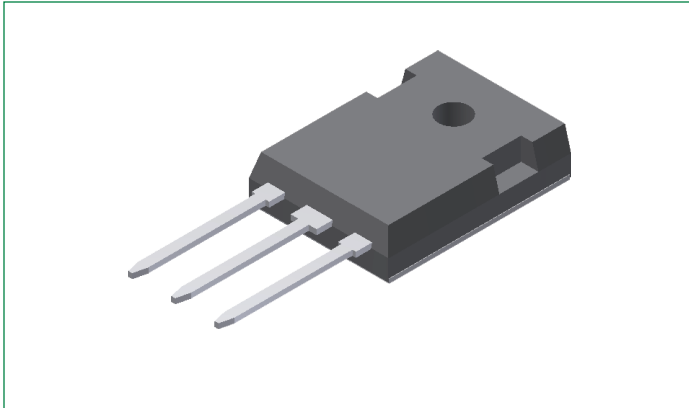


# CLA50E1200HB

## 1200 V, 50 A High Efficiency Thyristor

**RoHS**

### Features:

- Thyristor for line frequency
- Long-term stability
- Planar passivated chip

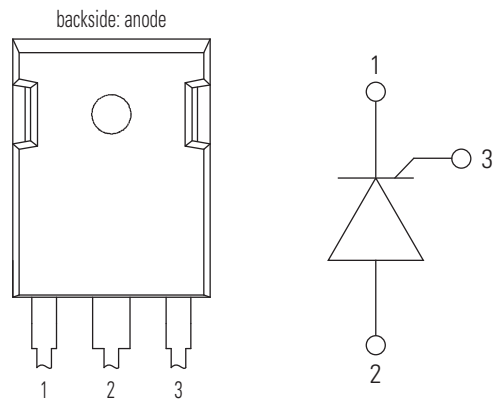
### Applications:

- Line rectifying 50/60 Hz
- DC motor control
- Soft start AC motor control
- Power converter
- Lighting and temperature control
- AC power control

