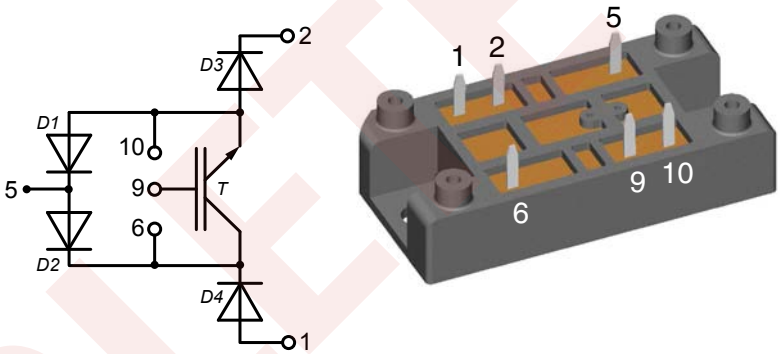
Rectifier Module for Three Phase Power Factor Correction

Typ. Rectified Mains Power
P_n = 15 kW at
V_n = 400 V 3~
f_T = 15 kHz
T_C = 80°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

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Transistor T

Symbol	Definitions	Conditions		Ratings min.	typ.	max.	Unit
V_{CES}	*collector emitter voltage*		T_{VJ} = 25°C to 150°C			1200	V
V_{GES}	*DC gate voltage*	continuous		-20		+20	V
I_{C25}	*collector current*	DC	T_C = 25°C			95	A
I_{C80}		DC	T_C = 80°C			65	A
$V_{CE(sat)}$	*collector emitter saturation voltage*	I_C = 20 A; V_{GE} = 15 V	T_{VJ} = 25°C		1.7	2.0	V
			T_{VJ} = 125°C		1.9		
$V_{GE(th)}$	*gate emitter threshold voltage*	I_C = 2 mA; V_{GE} = V_{CE}	T_{VJ} = 25°C	4.5		6.5	V
I_{CES}	*collector emitter leakage current*	V_{CE} = V_{CES}; V_{GE} = 0 V	T_{VJ} = 25°C			1.6	mA
			T_{VJ} = 125°C		1.8		mA
I_{GES}	*gate emitter leakage current*	V_{CE} = 0 V; V_{GE} = ±20 V				400	nA
$t_{d(on)}$	*turn-on delay time*	inductive load	T_{VJ} = 125°C		100		ns
t_r	*current rise time*	V_{CE} = 600 V; I_C = 20 A			70		ns
$t_{d(off)}$	*turn-off delay time*	V_{GE} = ±15 V; R_G = 22 Ω; L = 100 µH			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 V; V_{GE} = 0 V; f = 1 MHz			3.3		nF
Q_{Gon}	*total gate charge*	V_{CE} = 600 V; V_{GE} = 15 V; I_C = 50 A			240		nC
I_{CM}	*reverse bias safe operating area*	RBSOA; V_{GE} = ±15 V; R_G = 22 Ω; L = 100 µH			100		A
V_{CEK}		clamped inductive load;	T_{VJ} = 125°C		≤ V_{CES}-L_S·d_i/dt		V
t_{SC} (SCSOA)	*short circuit safe operating area*	V_{CE} = V_{CES}; V_{GE} = ±15 V; R_G = 22 Ω; non-repetitive	T_{VJ} = 125°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}	*repetitive reverse voltage*	T_{VJ} = 25°C			1200	V
I_{F25}	*collector current*	T_C = 25°C			40	A
I_{F80}		T_C = 80°C			25	A
I_R	*reverse current*	V_R = V_{RRM}	T_{VJ} = 25°C			0.75	mA
		V_R = 0.8·V_{RRM}	T_{VJ} = 125°C		2		mA
V_F	*forward voltage*	I_F = 20 A	T_{VJ} = 25°C		2.2	2.4	V
			T_{VJ} = 125°C		1.9		V
I_{RM}	*reverse recovery current*	I_F = 30 A; di_F/dt = -250 A/µs			16		A
t_{rr}	*reverse recovery time*	V_R = 540 V	T_{VJ} = 125°C		400		ns
R_{thJC}	*thermal resistance junction to case*	per diode	T_{VJ} = 25°C			1.3	K/W
R_{thJH}	*thermal resistance case to heatsink*	with heat transfer paste	T_{VJ} = 25°C		2.6		K/W

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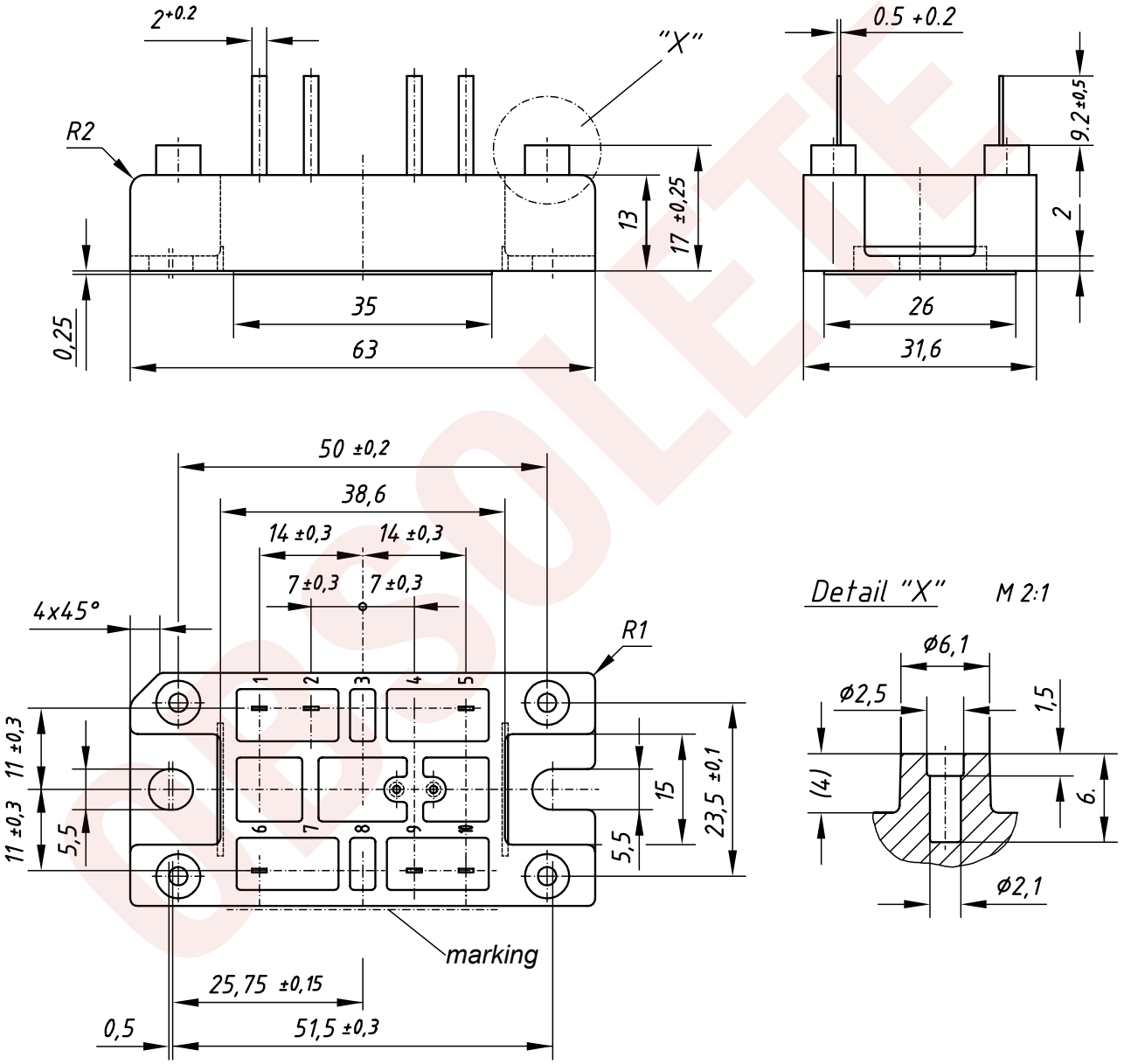
Module

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*	$I_{ISOL} \leq 1$ mA; 50/60 Hz;	t = 1 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

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