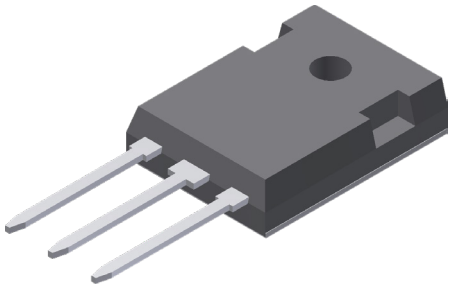
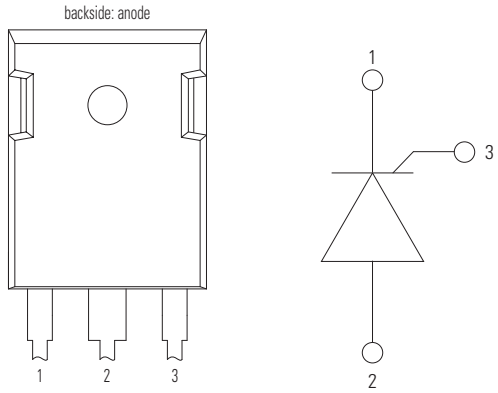
CLA50E1200HB

1200 V, 50 A High Efficiency Thyristor

RoHS



Pinout Diagram (TO-247-3L)



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

Description

CLA50E1200HB is a 1200 V, 50 A high-efficiency thyristor featuring planar passivated chip technology in a TO-247-3L package. The device delivers low conduction losses, high surge current capability, and reliable operation for line-frequency power conversion and control applications.

Features:

- Blocking voltage up to 1200 V
- Low forward voltage drop of 1.27 V @ T_{vj} = 125 °C
- Extended surge current capability of 700 A
- Planar passivated chip technology

Benefits:

- Suitable for high-voltage power conversion
- Low conduction losses; improved system efficiency
- Improved overload withstand capability
- Enhanced long-term reliability

Applications:

- Line rectification 50/60 Hz
- AC motor soft starters
- DC motor drives
- AC power controllers
- Power converters

Package:

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

Product Summary

Characteristic	Value	Unit
V_{RRM}	1200	V
$I_{T(AV)}$	50	A
V_T	1.27	V

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Maximum Ratings (T_{vj} = 25 °C unless otherwise specified)

Symbol	Characteristics	Conditions		Value	Units
V_{RRM}/V_{DRM}	Repetitive Peak Reverse / Peak Off-State Voltage	T_{vj} = 25 °C		1200	V
V_{RSM}/V_{DSM}	Non-Repetitive Peak Reverse / Peak Off-State Voltage	T_{vj} = 25 °C		1300	V
I_R / I_D	Reverse Current / Off-State Current	$V_{R/D}$ = 1200 V	T_{vj} = 25 °C	50	µA
			T_{vj} = 125 °C	4	mA
$I_{T(RMS)}$	R.M.S On-State Current	180° Sine; T_C = 125 °C; T_{vj} = 150 °C		79	A
$I_{T(AV)}$	Average On-State Current			50	
I_{tRMS}	Terminal RMS Current	–		70	A
I_{TSM}	Non-Repetitive Surge On-State Current	T_{vj} = 45 °C	t = 10 ms, 50 Hz sine, V_R = 0 V	650	A
			t = 8.3 ms, 60 Hz sine, V_R = 0 V	700	
		T_{vj} = 150 °C	t = 10 ms, 50 Hz sine, V_R = 0 V	555	
			t = 8.3 ms, 60 Hz sine, V_R = 0 V	595	
I^2t	I^2t Value	T_{vj} = 45 °C	t = 10 ms, 50 Hz sine, V_R = 0 V	2.12	kA^2s
			t = 8.3 ms, 60 Hz sine, V_R = 0 V	2.04	
		T_{vj} = 150 °C	t = 10 ms, 50 Hz sine, V_R = 0 V	1.54	
			t = 8.3 ms, 60 Hz sine, V_R = 0 V	1.48	
di/dt_{cr}	Critical Rate of Rise of On-State Current	t_p= 200 µs; f = 50 Hz; di_G/dt = 0.3 A/µs; I_G = 0.3 A; T_{vj} = 150 °C; V= ⅔ V_{DRM}	Repetitive, I_T = 150 A	150	A/µs
			Non-repetitive, I_T = 50 A	500	
dv/dt_{cr}	Critical Rate of Rise of On-State Voltage	V = ⅔ V_{DRM}, R_{GK} = ∞, method 1 (linear voltage rise), T_{vj} = 150 °C		1000	V/ µs
P_{GM}	Peak Gate Power Dissipation	T_C = 150 °C	t_p = 30 µs	10	W
			t_p = 300 µs	5	
$P_{G(AV)}$	Average Gate Power Dissipation	T_C = 150 °C		0.5	W
P_{tot}	Total Power Dissipation	T_C = 25 °C		500	W
T_{vj}	Virtual Junction Temperature Range	–		–40 to 150	°C
T_{stg}	Storage Temperature Range	–		–40 to 150	°C

