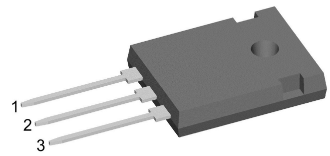
High Efficiency Thyristor

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

Three Quadrants operation: QI - QIII
1~ Triac

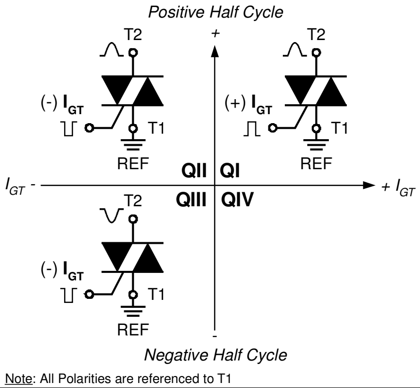
Part number

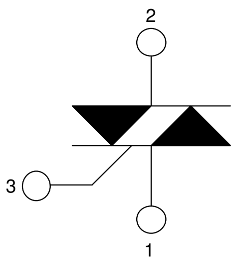
CLA40MT1200NHR



Backside: isolated

Three Quadrants Operation





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

Thyristor

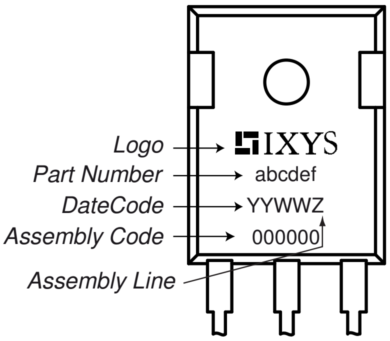
Ratings

Symbol	Definition	Conditions		min.	typ.	max.	Unit
$V_{RSM/DSM}$	*max. non-repetitive reverse/forward blocking voltage*		T_{VJ} = 25°C			1300	V
$V_{RRM/DRM}$	*max. repetitive reverse/forward blocking voltage*		T_{VJ} = 25°C			1200	V
$I_{R/D}$	*reverse current, drain current*	$V_{R/D}$ = 1200 V	T_{VJ} = 25°C			50	µA
		$V_{R/D}$ = 1200 V	T_{VJ} = 125°C			1	mA
V_T	*forward voltage drop*	I_T = 20 A	T_{VJ} = 25°C			1.31	V
		I_T = 40 A				1.63	V
		I_T = 20 A	T_{VJ} = 125°C			1.30	V
		I_T = 40 A				1.71	V
I_{TAV}	*average forward current*	T_C = 100°C	T_{VJ} = 150°C			20	A
I_{RMS}	*RMS forward current per phase*	180° sine				31	A
V_{T0}	*threshold voltage*	*for power loss calculation only*	T_{VJ} = 150°C			0.86	V
r_T	*slope resistance*					21.4	mΩ
R_{thJC}	*thermal resistance junction to case*					1.2	K/W
R_{thCH}	*thermal resistance case to heatsink*				0.25		K/W
P_{tot}	*total power dissipation*		T_C = 25°C			105	W
I_{TSM}	*max. forward surge current*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			180	A
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			195	A
		t = 10 ms; (50 Hz), sine	T_{VJ} = 150°C			155	A
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			165	A
I^2t	*value for fusing*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			160	A^2s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			160	A^2s
		t = 10 ms; (50 Hz), sine	T_{VJ} = 150°C			120	A^2s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			115	A^2s
C_J	*junction capacitance*	V_R = 230 V f = 1 MHz	T_{VJ} = 25°C		9		pF
P_{GM}	*max. gate power dissipation*	t_P = 30 µs	T_C = 150°C			5	W
		t_P = 300 µs				2.5	W
P_{GAV}	*average gate power dissipation*					0.5	W
$(di/dt)_{cr}$	*critical rate of rise of current*	T_{VJ} = 150°C; f = 50 Hz	repetitive, I_T = 60 A			150	A/µs
		t_P = 200 µs; di_G/dt = 0.15 A/µs;					
		I_G = 0.15 A; V = ⅔ V_{DRM}	non-repet., I_T = 20 A			500	A/µs
$(dv/dt)_{cr}$	*critical rate of rise of voltage*	V = ⅔ V_{DRM}	T_{VJ} = 150°C			500	V/µs
		R_{GK} = ∞; method 1 (linear voltage rise)					
V_{GT}	*gate trigger voltage*	V_D = 6 V	T_{VJ} = 25°C			1.5	V
			T_{VJ} = -40°C			2.5	V
I_{GT}	*gate trigger current*	V_D = 6 V	T_{VJ} = 25°C			± 60	mA
			T_{VJ} = -40°C			± 100	mA
V_{GD}	*gate non-trigger voltage*	V_D = ⅔ V_{DRM}	T_{VJ} = 150°C			0.2	V
I_{GD}	*gate non-trigger current*					± 3	mA
I_L	*latching current*	t_p = 10 µs	T_{VJ} = 25°C			75	mA
		I_G = 0.1 A; di_G/dt = 0.1 A/µs					
I_H	*holding current*	V_D = 6 V R_{GK} = ∞	T_{VJ} = 25°C			50	mA
t_{gd}	*gate controlled delay time*	V_D = ½ V_{DRM}	T_{VJ} = 25°C			2	µs
		I_G = 0.1 A; di_G/dt = 0.1 A/µs					
t_q	*turn-off time*	V_R = 100 V; I_T = 20 A; V = ⅔ V_{DRM}	T_{VJ} = 125 °C		150		µs
		di/dt = 10 A/µs dv/dt = 20 V/µs	t_p = 200 µs				

