

Rectifier Module for Three Phase Power Factor Correction

Typ. Rectified Mains Power

$P_n = 15 \text{ kW}$ at

$V_n = 400 \text{ V } 3\sim$

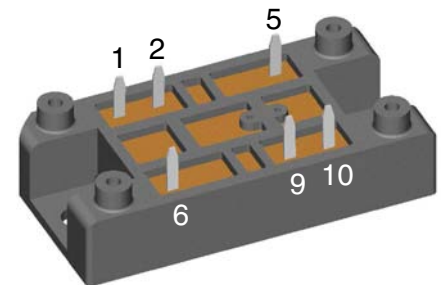
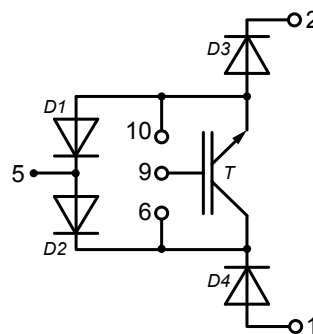
$f_T = 15 \text{ kHz}$

$T_c = 80^\circ\text{C}$

Preliminary data

Part name (Marking on product)

VUI30-12N1



Features:

- NPT IGBT with low saturation voltage
- Fast recovery epitaxial diodes (FRED)

Application:

Three phase rectifier with power factor correction, set up as follows:

- input from three phase mains
 - wide range of input voltage
 - mains currents approx. sinusoidal in phase with mains voltage
 - topology permits to control overcurrent such as in case of input voltage peaks
- output
 - direct current link
 - buck type converter - reduced output voltage
 - possibility to supply boost converter, inverter etc.
- required components
 - one power semiconductor module per phase
 - one inductor and one capacitor per phase on mains side
 - output inductor, depending on supplied circuit

Package:

- High level of integration
- Solder terminals for PCB mounting
- Isolated DCB ceramic base plate
- Large creepage and strike distances

Transistor T

Symbol	Definitions	Conditions	Ratings			
			min.	typ.	max.	Unit
V_{CES}	collector emitter voltage	$T_{VJ} = 25^{\circ}\text{C to } 150^{\circ}\text{C}$			1200	V
V_{GES}	DC gate voltage	continuous	-20		+20	V
I_{C25}	collector current	DC	$T_C = 25^{\circ}\text{C}$		95	A
I_{C80}		DC	$T_C = 80^{\circ}\text{C}$		65	A
$V_{CE(sat)}$	collector emitter saturation voltage	$I_C = 20\text{ A}; V_{GE} = 15\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$	1.7 1.9	2.0	V
$V_{GE(th)}$	gate emitter threshold voltage	$I_C = 2\text{ mA}; V_{GE} = V_{CE}$	$T_{VJ} = 25^{\circ}\text{C}$	4.5	6.5	V
I_{CES}	collector emitter leakage current	$V_{CE} = V_{CES}; V_{GE} = 0\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$	1.8	1.6	mA mA
I_{GES}	gate emitter leakage current	$V_{CE} = 0\text{ V}; V_{GE} = \pm 20\text{ V}$			400	nA
$t_{d(on)}$	turn-on delay time	} inductive load $V_{CE} = 600\text{ V}; I_C = 20\text{ A}$ $V_{GE} = \pm 15\text{ V}; R_G = 22\text{ }\Omega; L = 100\text{ }\mu\text{H}$ $T_{VJ} = 125^{\circ}\text{C}$		100		ns
t_r	current rise time			70		ns
$t_{d(off)}$	turn-off delay time			500		ns
t_f	current fall time			70		ns
E_{on}	turn-on energy per pulse			3.0		mJ
E_{off}	turn-off energy per pulse			2.2		mJ
C_{ies}	input capacitance	$V_{CE} = 25\text{ V}; V_{GE} = 0\text{ V}; f = 1\text{ MHz}$		3.3		nF
Q_{Gon}	total gate charge	$V_{CE} = 600\text{ V}; V_{GE} = 15\text{ V}; I_C = 50\text{ A}$		240		nC
I_{CM}	reverse bias safe operating area	RBSOA; $V_{GE} = \pm 15\text{ V}; R_G = 22\text{ }\Omega; L = 100\text{ }\mu\text{H}$		100		A
V_{CEK}		clamped inductive load; $T_{VJ} = 125^{\circ}\text{C}$		$\leq V_{CES} - L_s \cdot di/dt$		V
t_{SC} (SCSOA)	short circuit safe operating area	$V_{CE} = V_{CES}; V_{GE} = \pm 15\text{ V};$ $R_G = 22\text{ }\Omega; \text{non-repetitive}$	$T_{VJ} = 125^{\circ}\text{C}$		10	μs
R_{thJC}	thermal resistance junction to case				0.3	K/W
R_{thJH}	thermal resistance case to heatsink	with heat transfer paste, see mounting instructions		0.6		K/W

