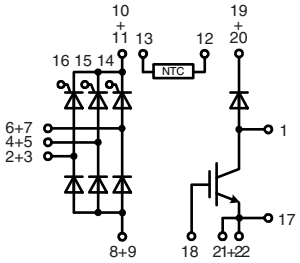
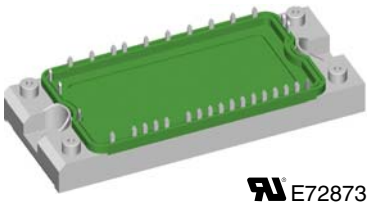
Three Phase Rectifier Bridge
with IGBT and Fast Recovery Diode for Braking System

V_{RRM} = 1600 V
I_{dAVM} = 135 A

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





See outline drawing for pin arrangement

Symbol		Conditions		Maximum Ratings	
V_{RRM}	Rectifier Bridge			1600	V
I_{dAVM}		T_C = 85°C; sinusoidal 120°		135	A
I_{FSM}		T_{VJ} = 45°C; t = 10 ms; V_R = 0 V		700	A
		T_{VJ} = 150°C; t = 10 ms; V_R = 0 V		610	A
I^2t		T_{VJ} = 45°C; t = 10 ms; V_R = 0 V		2450	A
		T_{VJ} = 150°C; t = 10 ms; V_R = 0 V		1860	A
P_{tot}		T_C = 25°C per diode		190	W
$(di/dt)_{cr}$		$T_{VJ} = T_{VJM}$; f = 50 Hz; t_P = 200 µs	repetitive; I_T = 150 A	100	A/µs
		$V_D = {}^2/_3 V_{DRM}$; I_G = 0.45 A; di_G/dt = 0.45 A/µs	non repetitive; $I_T = I_{d(AV)}/3$	500	A/µs
$(dv/dt)_{cr}$		$T_{VJ} = T_{VJM}$; $V_{DR} = {}^2/_3 V_{DRM}$; $R_{GK} = \infty$; method 1 (linear voltage rise)		1000	V/µs
P_{GM}		$T_{VJ} = T_{VJM}$; t_P = 30 µs		10	W
		$I_T = I_{d(AV)}/3$; t_P = 300 µs		5	W
P_{GAVM}				0.5	W
V_{CES}	IGBT	T_{VJ} = 25°C to 150°C		1200	V
V_{GE}		Continuous		± 20	V
I_{C25}		T_C = 25°C; DC		95	A
I_{C80}		T_C = 80°C; DC		67	A
I_{CM}		t_p = Pulse width limited by T_{VJM}		100	A
P_{tot}		T_C = 25°C		380	W
V_{RRM}	Fast Recovery Diode			1200	V
I_{FAV}		T_C = 80°C; rectangular d = 0.5		27	A
I_{FRMS}		T_C = 80°C; rectangular d = 0.5		38	A
I_{FRM}		T_C = 80°C; t_P = 10 µs; f = 5 kHz		tbd	A
I_{FSM}		T_{VJ} = 45°C; t = 10 ms		200	A
P_{tot}		T_C = 25°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

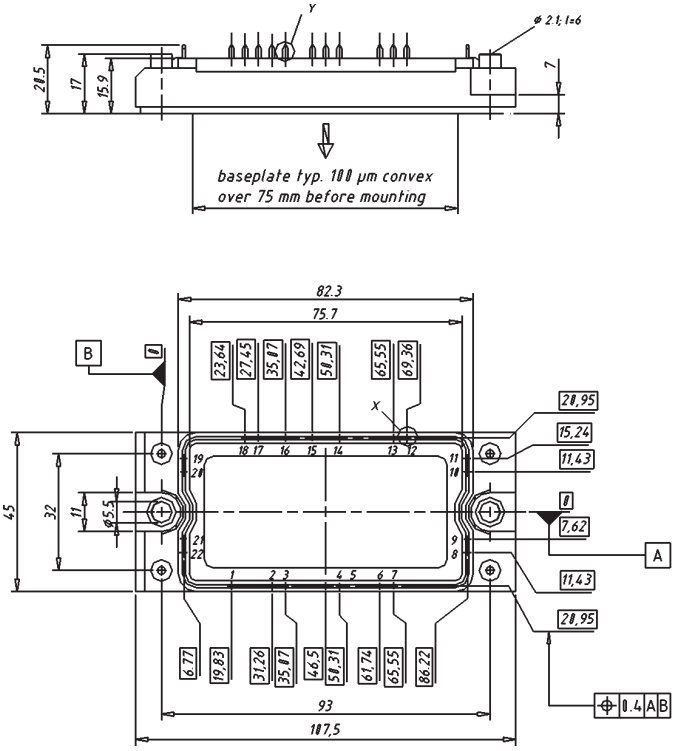
Advantages
- 2 functions in one package
- Easy to mount with two screws
- Suitable for wave soldering
- High temperature and power cycling capability

Symbol		Conditions	Characteristic Values (T_{VJ} = 25°C, unless otherwise specified) min.	typ.	max.	
I_R, I_D	Rectifier Bridge	$V_R = V_{RRM}$; T_{VJ} = 25°C			0.1	mA
		$V_R = V_{RRM}$; T_{VJ} = 150°C			20	mA
V_F, V_T		I_F = 80 A; T_{VJ} = 25°C			1.43	V
V_{T0}		for power-loss calculations only			0.85	V
r_T		T_{VJ} = 150°C			7.1	mΩ
V_{GT}		V_D = 6 V; T_{VJ} = 25°C			1.5	V
		T_{VJ} = -40°C			1.6	V
I_{GT}		V_D = 6 V; T_{VJ} = 25°C			78	mA
		T_{VJ} = -40°C			200	mA
V_{GD}		$T_{VJ} = T_{VJM}$; $V_D = {}^2/_3 V_{DRM}$			0.2	V
I_{GD}		$T_{VJ} = T_{VJM}$; $V_D = {}^2/_3 V_{DRM}$			5	mA
I_L		V_D = 6 V; t_G = 10 µs; di_G/dt = 0.45 A/µs; I_G = 0.45 A			450	mA
I_H		$T_{VJ} = T_{VJM}$; V_D = 6 V; $R_{GK} = \infty$			100	mA
t_{gd}		$V_D = ½ V_{DRM}$; di_G/dt = 0.45 A/µs; I_G = 0.45 A			2	µs
t_q		$T_{VJ} = T_{VJM}$; V_R = 100 V; $V_D = {}^2/_3 V_{DRM}$; t_P = 200 µs; dv/dt = 15 V/µs; I_T = 20 A; -di/dt = 10 A/µs			150	µs
R_{thJC}		per diode			0.65	K/W
R_{thCH}				0.2		K/W
$V_{BR(CES)}$	IGBT	V_{GS} = 0 V; I_C = 0.1 mA	1200			V
$V_{GE(th)}$		I_C = 8 mA	4.5		6.45	V
I_{CES}		V_{CE} = 1200 V; T_{VJ} = 25°C			0.1	mA
		V_{CE} = 0,8•V_{CES}; T_{VJ} = 125°C			0.5	mA
V_{CEsat}		V_{GE} = 15 V; I_C = 100 A			3.5	V
t_{SC} (SCSOA)		V_{GE} = 15 V; V_{CE} = 900 V; T_{VJ} = 125°C			10	µs
RBSOA		V_{GE} = 15 V; V_{CE} = 1200 V; T_{VJ} = 125°C; clamped inductive load; L = 100 µH; R_G = 22 Ω			100	A
C_{ies}		V_{CE} = 25 V; f = 1 MHz, V_{GE} = 0 V		3.8		nF
$t_{d(on)}$		V_{CE} = 720 V; I_C = 50 A		150		ns
$t_{d(off)}$		V_{GE} = 15 V; R_G = 22 Ω		680		ns
E_{on}		Inductive load; L = 100 µH;		6		mJ
E_{off}		T_{VJ} = 125°C		5		mJ
R_{thJC}					0.33	K/W
R_{thCH}				0.1		K/W

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

Symbol		Conditions	Maximum Ratings	
T_{VJ}	Module		-40...+150	°C
T_{VJM}			150	°C
T_{stg}			-40...+125	°C
V_{ISOL}		50/60 Hz; t = 1 min	2500	V~
		$I_{ISOL} \leq$ 1 mA; t = 1 s	3000	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/s²
Weight		typ.	180	g

Dimensions in mm (1 mm = 0.0394")



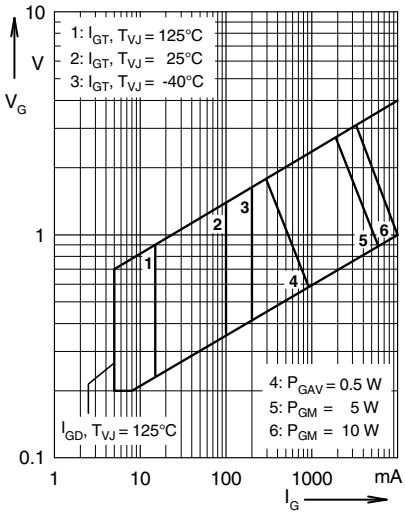


Fig. 1 Gate trigger characteristics

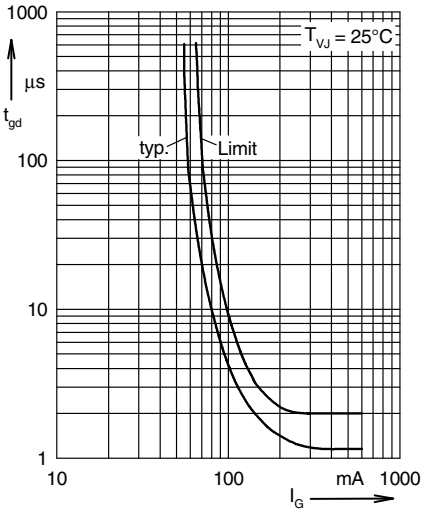


Fig. 2 Gate trigger delay time

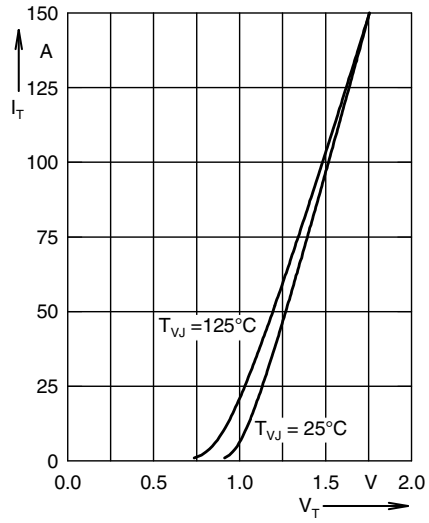


Fig. 3 Forward current versus voltage drop per leg

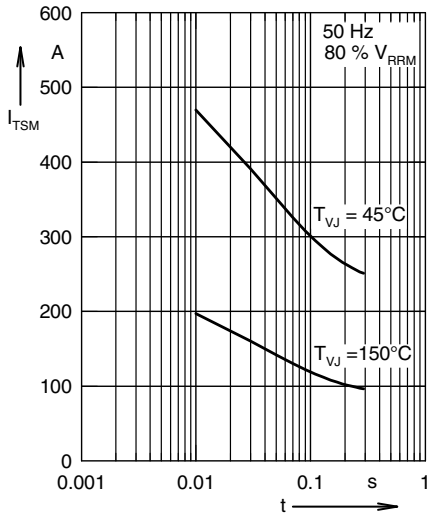


Fig. 4 Surge overload current

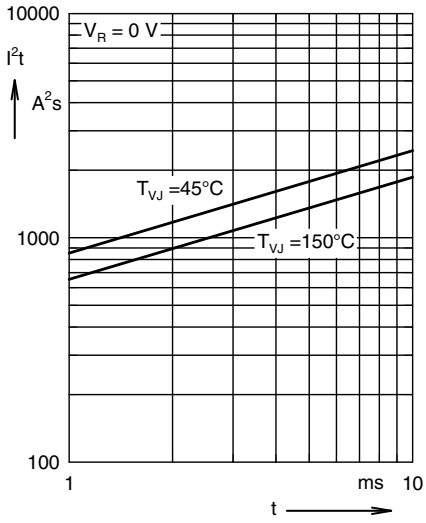


Fig. 5 I^2t versus time (per thyristor/diode)

