

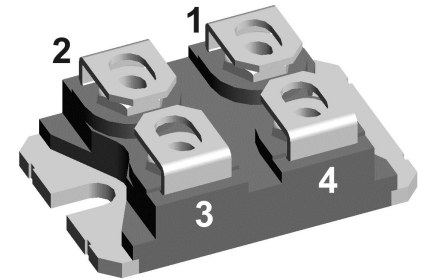
# HiPerFRED

$V_{RRM} = 1200\text{ V}$   
 $I_{DAV} = 60\text{ A}$   
 $t_{rr} = 60\text{ ns}$

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

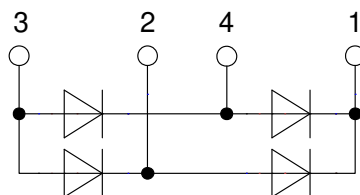
Part number

**VBE60-12A**



Backside: isolated

 E72873



### 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:

- Antiparallel diode for high frequency switching devices
- Antisaturation diode
- Snubber diode
- Free wheeling diode
- Rectifiers in switch mode power supplies (SMPS)
- Uninterruptible power supplies (UPS)

### Package: SOT-227B (minibloc)

- Isolation Voltage: 3000 V~
- Industry standard outline
- RoHS compliant
- Epoxy meets UL 94V-0
- Base plate: Copper internally DCB isolated
- Advanced power cycling

### Disclaimer Notice

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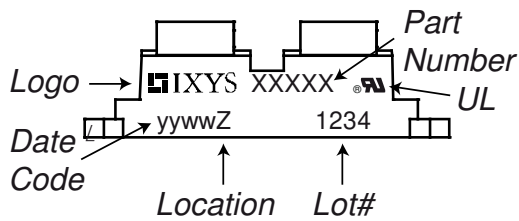


Fast Diode				Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit	
$V_{RSM}$	max. non-repetitive reverse blocking voltage	$T_{VJ} = 25^{\circ}C$			1200	V	
$V_{RRM}$	max. repetitive reverse blocking voltage	$T_{VJ} = 25^{\circ}C$			1200	V	
$I_R$	reverse current, drain current	$V_R = 1200 V$	$T_{VJ} = 25^{\circ}C$		250	$\mu A$	
		$V_R = 1200 V$	$T_{VJ} = 125^{\circ}C$		1	mA	
$V_F$	forward voltage drop	$I_F = 30 A$	$T_{VJ} = 25^{\circ}C$		2.68	V	
		$I_F = 60 A$			3.15	V	
		$I_F = 30 A$	$T_{VJ} = 150^{\circ}C$		1.73	V	
		$I_F = 60 A$			2.22	V	
$I_{DAV}$	bridge output current	$T_C = 70^{\circ}C$ rectangular $d = 0.5$	$T_{VJ} = 150^{\circ}C$		60	A	
$V_{FO}$	threshold voltage	} for power loss calculation only	$T_{VJ} = 150^{\circ}C$		1.31	V	
$r_F$	slope resistance				14	m $\Omega$	
$R_{thJC}$	thermal resistance junction to case				1.15	K/W	
$R_{thCH}$	thermal resistance case to heatsink			0.1		K/W	
$P_{tot}$	total power dissipation		$T_C = 25^{\circ}C$		110	W	
$I_{FSM}$	max. forward surge current	$t = 10 ms; (50 Hz), sine; V_R = 0 V$	$T_{VJ} = 45^{\circ}C$		200	A	
$C_J$	junction capacitance	$V_R = 600 V f = 1 MHz$	$T_{VJ} = 25^{\circ}C$		12	pF	
$I_{RM}$	max. reverse recovery current	} $I_F = 30 A; V_R = 600 V$ $-di_F / dt = 200 A/\mu s$	$T_{VJ} = 25^{\circ}C$		8.5	A	
			$T_{VJ} = 100^{\circ}C$		13	A	
$t_{rr}$	reverse recovery time		$T_{VJ} = 25^{\circ}C$		60	ns	
			$T_{VJ} = 100^{\circ}C$		170	ns	



Package SOT-227B (minibloc)		Ratings				
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$I_{RMS}$	RMS current	per terminal			150	A
$T_{VJ}$	virtual junction temperature		-40		150	°C
$T_{op}$	operation temperature		-40		125	°C
$T_{stg}$	storage temperature		-40		150	°C
<b>Weight</b>				30		g
$M_D$	mounting torque		1.1		1.5	Nm
$M_T$	terminal torque		1.1		1.5	Nm
$d_{Spp/App}$	creepage distance on surface   striking distance through air	terminal to terminal	10.5	3.2		mm
$d_{Spb/Apb}$		terminal to backside	8.6	6.8		mm
$V_{ISOL}$	isolation voltage	t = 1 second			3000	V
		t = 1 minute	50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA		2500	V

**Product Marking**

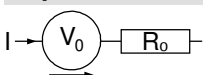


Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	VBE60-12A	VBE60-12A	Tube	10	514294

