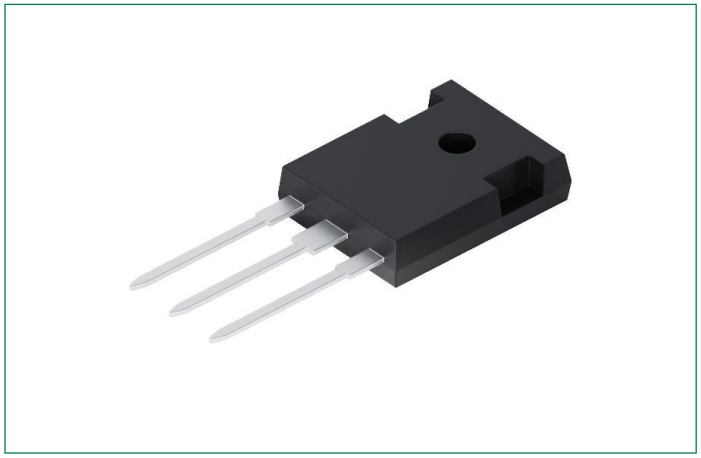
CLA120E1200HB

1200 V, 120 A High Efficiency Single Thyristor

RoHS



Features

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

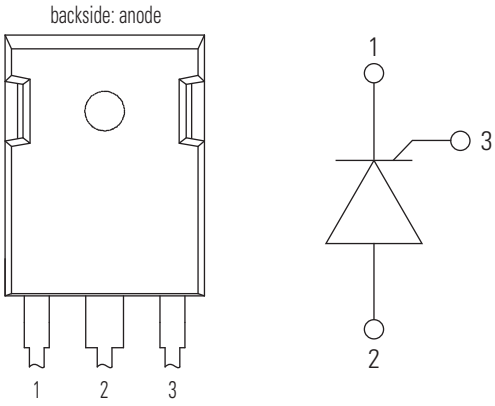
Applications

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

Package

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

Pinout Diagram (TO-247-3L)



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

Product Summary

Characteristic	Value	Unit
V_{RRM}	1200	V
$I_{T(AV)}$	120	A
V_T	1.37	V

Revised: TK.01/24/2025

Maximum Ratings

Symbol	Characteristics	Conditions		Value	Units
$I_{T(RMS)}$	RMS On-state Current	180° Sine, T_c = 105 °C, T_{vj} = 150 °C		190	A
$I_{T(AV)}$	Average On-state Current			120	A
$I_{R/D}$	Reverse Current/ Drain Current	T_{vj} = 25 °C	$V_{R/D}$ = 1200 V	10	µA
		T_{vj} = 125 °C		5	mA
I_{TSM}	Surge (Non-repetitive) On-state Current	T_{vj} = 45 °C	t = 10 ms, (50 Hz), sine V_R = 0 V	1.50	kA
			t = 8.3 ms; (60 Hz), sine V_R = 0 V	1.62	
		T_{vj}= 150 ° C	t = 10 ms, (50 Hz), sine V_R = 0 V	1.28	
			t = 8.3 ms; (60 Hz), sine V_R = 0 V	1.38	
I^2t	I^2t Value	T_{vj} = 45 °C	t = 10 ms; (50 Hz), sine V_R = 0 V	11.30	kA^2s
			t = 8.3 ms; (60 Hz), sine V_R = 0 V	10.90	
		T_{vj} = 150 °C	t = 10 ms; (50 Hz), sine V_R = 0 V	8.13	
			t = 8.3 ms; (60 Hz), sine V_R = 0 V	7.87	
V_{RSM}/ V_{DSM}	Non-repetitive Peak Reverse Voltage/ Non-repetitive Peak Off-state Voltage	T_{vj} = 25 °C		1300	V
V_{RRM}/ V_{DRM}	Repetitive Peak Reverse Voltage/ Repetitive Peak Off-state Voltage	T_{vj} = 25 °C		1200	V
di/dt_{cr}	Critical Rate of Rise of On-state Current	t_p= 200 µs; di_G/dt = 0.45 A/µs; T_{vj} = 150 °C, I_G = 0.45 A; V = 2/3 V_{DRM}	Repetitive, I_T = 360 A	150	A/µs
			Non-repetitive, I_T = 120 A	500	
dv/dt_{cr}	Critical Rate of Rise of Off-state Voltage	T_{vj} = 150 °C , R_{GK} = ∞, V = 2/3 V_{DRM}		1000	V/µs
P_{GM}	Peak Gate Power Dissipation	T_c = 150 °C	t_p = 30 µs	10	W
			t_p = 300 µs	1	
$P_{G(AV)}$	Average Gate Power Dissipation	T_c = 150 °C		0.5	W
P_{tot}	Total Power Dissipation	T_c = 25 °C		780	W
T_{stg}	Storage Temperature Range	–		–40 to 150	°C
T_{op}	Operating Temperature Range	–		–40 to 125	°C
T_{vj}	Virtual Junction Temperature Range	–		–40 to 150	°C

