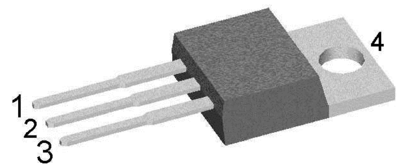
High Efficiency Thyristor

V_{RRM}	=	1200 V
I_{TAV}	=	20 A
V_T	=	1.37 V

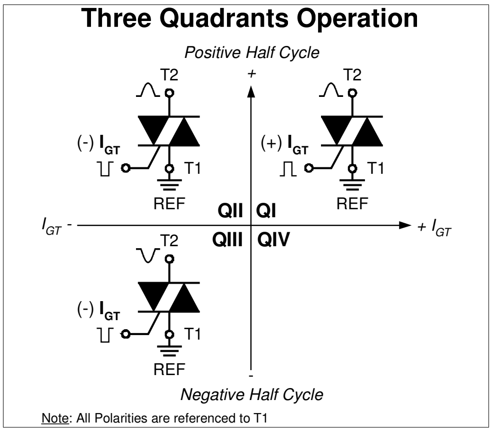
Three Quadrants operation: QI - QIII
1~ Triac

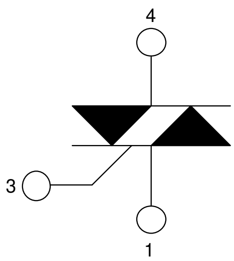
Part number

CLA40MT1200NPB



Backside: anode/cathode





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-220

- Industry standard outline
- RoHS compliant
- Epoxy meets UL 94V-0
- High creepage distance
  between terminals

Disclaimer Notice

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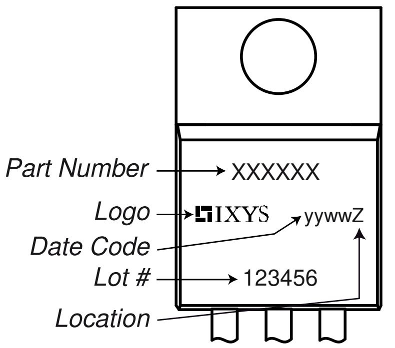
Rectifier

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			10	µA
		$V_{R/D}$ = 1200 V	T_{VJ} = 125°C			1.5	mA
V_T	*forward voltage drop*	I_T = 20 A	T_{VJ} = 25°C			1.37	V
		I_T = 40 A				1.71	V
		I_T = 20 A	T_{VJ} = 125°C			1.37	V
		I_T = 40 A				1.83	V
I_{TAV}	*average forward current*	T_C = 115°C	T_{VJ} = 150°C			20	A
I_{RMS}	*RMS forward current per phase*	180° sine				44	A
V_{T0}	*threshold voltage*	*for power loss calculation only*	T_{VJ} = 150°C			0.89	V
r_T	*slope resistance*					24	mΩ
R_{thJC}	*thermal resistance junction to case*					0.8	K/W
R_{thCH}	*thermal resistance case to heatsink*				0.5		K/W
P_{tot}	*total power dissipation*		T_C = 25°C			155	W
I_{TSM}	*max. forward surge current*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			200	A
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			215	A
		t = 10 ms; (50 Hz), sine	T_{VJ} = 150°C			170	A
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			185	A
I^2t	*value for fusing*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			200	A²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			190	A²s
		t = 10 ms; (50 Hz), sine	T_{VJ} = 150°C			145	A²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			140	A²s
C_J	*junction capacitance*	V_R = 400 V f = 1 MHz	T_{VJ} = 25°C		12		pF
P_{GM}	*max. gate power dissipation*	t_P = 30 µs	T_C = 150°C			5	W
		t_P = 300 µs				1	W
P_{GAV}	*average gate power dissipation*					0.2	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 = 0.3 A/µs;					
		I_G = 0.3 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			1.3	V
			T_{VJ} = -40°C			1.6	V
I_{GT}	*gate trigger current*	V_D = 6 V	T_{VJ} = 25°C			± 40	mA
			T_{VJ} = -40°C			± 60	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*					± 1	mA
I_L	*latching current*	t_p = 10 µs	T_{VJ} = 25°C			70	mA
		I_G = 0.3 A; di_G/dt = 0.3 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 = 0.3 A; di_G/dt = 0.3 A/µs					
t_q	*turn-off time*	V_R = 100 V; I_T = 20A; 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 TO-220			Ratings			
Symbol	**Definition**	**Conditions**	**min.**	**typ.**	**max.**	**Unit**
I_{RMS}	*RMS current*	per terminal			35	A
T_{VJ}	*virtual junction temperature*		-40		150	°C
T_{op}	*operation temperature*		-40		125	°C
T_{stg}	*storage temperature*		-40		150	°C
Weight				2		g
M_D	*mounting torque*		0.4		0.6	Nm
F_C	*mounting force with clip*		20		60	N

Product Marking



Part description

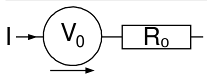
C = Thyristor (SCR)
L = High Efficiency Thyristor
A = (up to 1200V)
40 = Current Rating [A]
MT = 1~ Triac
1200 = Reverse Voltage [V]
N = Three Quadrants operation: QI - QIII
PB = TO-220AB (3)