**Equivalent Circuits for Simulation**

\* on die level

$T_{VJ} = 150^{\circ}C$

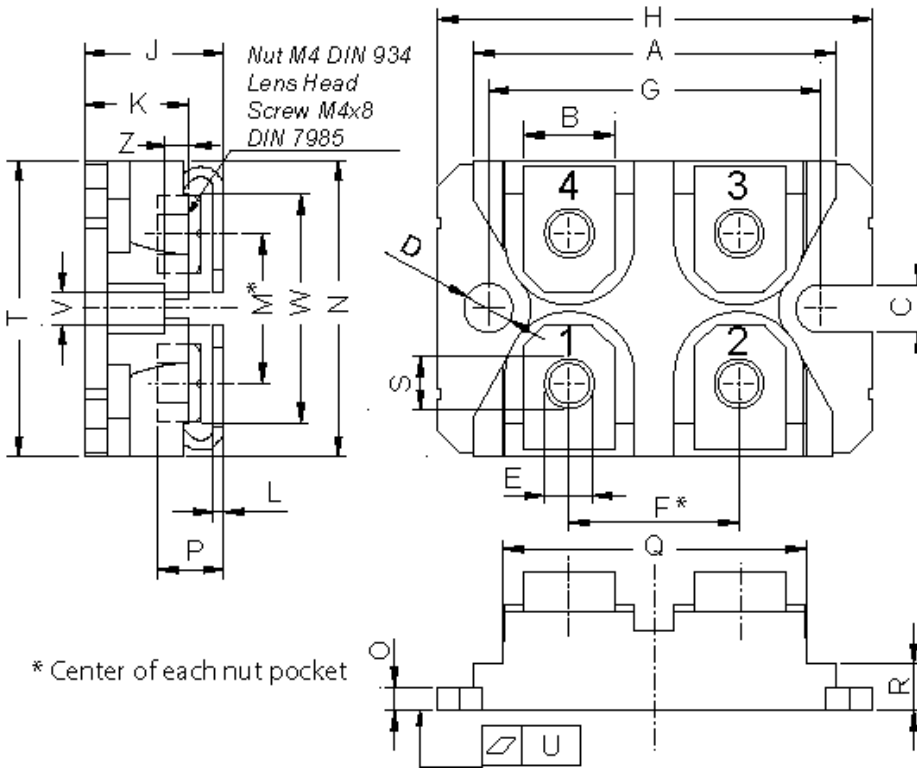


**Fast Diode**

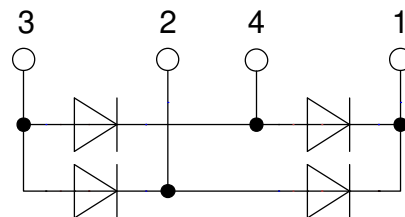
$V_{0\ max}$	threshold voltage	1.31	V
$R_{0\ max}$	slope resistance *	12	mΩ



**Outlines SOT-227B (minibloc)**



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	37.80	38.23	1.488	1.505
J	11.68	12.22	0.460	0.481
K	8.92	9.60	0.351	0.378
L	0.74	0.84	0.029	0.033
M	12.50	13.10	0.492	0.516
N	25.15	25.42	0.990	1.001
O	1.95	2.13	0.077	0.084
P	4.95	6.20	0.195	0.244
Q	26.54	26.90	1.045	1.059
R	3.94	4.42	0.155	0.167
S	4.55	4.85	0.179	0.191
T	24.59	25.25	0.968	0.994
U	-0.05	0.10	-0.002	0.004
V	3.20	5.50	0.126	0.217
W	19.81	21.08	0.780	0.830
Z	2.50	2.70	0.098	0.106



