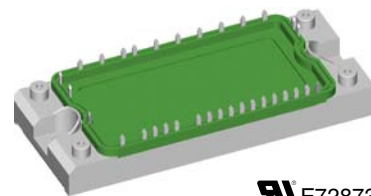
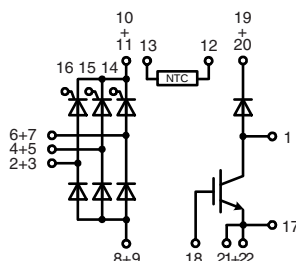


Three Phase Rectifier Bridge with IGBT and Fast Recovery Diode for Braking System

$$V_{RRM} = 1600 \text{ V}$$

$$I_{dAVM} = 135 \text{ A}$$

V_{RRM} V	Type
1600	VVZB 135-16 NO1



See outline drawing for pin arrangement

Symbol	Conditions	Maximum Ratings	
V_{RRM}		1600	V
I_{dAVM}	$T_C = 85^\circ\text{C}$; sinusoidal 120°	135	A
I_{FSM}	$T_{VJ} = 45^\circ\text{C}$; $t = 10 \text{ ms}$; $V_R = 0 \text{ V}$	700	A
	$T_{VJ} = 150^\circ\text{C}$; $t = 10 \text{ ms}$; $V_R = 0 \text{ V}$	610	A
I^2t	$T_{VJ} = 45^\circ\text{C}$; $t = 10 \text{ ms}$; $V_R = 0 \text{ V}$	2450	A ² s
	$T_{VJ} = 150^\circ\text{C}$; $t = 10 \text{ ms}$; $V_R = 0 \text{ V}$	1860	A ² s
P_{tot}	$T_C = 25^\circ\text{C}$ per diode	190	W
$(di/dt)_{cr}$	$T_{VJ} = T_{VJM}$; $f = 50 \text{ Hz}$; $t_p = 200 \mu\text{s}$ repetitive; $I_T = 150 \text{ A}$	100	A/ μs
	$V_D = \frac{2}{3} V_{DRM}$; $I_G = 0.45 \text{ A}$; $di_G/dt = 0.45 \text{ A}/\mu\text{s}$ non repetitive; $I_T = I_{d(AV)}/3$	500	A/ μs
$(dv/dt)_{cr}$	$T_{VJ} = T_{VJM}$; $V_{DR} = \frac{2}{3} V_{DRM}$; $R_{GK} = \infty$; method 1 (linear voltage rise)	1000	V/ μs
P_{GM}	$T_{VJ} = T_{VJM}$; $t_p = 30 \mu\text{s}$	10	W
	$I_T = I_{d(AV)}/3$; $t_p = 300 \mu\text{s}$	5	W
P_{GAVM}		0.5	W
V_{CES}	$T_{VJ} = 25^\circ\text{C}$ to 150°C	1200	V
V_{GE}	Continuous	± 20	V
I_{C25}	$T_C = 25^\circ\text{C}$; DC	95	A
I_{C80}	$T_C = 80^\circ\text{C}$; DC	67	A
I_{CM}	$t_p = \text{Pulse width limited by } T_{VJM}$	100	A
P_{tot}	$T_C = 25^\circ\text{C}$	380	W
V_{RRM}		1200	V
I_{FAV}	$T_C = 80^\circ\text{C}$; rectangular $d = 0.5$	27	A
I_{FRMS}	$T_C = 80^\circ\text{C}$; rectangular $d = 0.5$	38	A
I_{FRM}	$T_C = 80^\circ\text{C}$; $t_p = 10 \mu\text{s}$; $f = 5 \text{ kHz}$	tbd	A
I_{FSM}	$T_{VJ} = 45^\circ\text{C}$; $t = 10 \text{ ms}$	200	A
P_{tot}	$T_C = 25^\circ\text{C}$	130	W

Data according to IEC 60747

Features

- Soldering connections for PCB mounting
- Convenient package outline
- Thermistor
- Isolation voltage 2500 V~

Applications

- Drive Inverters with brake system

Advantages

- 2 functions in one package
- Easy to mount with two screws
- Suitable for wave soldering
- High temperature and power cycling capability

Recommended replacement:

VVZB 135-16ioXT

Symbol	Conditions	Characteristic Values ($T_{VJ} = 25^{\circ}\text{C}$, unless otherwise specified)		
		min.	typ.	max.
I_R, I_D	$V_R = V_{RRM}; T_{VJ} = 25^{\circ}\text{C}$ $V_R = V_{RRM}; T_{VJ} = 150^{\circ}\text{C}$			0.1 mA 20 mA
V_F, V_T	$I_F = 80 \text{ A}; T_{VJ} = 25^{\circ}\text{C}$			1.43 V
V_{T0} r_T	for power-loss calculations only $T_{VJ} = 150^{\circ}\text{C}$			0.85 V 7.1 m Ω
V_{GT} I_{GT}	$V_D = 6 \text{ V}; T_{VJ} = 25^{\circ}\text{C}$ $V_D = 6 \text{ V}; T_{VJ} = -40^{\circ}\text{C}$ $V_D = 6 \text{ V}; T_{VJ} = 25^{\circ}\text{C}$ $V_D = 6 \text{ V}; T_{VJ} = -40^{\circ}\text{C}$			1.5 V 1.6 V 78 mA 200 mA
V_{GD} I_{GD}	$T_{VJ} = T_{VJM}; V_D = \frac{2}{3} V_{DRM}$ $T_{VJ} = T_{VJM}; V_D = \frac{2}{3} V_{DRM}$			0.2 V 5 mA
I_L	$V_D = 6 \text{ V}; t_G = 10 \mu\text{s};$ $di_G/dt = 0.45 \text{ A}/\mu\text{s}; I_G = 0.45 \text{ A}$			450 mA
I_H	$T_{VJ} = T_{VJM}; V_D = 6 \text{ V}; R_{GK} = \infty$			100 mA
t_{gd}	$V_D = \frac{1}{2} V_{DRM};$ $di_G/dt = 0.45 \text{ A}/\mu\text{s}; I_G = 0.45 \text{ A}$			2 μs
t_q	$T_{VJ} = T_{VJM}; V_R = 100 \text{ V};$ $V_D = \frac{2}{3} V_{DRM}; t_p = 200 \mu\text{s};$ $dv/dt = 15 \text{ V}/\mu\text{s}; I_T = 20 \text{ A};$ $-di/dt = 10 \text{ A}/\mu\text{s}$			150 μs
R_{thJC} R_{thCH}	per diode		0.2	0.65 K/W K/W
$V_{BR(CES)}$ $V_{GE(th)}$	$V_{GS} = 0 \text{ V}; I_C = 0.1 \text{ mA}$ $I_C = 8 \text{ mA}$	1200 4.5		V V
I_{CES}	$V_{CE} = 1200 \text{ V}; T_{VJ} = 25^{\circ}\text{C}$ $V_{CE} = 0.8 \cdot V_{CES}; T_{VJ} = 125^{\circ}\text{C}$			0.1 mA 0.5 mA
V_{CEsat}	$V_{GE} = 15 \text{ V}; I_C = 100 \text{ A}$			3.5 V
$t_{SC}(\text{SCSOA})$	$V_{GE} = 15 \text{ V}; V_{CE} = 900 \text{ V}; T_{VJ} = 125^{\circ}\text{C}$			10 μs
RBSOA	$V_{GE} = 15 \text{ V}; V_{CE} = 1200 \text{ V}; T_{VJ} = 125^{\circ}\text{C};$ clamped inductive load; $L = 100 \mu\text{H};$ $R_G = 22 \Omega$			100 A
C_{ies}	$V_{CE} = 25 \text{ V}; f = 1 \text{ MHz}; V_{GE} = 0 \text{ V}$		3.8	nF
$t_{d(on)}$ $t_{d(off)}$ E_{on} E_{off}	$V_{CE} = 720 \text{ V}; I_C = 50 \text{ A}$ $V_{GE} = 15 \text{ V}; R_G = 22 \Omega$ Inductive load; $L = 100 \mu\text{H};$ $T_{VJ} = 125^{\circ}\text{C}$		150 680 6 5	ns ns mJ mJ
R_{thJC} R_{thCH}			0.1	0.33 K/W K/W

Symbol	Conditions	Characteristic Values ($T_{VJ} = 25^{\circ}\text{C}$, unless otherwise specified)		
		min.	typ.	max.
I_R	$V_R = V_{RRM}; T_{VJ} = 25^{\circ}\text{C}$ $V_R = 1200\text{ V}; T_{VJ} = 125^{\circ}\text{C}$		1	0.25 mA mA
V_F	$I_F = 30\text{ A}; T_{VJ} = 25^{\circ}\text{C}$			2.76 V
V_{T0}	For power-loss calculations only			1.3 V
r_T	$T_{VJ} = 150^{\circ}\text{C}$			16 m Ω
I_{RM}	$I_F = 50\text{ A}; -di_F/dt = 100\text{ A}/\mu\text{s}; V_R = 100\text{ V}$	5.5	11	A
t_{rr}	$I_F = 1\text{ A}; -di_F/dt = 200\text{ A}/\mu\text{s}; V_R = 30\text{ V}$	40		ns
R_{thJC}				0.9 K/W
R_{thCH}		0.25		K/W
R_{25} $B_{25/50}$	NTC $\left\{ R(T) = R_{25} \cdot e^{B_{25/100} \left(\frac{1}{T} - \frac{1}{298K} \right)} \right\}$	4.75	5.0 3375	5.25 k Ω K

Symbol	Conditions	Maximum Ratings	
T_{VJ}		-40...+150	$^{\circ}\text{C}$
T_{VJM}		150	$^{\circ}\text{C}$
T_{stg}		-40...+125	$^{\circ}\text{C}$
V_{ISOL}	50/60 Hz; $t = 1\text{ min}$ $I_{ISOL} \leq 1\text{ mA}; t = 1\text{ s}$	2500 3000	V~ V~
M_d	Mounting torque	2.7...3.3	Nm
d_s	Creep distance on surface	12.7	mm
d_A	Strike distance in air	9.6	mm
a	Maximum allowable acceleration	50	m/s ²
Weight	typ.	180	g

Dimensions in mm (1 mm = 0.0394")

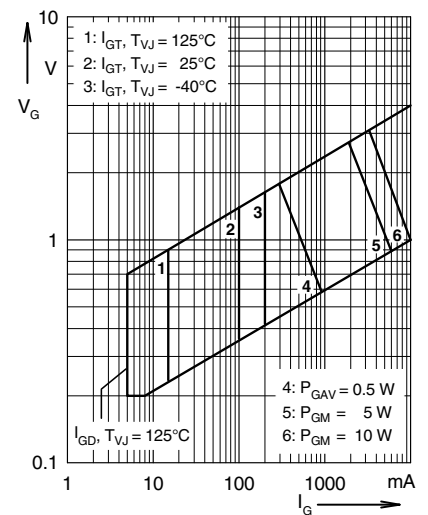
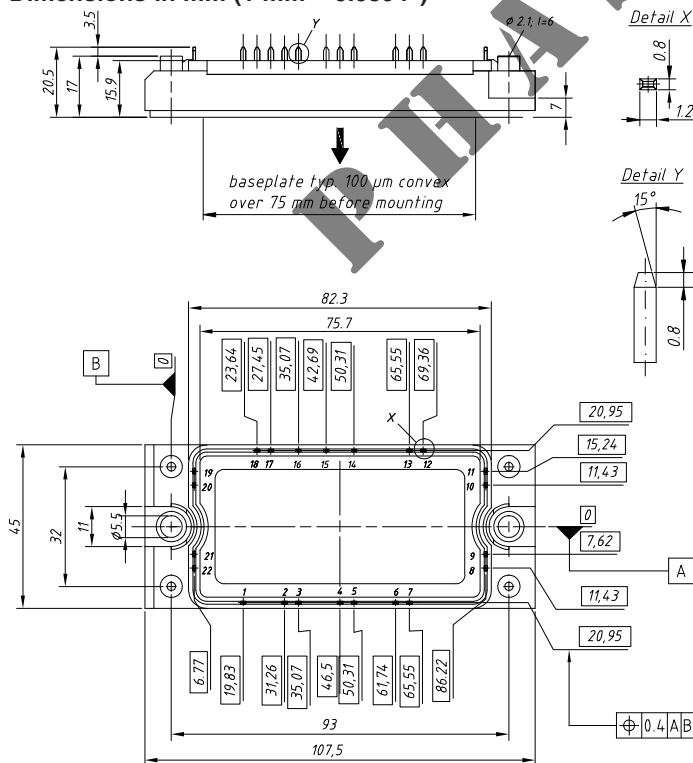


Fig. 1 Gate trigger characteristics

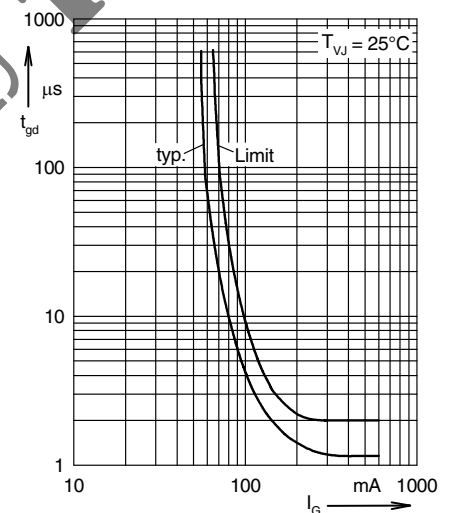


Fig. 2 Gate trigger delay time

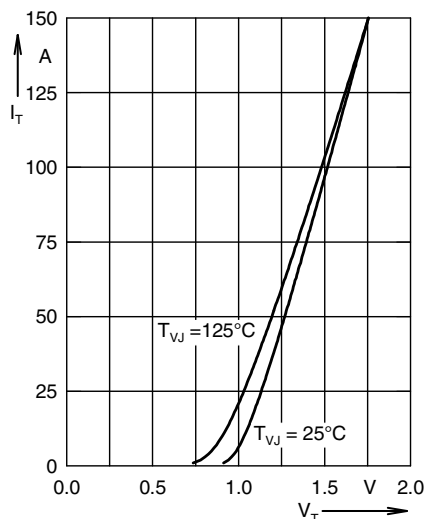


Fig. 3 Forward current versus voltage drop per leg

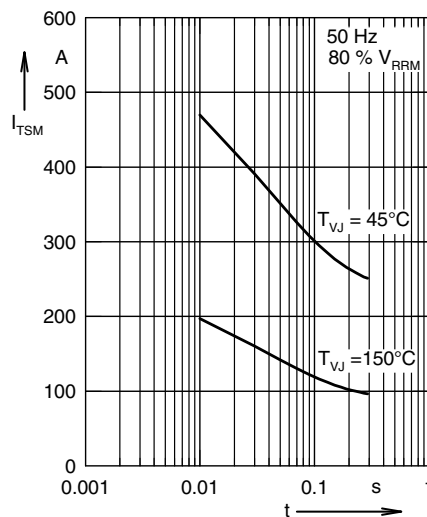


Fig. 4 Surge overload current

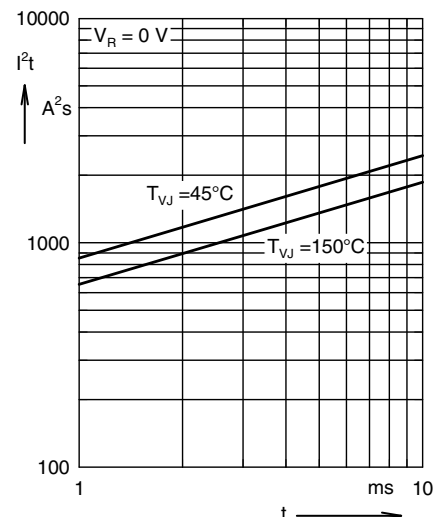


Fig. 5 I^2t versus time (per thyristor/diode)

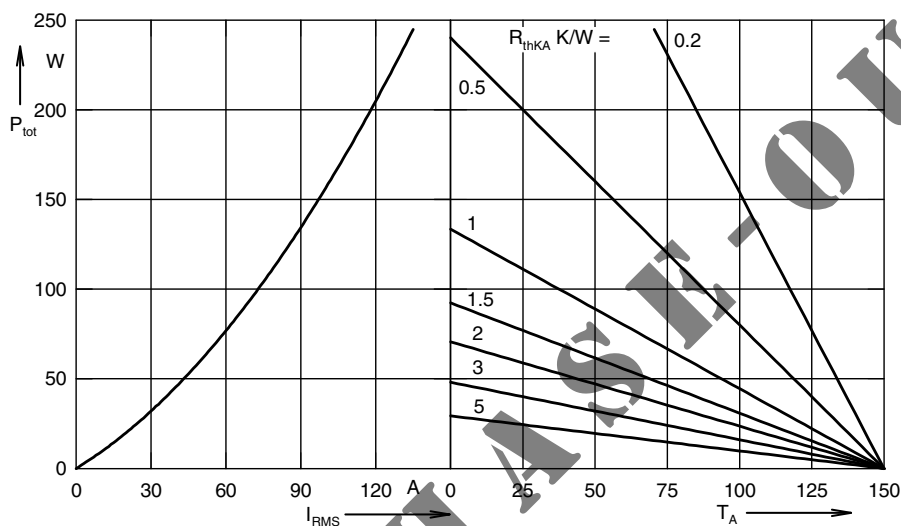


Fig. 6 Power dissipation versus direct output current and ambient temperature

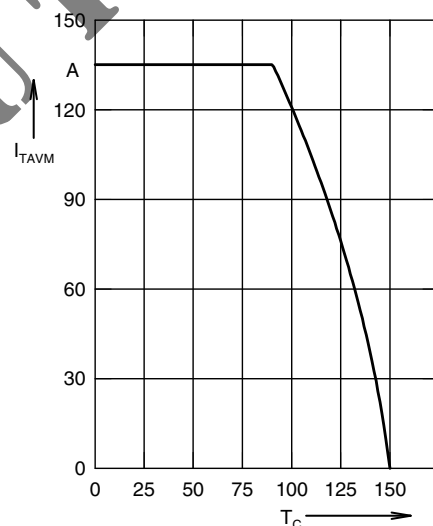


Fig. 7 Maximum forward current at case temperature

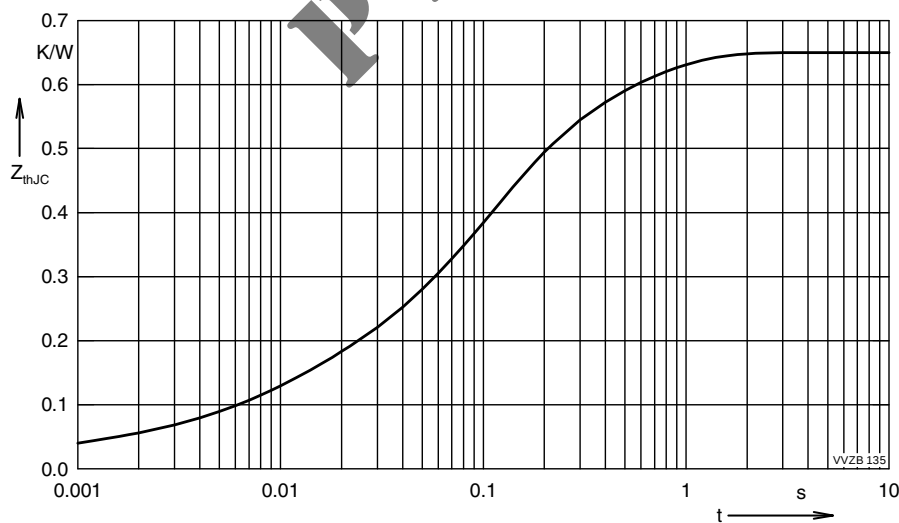


Fig. 8 Transient thermal impedance junction to case (per thyristor/diode)

Constants for Z_{thJC} calculation:	
R_{thi} / (K/W)	t_i / (s)
0.03	0.0005
0.083	0.008
0.361	0.094
0.176	0.45

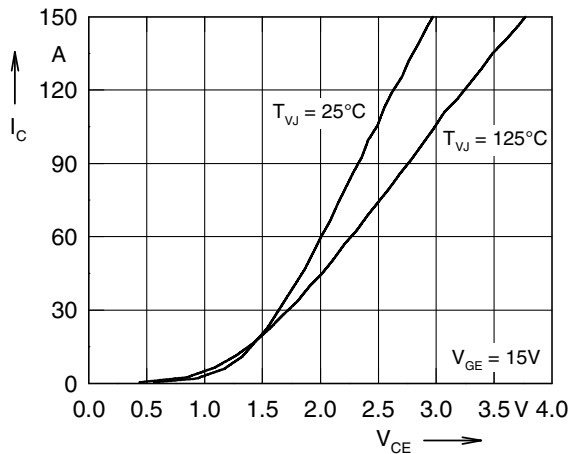


Fig. 9 Typ. output characteristics

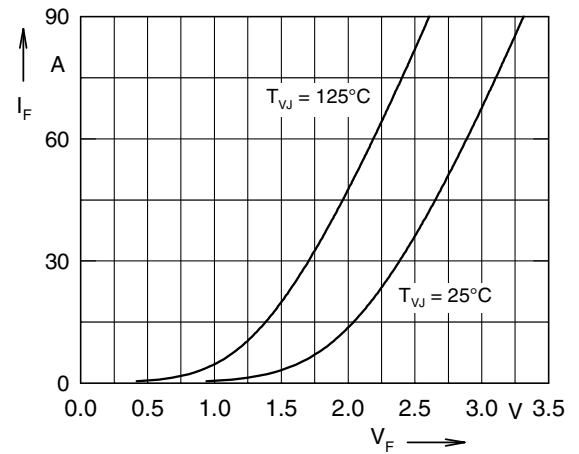


Fig. 10 Typ. forward characteristics of free wheeling diode

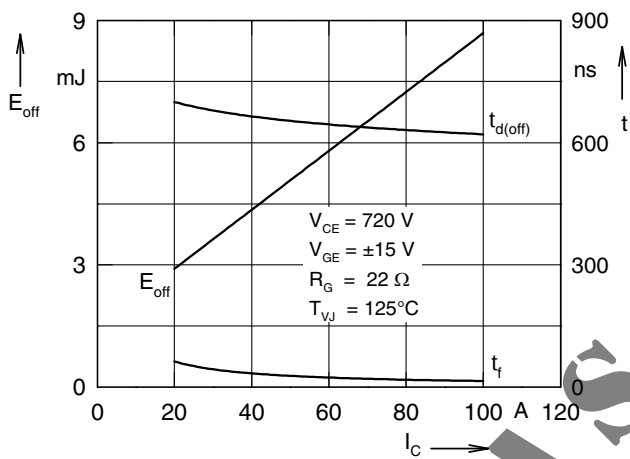


Fig. 11 Typ. turn off energy and switching times versus collector current

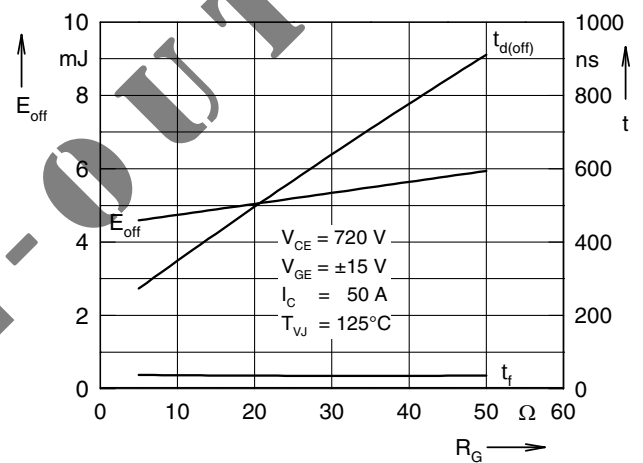


Fig. 12 Typ. turn off energy and switching times versus gate resistor

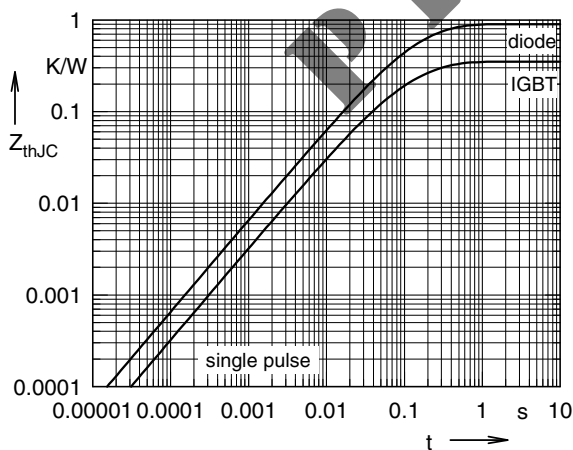


Fig. 13 Typ. transient thermal impedance

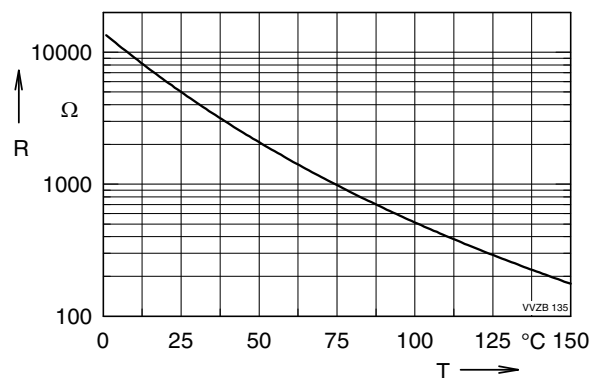


Fig. 14 Typ. thermistor resistance versus temperature