

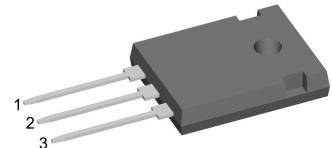
# High Efficiency Thyristor

$V_{RRM}$  = 1200 V  
 $I_{TAV}$  = 20 A  
 $V_T$  = 1.3 V

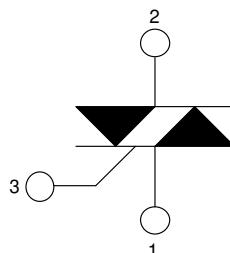
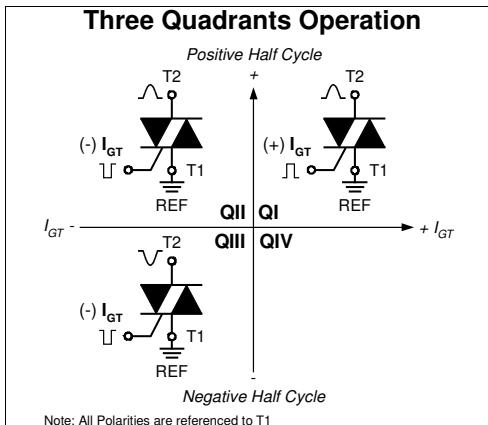
Three Quadrants operation: QI - QIII  
1~ Triac

## Part number

**CLA40MT1200NHR**



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

## Disclaimer Notice

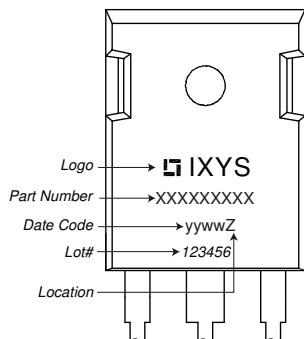
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**Thyristor**

