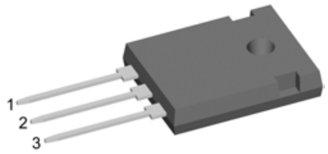
Thyristor

V_{RRM} = 1600 V
I_{TAV} = 40 A
V_T = 1,34 V

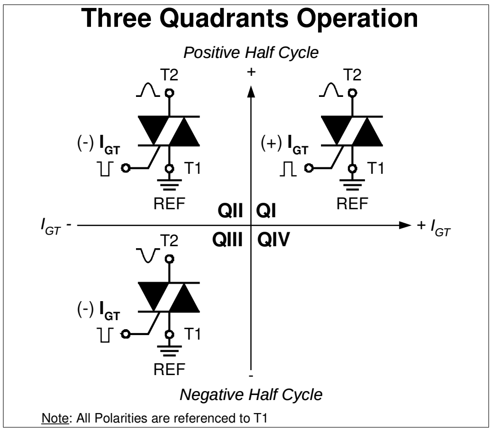
Three Quadrants operation: QI - QIII
1~ Triac

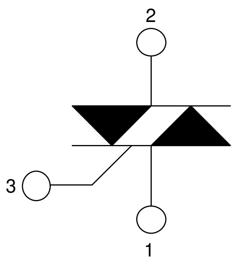
Part number

CMA80MT1600NHB



Backside: Terminal 2





Features / Advantages:

- Triac for line frequency
- Three Quadrants Operation
  - QI - QIII
- Planar passivated chip
- Long-term stability
  of blocking currents and voltages

Applications:

- Line rectifying 50/60 Hz
- Softstart AC motor control
- DC Motor control
- Power converter
- AC power control
- Lighting and temperature control

Package: TO-247

- Industry standard outline
- RoHS compliant
- Epoxy meets UL 94V-0

Disclaimer Notice

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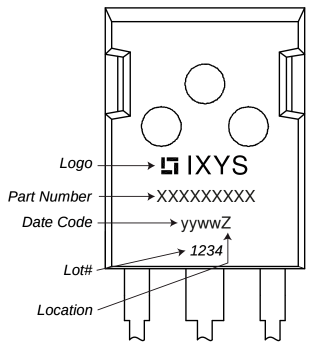
Rectifier

Symbol	Definition	Conditions		Ratings min.	Ratings typ.	Ratings max.	Unit
$V_{RSM/DSM}$	*max. non-repetitive reverse/forward blocking voltage*		T_{VJ} = 25°C			1700	V
$V_{RRM/DRM}$	*max. repetitive reverse/forward blocking voltage*		T_{VJ} = 25°C			1600	V
$I_{R/D}$	*reverse current, drain current*	$V_{R/D}$ = 1600 V	T_{VJ} = 25°C			10	µA
		$V_{R/D}$ = 1600 V	T_{VJ} = 125°C			2	mA
V_T	*forward voltage drop*	I_T = 40 A	T_{VJ} = 25°C			1,36	V
		I_T = 80 A				1,70	V
		I_T = 40 A	T_{VJ} = 125°C			1,34	V
		I_T = 80 A				1,78	V
I_{TAV}	*average forward current*	T_C = 115°C	T_{VJ} = 150°C			40	A
I_{RMS}	*RMS forward current per phase*	180° sine				88	A
V_{T0}	*threshold voltage* }	*for power loss calculation only*	T_{VJ} = 150°C			0,89	V
r_T	*slope resistance* }					11,3	mΩ
R_{thJC}	*thermal resistance junction to case*					0,4	K/W
R_{thCH}	*thermal resistance case to heatsink*				0,25		K/W
P_{tot}	*total power dissipation*		T_C = 25°C			310	W
I_{TSM}	*max. forward surge current*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			380	A
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			410	A
		t = 10 ms; (50 Hz), sine	T_{VJ} = 150°C			325	A
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			350	A
I^2t	*value for fusing*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			720	A²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			700	A²s
		t = 10 ms; (50 Hz), sine	T_{VJ} = 150°C			530	A²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			510	A²s
C_J	*junction capacitance*	V_R = 400V f = 1 MHz	T_{VJ} = 25°C		14		pF
P_{GM}	*max. gate power dissipation*	t_P = 30 µs	T_C = 150°C			10	W
		t_P = 300 µs				5	W
P_{GAV}	*average gate power dissipation*					0,5	W
$(di/dt)_{cr}$	*critical rate of rise of current*	T_{VJ} = 125°C; f = 50 Hz	repetitive, I_T = 90 A			150	A/µs
		t_P = 200 µs; di_G/dt = 0,2 A/µs;					
		I_G = 0,2A; V_D = ⅔ V_{DRM}	non-repet., I_T = 40 A			500	A/µs
$(dv/dt)_{cr}$	*critical rate of rise of voltage*	V_D = ⅔ V_{DRM}	T_{VJ} = 125°C			500	V/µs
		R_{GK} = ∞; method 1 (linear voltage rise)					
V_{GT}	*gate trigger voltage*	V_D = 6 V	T_{VJ} = 25°C			1,7	V
			T_{VJ} = -40°C			1,9	V
I_{GT}	*gate trigger current*	V_D = 6 V	T_{VJ} = 25°C			± 70	mA
			T_{VJ} = -40°C			± 90	mA
V_{GD}	*gate non-trigger voltage*	V_D = ⅔ V_{DRM}	T_{VJ} = 125°C			0,2	V
I_{GD}	*gate non-trigger current*					± 1	mA
I_L	*latching current*	t_p = 10 µs	T_{VJ} = 25°C			100	mA
		I_G = 0,2A; di_G/dt = 0,2 A/µs					
I_H	*holding current*	V_D = 6 V R_{GK} = ∞	T_{VJ} = 25°C			70	mA
t_{gd}	*gate controlled delay time*	V_D = ½ V_{DRM}	T_{VJ} = 25°C			2	µs
		I_G = 0,5A; di_G/dt = 0,5 A/µs					
t_q	*turn-off time*	V_R = 100 V; I_T = 40A; V_D = ⅔ V_{DRM}	T_{VJ} =125 °C		150		µs
		di/dt = 10 A/µs; dv/dt = 20 V/µs; t_p = 200 µs					