Package ISO247

Symbol	Definition	Conditions		Ratings 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
Weight					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	50/60 Hz, RMS; I_{ISOL} ≤ 1 mA	3600			V
		t = 1 minute		3000			V

Product Marking



Part description

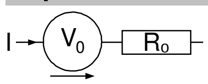
C = Thyristor (SCR)
L = High Efficiency Thyristor
A = (up to 1200V)
40 = Current Rating [A]
MT = 1~ Triac
1200 = Reverse Voltage [V]
N = Three Quadrants operation: QI - QIII
HR = ISO247 (3)

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

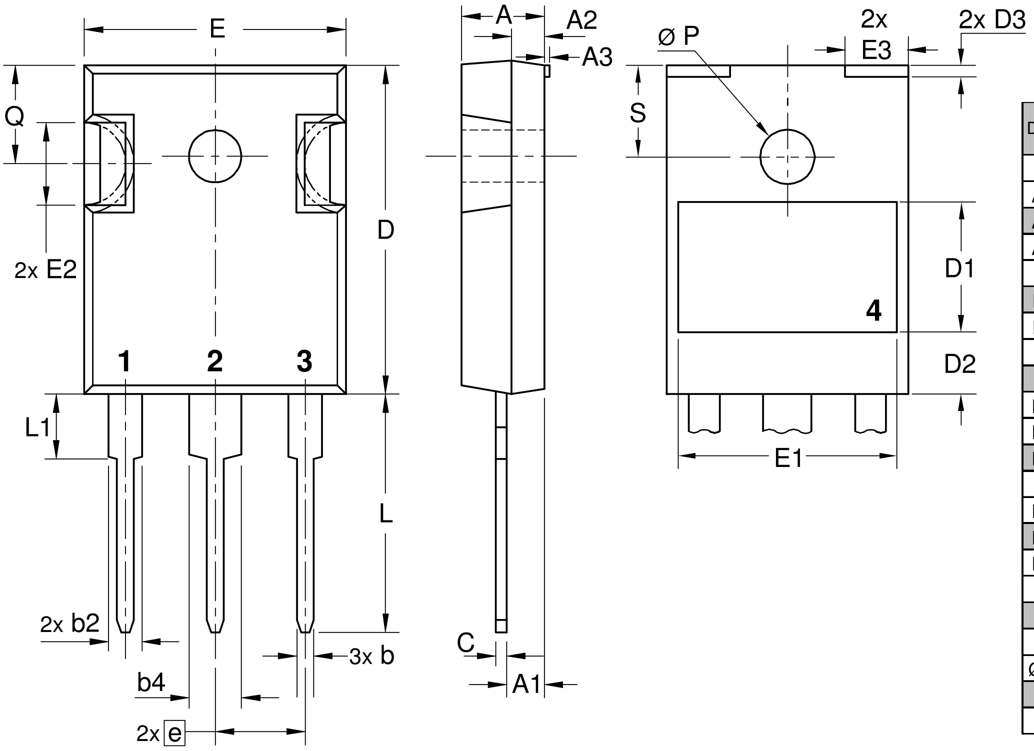
** on die level* T_{VJ} = 150 °C



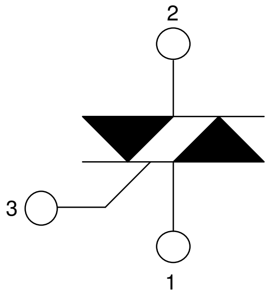
Thyristor

$V_{0\ max}$	*threshold voltage*	0.86	V
$R_{0\ max}$	*slope resistance **	18.9	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

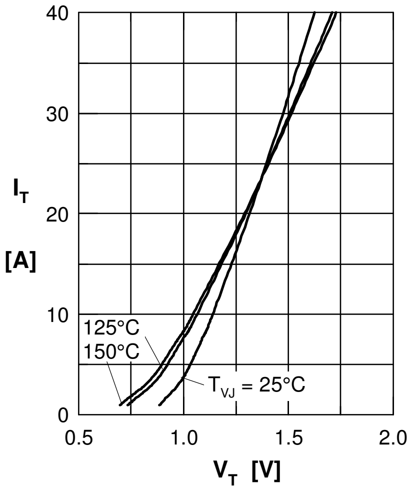


Fig. 1 Forward characteristics

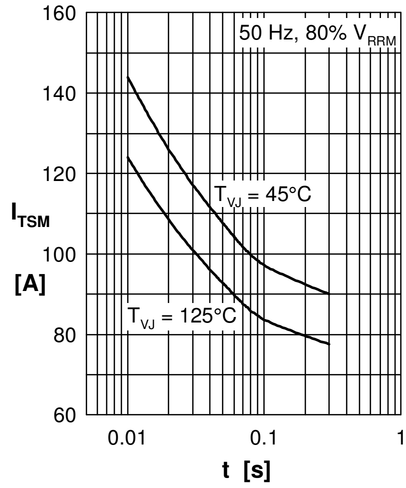


Fig. 2 Surge overload current

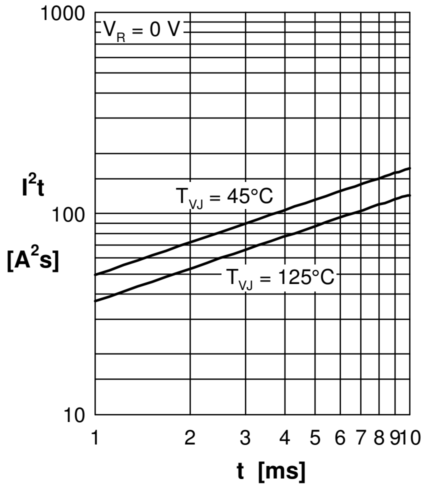


Fig. 3 I^2t versus time (1-10 ms)

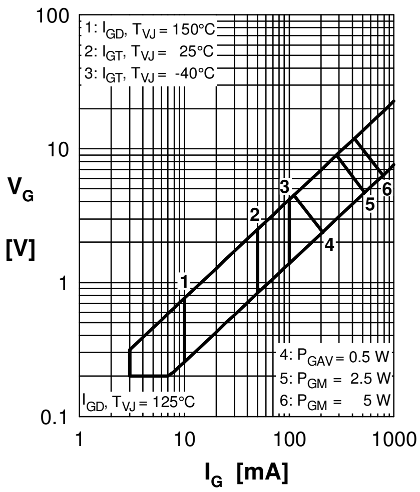


Fig. 4 Gate trigger characteristics

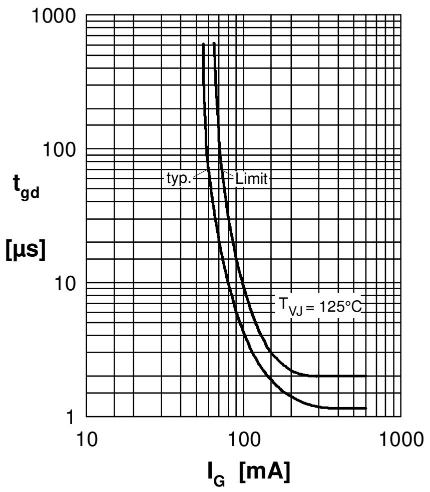


Fig. 5 Gate controlled delay time

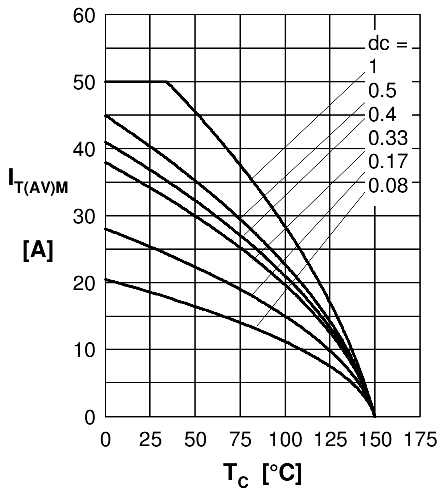


Fig. 6 Max. forward current at case temperature

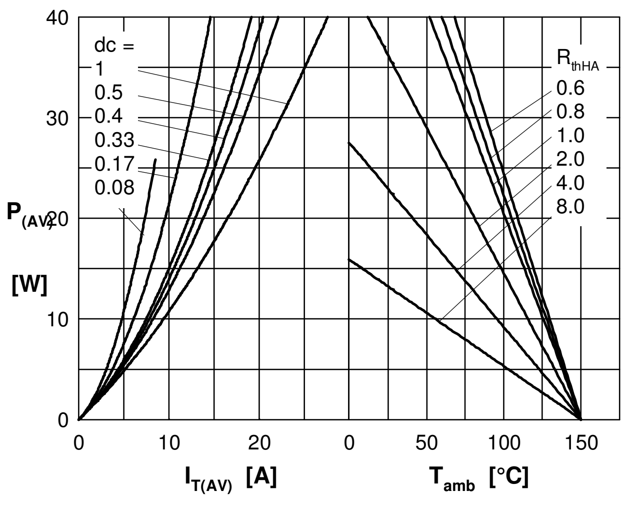


Fig. 7a Power dissipation versus direct output current
Fig. 7b and ambient temperature

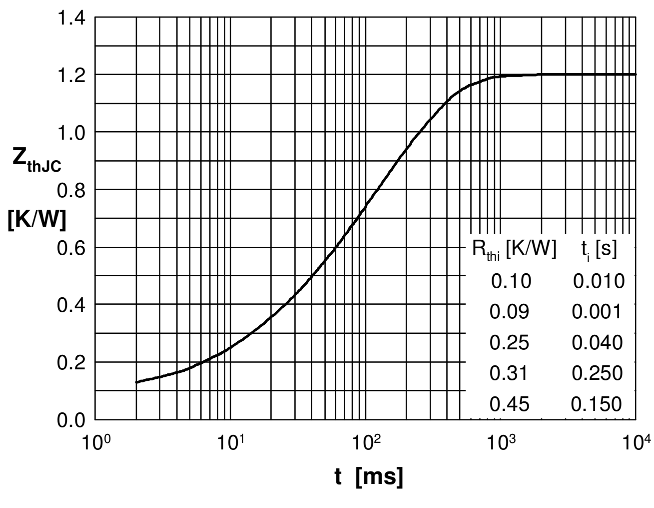


Fig. 8 Transient thermal impedance junction to case