### Package:

- RoHS compliant
- Industry standard TO-247 package
- Epoxy meets UL 94V-0

### Pinout Diagram (TO-247-3L)



**1:** Cathode; **2:** Anode; **3:** Gate

### Product Summary

Characteristic	Value	Unit
$V_{RRM}$	1200	V
$I_{TAV}$	50	A
$V_T$	1.27	V

## Maximum Ratings

Symbol	Characteristics	Conditions	Value	Units	
$I_{T(RMS)}$	RMS On-state Current (Half Sine Wave)	180° Sine; $T_C = 125^\circ\text{C}$ ; $T_{VJ} = 150^\circ\text{C}$	79	A	
$I_{TAV}$	Average Forward Current		50		
$I_{RVD}$	Reverse Current, Drain Current	$T_{VJ} = 25^\circ\text{C}$ ; $V_{R/D} = 1200\text{ V}$	50	$\mu\text{A}$	
		$T_{VJ} = 125^\circ\text{C}$ ; $V_{R/D} = 1200\text{ V}$	4	mA	
$I_{TSM}$	Maximum Forward Surge Current	$T_{VJ} = 45^\circ\text{C}$	t = 10 ms, 50 Hz sine, $V_R = 0\text{ V}$	650	A
			t = 8.3 ms, 60 Hz sine, $V_R = 0\text{ V}$	700	
		$T_{VJ} = 150^\circ\text{C}$	t = 10 ms, 50 Hz sine, $V_R = 0\text{ V}$	555	
			t = 8.3 ms, 60 Hz sine, $V_R = 0\text{ V}$	595	
$I^2t$	$I^2t$ Value for Fusing	$T_{VJ} = 45^\circ\text{C}$	t = 10 ms, 50 Hz sine, $V_R = 0\text{ V}$	2.12	kA <sup>2</sup> s
			t = 8.3 ms, 60 Hz sine, $V_R = 0\text{ V}$	2.04	
		$T_{VJ} = 150^\circ\text{C}$	t = 10 ms, 50 Hz sine, $V_R = 0\text{ V}$	1.54	
			t = 8.3 ms, 60 Hz sine, $V_R = 0\text{ V}$	1.48	
$V_{RSM}/V_{DSM}$	Maximum Non-repetitive Reverse/Forward Blocking Voltage	$T_{VJ} = 25^\circ\text{C}$	1300	V	
$V_{RRM}/V_{DRM}$	Maximum Repetitive Reverse/Forward Blocking Voltage	$T_{VJ} = 25^\circ\text{C}$	1200	V	
$di/dt_{cr}$	Critical Rate of Rise of On-state Current	$t_p = 200\ \mu\text{s}$ ; $f = 50\text{ Hz}$ ; $di_G/dt = 0.3\text{ A}/\mu\text{s}$ ; $I_G = 0.3\text{ A}$ ; $T_{VJ} = 150^\circ\text{C}$ ; $V = 2/3 V_{DRM}$	Repetitive, $I_T = 150\text{ A}$	150	A/ $\mu\text{s}$
			Non-repetitive, $I_T = 50\text{ A}$	500	
$dv/dt_{cr}$	Critical Rate of Rise of Voltage	$V = 2/3 V_{DRM}$ , $R_{GK} = \infty$ , method 1 (linear voltage rise), $T_{VJ} = 150^\circ\text{C}$	1000	V/ $\mu\text{s}$	
$P_{GM}$	Maximum Gate Power Dissipation	$T_C = 150^\circ\text{C}$	$t_p = 30\ \mu\text{s}$	10	W
			$t_p = 300\ \mu\text{s}$	5	
$P_{GAV}$	Average Gate Power Dissipation	$T_C = 150^\circ\text{C}$	0.5	W	
$P_{tot}$	Total Power Dissipation	$T_C = 25^\circ\text{C}$	500	W	
$T_{STG}$	Storage Temperature Range	–	–40 to 150	$^\circ\text{C}$	
$T_{OP}$	Operating Temperature Range	–	–40 to 125	$^\circ\text{C}$	
$T_{VJ}$	Virtual Junction Temperature Range	–	–40 to 150	$^\circ\text{C}$	

## Thermal Characteristics

Symbol	Characteristics	Value			Units
		Min.	Typ.	Max.	
$R_{thJC}$	Thermal Resistance, Junction to Case	–	–	0.25	K/W
$R_{thCH}$	Thermal Resistance, Case to Heatsink	–	0.3	–	K/W

**Electrical Characteristics**

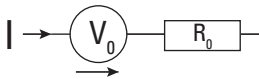
Symbol	Characteristics	Conditions	Value			Units	
			Min.	Typ.	Max.		
I <sub>GT</sub>	Gate Trigger Current	T <sub>VJ</sub> = 25°C	V <sub>D</sub> = 6 V	-	-	50	mA
		T <sub>VJ</sub> = -40°C		-	-	80	
V <sub>GT</sub>	Gate Trigger Voltage	T <sub>VJ</sub> = 25°C	V <sub>D</sub> = 6 V	-	-	1.5	V
		T <sub>VJ</sub> = -40°C		-	-	1.6	
I <sub>GD</sub>	Gate Non-trigger Current	V <sub>D</sub> = 2/3 V <sub>DRM</sub> ; T <sub>VJ</sub> = 150°C	-	-	3	mA	
V <sub>GD</sub>	Gate Non-trigger Voltage	V <sub>D</sub> = 2/3 V <sub>DRM</sub> ; T <sub>VJ</sub> = 150°C	-	-	0.2	V	
V <sub>T</sub>	Forward Voltage Drop	T <sub>VJ</sub> = 25°C	I <sub>T</sub> = 50 A	-	-	1.32	V
				T <sub>VJ</sub> = 125°C	-	-	
		I <sub>T</sub> = 100 A			-	-	
				I <sub>T</sub> = 100 A	-	-	
I <sub>L</sub>	Latching Current	t <sub>p</sub> = 10 μs; I <sub>G</sub> = 0.3 A; di <sub>G</sub> /dt = 0.3 A/μs; T <sub>VJ</sub> = 25°C	-	-	125	mA	
I <sub>H</sub>	Holding Current	V <sub>D</sub> = 6 V; R <sub>GK</sub> = ∞; T <sub>VJ</sub> = 25°C	-	-	115	mA	
V <sub>TO</sub>	Threshold Voltage <sup>1</sup>	T <sub>VJ</sub> = 150°C	-	-	0.88	V	
r <sub>T</sub>	Slope Resistance <sup>1</sup>	T <sub>VJ</sub> = 150°C	-	-	7.7	mΩ	
C <sub>J</sub>	Junction Capacitance	V <sub>R</sub> = 400 V, f = 1 MHz	-	25	-	pF	
t <sub>gd</sub>	Gate Controlled Delay Time	V <sub>D</sub> = 1/2 V <sub>DRM</sub> ; I <sub>G</sub> = 0.3 A; di <sub>G</sub> /dt = 0.3 A/μs; T <sub>VJ</sub> = 25°C	-	-	2	μs	
t <sub>q</sub>	Turn-off Time	V <sub>R</sub> = 100 V; I <sub>T</sub> = 50 A; V = 2/3 V <sub>DRM</sub> ; di/dt = 10 A/μs; dv/dt = 20 V/μs; t <sub>p</sub> = 200 μs; T <sub>VJ</sub> = 125°C	-	200	-	μs	