Package TO-247			Ratings			
Symbol	**Definition**	**Conditions**	**min.**	**typ.**	**max.**	**Unit**
I_{RMS}	*RMS current*	per terminal			70	A
T_{VJ}	*virtual junction temperature*		-40		150	°C
T_{op}	*operation temperature*		-40		125	°C
T_{stg}	*storage temperature*		-40		150	°C
Weight				6		g
M_D	*mounting torque*		0,8		1,2	Nm
F_C	*mounting force with clip*		20		120	N

Product Marking



Part description

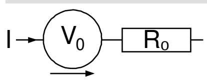
C = Thyristor (SCR)
M = Thyristor
A = (up to 1800V)
80 = Current Rating [A]
MT = 1~ Triac
1600 = Reverse Voltage [V]
N = Three Quadrants operation: QI - QIII
HB = TO-247AD (3)

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	CMA80MT1600NHB	CMA80MT1600NHB	Tube	30	522868

Similar Part	Package	Voltage class
CMA80MT1600NHR	ISO247 (3)	1600

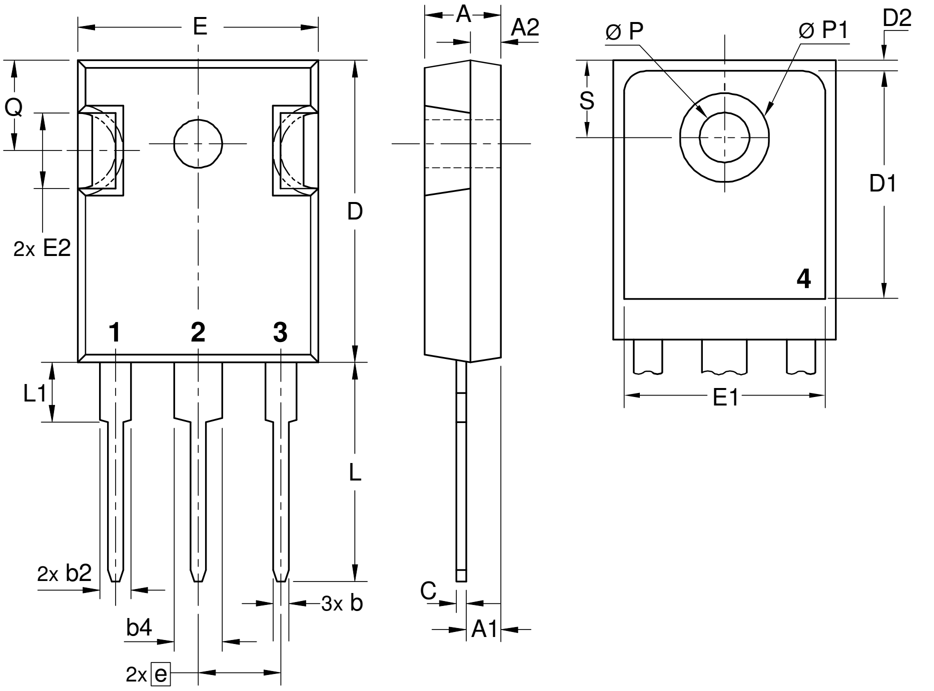
Equivalent Circuits for Simulation

** on die level* $T_{VJ} = 150°C$

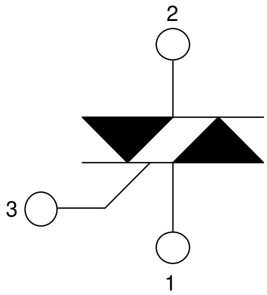