Revised: AO.08/19/26

Electrical Characteristics - Static (T_{vj} = 25 °C unless otherwise specified)

Symbol	Characteristics	Conditions			Value			Units
					Min.	Typ.	Max.	
V_T	On-State Voltage	T_{vj} = 25 °C	I_T = 50 A		–	–	1.32	V
			I_T = 100 A		–	–	1.60	
		T_{vj} = 125 °C	I_T = 50 A		–	–	1.27	
			I_T = 100 A		–	–	1.65	
V_{GT}	Gate Trigger Voltage	T_{vj} = 25 °C		V_D = 6 V	–	–	1.5	V
		T_{vj} = –40 °C			–	–	1.6	
V_{GD}	Gate Non-trigger Voltage	V_D = ⅔ V_{DRM}, T_{vj} = 150 °C			–	–	0.2	V
$V_{(TO)}$	Threshold Voltage[1]	T_{vj} = 150 °C			–	–	0.88	V
r_T	Slope Resistance[1]	T_{vj} = 150 °C			–	–	7.7	mΩ
I_{GD}	Gate Non-trigger Current	V_D = ⅔ V_{DRM}, T_{vj} = 150 °C			–	–	3	mA
I_{GT}	Gate Trigger Current	T_{vj} = 25 °C		V_D = 6 V	–	–	50	mA
		T_{vj} = –40 °C			–	–	80	
I_L	Latching Current	t_p = 10 µs; I_G = 0.3 A; di_G/dt = 0.3 A/µs; T_{vj} = 25 °C			–	–	300	mA
I_H	Holding Current	V_D = 6 V; R_{GK} = ∞; T_{vj} = 25 °C			–	–	150	mA

Note 1: For power loss calculation only

Electrical Characteristics - Dynamic (T_{vj} = 25 °C unless otherwise specified)

Symbol	Characteristics	Conditions	Value			Units
			Min.	Typ.	Max.	
C_j	Junction Capacitance	V_R = 400 V, f = 1 MHz	–	25	–	pF
t_{gd}	Gate-Controlled Turn-On Delay Time	V_D = ½ V_{DRM}; I_G = 0.3 A ; di_G/dt = 0.3 A/µs; T_{vj} = 25 °C	–	–	2	µs
t_q	Circuit-Commutated Turn-Off Time	V_R = 100 V; I_T = 50 A; V = ⅔ V_{DRM} ; di/dt = 10 A/µs; dv/dt = 20 V/µs; t_p = 200 µs; T_{VJ} = 125°C	–	200	–	µs

Thermal Characteristics

Symbol	Characteristics	Value			Units
		Min.	Typ.	Max.	
$R_{th(j-c)}$	Thermal Resistance Junction to Case	–	–	0.25	K/W
$R_{th(c-h)}$	Thermal Resistance Case to Heat Sink	–	0.3	–	K/W

Package

Symbol	Characteristics	Conditions	Value			Units
			Min.	Typ.	Max.	
T_{op}	Operating Temperature	–	-40	–	125	°C
M_s	Mounting Torque for Screws to Heatsink	–	0.8	–	1.2	Nm/lb.in
F_C	Mounting Force	with clip	20	–	120	N
G	Weight	–	–	6	–	g