Symbol	Definition	Conditions	Ratings			
			min.	typ.	max.	
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^\circ\text{C}$			1300	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^\circ\text{C}$			1200	V
$I_{R/D}$	reverse current, drain current	$V_{R/D} = 1200 \text{ V}$ $V_{R/D} = 1200 \text{ V}$	$T_{VJ} = 25^\circ\text{C}$ $T_{VJ} = 125^\circ\text{C}$		50 1	$\mu\text{A}$ mA
$V_T$	forward voltage drop	$I_T = 20 \text{ A}$	$T_{VJ} = 25^\circ\text{C}$		1.31	V
		$I_T = 40 \text{ A}$			1.63	V
		$I_T = 20 \text{ A}$ $I_T = 40 \text{ A}$	$T_{VJ} = 125^\circ\text{C}$		1.30 1.71	V
$I_{TAV}$	average forward current	$T_C = 100^\circ\text{C}$	$T_{VJ} = 150^\circ\text{C}$		20	A
$I_{RMS}$	RMS forward current per phase	180° sine			31	A
$V_{T0}$	threshold voltage	$\left. \begin{array}{l} \text{slope resistance} \\ \end{array} \right\} \text{for power loss calculation only}$	$T_{VJ} = 150^\circ\text{C}$		0.86	V
$r_T$	slope resistance				21.4	$\text{m}\Omega$
$R_{thJC}$	thermal resistance junction to case				1.2	K/W
$R_{thCH}$	thermal resistance case to heatsink			0.3		K/W
$P_{tot}$	total power dissipation		$T_C = 25^\circ\text{C}$		105	W
$I_{TSM}$	max. forward surge current	$t = 10 \text{ ms}; (50 \text{ Hz}), \text{sine}$	$T_{VJ} = 45^\circ\text{C}$		180	A
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{sine}$	$V_R = 0 \text{ V}$		195	A
		$t = 10 \text{ ms}; (50 \text{ Hz}), \text{sine}$	$T_{VJ} = 150^\circ\text{C}$		155	A
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{sine}$	$V_R = 0 \text{ V}$		165	A
$I^2t$	value for fusing	$t = 10 \text{ ms}; (50 \text{ Hz}), \text{sine}$	$T_{VJ} = 45^\circ\text{C}$		160	$\text{A}^2\text{s}$
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{sine}$	$V_R = 0 \text{ V}$		160	$\text{A}^2\text{s}$
		$t = 10 \text{ ms}; (50 \text{ Hz}), \text{sine}$	$T_{VJ} = 150^\circ\text{C}$		120	$\text{A}^2\text{s}$
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{sine}$	$V_R = 0 \text{ V}$		115	$\text{A}^2\text{s}$
$C_J$	junction capacitance	$V_R = 230 \text{ V}$ $f = 1 \text{ MHz}$	$T_{VJ} = 25^\circ\text{C}$	9		pF
$P_{GM}$	max. gate power dissipation	$t_p = 30 \mu\text{s}$	$T_C = 150^\circ\text{C}$		5	W
		$t_p = 300 \mu\text{s}$			2.5 0.5	W
$P_{GAV}$	average gate power dissipation					W
$(di/dt)_{cr}$	critical rate of rise of current	$T_{VJ} = 150^\circ\text{C}; f = 50 \text{ Hz}$ repetitive, $I_T = 60 \text{ A}$			150	$\text{A}/\mu\text{s}$
		$t_p = 200 \mu\text{s}; di_G/dt = 0.15 \text{ A}/\mu\text{s};$				
		$I_G = 0.15 \text{ A}; V = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 20 \text{ A}$			500	$\text{A}/\mu\text{s}$
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V = \frac{2}{3} V_{DRM}$	$T_{VJ} = 150^\circ\text{C}$		500	$\text{V}/\mu\text{s}$
		$R_{GK} = \infty$ ; method 1 (linear voltage rise)				
$V_{GT}$	gate trigger voltage	$V_D = 6 \text{ V}$	$T_{VJ} = 25^\circ\text{C}$		1.5	V
			$T_{VJ} = -40^\circ\text{C}$		2.5	V
$I_{GT}$	gate trigger current	$V_D = 6 \text{ V}$	$T_{VJ} = 25^\circ\text{C}$		$\pm 60$	mA
			$T_{VJ} = -40^\circ\text{C}$		$\pm 100$	mA
$V_{GD}$	gate non-trigger voltage	$V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 150^\circ\text{C}$		0.2	V
$I_{GD}$	gate non-trigger current				$\pm 3$	mA
$I_L$	latching current	$t_p = 10 \mu\text{s}$	$T_{VJ} = 25^\circ\text{C}$		75	mA
		$I_G = 0.1 \text{ A}; di_G/dt = 0.1 \text{ A}/\mu\text{s}$				
$I_H$	holding current	$V_D = 6 \text{ V}$ $R_{GK} = \infty$	$T_{VJ} = 25^\circ\text{C}$		50	mA
$t_{gd}$	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$	$T_{VJ} = 25^\circ\text{C}$		2	$\mu\text{s}$
		$I_G = 0.1 \text{ A}; di_G/dt = 0.1 \text{ A}/\mu\text{s}$				
$t_q$	turn-off time	$V_R = 100 \text{ V}; I_T = 20 \text{ A}; V = \frac{2}{3} V_{DRM}$ $T_{VJ} = 125^\circ\text{C}$	$di/dt = 10 \text{ A}/\mu\text{s}$ $dv/dt = 20 \text{ V}/\mu\text{s}$ $t_p = 200 \mu\text{s}$	150		$\mu\text{s}$

Package ISO247			Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$I_{RMS}$	RMS current	per terminal			50	A
$T_{VJ}$	virtual junction temperature		-55		150	°C
$T_{op}$	operation temperature		-55		125	°C
$T_{stg}$	storage temperature		-55		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 t = 1 minute	50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA		3600 3000	V V

### Product Marking



### Part description

C = Thyristor (SCR)  
 L = High Efficiency Thyristor  
 A = (up to 1200V)  
 40 = Current Rating [A]  
 MT = 1~ Triac  
 1200 = Reverse Voltage [V]  
 N = Three Quadrants operation: Q1 - QIII  
 HR = ISO247 (3)

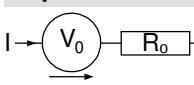
Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	CLA40MT1200NHR	CLA40MT1200NHR	Tube	30	521685