		Thyristor	
$V_{0\,max}$	*threshold voltage*	0,89	V
$R_{0\,max}$	*slope resistance **	8,8	mΩ

Outlines TO-247



Sym.	Inches min.	Inches max.	Millimeter min.	Millimeter max.
A	0.185	0.209	4.70	5.30
A1	0.087	0.102	2.21	2.59
A2	0.059	0.098	1.50	2.49
D	0.819	0.845	20.79	21.45
E	0.610	0.640	15.48	16.24
E2	0.170	0.216	4.31	5.48
e	0.215 BSC		5.46 BSC	
L	0.780	0.800	19.80	20.30
L1	-	0.177	-	4.49
Ø P	0.140	0.144	3.55	3.65
Q	0.212	0.244	5.38	6.19
S	0.242 BSC		6.14 BSC	
b	0.039	0.055	0.99	1.40
b2	0.065	0.094	1.65	2.39
b4	0.102	0.135	2.59	3.43
c	0.015	0.035	0.38	0.89
D1	0.515	-	13.07	-
D2	0.020	0.053	0.51	1.35
E1	0.530	-	13.45	-
Ø P1	-	0.29	-	7.39



Thyristor

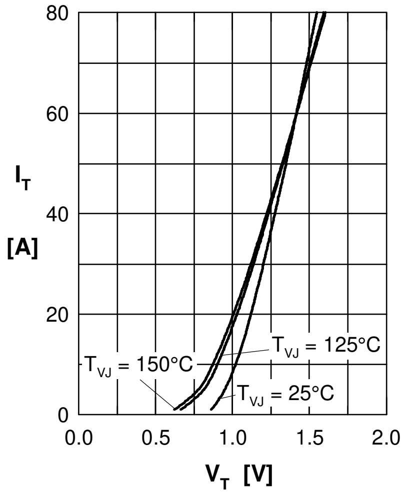


Fig. 1 Forward characteristics

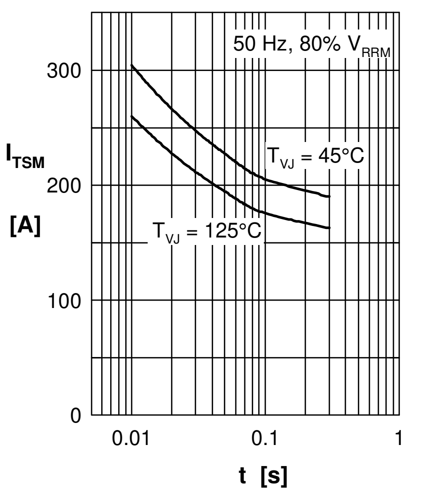


Fig. 2 Surge overload current
I_{TSM}: crest value, t: duration

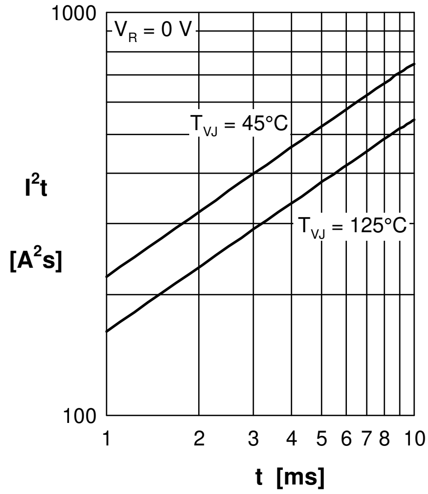


Fig. 3 I^2t versus time (1-10 s)

