

Rectifier Module for Power Factor Correction

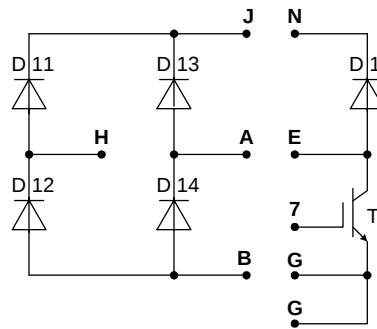
Fast Single Phase Rectifier
Ultra Fast Boost Chopper

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

$$I_{FAV25} = 15 \text{ A}$$

$$V_{CES} = 600 \text{ V}$$

$$I_{C25} = 37 \text{ A}$$



Typical Rectified Mains Power

$$P_n = 900 \text{ W at } V_n = 110 \text{ V}$$

$$P_n = 2100 \text{ W at } V_n = 240 \text{ V}$$

at $V_{DC} = 400 \text{ V}$, $f_T = 75 \text{ kHz}$, $T_C = 80^\circ\text{C}$

Input Rectifier Bridge D11 - D14

Symbol	Conditions	Maximum Ratings	
V_{RRM}		1200	V
I_{FAV25}	$T_C = 25^\circ\text{C}$; sine 180°	15	A
I_{FAV80}	$T_C = 80^\circ\text{C}$; sine 180°	10	A
I_{FSM}	$T_{VJ} = 25^\circ\text{C}$; $t = 10 \text{ ms}$ sine 50 Hz	75	A

Symbol	Conditions	Characteristic Values ($T_{VJ} = 25^\circ\text{C}$, unless otherwise specified)		
		min.	typ.	max.
V_F	$I_F = 10 \text{ A}$ $T_{VJ} = 25^\circ\text{C}$ $T_{VJ} = 125^\circ\text{C}$		1.4 1.6	1.8 V V
I_R	$V_R = V_{RRM}$ $T_{VJ} = 25^\circ\text{C}$ $T_{VJ} = 125^\circ\text{C}$		0.5	0.05 mA mA
t_{rr}	$V_R = 100 \text{ V}$; $I_F = 10 \text{ A}$; $-di/dt = 5 \text{ A}/\mu\text{s}$		1	μs
R_{thJC} R_{thJS}	(per diode) with heat transfer paste		tbd	2.5 K/W K/W

Application

- single phase rectification with power factor correction (PFC)
- low harmonic content of mains current
- mains current and voltage in phase
- wide input voltage range, controlled output voltage

Features

- high level of integration - only one power semiconductor module required for the whole PFC rectifier
- standard PFC control ICs useable
- fast rectifier diodes for enhanced EMC behaviour
- NPT IGBT with low saturation voltage, ultra fast switching capability, high RBSOA and short circuit ruggedness
- internally **series connected** HiPerFRED™ free wheeling diode for fast and soft reverse recovery at high switching frequency
- package with insulated DCB base and soldering pins for PCB mounting

Chopper T

Symbol	Conditions	Maximum Ratings	
V_{CES}	$T_{VJ} = 25^{\circ}\text{C}$ to 150°C	600	V
V_{GES}	Continuous	± 20	V
I_{C25}	$T_C = 25^{\circ}\text{C}$	37	A
I_{C80}	$T_C = 80^{\circ}\text{C}$	25	A
RBSOA	$V_{CE} = 600\text{ V}$; $R_G = 10\ \Omega$; $T_{VJ} = 125^{\circ}\text{C}$ Clamped inductive load; $L = 100\ \mu\text{H}$	$I_{CM} = 100$ $V_{CEK} \leq V_{CES}$	A
t_{SC}	$V_{CE} = 600\text{ V}$; $V_{GE} = \pm 15\text{ V}$; $R_G = 10\ \Omega$; $T_{VJ} = 125^{\circ}\text{C}$; non-repetitive	10	μs

