



flowCON 0

1600 V / 42 A

**Topology features**

- Three-phase Half Controlled Converter

**Component features**

- High inrush current capability

**Housing features**

- Base isolation: Al<sub>2</sub>O<sub>3</sub>
- Clip-in, reliable mechanical connection, qualified for wave soldering
- Convex shaped substrate for superior thermal contact
- Thermo-mechanical push-and-pull force relief
- Solder pin

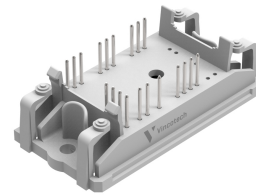
**Target applications**

- Industrial Drives
- Embedded Drives
- UPS

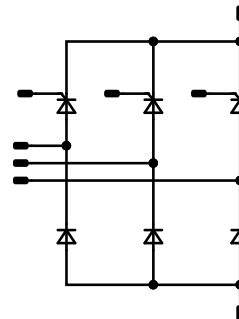
**Types**

- V23990-P640-H10-PM

**flow 0 17 mm housing**



**Schematic**





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## Maximum Ratings

$T_j = 25\text{ °C}$ , unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
<b>Rectifier Thyristor</b>				
Repetitive peak reverse voltage	$V_{RRM}$		1600	V
Maximum RMS on-state current	$I_{TRMSM}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	55	A
Surge on-state current	$I_{TSM}$	Single Half Sine Wave, $t_p = 10\text{ ms}$ $T_j = 130\text{ °C}$	450	A
I2t value	$I^2t$	Single Half Sine Wave, $t_p = 10\text{ ms}$ $T_j = 130\text{ °C}$	1010	A <sup>2</sup> s
Mean total power loss	$P_{tot(AV)}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	67	W
Maximum Junction Temperature	$T_{jmax}$		130	°C

## Rectifier Diode

Peak repetitive reverse voltage	$V_{RRM}$		1600	V
Forward current (DC current)	$I_F$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	78	A
Surge (non-repetitive) forward current	$I_{FSM}$	Single Half Sine Wave, $t_p = 10\text{ ms}$ $T_j = 150\text{ °C}$	740	A
Surge current capability	$I^2t$		2740	A <sup>2</sup> s
Total power dissipation	$P_{tot}$	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	88	W
Maximum junction temperature	$T_{jmax}$		150	°C

## Module Properties

### Thermal Properties

Storage temperature	$T_{stg}$		-40...+125	°C
Operation temperature under switching condition	$T_{jop}$		-40...+( $T_{jmax} - 25$ )	°C

### Isolation Properties

Isolation voltage	$V_{isol}$	DC Test Voltage* $t_p = 2\text{ s}$	6000	V
Isolation voltage	$V'_{isol}$	AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance			>12,7	mm
Clearance			>12,7	mm
Comparative Tracking Index	CTI		≥ 200	

\*100 % tested in production



### Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
		$V_{GE}$ [V] $V_{GS}$ [V]	$V_{CE}$ [V] $V_{DS}$ [V] $V_F$ [V]	$I_C$ [A] $I_D$ [A] $I_F$ [A]	$T_j$ [°C]	Min	Typ	Max		

#### Rectifier Thyristor

##### Static

Direct reverse current	$I_{RD}$	$V_T = 1600$ V				25			200	μA
Holding current	$I_H$	$I_T = A$				25			165	mA
Latching current	$I_L$	$t_p = \mu s$ $I_G = A$ $di_G/dt = A/\mu s$				25			330	mA
Gate trigger voltage	$V_{GT}$					25			1,98	V
Gate trigger current	$I_{GT}$					25			100	mA

##### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)							0,75	K/W
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#### Rectifier Diode

##### Static

Forward voltage	$V_F$				80	25 125 150		1,18 1,15	1,23 <sup>(1)</sup> 1,17 <sup>(1)</sup>	V
Reverse leakage current	$I_R$	$V_T = 1600$ V				25 150			50 1500	μA

##### Thermal

Thermal resistance junction to sink <sup>(2)</sup>	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)							0,79	K/W
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<sup>(1)</sup> Value at chip level

<sup>(2)</sup> Only valid with pre-applied Vincotech thermal interface material.

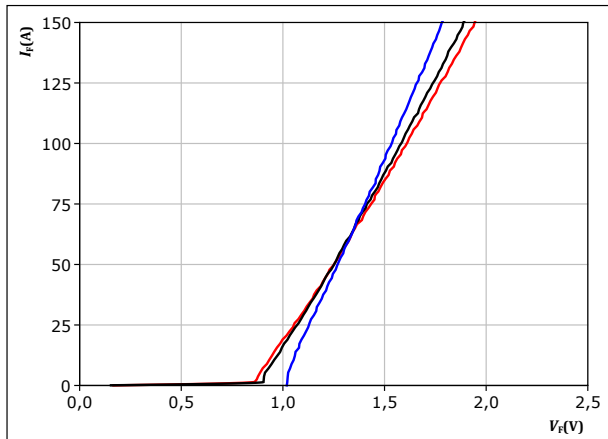


## Rectifier Thyristor Characteristics

**figure 1.** Thyristor

Typical forward characteristics

$$I_F = f(V_F)$$



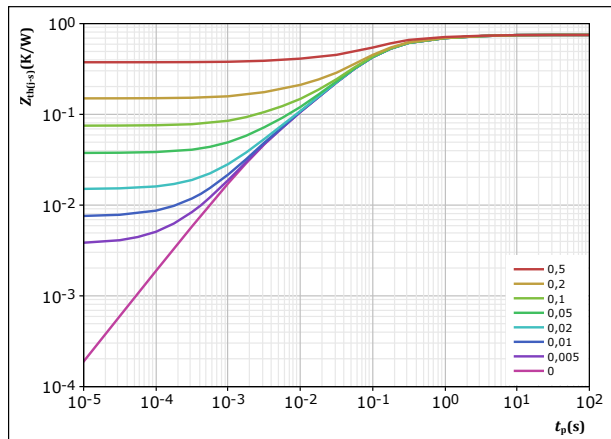
$t_p = 250 \mu s$

$T_j$ :  
— 25 °C  
— 100 °C  
— 125 °C

**figure 2.** Thyristor

Transient thermal impedance as a function of pulse width

$$Z_{th(j-s)} = f(t_p)$$



$D = \frac{t_p}{T}$   
 $R_{th(j-s)} = 0,75 \text{ K/W}$

Thyristor thermal model values

$R$ (K/W)	$\tau$ (s)
5,49E-02	3,39E+00
1,27E-01	4,99E-01
4,30E-01	1,03E-01
1,02E-01	3,06E-02
3,72E-02	3,32E-03



## Rectifier Diode Characteristics

figure 3. Rectifier

Typical forward characteristics

$$I_F = f(V_F)$$

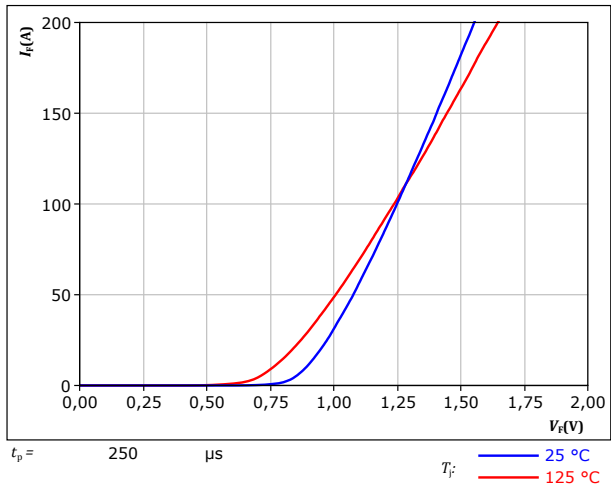
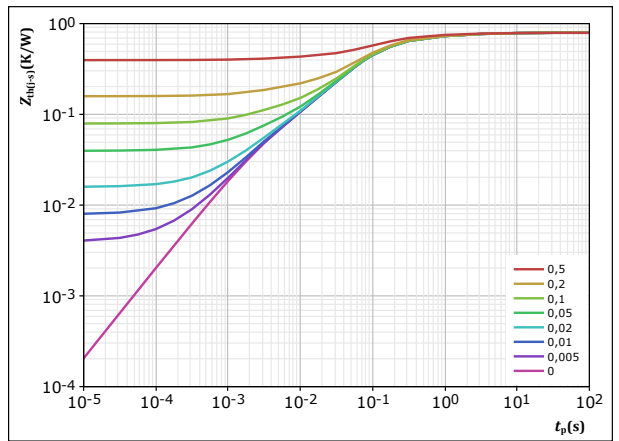


figure 4. Rectifier

Transient thermal impedance as a function of pulse width

$$Z_{th(j-s)} = f(t_p)$$



$D = \frac{t_p}{T}$   
 $R_{th(j-s)} = 0,792 \text{ K/W}$

Rectifier thermal model values


$R$ (K/W)	$\tau$ (s)
3,05E-02	5,90E+00
8,93E-02	1,13E+00
2,82E-01	1,79E-01
3,51E-01	6,17E-02
3,93E-02	3,00E-03



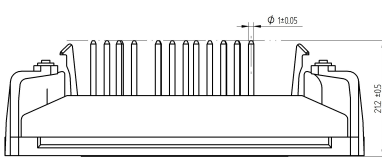
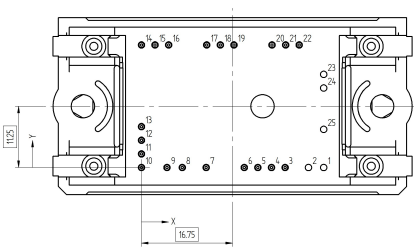
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**V23990-P640-H10-PM**  
datasheet

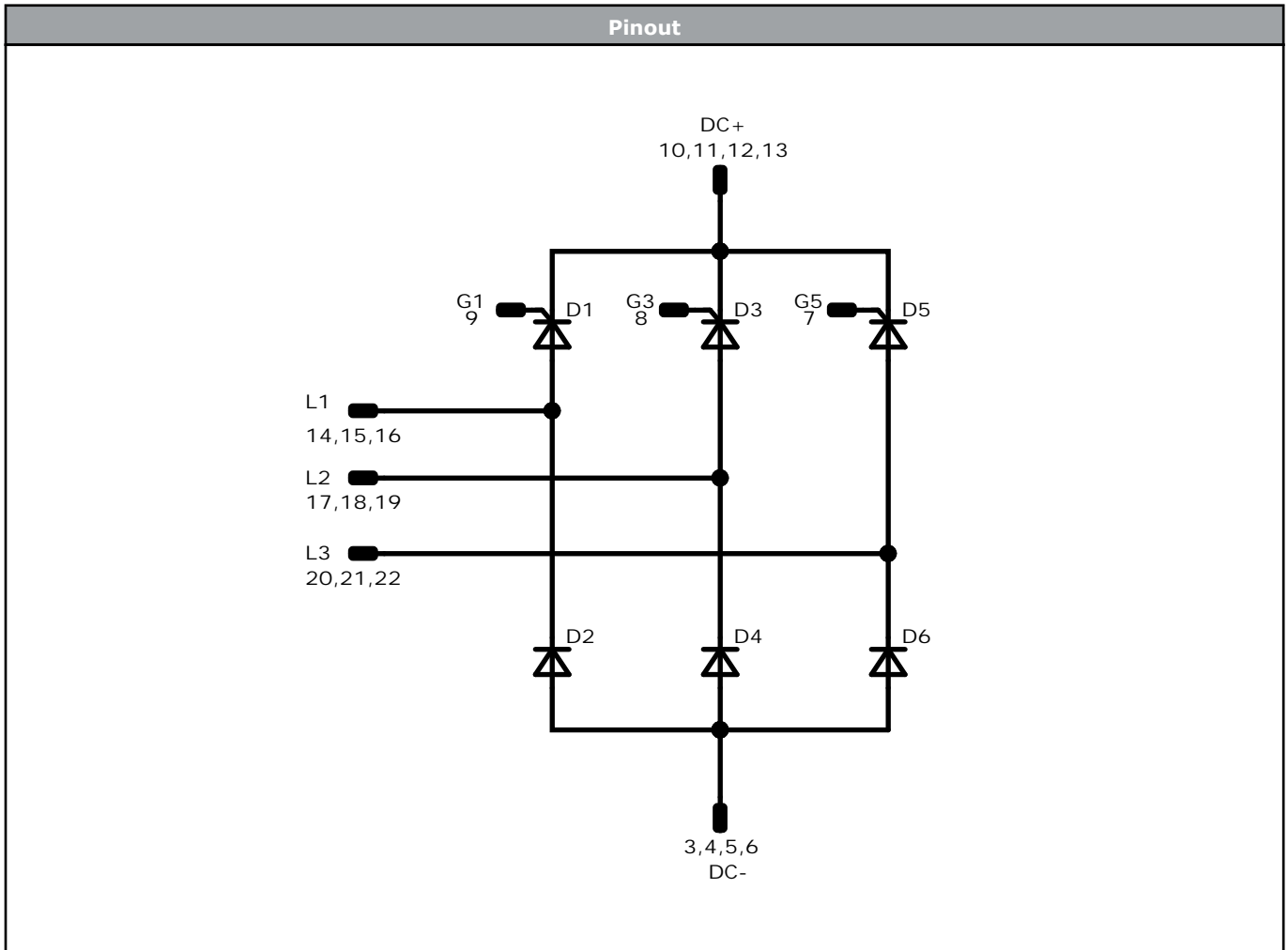
Ordering Code	
<b>Version</b>	<b>Ordering Code</b>
Without thermal paste	V23990-P640-H10-PM
With thermal paste (5,2 W/mK, PTM6000HV)	V23990-P640-H10-/7/-PM
With thermal paste (3,4 W/mK, PSX-P7)	V23990-P640-H10-/3/-PM

Marking							
	<b>Text</b>	<b>VIN</b> VIN	<b>Date code</b> WWYY	<b>Type&amp;Ver</b> TTTTTTVV	<b>UL</b> UL	<b>Lot</b> LLLLL	<b>Serial</b> SSSS
	<b>Datamatrix</b>	<b>Type&amp;Ver</b>	<b>Lot number</b>	<b>Serial</b>	<b>Date code</b>		
		TTTTTTVV	LLLLL	SSSS	WWYY		

Outline				
Pin table [mm]				
Pin	X	Y	Function	
1			not assembled	
2			not assembled	
3	26,4	0	DC-	
4	23,9	0	DC-	
5	21,4	0	DC-	
6	18,9	0	DC-	
7	11,9	0	G5	
8	7,5	0	G3	
9	4,7	0	G1	
10	0	0	DC+	
11	0	2,5	DC+	
12	0	5	DC+	
13	0	7,5	DC+	
14	0	22,5	L1	
15	2,5	22,5	L1	
16	5	22,5	L1	
17	12	22,5	L2	
18	14,5	22,5	L2	
19	17	22,5	L2	
20	24	22,5	L3	
21	26,5	22,5	L3	
22	29	22,5	L3	
23			not assembled	
24			not assembled	
25			not assembled	

Tolerance of pinpositions: ±0.5mm at the end of pins  
Dimension of coordinate axis is only offset without tolerance



Identification					
ID	Component	Voltage	Current	Function	Comment
D1, D3, D5	Thyristor	1600 V	55 A	Rectifier Thyristor	
D2, D4, D6	Rectifier	1600 V	80 A	Rectifier Diode	




Packaging instruction				
Standard packaging quantity (SPQ) 135	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for <i>flow 0</i> packages see vincotech.com website.

Package data
Package data for <i>flow 0</i> packages see vincotech.com website.

Vincotech thermistor reference
See Vincotech thermistor reference table at vincotech.com website.

UL recognition and file number
This device is certified according to UL 1557 standard, UL file number E192116. For more information see vincotech.com website. 

Document No.:	Date:	Modification:	Pages
V23990-P640-H10-PM-D2-14	7 May. 2023	New Datasheet format, module is unchanged Updated Rectifier Thyristor characteristic	

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