High Efficiency Thyristor

V_{RRM} = 1200 V
I_{TAV} = 50 A
V_T = 1.27 V

Single Thyristor

Part number

CLA50E1200HB

1
2
3

Backside: anode

2 ○——|◁——○ 1

3
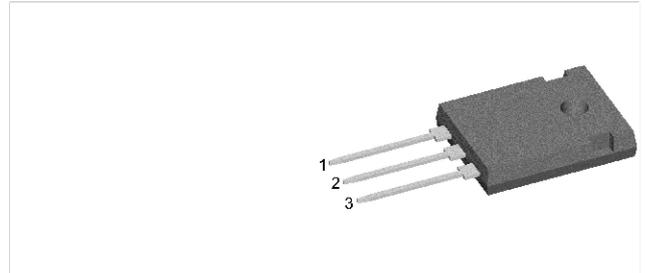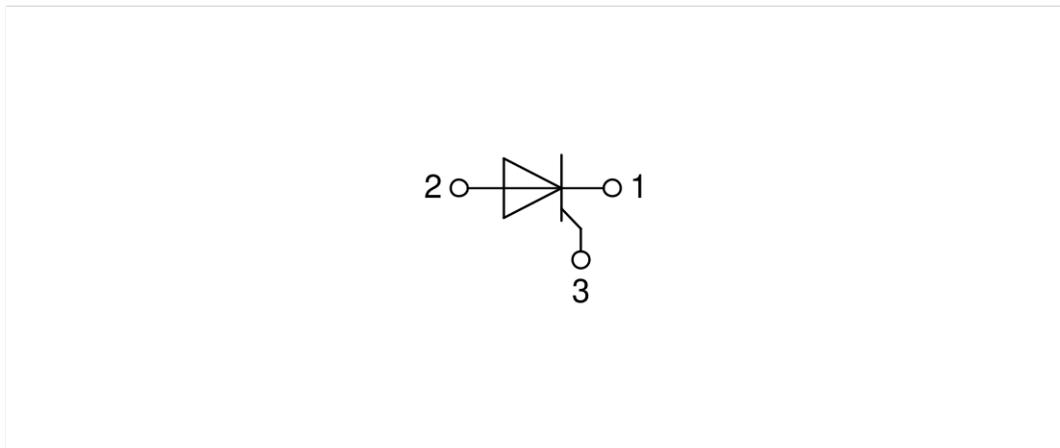
Features / Advantages:
● Thyristor for line frequency
● Planar passivated chip
● Long-term stability

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

Thyristor					**Ratings**	
Symbol	**Definition**	**Conditions**		**min.**	**typ.**	**max.**	**Unit**

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			4	mA
V_T	forward voltage drop	I_T = 50 A	T_{VJ} = 25°C			1.32	V
		I_T = 100 A				1.60	V
		I_T = 50 A	T_{VJ} = 125°C			1.27	V
		I_T = 100 A				1.65	V
I_{TAV}	average forward current	T_C = 125°C	T_{VJ} = 150°C			50	A
$I_{T(RMS)}$	RMS forward current	180° sine				79	A
V_{T0}	threshold voltage	for power loss calculation only	T_{VJ} = 150°C			0.88	V
r_T	slope resistance					7.7	mΩ
R_{thJC}	thermal resistance junction to case					0.25	K/W
R_{thCH}	thermal resistance case to heatsink				0.25		K/W
P_{tot}	total power dissipation	T_C = 25°C				500	W
I_{TSM}	max. forward surge current	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			650	A
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			700	A
		t = 10 ms; (50 Hz), sine	T_{VJ} = 150°C			555	A
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			595	A
I^2t	value for fusing	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			2.12	kA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			2.04	kA²s
		t = 10 ms; (50 Hz), sine	T_{VJ} = 150°C			1.54	kA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			1.48	kA²s
C_J	junction capacitance	V_R = 400 V f = 1 MHz	T_{VJ} = 25°C		25		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} = 150°C; f = 50 Hz repetitive, I_T = 150 A t_P = 200 µs; di_G/dt = 0.3 A/µs;				150	A/µs
		I_G = 0.3 A; V = ⅔ V_{DRM} non-repet., I_T = 50 A				500	A/µs
$(dv/dt)_{cr}$	critical rate of rise of voltage	V = ⅔ V_{DRM}	T_{VJ} = 150°C			1000	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			1.6	V
I_{GT}	gate trigger current	V_D = 6 V	T_{VJ} = 25°C			50	mA
			T_{VJ} = -40°C			80	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			125	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			100	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 = 50 A; V = ⅔ V_{DRM} T_{VJ} = 125 °C di/dt = 10 A/µs dv/dt = 20 V/µs t_p = 200 µs			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