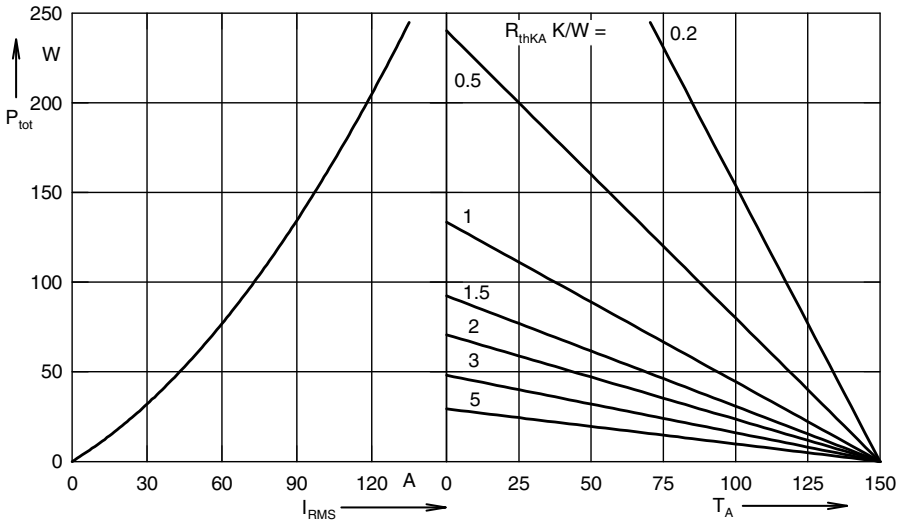


Fig. 6 Power dissipation versus direct output current and ambient temperature

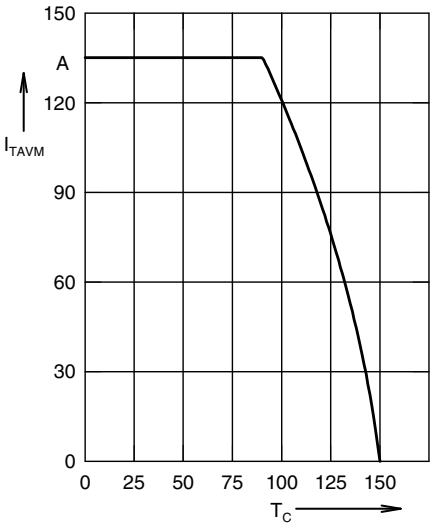


Fig. 7 Maximum forward current at case temperature

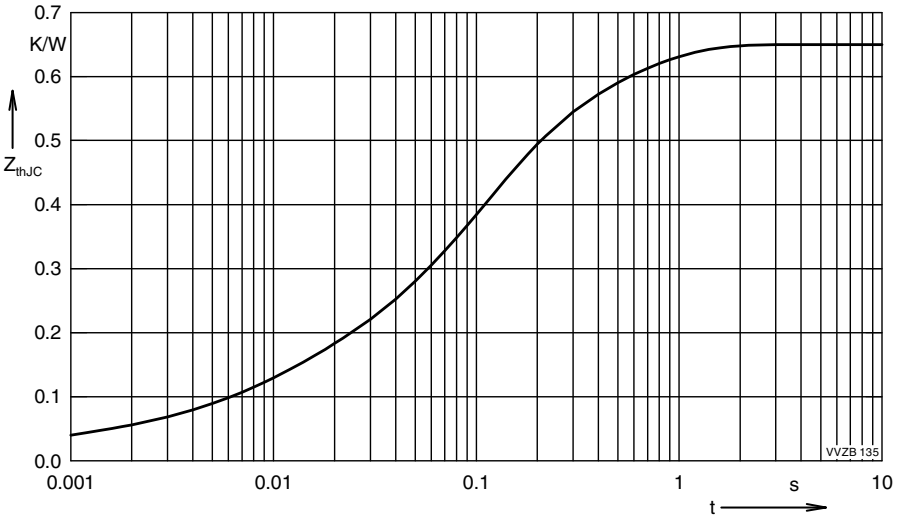


Fig. 8 Transient thermal impedance junction to case (per thyristor/diode)

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

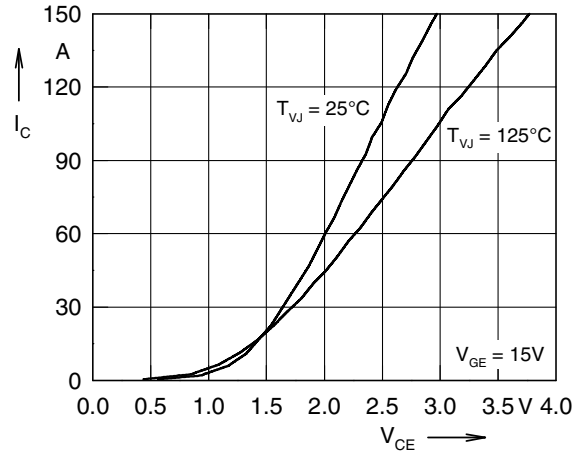


Fig. 9 Typ. output characteristics

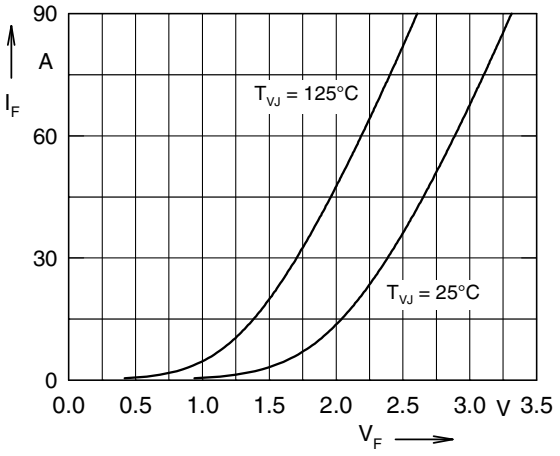


Fig. 10 Typ. forward characteristics of free wheeling diode

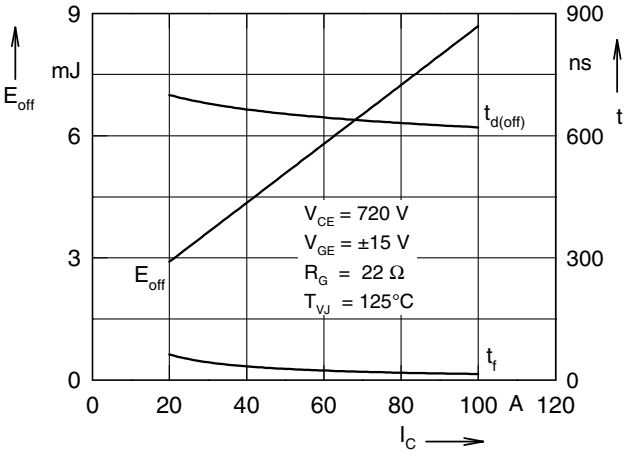


Fig. 11 Typ. turn off energy and switching times versus collector current

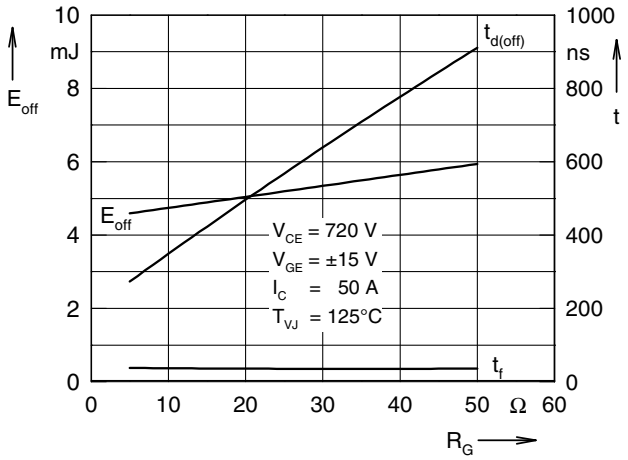


Fig. 12 Typ. turn off energy and switching times versus gate resistor

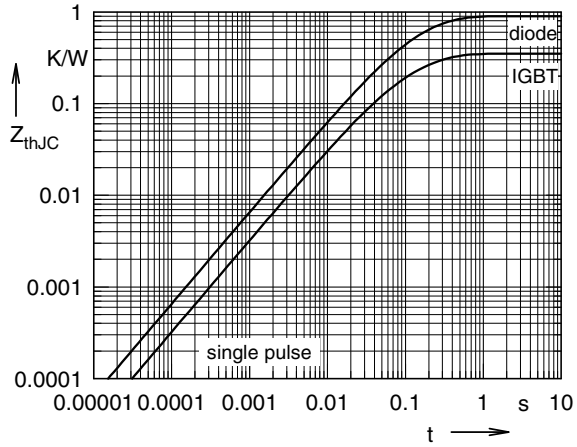


Fig. 13 Typ. transient thermal impedance

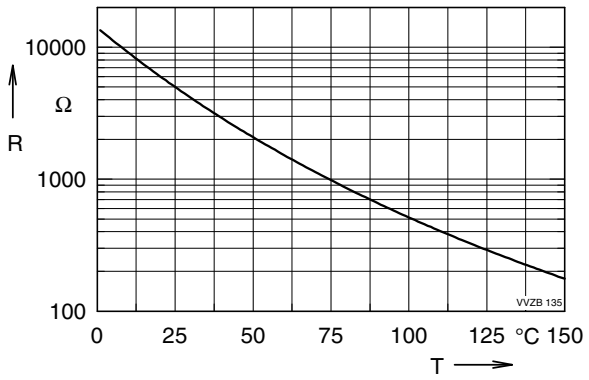


Fig. 14 Typ. thermistor resistance versus temperature