Characteristic Curves

Fig. 1. Typical Forward Characteristics

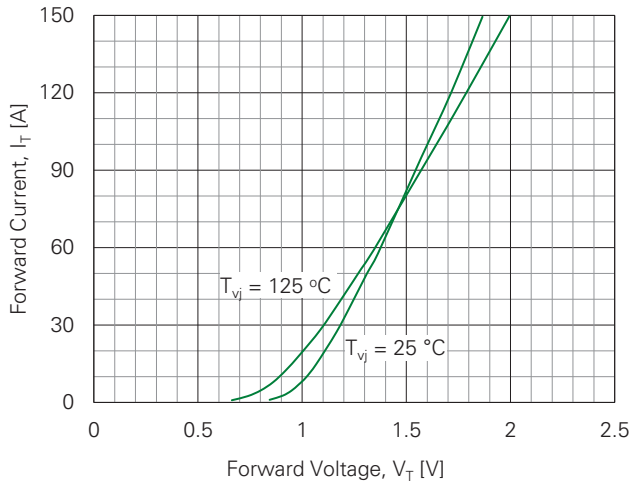


Fig. 2. Typical Surge On-State Current vs. Pulse Width

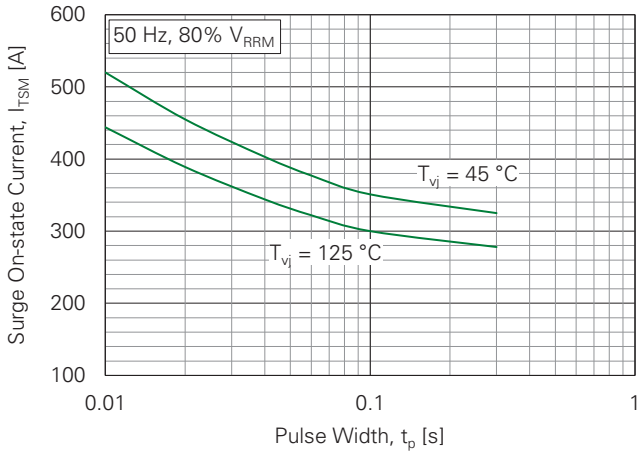


Fig. 3. I^2t vs. Time

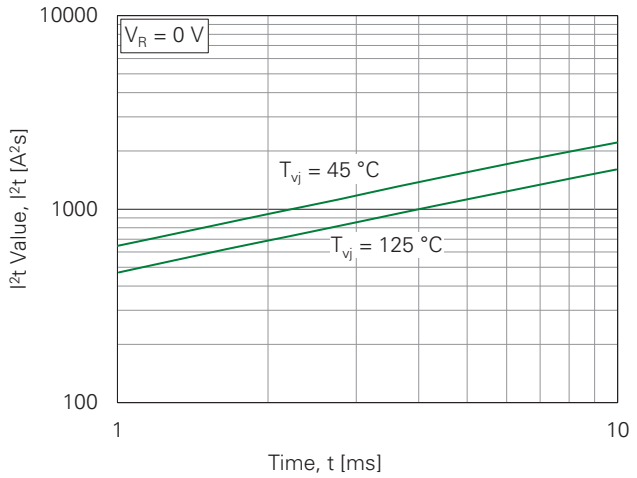