Diodes D1 - D4

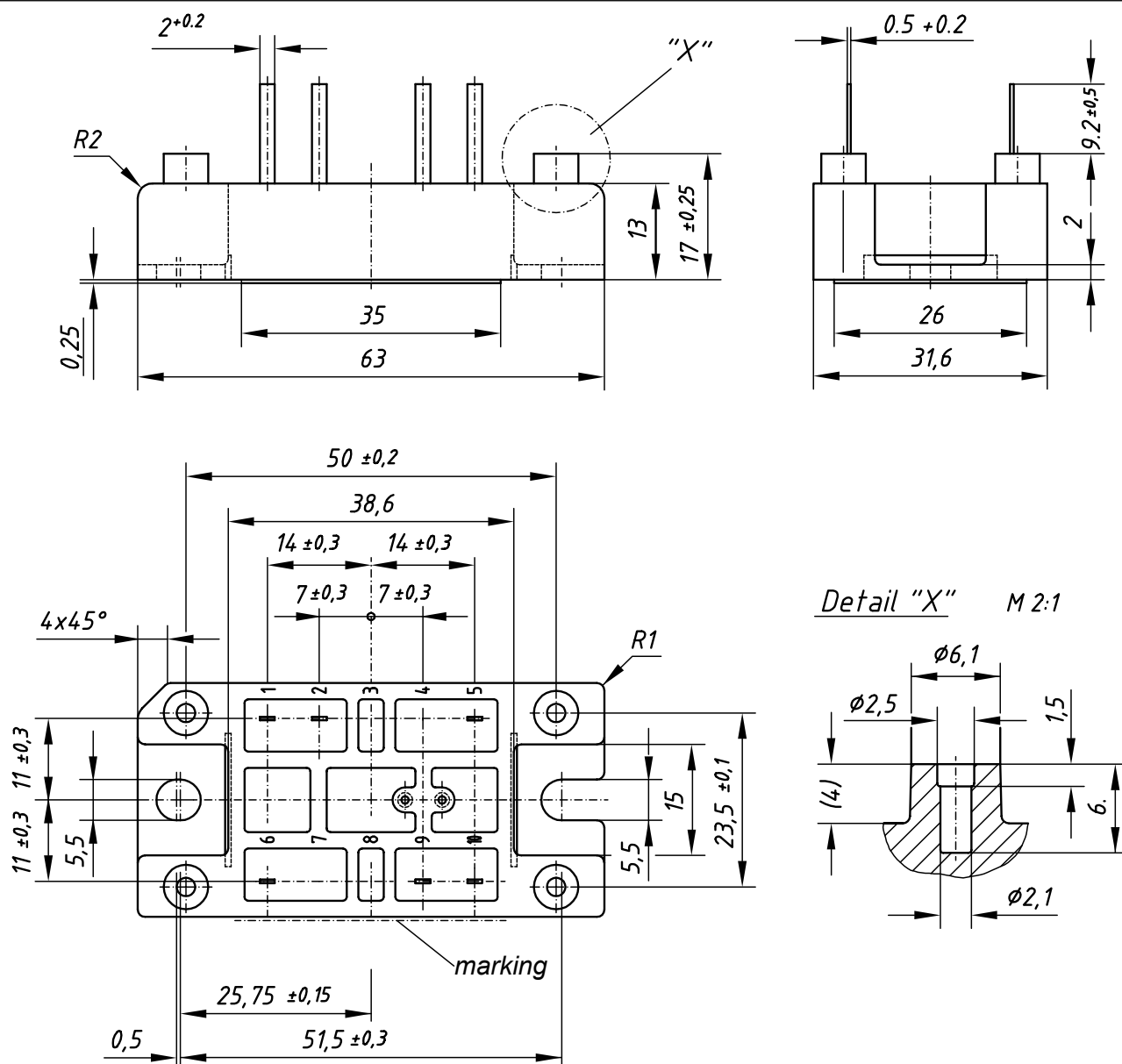
Symbol	Conditions	Ratings				
		min.	typ.	max.		
V_{RRM}	<i>repetitive reverse voltage</i>	$T_{VJ} = 25^{\circ}\text{C}$		1200	V	
I_{F25}	<i>collector current</i>	$T_C = 25^{\circ}\text{C}$		40	A	
I_{F80}		$T_C = 80^{\circ}\text{C}$		25	A	
I_R	<i>reverse current</i>	$V_R = V_{RRM}$ $V_R = 0.8 \cdot V_{RRM}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$	0.75 2	mA mA	
V_F	<i>forward voltage</i>	$I_F = 20\text{ A}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$	2.2 1.9	V V	
I_{RM}	<i>reverse recovery current</i>	$I_F = 30\text{ A}; di_F/dt = -250\text{ A}/\mu\text{s}$ $V_R = 540\text{ V}$		16	A	
t_{rr}	<i>reverse recovery time</i>		$T_{VJ} = 125^{\circ}\text{C}$	400	ns	
R_{thJC}	<i>thermal resistance junction to case</i>	per diode	$T_{VJ} = 25^{\circ}\text{C}$		1.3	K/W
R_{thJH}	<i>thermal resistance case to heatsink</i>	with heat transfer paste	$T_{VJ} = 25^{\circ}\text{C}$	2.6		K/W

Module

Symbol	Definitions	Conditions	Ratings			
			min.	typ.	max.	Unit
T_{VJ}	operating temperature		-40		150	°C
T_{stg}	storage temperature		-40		125	°C
V_{ISOL}	isolation voltage	$I_{ISOL} \leq 1 \text{ mA}; 50/60 \text{ Hz}; t = 1 \text{ min}$			3600	V~
M_d	mounting torque	(M5)	2		2.5	Nm
$d_s; d_A$	creep distance on surface / through air		5			mm
Weight				35		g

Outline Drawing

Dimensions in mm (1 mm = 0.0394")


Product Marking

Ordering	Part Name	Marking on Product	Delivering Mode	Base Qty	Ordering Code
Standard	VUI30-12N1	VUI30-12N1	Box	10	487554