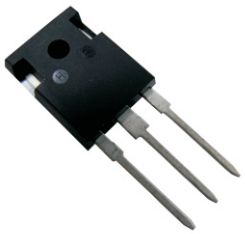
FRED
Ultrafast Soft Recovery Diode
2 x 15A / 400V

FEATURES

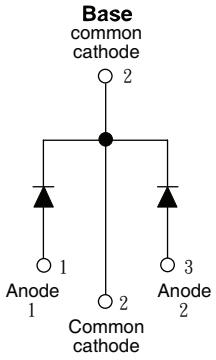
- Ultrafast recovery time
- Very low leakage current
- Very low Q_{rr}
- Specified at operating conditions
- Designed and qualified for industrial level
- Planar FRED Chip
- 175°C operating junction temperature



TO-247 AB

BENEFITS

- Reduced RFI and EMI
- Reduced power loss in diode and switching transistor
- Higher frequency operation
- Reduced snubbing
- Reduced parts count



DESCRIPTION

HFA30PA40C is a state of the art center tap ultrafast recovery diode. Employing the latest in epitaxial construction and advanced processing techniques it features a superb combination of characteristics which result in performance which is unsurpassed by any rectifier previously available. With basic ratings of 400V and 15A per leg continuous current, the HFA30PA40C is especially well suited for use as the companion diode for IGBTs and MOSFETs. In addition to ultrafast recovery time, the FRED product line features extremely low values of peak recovery current (I_{RRM}) and does not exhibit any tendency to "snap-off" during the t_b portion of recovery. The FRED features combine to offer designers a rectifier with lower noise and significantly lower switching losses in both the diode and the switching transistor. These FRED advantages can help to significantly reduce snubbing, component count and heatsink sizes. The FRED HFA30PA40C is ideally suited for applications in power conversion systems (such as inverters), motor drives, and many other similar applications where high speed, high efficiency is needed.

PRODUCT SUMMARY	
V_R	400 V
V_F at 15A at 25 °C	1.3 V
$I_{F(AV)}$	2 x 15 A
t_{rr} (typical)	19 ns
T_J (maximum)	175 °C
Q_{rr} (typical)	60 nC
I_{RRM} (typical)	3.0 A

ABSOLUTE MAXIMUM RATINGS

PARAMETER		SYMBOL	TEST CONDITIONS	VALUES	UNITS
Cathode to anode voltage		V_R		400	V
Maximum continuous forward current	per leg	I_F	T_C = 140 °C	15	A
	per device			30	
Single pulse forward current		I_{FSM}		150	
Maximum repetitive forward current		I_{FRM}	T_C = 140 °C, square wave, 20KHz	30	
Operating junction and storage temperature range		T_J, T_{Stg}		- 55 to + 175	°C

ELECTRICAL SPECIFICATIONS (T_J = 25 ºC unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Cathode to anode breakdown voltage	V_{BR}	I_R = 100 µA	400	-	-	V
Maximum forward voltage	V_{FM}	I_F = 15 A	-	1.15	1.3	
		I_F = 30 A	-	-	1.6	
		I_F = 15 A, T_J = 125 ºC	-	1.0	-	
Maximum reverse leakage current	I_{RM}	V_R = V_R rated	-	0.5	10	µA
		T_J = 125°C, V_R = V_R rated	-	-	500	
Junction capacitance	C_T	V_R = 200V	-	33	50	pF
Series inductance	L_S	Measured lead to lead 5 mm from package body	-	12	-	nH

DYNAMIC RECOVERY CHARACTERISTICS PERLEG (T_J = 25 ºC unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Reverse recovery time	t_{rr}	I_F = 0.5A, I_R = 1.0A, I_{RR} = 0.25A (RG#1 CKT)		-	22	27	ns
		I_F = 1.0 A, dI_F/dt = 100 A/µs, V_R =30 V, T_J = 25°C		-	19	-	
	t_{rr1}	T_J = 25 ºC	I_F= 15A dI_F/dt = 200 A/µs V_R = 266 V	-	35	60	
	t_{rr2}	T_J = 125 ºC		-	95	120	
Peak recovery current	I_{RRM1}	T_J = 25 ºC		-	3	6.0	A
	I_{RRM2}	T_J = 125 ºC		-	6	10	
Reverse recovery charge	Q_{rr1}	T_J = 25 ºC		-	60	180	nC
	Q_{rr2}	T_J = 125 ºC		-	300	600	

THERMAL - MECHANICAL SPECIFICATIONS PER LEG						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Lead temperature	T_{lead}	0.063" from case (1.6 mm) for 10 s	-	-	300	°C
Junction to case, single leg conduction	R_{thJC}		-	-	1.40	K/W
Junction to case, both legs conducting			-	-	0.70	
Thermal resistance, junction to ambient	R_{thJA}	Typical socket mount	-	-	40	
Thermal resistance, case to heatsink	R_{thCS}	Mounting surface, flat, smooth and greased	-	0.25	-	
Weight			-	6.0	-	g
			-	0.21	-	oz.
Mounting torque			6.0 (5.0)	-	12 (10)	kgf . cm (lbf . in)
Marking device		Case style TO-247AB (JEDEC)	HFA30PA40C			

Fig.1 Maximum effective transient thermal impedance, junction-to-case vs. pulse duration

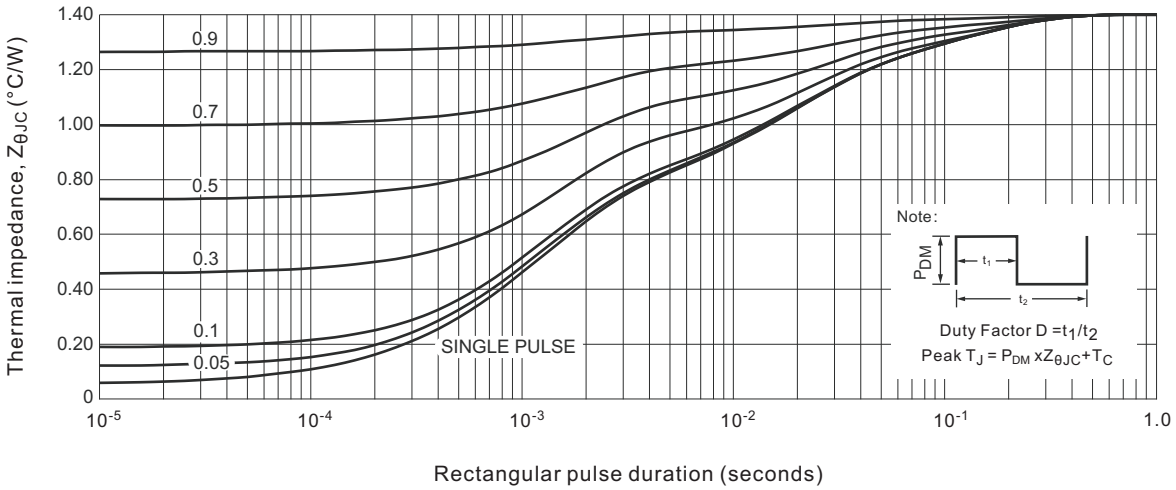


Fig.2 Forward current vs. forward voltage

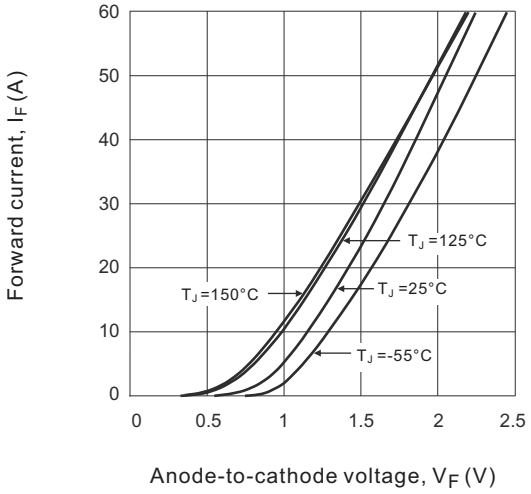


Fig.3 Typical reverse recovery time vs. current rate of change

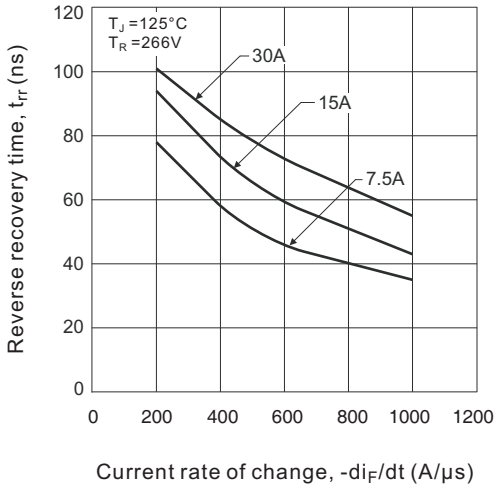


Fig.4 Typical reverse recovery charge vs. current rate of change

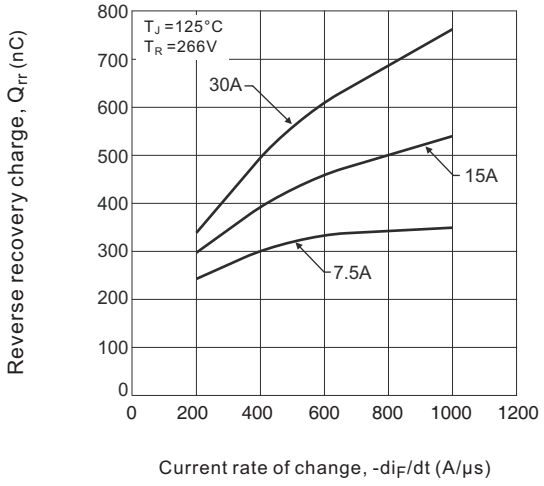


Fig 5. Typical reverse recovery current vs. current rate of change

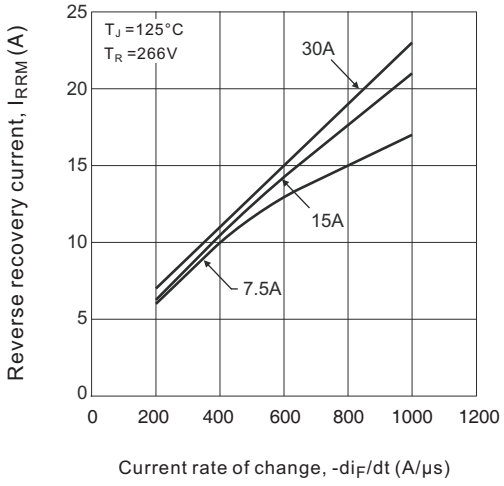


Fig6. Dynamic parameters vs. junction temperature

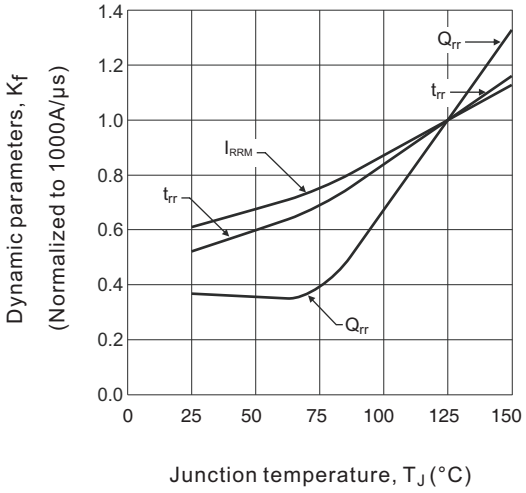


Fig.7 Maximum average forward current vs. case temperature

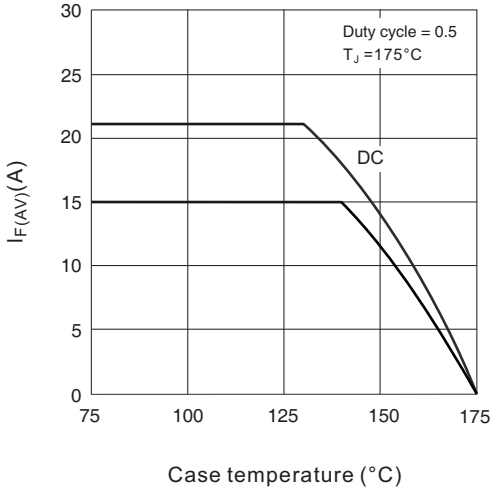


Fig.8 Junction capacitance vs. reverse voltage

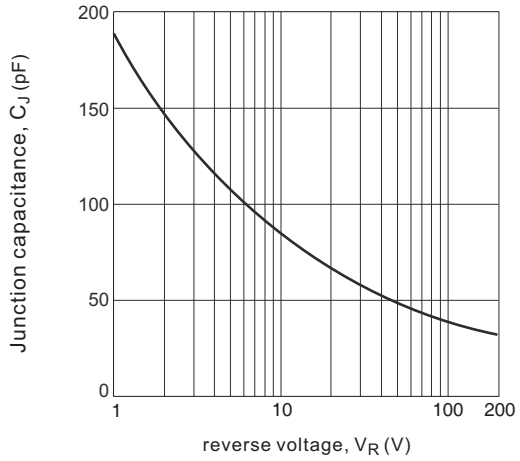


Fig.9 Reverse recovery parameter test circuit

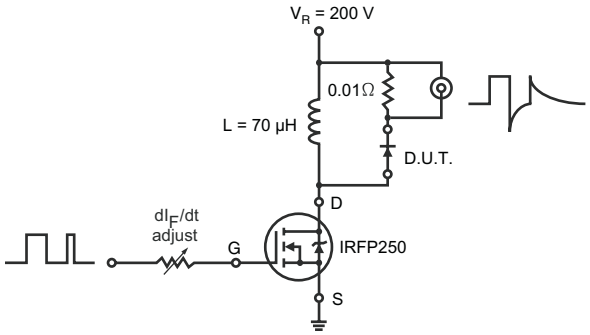
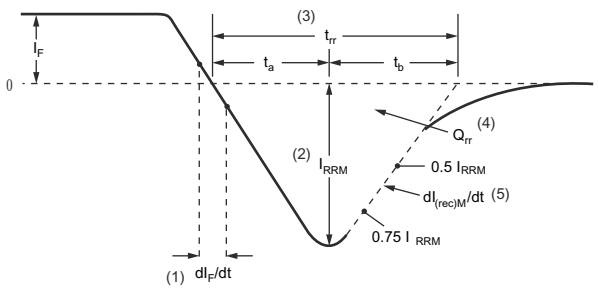


Fig.10 Reverse recovery waveform and definitions



(1) dI_F/dt - rate of change of current through zero crossing

(2) I_{RRM} - peak reverse recovery current

(3) t_{rr} - reverse recovery time measured from zero crossing point of negative going I_F to point where a line passing through 0.75 I_{RRM} and 0.50 I_{RRM} extrapolated to zero current.