Logo → IXYS
Part No. → XXXXXXXXX
Assembly Line → Zyyww
Assembly Code → abcd
Date Code
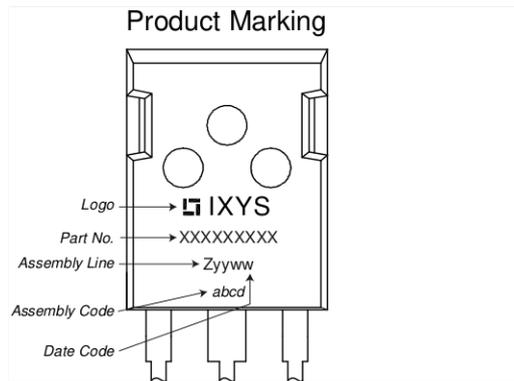
Part description

C	=	Thyristor (SCR)
L	=	High Efficiency Thyristor
A	=	(up to 1200V)
50	=	Current Rating [A]
E	=	Single Thyristor
1200	=	Reverse Voltage [V]
HB	=	TO-247AD (3)

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	CLA50E1200HB	CLA50E1200HB	Tube	30	503748

Similar Part	Package	Voltage class
CLA50E1200TC	TO-268AA (D3Pak) (2)	1200

Equivalent Circuits for Simulation   * on die level $T_{VJ} = 150°C$
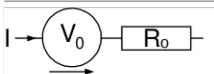
I — V_0 — R_0 **Thyristor**

$V_{0\ max}$	threshold voltage	0.88		V
$R_{0\ max}$	slope resistance *	5.2		mΩ

Outlines   TO-247
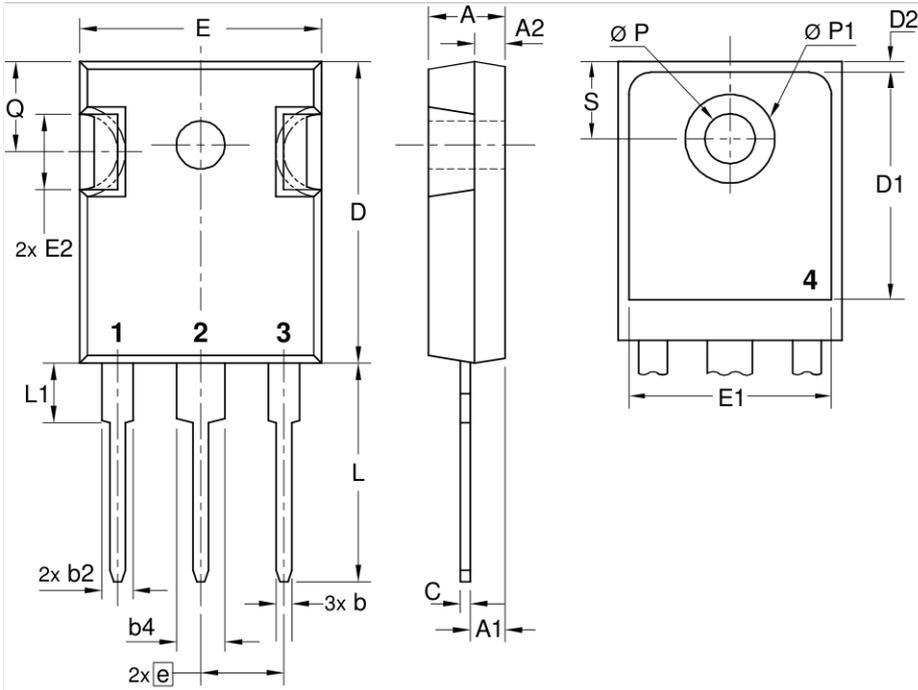
| Sym.	Inches min.	Inches max.	Millimeter min.	Millimeter max.
A	0.185	0.209	4.70	5.30
A1	0.087	0.102	2.21	2.59
A2	0.059	0.098	1.50	2.49
D	0.819	0.845	20.79	21.45
E	0.610	0.640	15.48	16.24
E2	0.170	0.216	4.31	5.48
e	0.215 BSC		5.46 BSC	
L	0.780	0.800	19.80	20.30
L1	-	0.177	-	4.49
Ø P	0.140	0.144	3.55	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
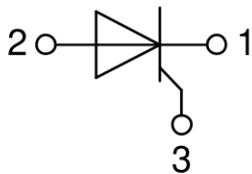
**Thyristor**
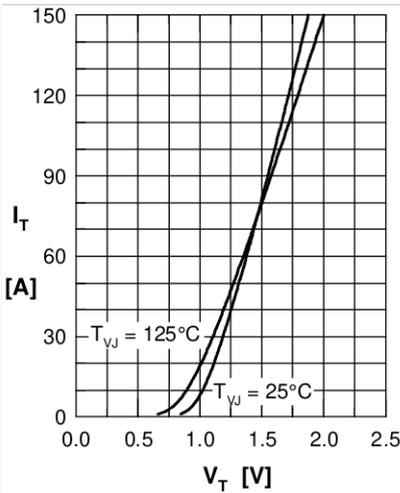
Fig. 1 Forward characteristics
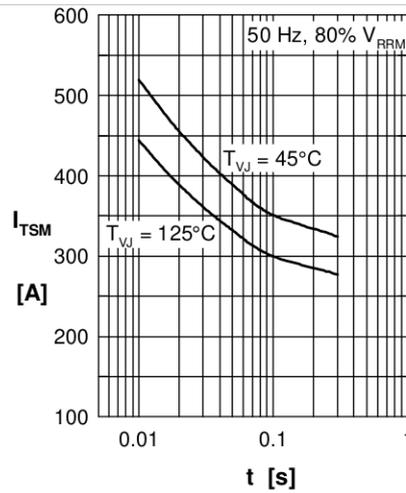
Fig. 2 Surge overload current
I_{TSM}: crest value, t: duration
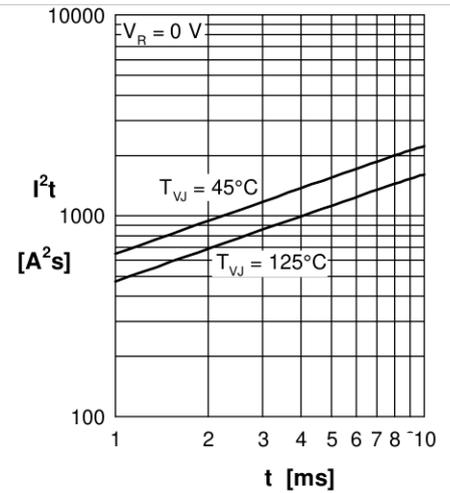
Fig. 3 I^2t versus time (1-10 s)
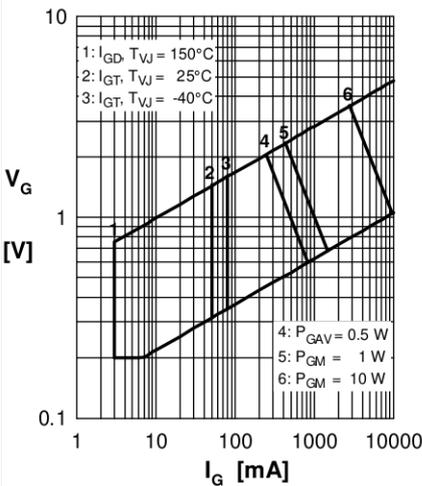
Fig. 4 Gate voltage & gate current
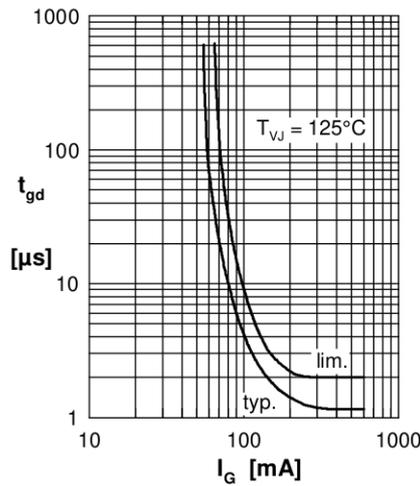
Fig. 5 Gate controlled delay time t_{gd}
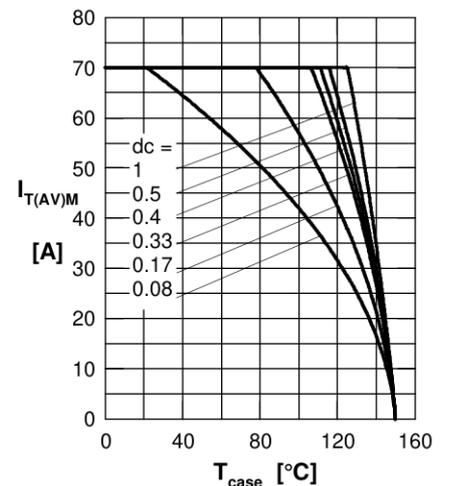