Note 1: For power loss calculation only

**Package**

Symbol	Characteristics	Conditions	Value			Units
			Min.	Typ.	Max.	
I <sub>RMS</sub>	RMS Current	per terminal	-	-	70	A
M <sub>D</sub>	Mounting Torque	-	0.8	-	1.2	Nm
F <sub>C</sub>	Mounting force with clip	-	20	-	120	N
G	Weight	-	-	6	-	g

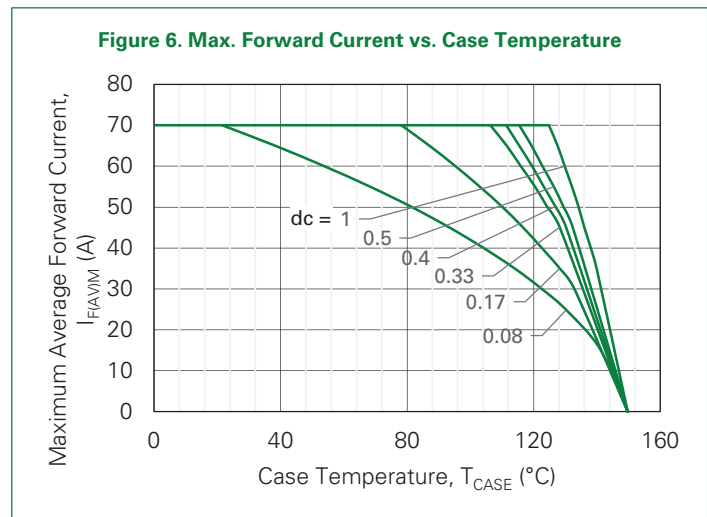
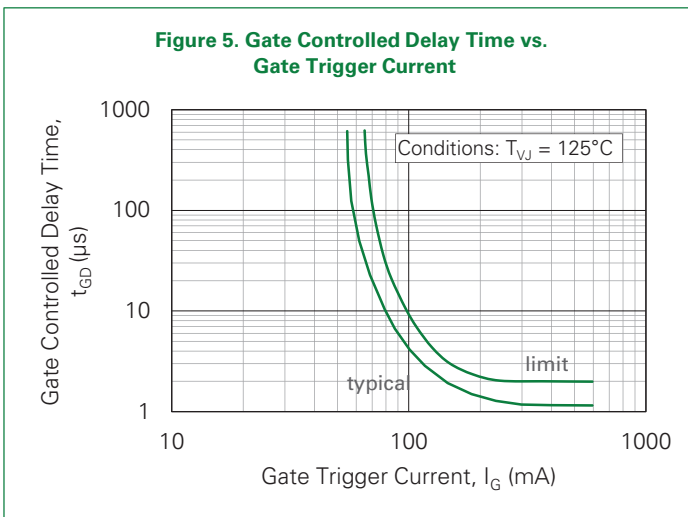
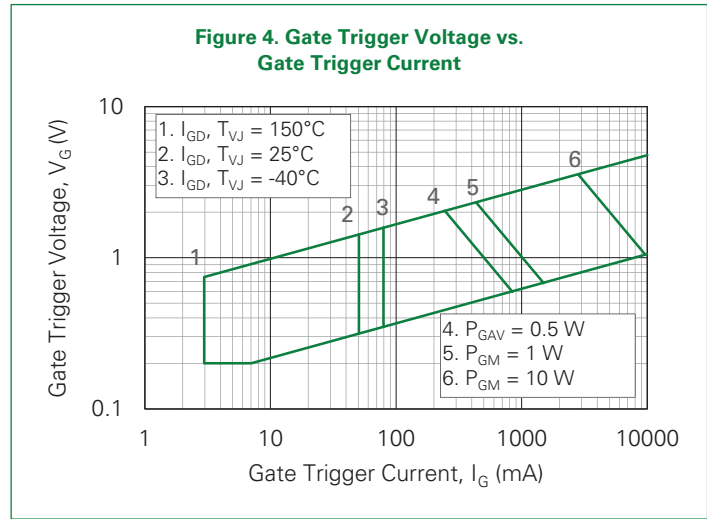
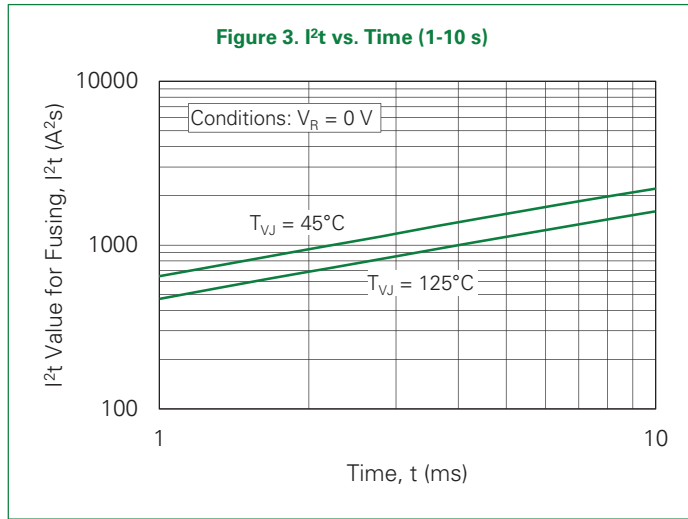
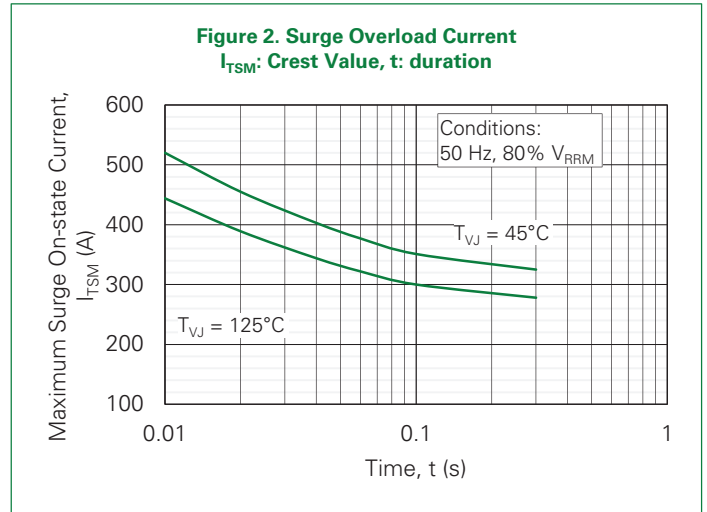
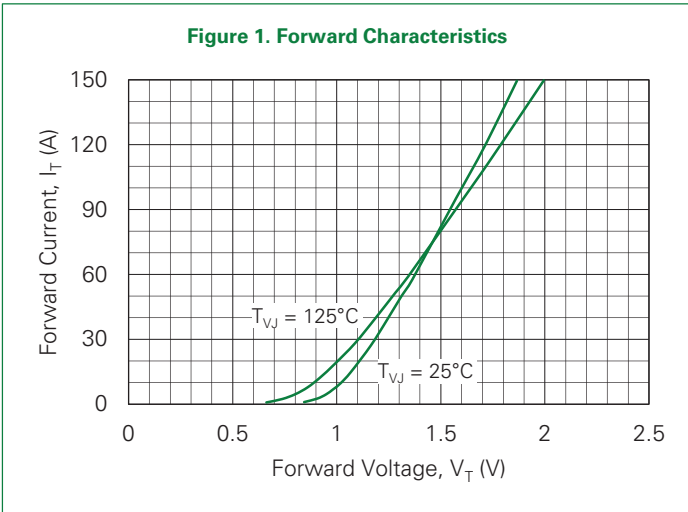
**Equivalent Circuits for Simulation** (T<sub>VJ</sub> = 150°C)