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	CLA40MT1200NPB	CLA40MT1200NPB	Tube	50	517038

Similar Part	Package	Voltage class
CLA40MT1200NPZ	TO-263AB (D2Pak) (2HV)	1200

Equivalent Circuits for Simulation

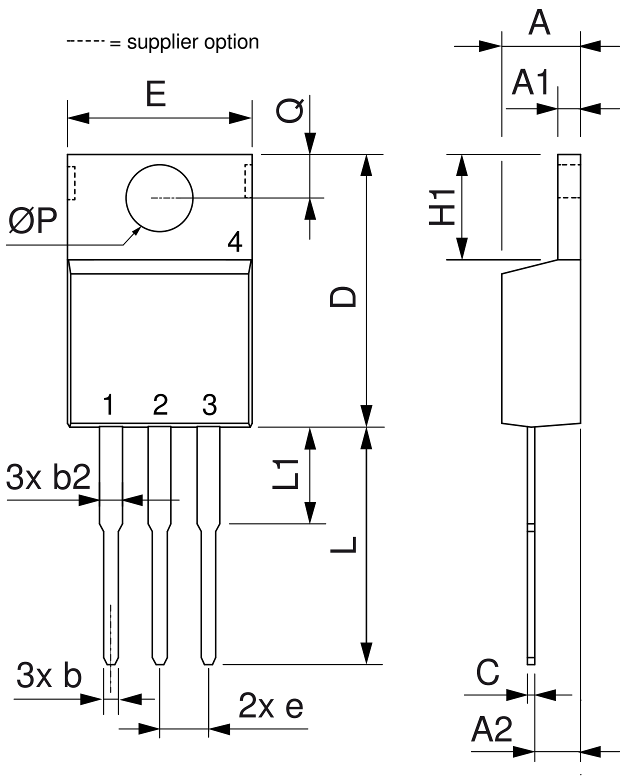
** on die level* $T_{VJ} = 150°C$



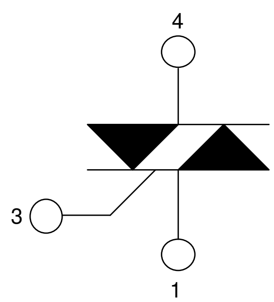
Thyristor

$V_{0\ max}$	*threshold voltage*	0.89	V
$R_{0\ max}$	*slope resistance **	21	mΩ

Outlines TO-220



Dim.	Millimeter Min.	Millimeter Max.	Inches Min.	Inches Max.
A	4.32	4.82	0.170	0.190
A1	1.14	1.39	0.045	0.055
A2	2.29	2.79	0.090	0.110
b	0.64	1.01	0.025	0.040
b2	1.15	1.65	0.045	0.065
C	0.35	0.56	0.014	0.022
D	14.73	16.00	0.580	0.630
E	9.91	10.66	0.390	0.420
e	2.54	BSC	0.100	BSC
H1	5.85	6.85	0.230	0.270
L	12.70	13.97	0.500	0.550
L1	2.79	5.84	0.110	0.230
ØP	3.54	4.08	0.139	0.161
Q	2.54	3.18	0.100	0.125



Thyristor

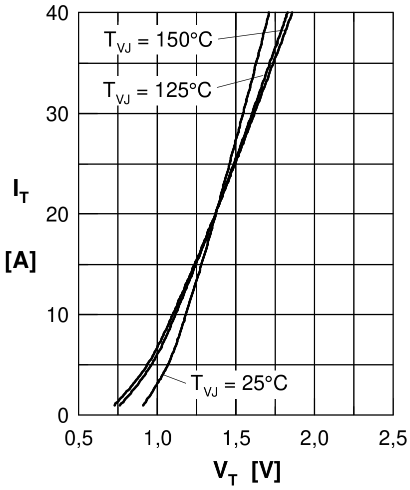


Fig. 1 Forward characteristics

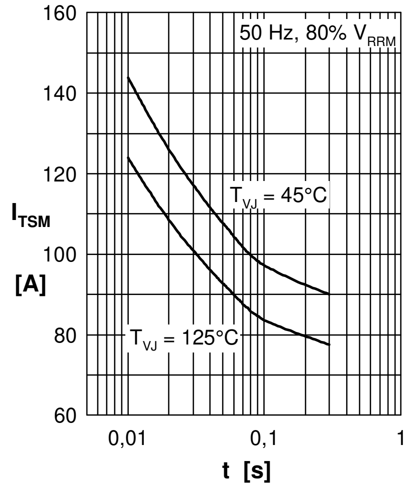


Fig. 2 Surge overload current

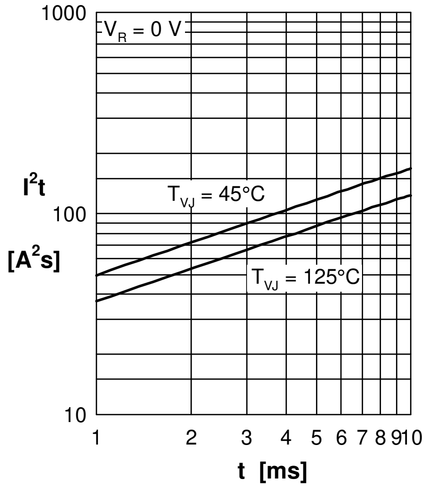


Fig. 3 I^2t versus time (1-10 ms)