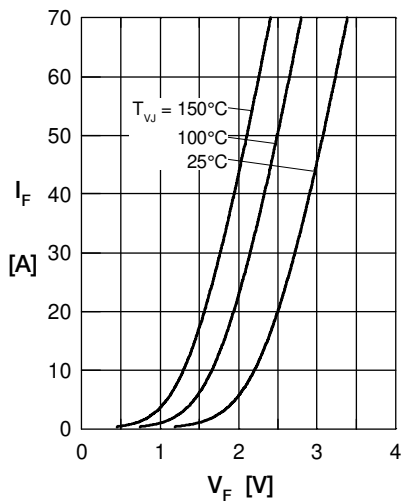
**Fast Diode**


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

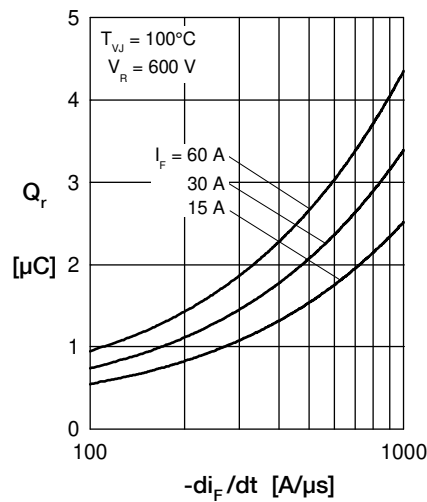


Fig. 2 Typ. reverse recov. charge  $Q_r$  versus  $-di_F/dt$

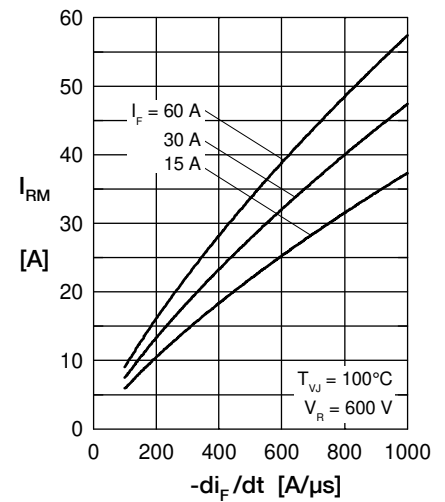


Fig. 3 Typ. peak reverse current  $I_{RM}$  versus  $-di_F/dt$

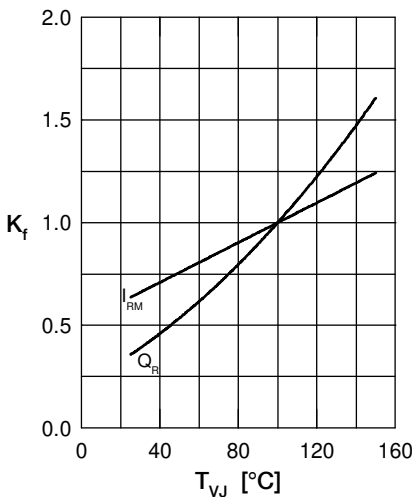


Fig. 4 Dynamic parameters  $Q_r$ ,  $I_{RM}$  versus  $T_{VJ}$

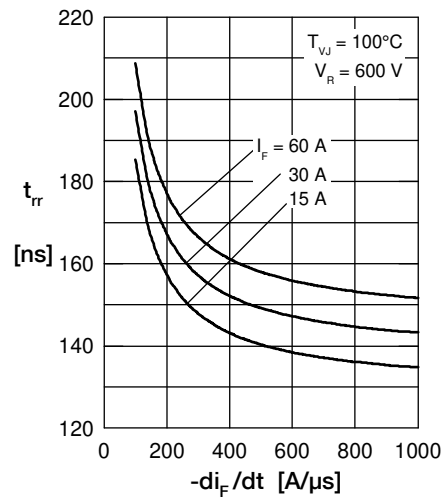


Fig. 5 Typ. recovery time  $t_{rr}$  versus  $-di_F/dt$

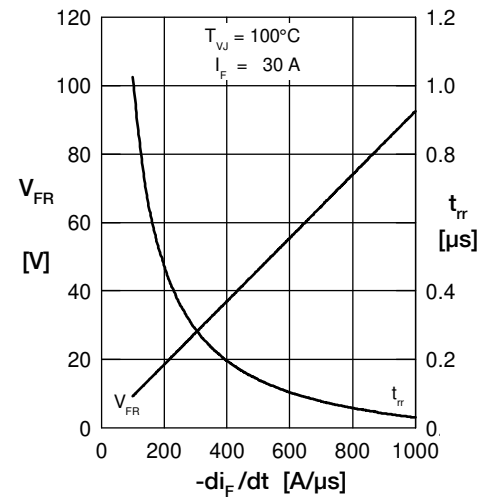


Fig. 6 Typ. peak forward voltage  $V_{FR}$  and  $t_{rr}$  versus  $di_F/dt$

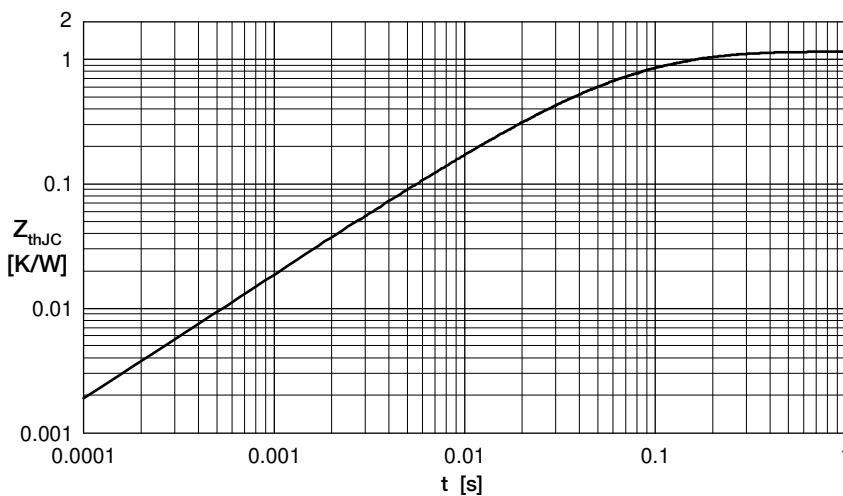


Fig. 7 Transient thermal impedance junction to case

Constants for  $Z_{thJC}$  calculation:

i	$R_{thi}$ (K/W)	$t_i$ (s)
1	0.436	0.0055
2	0.482	0.0092
3	0.117	0.0007
4	0.115	0.0418