

# Fast Recovery Epitaxial Diode (FRED)

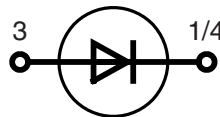
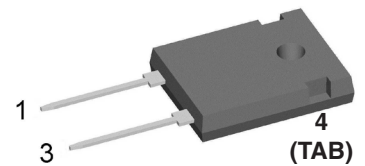
$$I_{FAV} = 109 \text{ A}$$

$$V_{RRM} = 1200 \text{ V}$$

$$t_{rr} = 40 \text{ ns}$$

**Part number**

DSEI 120-12A

**TO-247AD**

**Features / Advantages:**

- Planar passivated chips
- Low leakage current
- Very short recovery time
- Improved thermal behaviour
- Extremely low switching losses
- Low  $I_{RM}$ -values
- Soft recovery behaviour
- High reliability circuit operation
- Low voltage peaks for reduced protection circuits
- Low noise switching
- Low losses
- Operating at lower temperature or space saving by reduced cooling

**Applications:**

- Antiparallel diode for high frequency switching devices
- Antisaturation diode
- Snubber diode
- Free wheeling diode in converters and motor control circuits
- Rectifiers in switch mode power supplies (SMPS)
- Inductive heating and melting
- Uninterruptible power supplies (UPS)
- Ultrasonic cleaners and welders

**Package:** TO-247AD

- Industry standard outline
- RoHS compliant
- Epoxy meets UL 94V-0

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Symbol	Conditions	Maximum Ratings	
$I_{FRMS}$	$T_{VJ} = T_{VJM}$	100	A
$I_{FAVM}$ ①	$T_C = 60^\circ\text{C}$ ; rectangular, $d = 0.5$	109	A
$I_{FAV}$ ②	$T_C = 95^\circ\text{C}$ ; rectangular, $d = 0.5$	75	A
$I_{FRM}$	$t_p < 10$ s; rep. rating, pulse width limited by $T_{VJM}$	1200	A
$I_{FSM}$	$T_{VJ} = 45^\circ\text{C}$ ; $t = 10$ ms (50 Hz), sine	600	A
	$t = 8.3$ ms (60 Hz), sine	660	A
	$T_{VJ} = 150^\circ\text{C}$ ; $t = 10$ ms (50 Hz), sine	540	A
	$t = 8.3$ ms (60 Hz), sine	600	A
$I^2t$	$T_{VJ} = 45^\circ\text{C}$ ; $t = 10$ ms (50 Hz), sine	1800	A <sup>2</sup> s
	$t = 8.3$ ms (60 Hz), sine	1800	A <sup>2</sup> s
	$T_{VJ} = 150^\circ\text{C}$ ; $t = 10$ ms (50 Hz), sine	1450	A <sup>2</sup> s
	$t = 8.3$ ms (60 Hz), sine	1500	A <sup>2</sup> s
$P_{tot}$	$T_C = 25^\circ\text{C}$	357	W

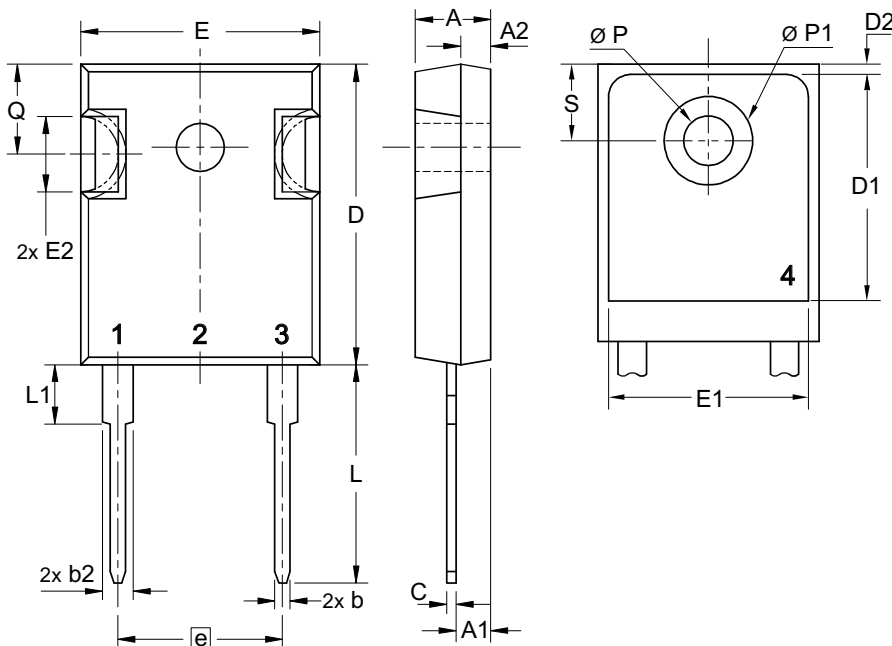
Symbol	Conditions	Characteristic Values		
		typ.	max.	
$I_R$	$V_R = V_{RRM}$ $T_{VJ} = 25^\circ\text{C}$		3	mA
	$V_R = 0.8 \cdot V_{RRM}$ $T_{VJ} = 25^\circ\text{C}$		1.5	mA
	$V_R = 0.8 \cdot V_{RRM}$ $T_{VJ} = 125^\circ\text{C}$		20	mA
$V_F$	$I_F = 70$ A $T_{VJ} = 150^\circ\text{C}$		1.55	V
	$T_{VJ} = 25^\circ\text{C}$		1.80	V
$V_{T0}$	For power-loss calculations only		1.2	V
$r_T$	$T_{VJ} = T_{VJM}$		4.6	mΩ
$R_{thJC}$		0.25	0.35	K/W
$R_{thCH}$				K/W
$R_{thJA}$			35	K/W
$t_{rr}$	$I_F = 1$ A; $-di/dt = 200$ A/μs; $V_R = 30$ V; $T_{VJ} = 25^\circ\text{C}$	40	60	ns
$I_{RM}$	$V_R = 350$ V; $I_F = 75$ A; $-di_F/dt = 200$ A/μs	25	30	A
	$L \leq 0.05$ μH; $T_{VJ} = 100^\circ\text{C}$			

① Chip capability; ② limited to 70 A by leads

Data according to IEC 60747

**Outline Drawing TO-247AD**

Dimensions in mm (1 mm = 0.0394")



Sym.	Inches		Millimeter	
	min.	max.	min.	max.
A	0.185	0.209	4.70	5.30
A1	0.087	0.102	2.21	2.59
A2	0.059	0.098	1.50	2.49
D	0.819	0.845	20.79	21.45
E	0.610	0.640	15.48	16.24
E2	0.170	0.216	4.31	5.48
e	0.430 BSC		10.92 BSC	
L	0.780	0.800	19.80	20.30
L1	-	0.177	-	4.49
Ø P	0.140	0.144	3.55	3.65
Q	0.212	0.244	5.38	6.19
S	0.242 BSC		6.14 BSC	
b	0.039	0.055	0.99	1.40
b2	0.065	0.094	1.65	2.39
b4	0.102	0.135	2.59	3.43
c	0.015	0.035	0.38	0.89
D1	0.515	-	13.07	-
D2	0.020	0.053	0.51	1.35
E1	0.530	-	13.45	-
Ø P1	-	0.29	-	7.39

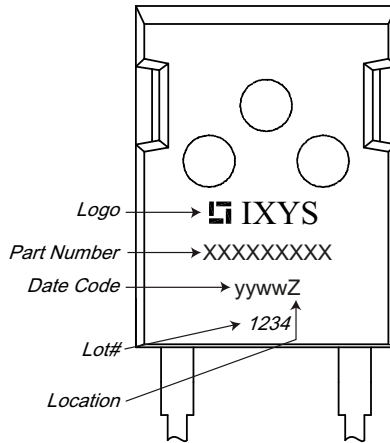
IXYS reserves the right to change limits, test conditions and dimensions.

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Package TO-247AD			Ratings			
Symbol	Definitions	Conditions	min.	typ.	max.	
T <sub>vj</sub>	virtual junction temperature		-40		150	°C
T <sub>stg</sub>	storage temperature		-40		150	°C
<b>Weight</b>				6		g
M <sub>D</sub>	mounting torque		0.8		1.2	Nm

**Product Marking**



Ordering	Part Number	Marking on Product	Delivering Mode	Base Qty	Ordering Code
Standard	DSEI120-12A	DSEI120-12A	Tube	30	467731

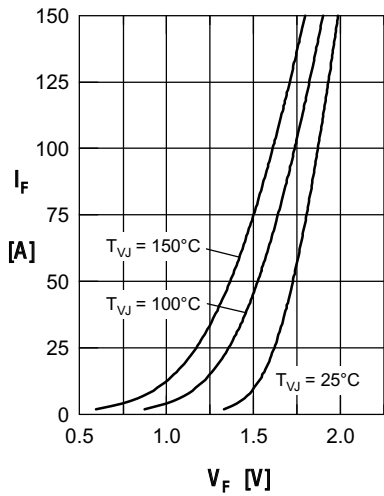
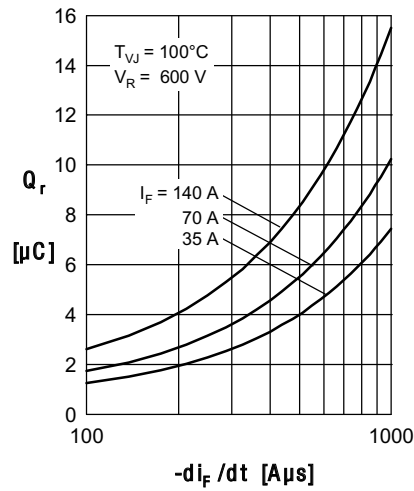
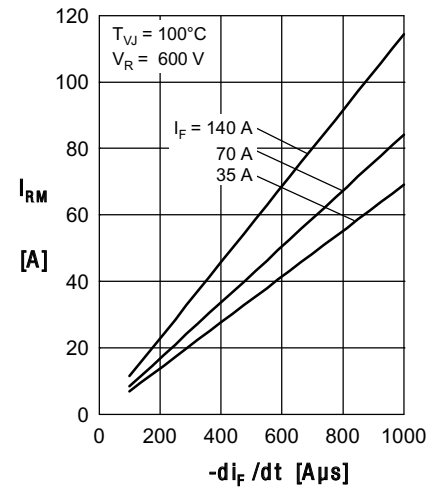
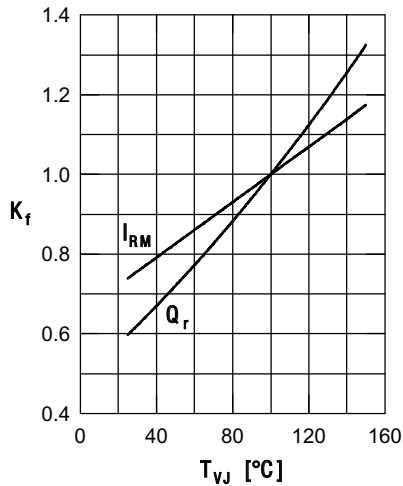
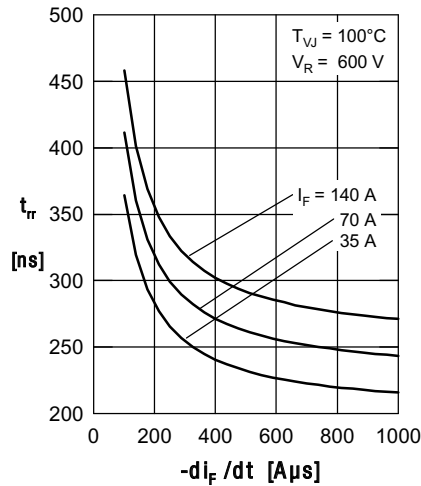
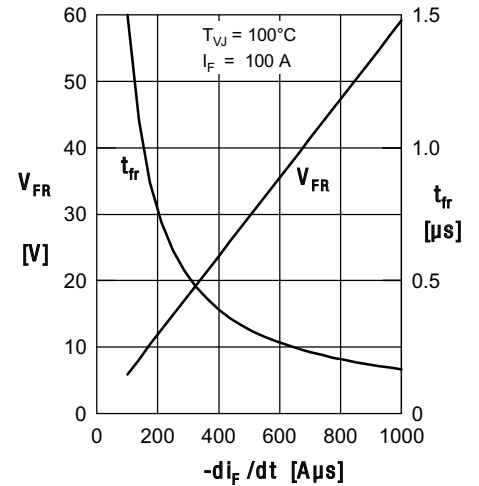
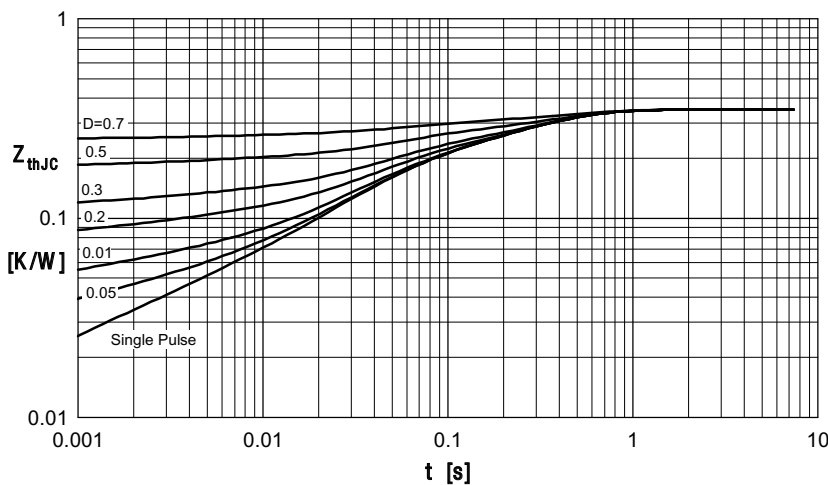
**Curves**

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

 Fig. 2 Reverse recovery charge  $Q_r$  versus  $-di_F/dt$ 

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

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

 Fig. 5 Recovery time  $t_{tr}$  versus  $-di_F/dt$ 

 Fig. 6 Peak forward voltage  $V_{FR}$  and  $t_{tr}$  versus  $-di_F/dt$ 


Fig. 7 Transient thermal resistance junction to case at various duty cycles

 Constants for  $Z_{thJC}$  calculation:

i	$R_{thi}$ (K/W)	$t_i$ (s)
1	0.017	0.00038
2	0.0184	0.0026
3	0.1296	0.0387
4	0.185	0.274