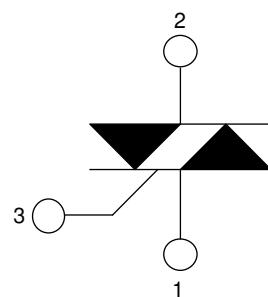
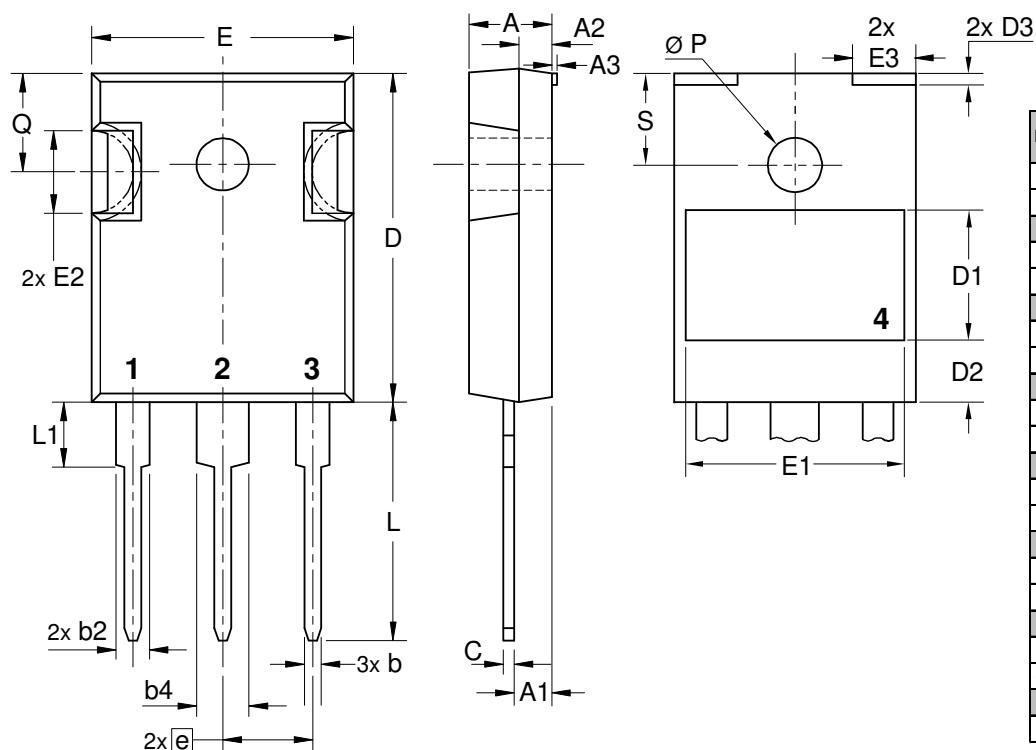
Similar Part	Package	Voltage class
CLA60MT1200NHR	ISO247 (3)	1200
CLA80MT1200NHR	ISO247 (3)	1200

### Equivalent Circuits for Simulation

\* on die level

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

	<b>Thyristor</b>	
$V_0$		
$V_{0\max}$	threshold voltage	0.86 V
$R_{0\max}$	slope resistance *	18.9 mΩ

**Outlines ISO247**


## Thyristor

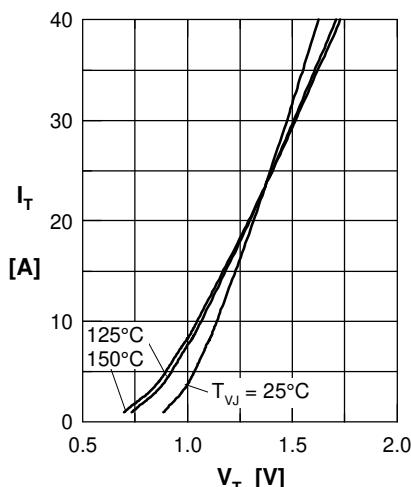


Fig. 1 Forward characteristics

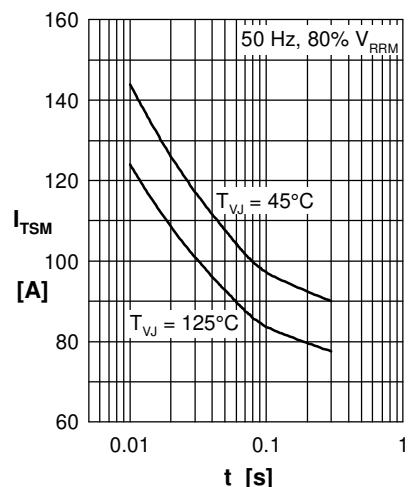


Fig. 2 Surge overload current

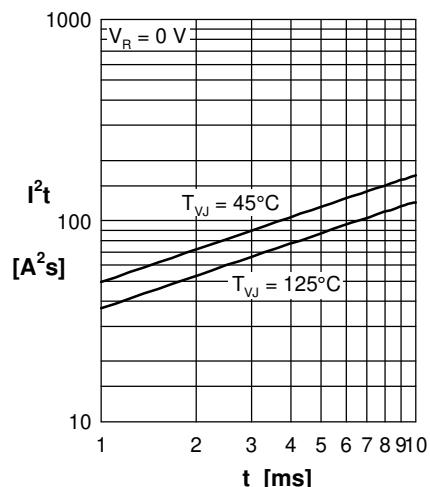


Fig. 3  $I^2t$  versus time (1-10 ms)

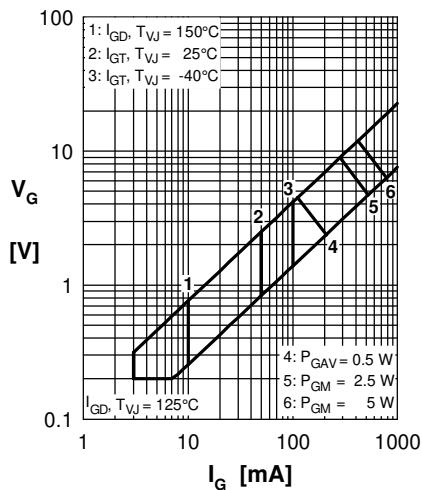


Fig. 4 Gate trigger characteristics

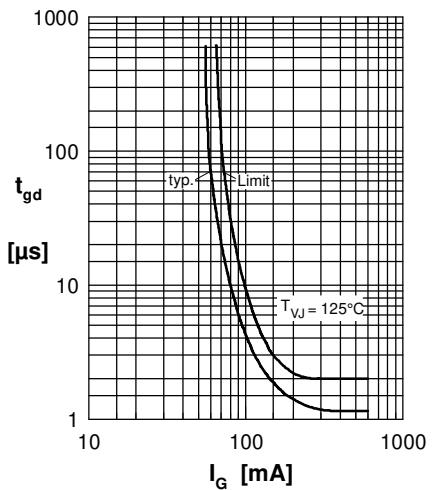


Fig. 5 Gate controlled delay time

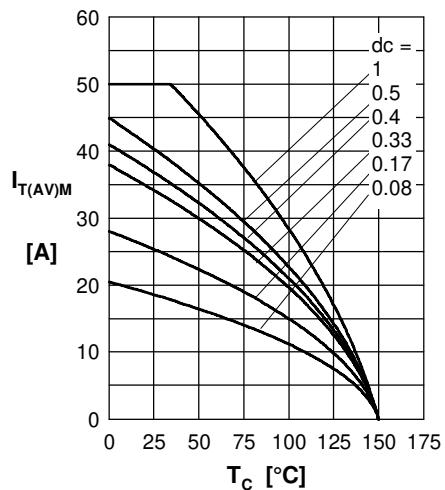


Fig. 6 Max. forward current at case temperature

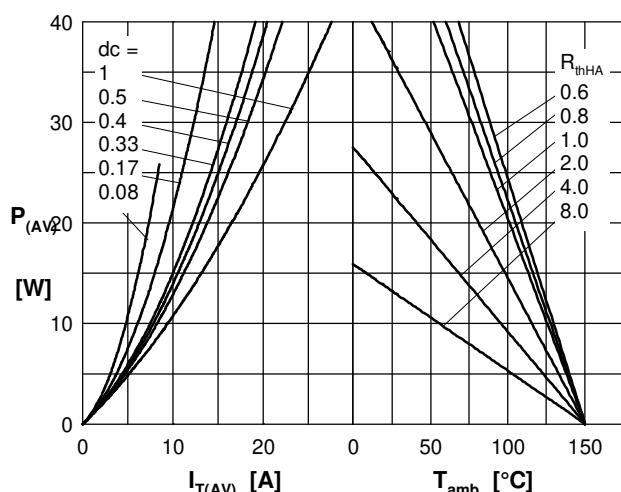


Fig. 7a Power dissipation versus direct output current  
Fig. 7b and ambient temperature

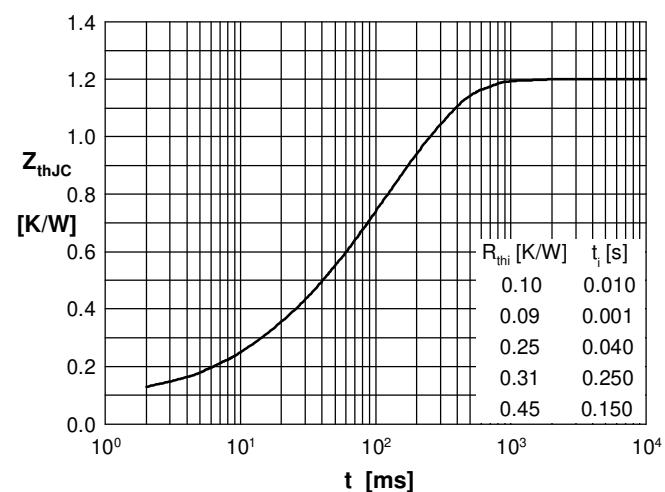


Fig. 7b Transient thermal impedance junction to case

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