



# Thyristor

$$V_{RRM} = 1600V$$

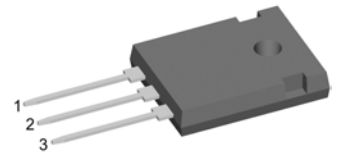
$$I_{TAV} = 40A$$

$$V_T = 1,34V$$

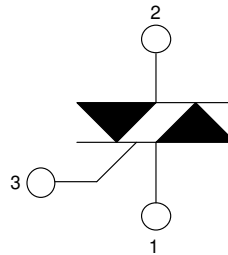
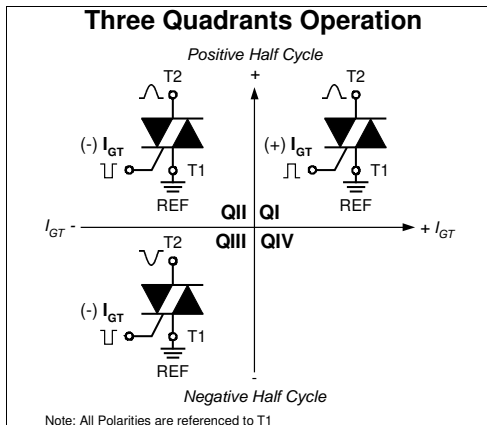
Three Quadrants operation: QI - QIII  
1~ Triac

Part number

**CMA80MT1600NHR**



Backside: Isolated



### 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: ISO247

- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- Epoxy meets UL 94V-0

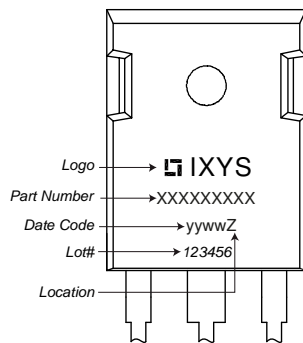
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Rectifier			Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1700	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1600	V
$I_{RD}$	reverse current, drain current	$V_{R/D} = 1600 V$	$T_{VJ} = 25^{\circ}C$		10	$\mu A$
		$V_{R/D} = 1600 V$	$T_{VJ} = 125^{\circ}C$		2	mA
$V_T$	forward voltage drop	$I_T = 40 A$	$T_{VJ} = 25^{\circ}C$		1,36	V
		$I_T = 80 A$			1,70	V
		$I_T = 40 A$	$T_{VJ} = 125^{\circ}C$		1,34	V
		$I_T = 80 A$			1,78	V
$I_{TAV}$	average forward current	$T_C = 95^{\circ}C$	$T_{VJ} = 150^{\circ}C$		40	A
$I_{RMS}$	RMS forward current per phase	180° sine			88	A
$V_{T0}$	threshold voltage	} for power loss calculation only	$T_{VJ} = 150^{\circ}C$		0,89	V
$r_T$	slope resistance				11,3	m $\Omega$
$R_{thJC}$	thermal resistance junction to case				0,65	K/W
$R_{thCH}$	thermal resistance case to heatsink			0,25		K/W
$P_{tot}$	total power dissipation		$T_C = 25^{\circ}C$		190	W
$I_{TSM}$	max. forward surge current	$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		380	A
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		410	A
		$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 150^{\circ}C$		325	A
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		350	A
$I^2t$	value for fusing	$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		720	A <sup>2</sup> s
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		700	A <sup>2</sup> s
		$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 150^{\circ}C$		530	A <sup>2</sup> s
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		510	A <sup>2</sup> s
$C_J$	junction capacitance	$V_R = 400V \quad f = 1 \text{ MHz}$	$T_{VJ} = 25^{\circ}C$		14	pF
$P_{GM}$	max. gate power dissipation	$t_p = 30 \mu s$	$T_C = 150^{\circ}C$		10	W
		$t_p = 300 \mu s$			5	W
$P_{GAV}$	average gate power dissipation				0,5	W
$(di/dt)_{cr}$	critical rate of rise of current	$T_{VJ} = 125^{\circ}C; f = 50 \text{ Hz}$ repetitive, $I_T = 90 A$			150	A/ $\mu s$
		$t_p = 200 \mu s; di_G/dt = 0,2 A/\mu s;$ $I_G = 0,2A; V_D = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 40 A$			500	A/ $\mu s$
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V_D = \frac{2}{3} V_{DRM}$ $R_{GK} = \infty$ ; method 1 (linear voltage rise)	$T_{VJ} = 125^{\circ}C$		500	V/ $\mu s$
$V_{GT}$	gate trigger voltage	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		1,7	V
			$T_{VJ} = -40^{\circ}C$		1,9	V
$I_{GT}$	gate trigger current	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		$\pm 70$	mA
			$T_{VJ} = -40^{\circ}C$		$\pm 90$	mA
$V_{GD}$	gate non-trigger voltage	$V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 125^{\circ}C$		0,2	V
$I_{GD}$	gate non-trigger current				$\pm 1$	mA
$I_L$	latching current	$t_p = 10 \mu s$	$T_{VJ} = 25^{\circ}C$		100	mA
		$I_G = 0,2A; di_G/dt = 0,2 A/\mu s$				
$I_H$	holding current	$V_D = 6 V \quad R_{GK} = \infty$	$T_{VJ} = 25^{\circ}C$		70	mA
$t_{gd}$	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$	$T_{VJ} = 25^{\circ}C$		2	$\mu s$
		$I_G = 0,5A; di_G/dt = 0,5 A/\mu s$				
$t_q$	turn-off time	$V_R = 100 V; I_T = 40A; V_D = \frac{2}{3} V_{DRM}$ $di/dt = 10 A/\mu s; dv/dt = 20 V/\mu s; t_p = 200 \mu s$	$T_{VJ} = 125^{\circ}C$		150	$\mu s$

Package ISO247		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
<b>Weight</b>				6		g
$M_D$	mounting torque		0,8		1,2	Nm
$F_C$	mounting force with clip		20		120	N
$d_{Spp/App}$	creepage distance on surface   striking distance through air	terminal to terminal	2,7			mm
$d_{Spb/Apb}$		terminal to backside	4,1			mm
$V_{ISOL}$	isolation voltage	t = 1 second	3600			V
		t = 1 minute	3000			V

### 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  
 HR = ISO247 (3)

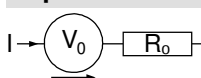
Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	CMA80MT1600NHR	CMA80MT1600NHR	Tube	30	521828

Similar Part	Package	Voltage class
CMA80MT1600NHB	TO-247AD (3)	1600

### Equivalent Circuits for Simulation

\* on die level

$T_{VJ} = 150^{\circ}\text{C}$

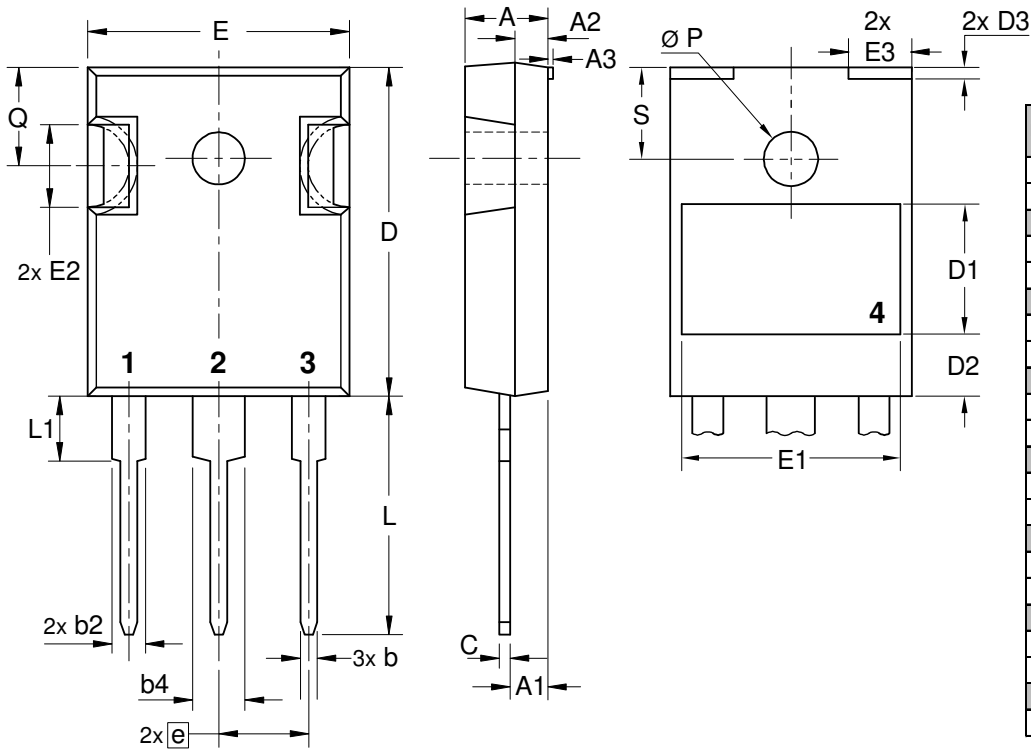


Thyristor

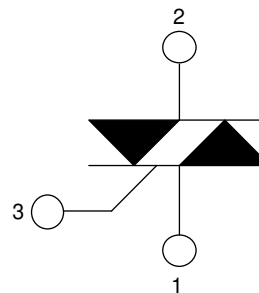