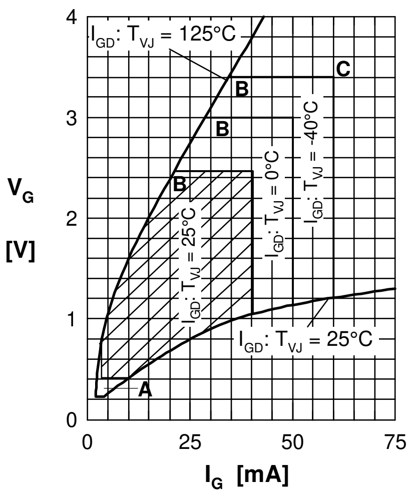


Fig. 4 Gate trigger characteristics

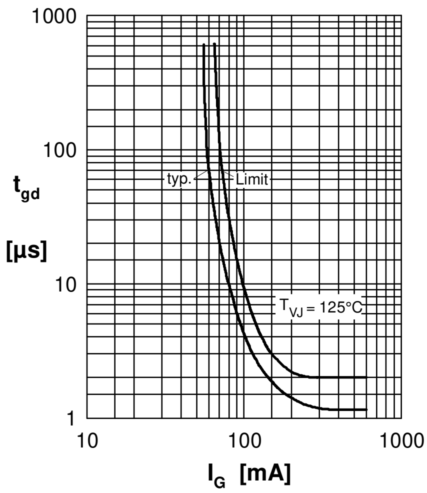


Fig. 5 Gate controlled delay time

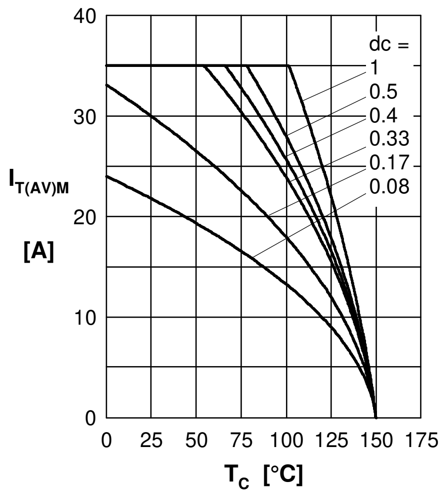


Fig. 6 Max. forward current at case temperature

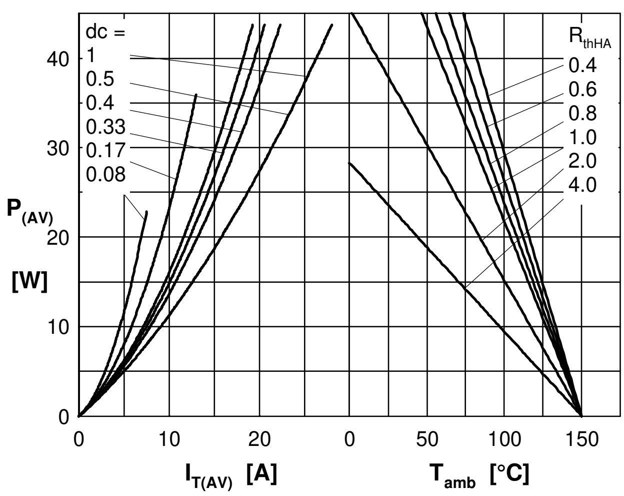


Fig. 7a Power dissipation versus direct output current
Fig. 7b and ambient temperature

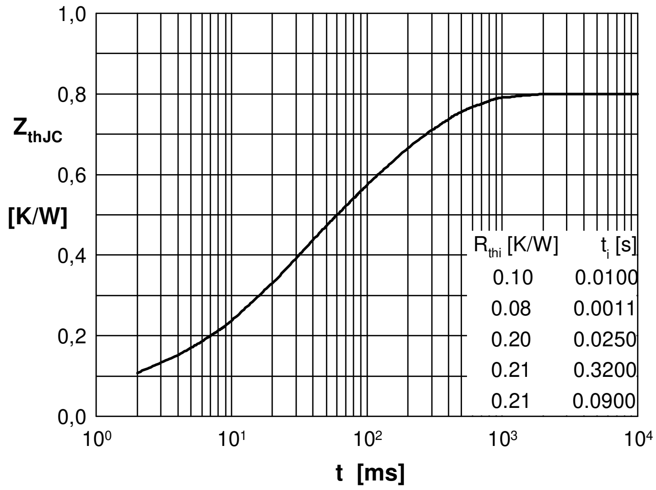


Fig. 8 Transient thermal impedance