Fig. 4. Typical Gate Trigger Characteristcs

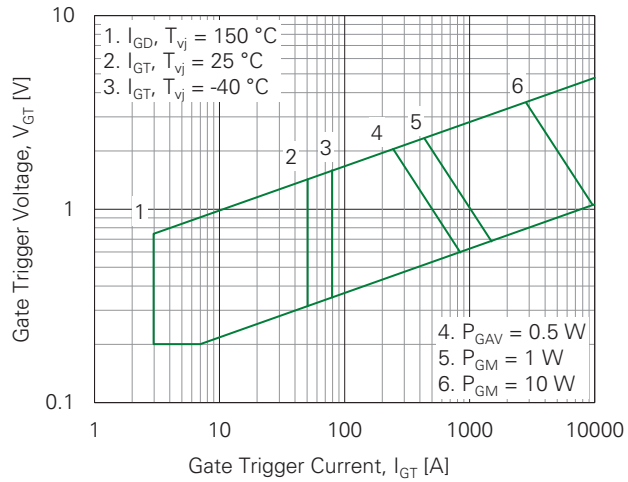


Fig. 5. Typical Gate Current Delay Time t_{gd} vs. Gate Current

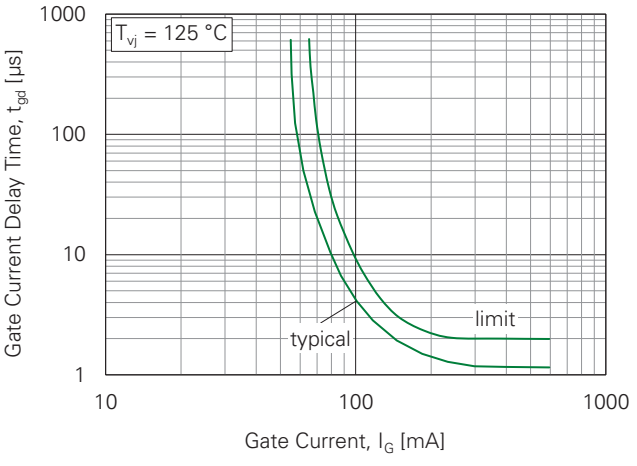
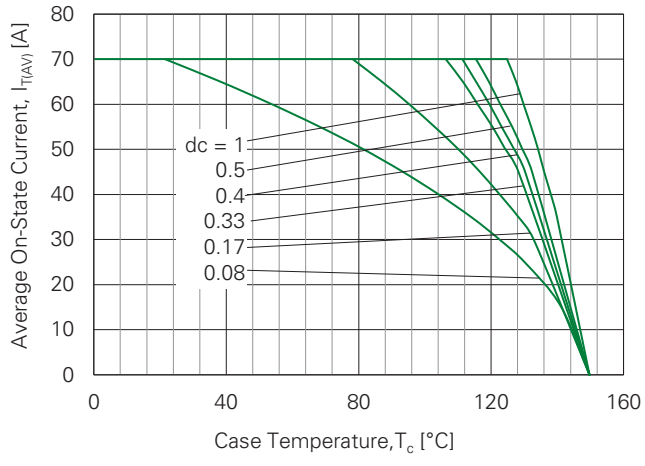