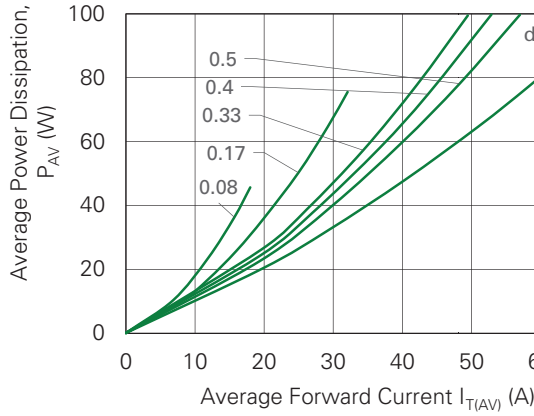
Symbol	Characteristics	Value	Units
V <sub>0 max</sub>	Threshold Voltage	0.88	V
R <sub>0 max</sub>	Slope Resistance <sup>1</sup>	5.2	mΩ

Note 1: On die level

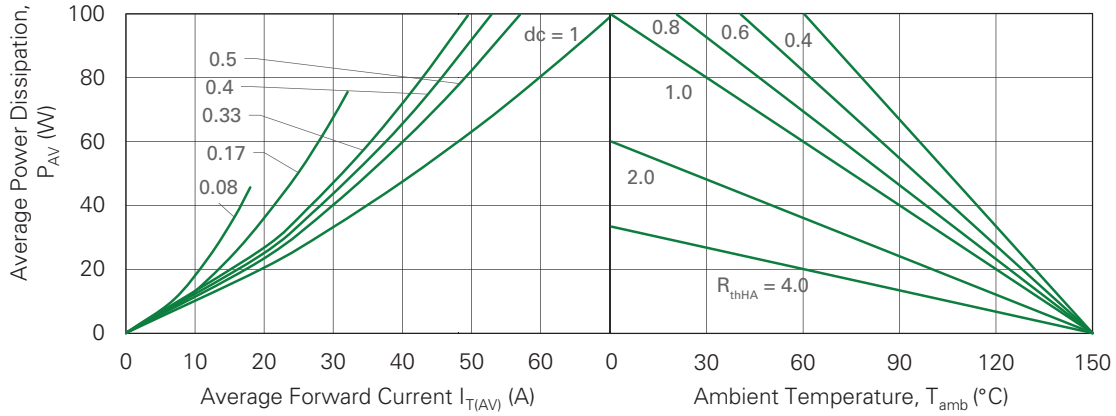
**Characteristic Curves**



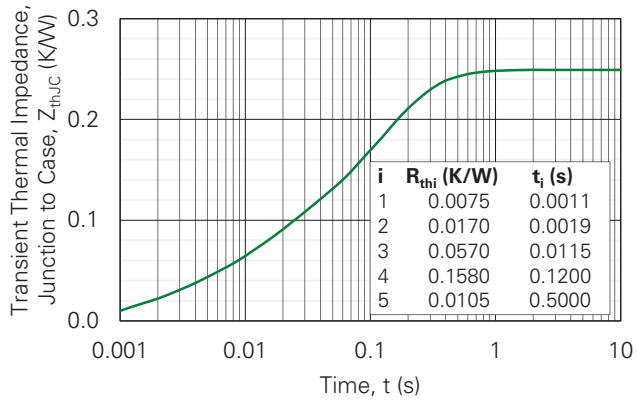
**Figure 7a. Power Dissipation vs. Direct Output Current**