$V_{0 \max}$	threshold voltage	0,89	V
$R_{0 \max}$	slope resistance *	8,8	mΩ



Outlines ISO247



Dim.	Millimeter		Inches	
	min	max	min	max
A	4.70	5.30	0.185	0.209
A1	2.21	2.59	0.087	0.102
A2	1.50	2.49	0.059	0.098
A3	typ. 0.05		typ. 0.002	
b	0.99	1.40	0.039	0.055
b2	1.65	2.39	0.065	0.094
b4	2.59	3.43	0.102	0.135
c	0.38	0.89	0.015	0.035
D	20.79	21.45	0.819	0.844
D1	typ. 8.90		typ. 0.350	
D2	typ. 2.90		typ. 0.114	
D3	typ. 1.00		typ. 0.039	
E	15.49	16.24	0.610	0.639
E1	typ. 13.45		typ. 0.530	
E2	4.31	5.48	0.170	0.216
E3	typ. 4.00		typ. 0.157	
e	5.46 BSC		0.215 BSC	
L	19.80	20.30	0.780	0.799
L1	-	4.49	-	0.177
Ø P	3.55	3.65	0.140	0.144
Q	5.38	6.19	0.212	0.244
S	6.14 BSC		0.242 BSC	



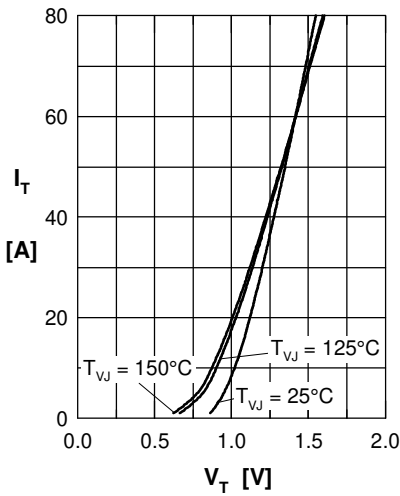
**Thyristor**


Fig. 1 Forward characteristics

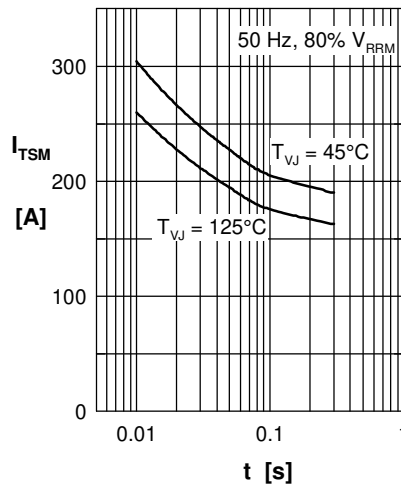
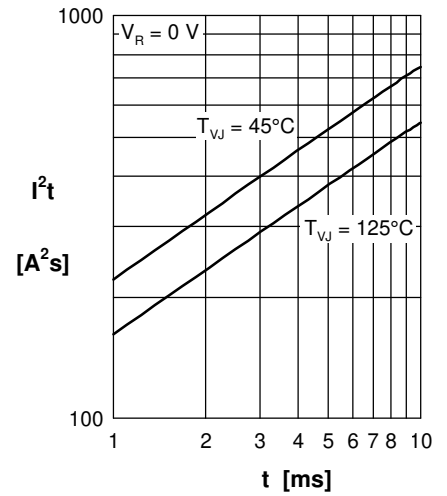
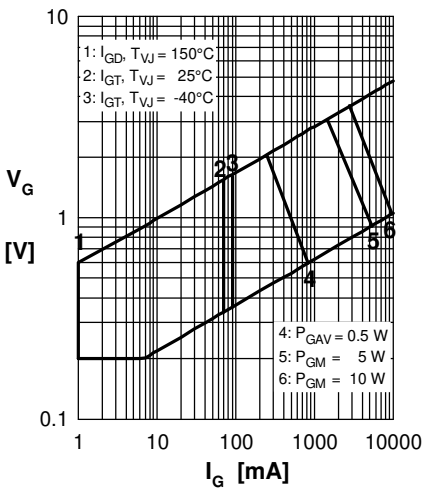