Fig. 6. Average On-State Current vs. Case Temperature



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Characteristic Curves

Fig. 7. Average On-State Power Dissipation vs. Average On-State Current

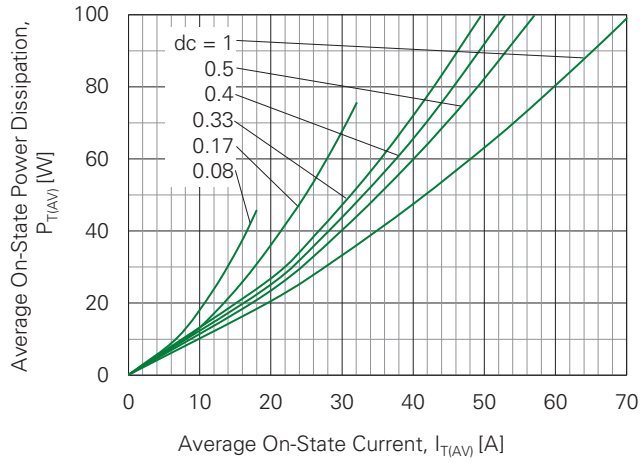


Fig. 8. Average On-State Power Dissipation vs. Ambient Temperature

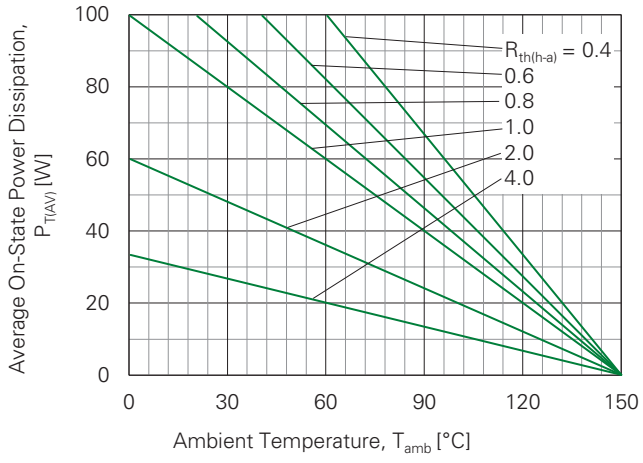
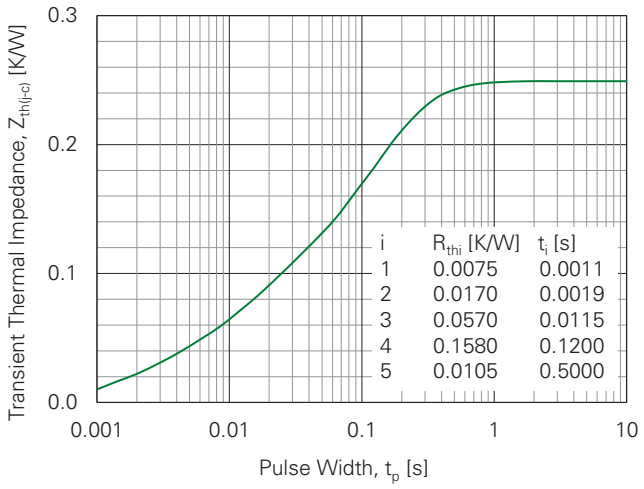
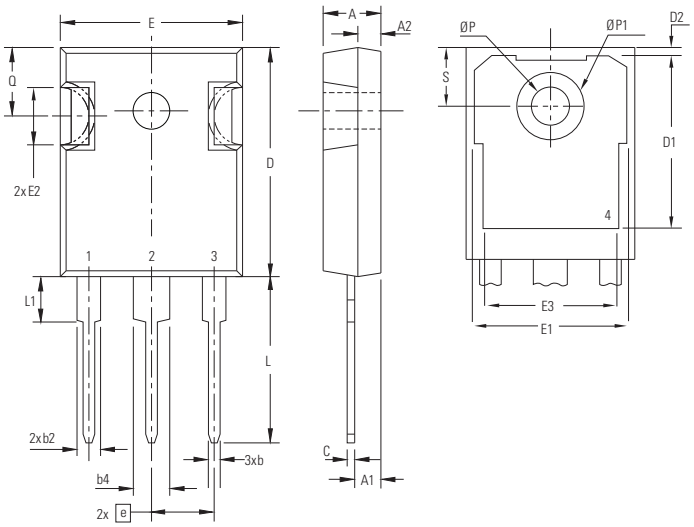


Fig. 9. Typical Transient Thermal Impedance



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^3PAK)

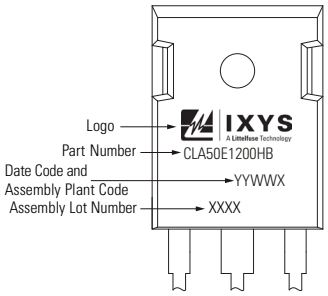
Packing Options

Part Number	Marking	Packing Mode	Quantity
CLA50E1200HB	CLA50E1200HB	Tube	30

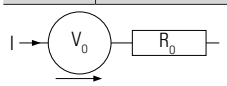
Part Numbering and Marking

C L A 50 E 1200 HB

- **Thyristor (SCR)**
- **High Efficiency Thyristor**
- **Voltage Class**
  A: up to 1200 V
- **Current Rating**
  50: 50 A
- **Configuration**
  E: Single Thyristor
- **Reverse Voltage**
  1200: 1200 V
- **Package Type**
  HB: TO-247AD-3L
  TC: TO-268AA (D^3Pak)



Equivalent Circuits for Simulation (*on die level, T_{vj} = 150 °C)

Symbol	Definition	Thyristor	Units
			
V_{0max}	Threshold voltage	0.88	V
R_{0max}	Slope resistance*	5.2	mΩ

IXYS Part of: Littelfuse
Expertise Applied | Answers Delivered

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