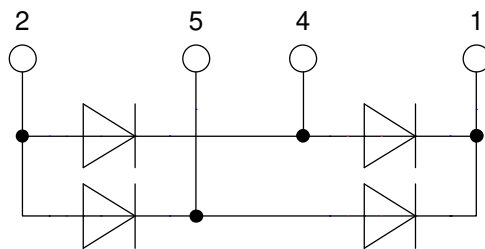


**Outlines i4-Pac**



Dim.	Millimeter		Inches	
	min	max	min	max
A	4.83	5.21	0.190	0.205
A1	2.59	3.00	0.102	0.118
A2	1.17	2.16	0.046	0.085
b	1.14	1.40	0.045	0.055
b2	1.47	1.73	0.058	0.068
b4	2.54	2.79	0.100	0.110
c	0.51	0.74	0.020	0.029
D	20.80	21.34	0.819	0.840
D1	14.99	15.75	0.590	0.620
D2	1.65	2.03	0.065	0.080
D3	20.30	20.70	0.799	0.815
E	19.56	20.29	0.770	0.799
E1	16.76	17.53	0.660	0.690
e	3.81 BSC		0.150 BSC	
L	19.81	21.34	0.780	0.840
L1	2.11	2.59	0.083	0.102
Q	5.33	6.20	0.210	0.244
R	2.54	4.57	0.100	0.180
W	-	0.10	-	0.004

Die konvexe Form des Substrates ist typ. < 0.05 mm über der Kunststoffoberfläche der Bauteilunterseite  
The convexbow of substrate is typ. < 0.05 mm over plastic surface level of device bottom side



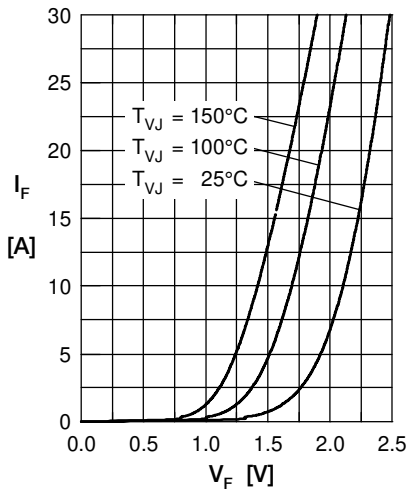
**Fast Diode**


Fig. 1 Forward current  $I_F$  versus  $V_F$

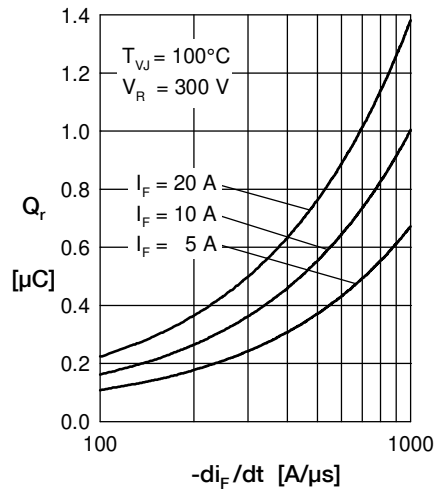


Fig. 2 Typ. reverse recov. charge  $Q_r$  versus  $-di_F/dt$

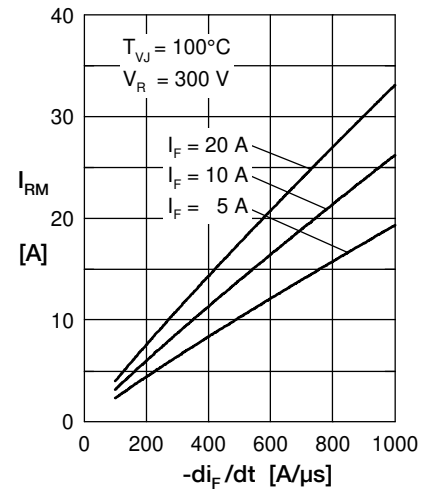


Fig. 3 Typ. peak reverse current  $I_{RM}$  versus  $-di_F/dt$

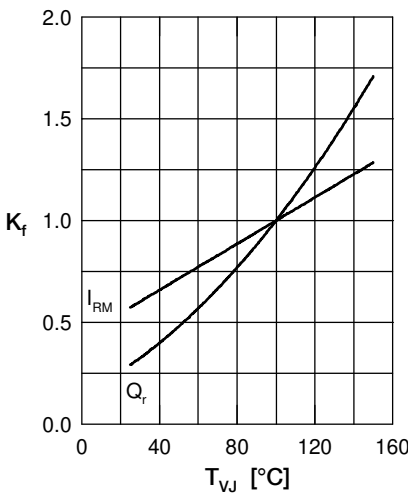


Fig. 4 Dynamic parameters  $Q_r$ ,  $I_{RM}$  versus  $T_{VJ}$

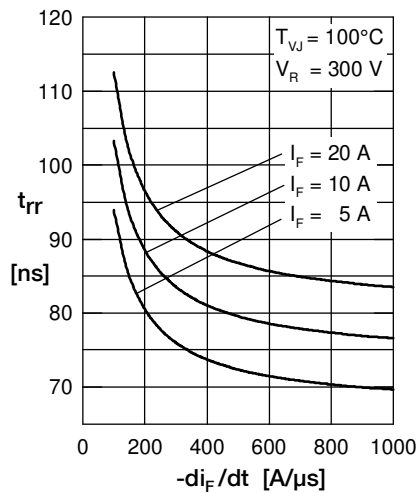


Fig. 5 Typ. recovery time  $t_{rr}$  versus  $-di_F/dt$

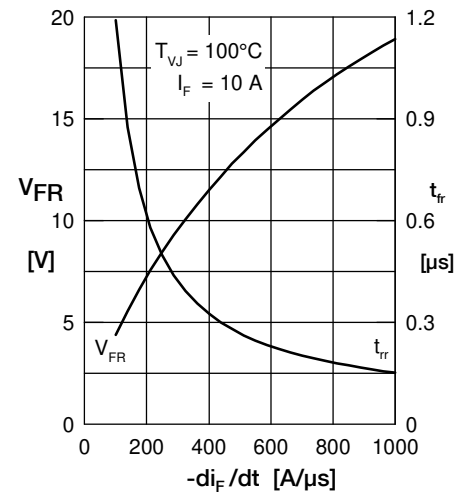


Fig. 6 Typ. peak forward voltage  $V_{FR}$  and  $t_{rr}$  versus  $di_F/dt$

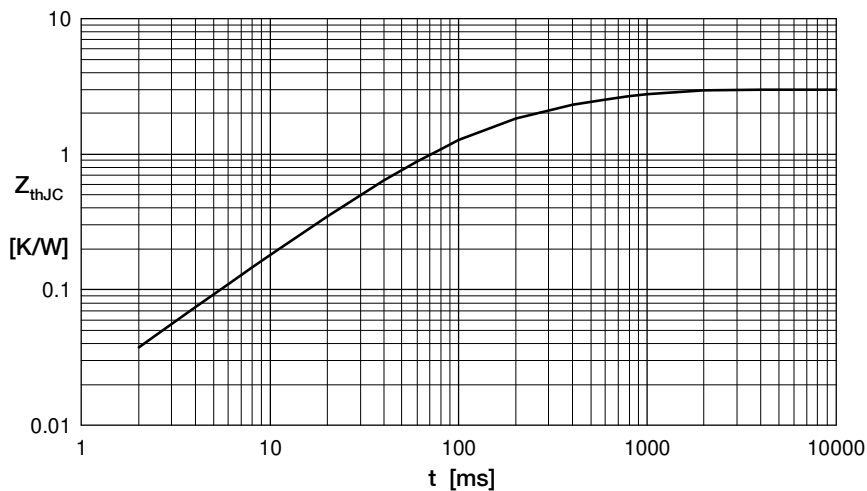


Fig. 7 Transient thermal impedance junction to case

Constants for  $Z_{thJC}$  calculation:

i	$R_{thi}$ [K/W]	$t_i$ [s]
1	1.3590	0.1015
2	0.4651	0.1026
3	0.8473	0.4919
4	0.8473	0.6200