Symbol	Conditions	Characteristic Values ($T_{VJ} = 25^{\circ}\text{C}$, unless otherwise specified)		
		min.	typ.	max.
$V_{CE(sat)}$	$I_C = 10\text{ A}$; $V_{GE} = 15\text{ V}$; $T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$		1.5 1.6	1.8 V
$V_{GE(th)}$	$I_C = 1\text{ mA}$; $V_{GE} = V_{CE}$	3		5 V
I_{CES}	$V_{CE} = V_{CES}$; $V_{GE} = 0\text{ V}$; $T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$		1	0.04 mA mA
I_{GES}	$V_{CE} = 0\text{ V}$; $V_{GE} = \pm 20\text{ V}$			100 nA
$t_{d(on)}$ t_r $t_{d(off)}$ t_f E_{on} E_{off}	Inductive load, $T_{VJ} = 125^{\circ}\text{C}$ $V_{CE} = 400\text{ V}$; $I_C = 10\text{ A}$ $V_{GE} = \pm 15\text{ V}$; $R_G = 10\ \Omega$		30 50 320 70 0.60 0.31	ns ns ns ns mJ mJ
C_{ies}			1600	pF
Q_{Gon}			140	nC
R_{thJC} R_{thJS}			tbd	0.96 K/W K/W

Chopper D1

Symbol	Conditions	Maximum Ratings	
V_{RRM}	$T_{VJ} = 25^{\circ}\text{C}$ to 150°C	600	V
I_{F25}	$T_C = 25^{\circ}\text{C}$	35	A
I_{F80}	$T_C = 80^{\circ}\text{C}$	22	A

Symbol	Conditions	Characteristic Values ($T_{VJ} = 25^{\circ}\text{C}$, unless otherwise specified)		
		min.	typ.	max.
V_F	$I_F = 10\text{ A}$; $T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$		2.2	3.2 V 2.4 V
I_R	$V_R = V_{RRM}$; $T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$		0.1	0.1 mA mA
I_{RM} t_{rr}	$I_F = 10\text{ A}$; $di_F/dt = -400\text{ A}/\mu\text{s}$; $T_{VJ} = 125^{\circ}\text{C}$ $V_R = 400\text{ V}$		tbd tbd	A ns
R_{thJC} R_{thJS}	with heat transfer paste		tbd	1.15 K/W K/W

Symbol	Conditions	Maximum Ratings	
T_{VJ}		-40...+150	°C
T_{stg}		-40...+125	°C
V_{ISOL}	$I_{ISOL} \leq 1 \text{ mA}$; 50/60 Hz; t = 1 min	3000	V~
M_d	Mounting torque (M4)	1.5 - 2.0	Nm

Symbol	Conditions	Characteristic Values (T _{vj} = 25°C, unless otherwise specified)		
		min.	typ.	max.
d_s	Creepage distance on surface	tbd		mm
d_A	Strike distance through air	tbd		mm
Weight	typ.		18	g

Technical drawing of a mechanical part, showing two views: a top view and a front view.

Top View Dimensions:

- Overall width: 39
- Overall height: $47^{+0.2}_{-0.2}$
- Top edge features:
 - Left corner radius: $R2.15$
 - Top edge width: $13.7^{+0.1}_{-0.1}$
 - Top edge width: $10.8^{+0.3}_{-0.3}$
 - Top edge width: $10.8^{+0.3}_{-0.3}$
 - Top edge width: $1.2^{+0.2}_{-0.2}$
- Internal features:
 - Horizontal slots: $5, 6, 7, 8$
 - Vertical slots: $1, 2, 3, 4$
 - Vertical slots: $8.6^{+0.1}_{-0.1}$
 - Vertical slots: $10.8^{+0.3}_{-0.3}$
 - Vertical slots: $13.7^{+0.1}_{-0.1}$
 - Vertical slots: $30.3^{+0.2}_{-0.2}$
- Labels: A, B, C, D, E, F, G, H, I, J, K, L, M, N

Front View Dimensions:

- Overall height: $20.3^{+0.2}_{-0.2}$
- Overall width: 39
- Top edge features:
 - Top edge width: $5.2^{+0.3}_{-0.3}$
 - Top edge width: $1.2^{+0.2}_{-0.2}$
 - Top edge width: 1.5
- Internal features:
 - Vertical slots: $1, 2$
 - Vertical slots: 8