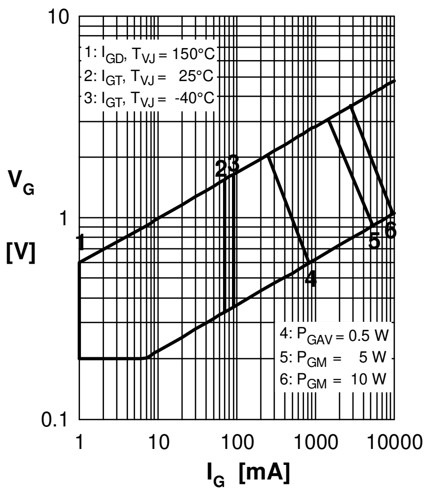


Fig. 4 Gate voltage & gate current

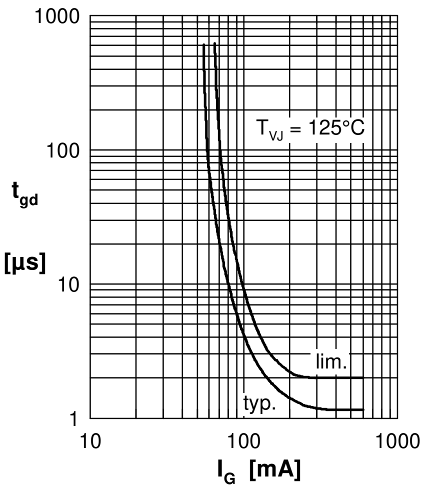


Fig. 5 Gate controlled delay time t_{gd}

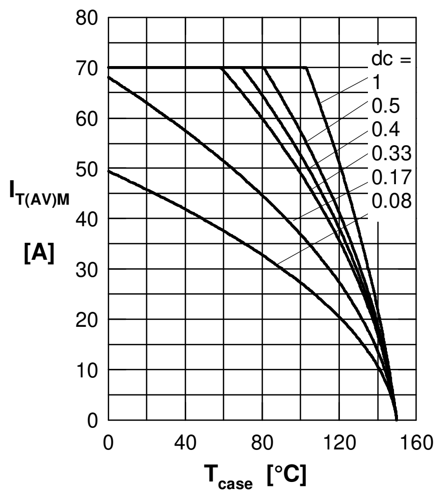


Fig. 6 Max. forward current at case temperature

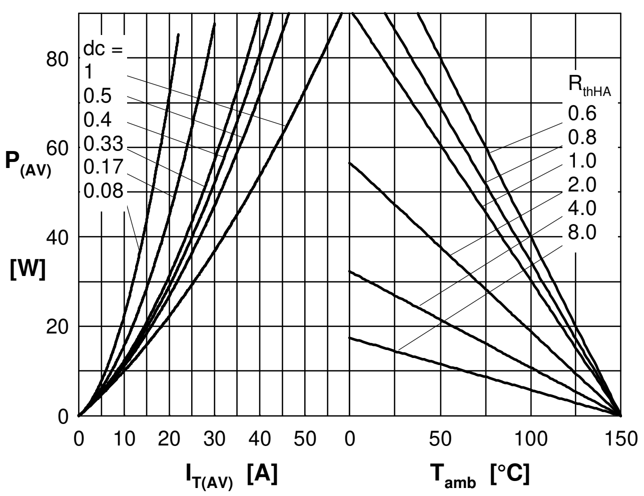
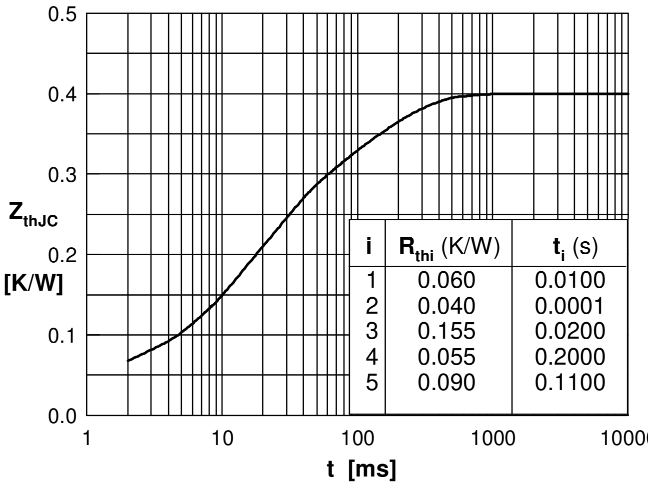


Fig. 7a Power dissipation versus direct output current
Fig. 7b and ambient temperature



i	R_{thi} (K/W)	t_i (s)
1	0.060	0.0100
2	0.040	0.0001
3	0.155	0.0200
4	0.055	0.2000
5	0.090	0.1100

Fig. 8 Transient thermal impedance junction to case