Fig. 6 Max. forward current at
case temperature
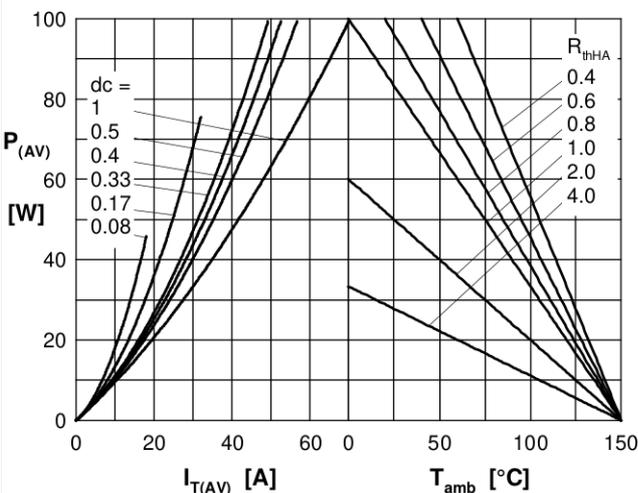
Fig. 7a Power dissipation versus direct output current
Fig. 7b and ambient temperature
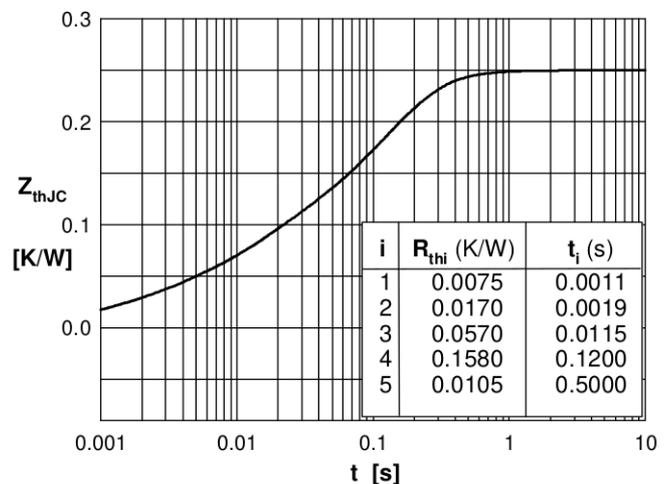
Fig. 7 Transient thermal impedance junction to case

i	R_{thi} (K/W)	t_i (s)
1	0.0075	0.0011
2	0.0170	0.0019
3	0.0570	0.0115
4	0.1580	0.1200
5	0.0105	0.5000