 Fig. 2 Surge overload current  
 $I_{TSM}$ : crest value,  $t$ : duration

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


Fig. 4 Gate voltage &amp; gate current

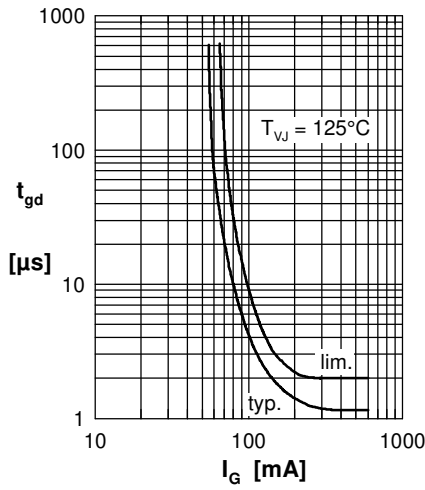
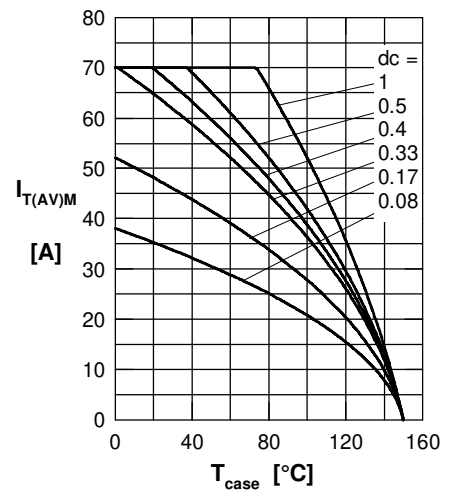

 Fig. 5 Gate controlled delay time  $t_{gd}$ 


Fig. 6 Max. forward current at case temperature

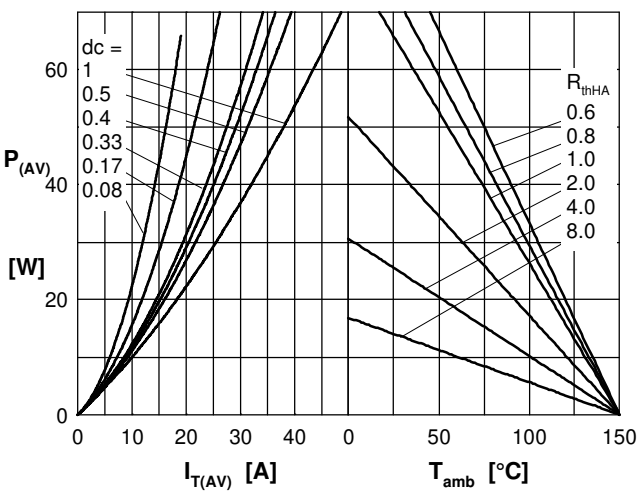
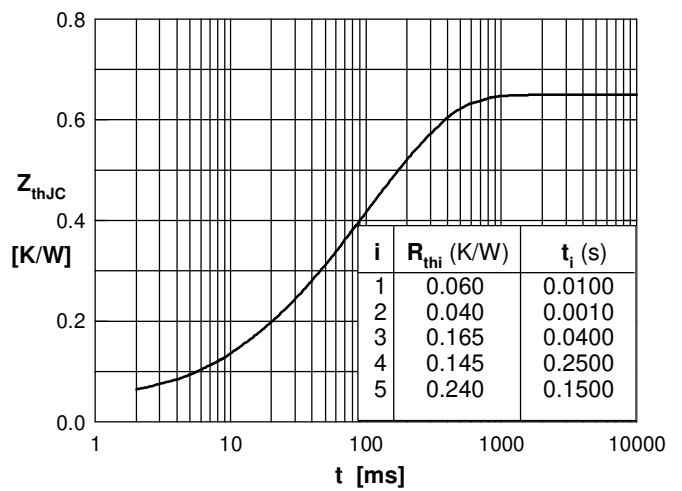

 Fig. 7a Power dissipation versus direct output current  
 Fig. 7b and ambient temperature


Fig. 8 Transient thermal impedance junction to case