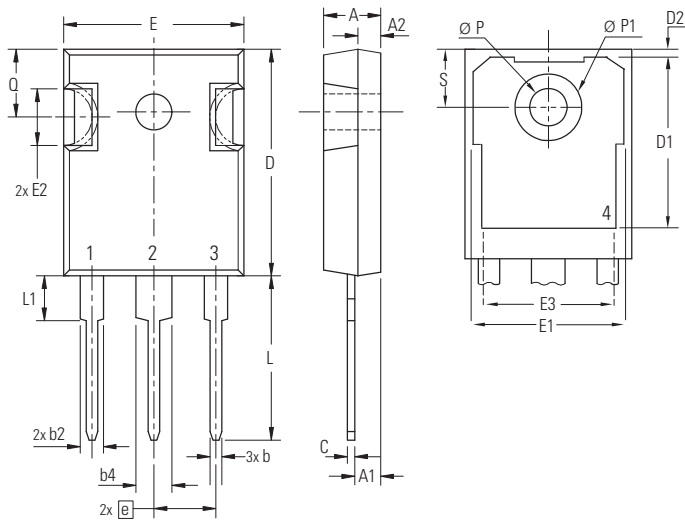
**Figure 7b. Power Dissipation vs. Ambient Temperature**



**Figure 8. Transient Thermal Impedance, Junction to Case**



Part Outline Drawing (TO-247-3L)



Symbol	Millimeters		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
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	0.845
D1	13.07	-	0.515	-
D2	0.51	1.35	0.020	0.053
e	5.45 BSC		0.215 BSC	
E	15.48	16.24	0.610	0.640
E1	13.45	-	0.530	-
E2	4.31	5.48	0.170	0.216
E3	-	13.43	-	0.529
L	19.80	20.30	0.780	0.800
L1	-	4.49	-	0.177
Q	5.38	6.19	0.212	0.244
S	6.14 BSC		0.242 BSC	
ØP	3.55	3.65	0.140	0.144
ØP1	-	7.39	-	0.29

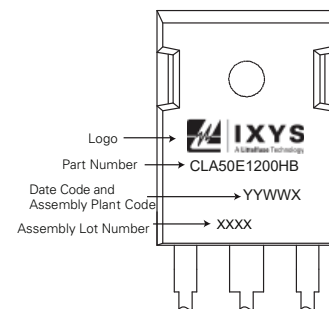
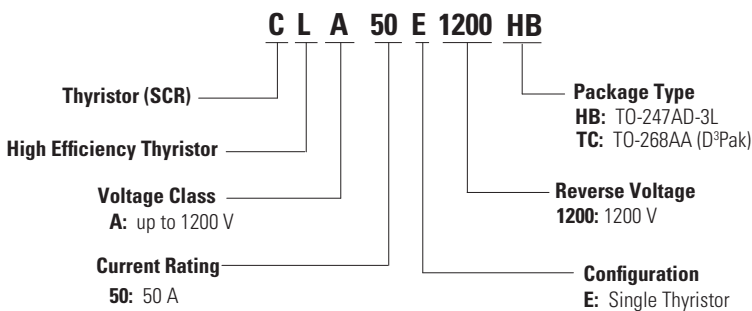
Product Selector

Part Number	Voltage Class	Package
CLA50E1200HB	1200 V	TO-247AD-3L
CLA50E1200TC	1200 V	TO-268AA (D <sup>3</sup> PAK)

Packing Options

Part Number	Marking	Packing Mode	Quantity
CLA50E1200HB	CLA50E1200HB	Tube	30

Part Numbering and Marking



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Part of:

