

# Three Phase Rectifier Bridge

with IGBT and Fast Recovery Diode  
for Braking System

Rectifier Diode	Fast Recov. Diode	IGBT
$V_{RRM} = 1200\text{ V}$ $1600\text{ V}$	$V_{CES} = 1200\text{ V}$	$V_{CES} = 1200\text{ V}$
$I_{DAVM} = 188\text{ A}$	$V_F = 2.7\text{ V}$	$I_{C80} = 125\text{ A}$
$I_{FSM} = 1100\text{ A}$	$I_{FSM} = 200\text{ A}$	$V_{CEsat} = 2.2\text{ V}$

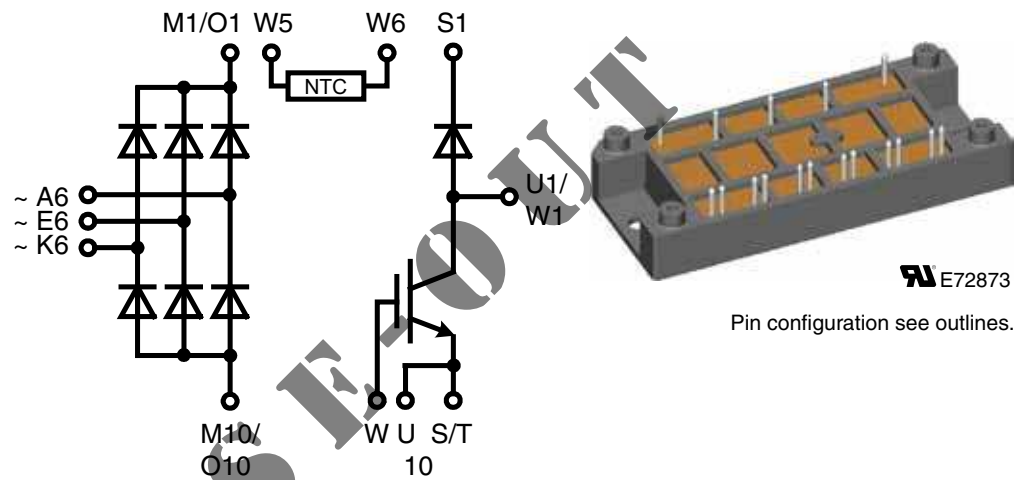
Preliminary data

**Part name** (Marking on product)

VUB160-12NO2(T)

VUB160-16NO2(T)

(T) = NTC optional



Pin configuration see outlines.

**Features:**

- Soldering connections for PCB mounting
- Isolation voltage 3600 V~
- Ultrafast diode
- Convenient package outline
- Optional NTC

**Application:**

- Drive Inverters with brake system

**Package:**

- Two functions in one package
- Easy to mount with two screws
- Suitable for wave soldering
- High temperature and power cycling capability
- UL registered, E72873

**Recommended replacement: VUB160-16NOX(T)**

IGBT						
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
$V_{GES}$	max. DC gate voltage	continuous	-20		+20	V
$V_{GEM}$	max. transient collector gate voltage	transient	-30		+30	V
$I_{C25}$	collector current	DC			177	A
$I_{C80}$		DC			125	A
$P_{tot}$	total power dissipation				690	W
$V_{CE(sat)}$	collector emitter saturation voltage	$I_C = 75\text{ A}; V_{GE} = 15\text{ V}$			2.2	V
$V_{GE(th)}$	gate emitter threshold voltage	$I_C = 4\text{ mA}; V_{GE} = V_{CE}$	4.5		6.5	V
$I_{CES}$	collector emitter leakage current	$V_{CE} = V_{CES}; V_{GE} = 0\text{ V}$			0.2 1	mA mA
$C_{ies}$	input capacitance	$V_{CE} = 25\text{ V}; V_{GE} = 0\text{ V}; f = 1\text{ MHz}$			7.4	nF
$t_{d(on)}$	turn-on delay time	inductive load $V_{CE} = 600\text{ V}; I_C = 75\text{ A}$ $V_{GE} = \pm 15\text{ V}; R_G = 10\ \Omega; L = 100\ \mu\text{H}$	$T_{VJ} = 125^{\circ}\text{C}$		330	ns
$t_{d(off)}$	turn-off delay time				750	ns
$E_{on}$	turn-on energy per pulse				12	mJ
$E_{off}$	turn-off energy per pulse				10	mJ
$I_{CM}$	reverse bias safe operating area	RBSOA; $V_{GE} = \pm 15\text{ V}; R_G = 10\ \Omega; L = 100\ \mu\text{H}$			350	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	$V_{CE} = 900\text{ V}; V_{GE} = \pm 15\text{ V}; R_G = 10\ \Omega$ ; non-repetitive	$T_{VJ} = 125^{\circ}\text{C}$		10	$\mu\text{s}$
RBSOA	reverse bias safe operating area	$V_{CE} = 1200\text{ V}; V_{GE} = \pm 15\text{ V}; R_G = 10\ \Omega; L = 100\ \mu\text{H}$ ; clamped inductive load	$T_{VJ} = 125^{\circ}\text{C}$		200	A
$R_{thJC}$	thermal resistance junction to case				0.18	K/W
$R_{thCH}$	thermal resistance case to heatsink				0.1	K/W

Fast Recovery Diode						
Symbol	Definitions	Conditions	Ratings			
			min.	typ.	max.	Unit
$V_{RRM}$	max. repetitive reverse voltage	$T_{VJ} = 150^{\circ}\text{C}$			1200	V
$I_{FAV}$	average forward current	rect.; $d = 0.5$			34	A
$I_{FRMS}$	rms forward current	rect.; $d = 0.5$			48	A
$I_{FSM}$	max. surge forward current	$t = 10\text{ ms}$	$T_{VJ} = 45^{\circ}\text{C}$		200	A
		$t = 10\text{ ms}$	$T_{VJ} = 150^{\circ}\text{C}$		180	A
$P_{tot}$	total power dissipation		$T_C = 25^{\circ}\text{C}$		140	W
$V_{F0}$	threshold voltage		$T_{VJ} = 150^{\circ}\text{C}$		1.3	V
$r_F$	slope resistance	for power loss calculation only			15	m $\Omega$
$V_F$	forward voltage	$I_F = 30\text{ A}$	$T_{VJ} = 25^{\circ}\text{C}$		2.7	V
$I_R$	reverse current	$V_R = V_{RRM}$	$T_{VJ} = 25^{\circ}\text{C}$ $T_{VJ} = 125^{\circ}\text{C}$		0.5 1	mA mA
$I_{RM}$	reverse recovery current	$I_F = 50\text{ A}; V_R = 100\text{ V}; di_F/dt = -100\text{ A}/\mu\text{s}$			8 12	A
$t_{rr}$	reverse recovery time	$I_F = 1\text{ A}; V_R = 30\text{ V}; di_F/dt = -100\text{ A}/\mu\text{s}$			40 60	ns
$R_{thJC}$	thermal resistance junction to case				0.9	K/W
$R_{thCH}$	thermal resistance case to heatsink				0.3	K/W

$T_C = 25^{\circ}\text{C}$  unless otherwise stated

**Rectifier Diode**

Symbol	Conditions	Ratings			Unit
		min.	typ.	max.	
$V_{RRM}$	max. repetitive reverse voltage			1200 1600	V V
$I_R$	reverse current	$V_R = V_{RRM}$	$T_{VJ} = 25^\circ\text{C}$ $T_{VJ} = 150^\circ\text{C}$	0.3 5	mA mA
$V_F$	forward voltage	$I_F = 150\text{ A}$	$T_{VJ} = 25^\circ\text{C}$	1.46	V
$I_{D(AV)M}$	max. average DC output current	rectangular; $d = 1/3$ ; bridge	$T_C = 80^\circ\text{C}$	188	A
$V_{F0}$	threshold voltage		$T_{VJ} = 150^\circ\text{C}$	0.87	V
$r_F$	slope resistance	for power loss calculation only		4	m $\Omega$
$R_{thJC}$	thermal resistance junction to case	per diode	$T_{VJ} = 25^\circ\text{C}$	0.6	K/W
$R_{thCH}$	thermal resistance case to heatsink		$T_{VJ} = 25^\circ\text{C}$	0.2	K/W
$P_{tot}$	total power dissipation		$T_{VJ} = 25^\circ\text{C}$	160	W
$I_{FSM}$	max. forward surge current	$t = 10\text{ ms (50Hz)}$ $V_R = 0\text{ V}$	$T_{VJ} = 45^\circ\text{C}$ $T_{VJ} = 150^\circ\text{C}$	1100 960	A A
$I^2t$	value for fusing	$t = 10\text{ ms (50Hz)}$ $V_R = 0\text{ V}$	$T_{VJ} = 45^\circ\text{C}$ $T_{VJ} = 150^\circ\text{C}$	6050 4610	A <sup>2</sup> s A <sup>2</sup> s

**Temperature Sensor NTC**

Symbol	Definitions	Conditions	Ratings			Unit	
			min.	typ.	max.		
$R_{25}$	resistance		$T_C = 25^\circ\text{C}$	4.75	5.0	5.25	k $\Omega$
$B_{25/85}$					3375		K

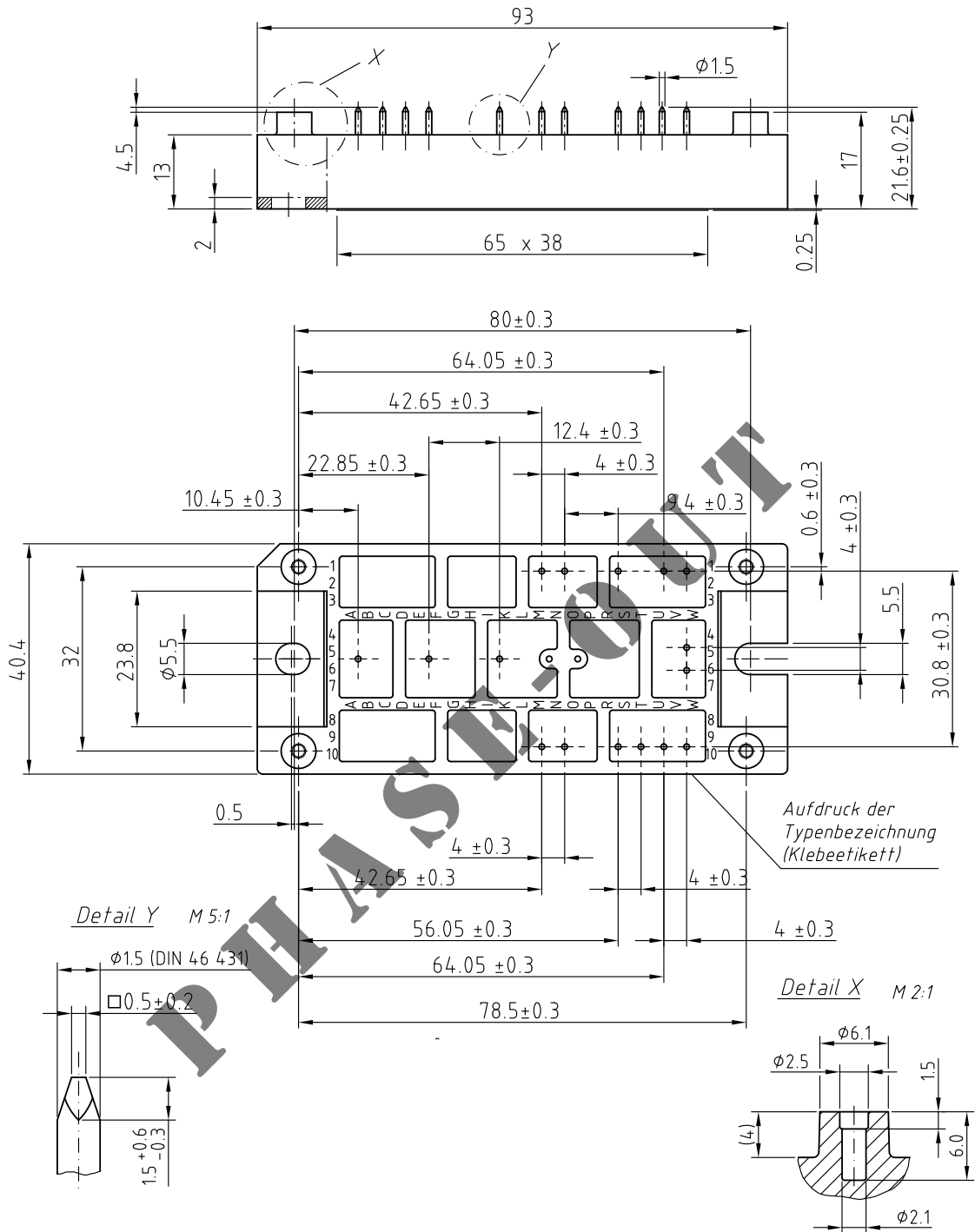
**Module**

Symbol	Definitions	Conditions	Ratings			Unit
			min.	typ.	max.	
$T_{VJ}$	operating temperature		-40		150	$^\circ\text{C}$
$T_{VJM}$	max. virtual junction temperature				150	$^\circ\text{C}$
$T_{stg}$	storage temperature		-40		125	$^\circ\text{C}$
$V_{ISOL}$	isolation voltage	$I_{ISOL} \leq 1\text{ mA}; 50/60\text{ Hz};$ $t = 1\text{ min.}$ $t = 1\text{ s}$			3000 3600	V~ V~
$M_d$	mounting torque	(M5)	2.0		2.5	Nm
$d_s$	creep distance on surface		12.7			mm
$d_A$	strike distance through air		9.4			mm
$a$	maximum allowable acceleration		50			m/s <sup>2</sup>
<b>Weight</b>				80		g

 $T_C = 25^\circ\text{C}$  unless otherwise stated

## Outline Drawing

Dimensions in mm (1 mm = 0.0394")



## Product Marking

Ordering	Part Name	Marking on Product	Delivering Mode	Base Qty	Ordering Code
Standard	VUB 160-12NO2	VUB160-12NO2	Box	6	495972
Standard	VUB 160-16NO2	VUB160-16NO2	Box	6	495980
+NTC	VUB 160-12NO2T	VUB160-12NO2	Box	6	499706
+NTC	VUB 160-16NO2T	VUB160-16NO2	Box	6	499722