(4) Q_{rr} - area under curve defined by t_{rr} and I_{RRM}

$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

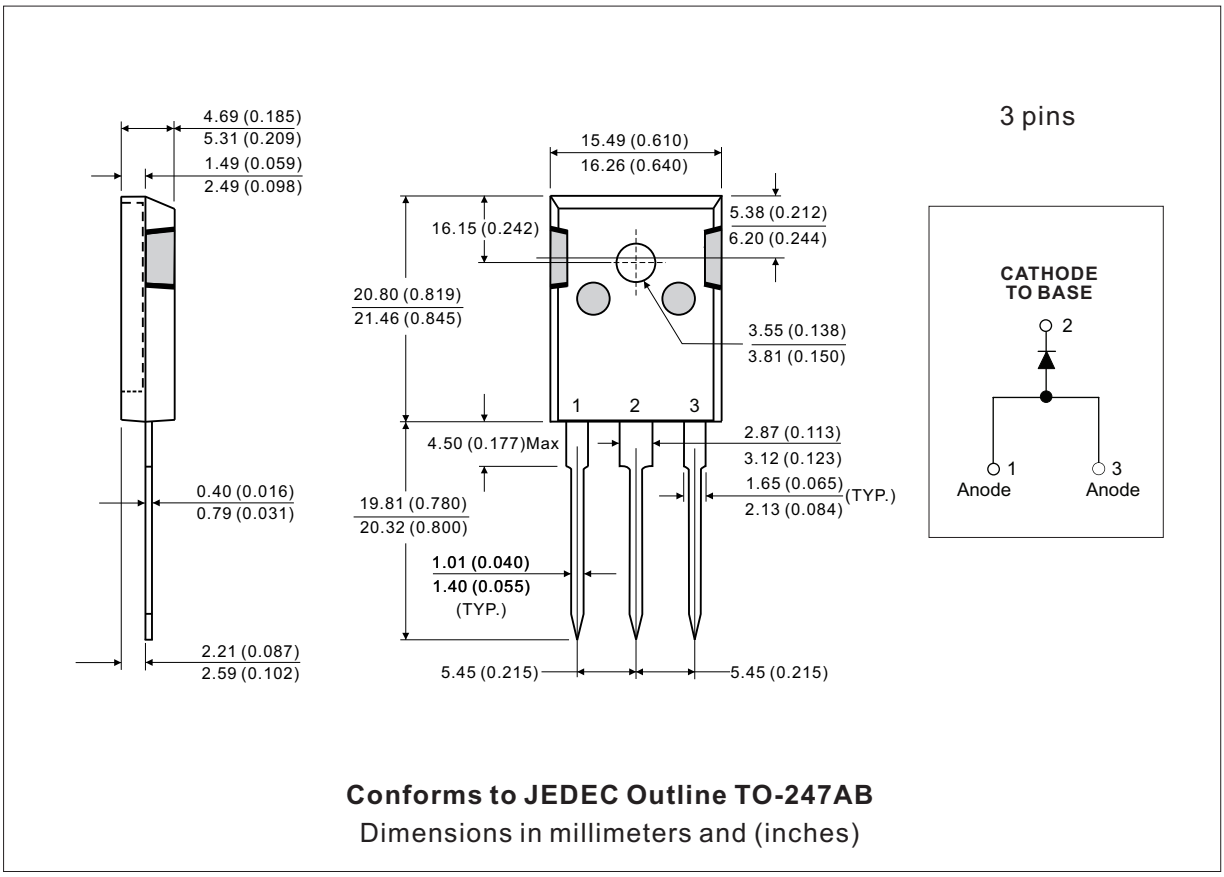
(5) $dI_{(rec)M}/dt$ - peak rate of change of current during t_b portion of t_{rr}

ORDERING INFORMATION TABLE

Device code

HFA	30	PA	40	C
1	2	3	4	5

1 - FRED family
2 - Current rating (30 = 30 A, 15A x 2)
3 - Package outline (PA = TO-247, 3 pins)
4 - Voltage rating (40 = 400 V)
5 - Configuration (C = Center tap common cathode)



Conforms to JEDEC Outline TO-247AB
Dimensions in millimeters and (inches)