Thermal Characteristics

Symbol	Characteristics	Value			Units
		Min.	Typ.	Max.	
$R_{th(j-c)}$	Thermal Resistance Junction to Case	–	–	0.16	K/W
$R_{th(c-h)}$	Thermal Resistance Case to Heatsink	–	0.15	–	K/W

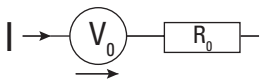
Electrical Characteristics

Symbol	Characteristics	Conditions		Value			Units
				Min.	Typ.	Max.	
I_{GT}	Gate Trigger Current	T_{vj} = 25 °C	V_D = 6 V	–	–	70	mA
		T_{vj} = –40 °C		–	–	150	
V_{GT}	Gate Trigger Voltage	T_{vj} = 25 °C	V_D = 6 V	–	–	1.5	V
		T_{vj} = –40 °C		–	–	1.6	
I_{GD}	Gate Non-trigger Current	V = 2/3 V_{DRM}, T_{vj} = 150 °C		–	–	5	mA
V_{GD}	Gate Non-trigger Voltage	V = 2/3 V_{DRM}, T_{vj} = 150 °C		–	–	0.2	V
V_T	On-state Voltage	T_{vj} = 25 °C	I_T = 120 A	–	–	1.39	V
			I_T = 240 A	–	–	1.83	
		T_{vj} = 125 °C	I_T = 120 A	–	–	1.37	
			I_T = 240 A	–	–	1.91	
$V_{(TO)}$	Threshold Voltage	T_{vj} = 150 °C		–	–	0.82	V
r_T	Slope Resistance			–	–	4.6	mΩ
I_L	Latching Current	t_p = 10 µs; I_G = 0.45 A; di_G/dt = 0.45 A/µs, T_{vj} = 25 °C		–	–	150	mA
I_H	Holding Current	V_D = 6 V; R_{GK} = ∞; T_{vj} = 25 °C		–	–	100	mA
C_j	Junction Capacitance	V_R = 400 V, f = 1 MHz		–	55	–	pF
t_{gd}	Gate-controlled Turn-on Delay Time	V_D = 1/2 V_{DRM}; I_G = 0.5 A ; di_G/dt = 0.5 A/µs		–	–	2	µs
t_q	Circuit-commutated Turn-off Time	V_R = 100 V, I_T = 120 A, V_D = 2/3 V_{DRM}, di/dt = 10 A/µs; dv/dt = 20 V/µs, t_p = 200 µs, T_{vj} = 125 °C		–	150	–	µs

Package

Symbol	Characteristics	Conditions	Value			Units
			Min.	Typ.	Max.	
F_C	Mounting Force with Clip	–	20	–	120	N
M_t	Mounting Torque	–	0.8	–	1.2	Nm
G	Weight	–	–	6	–	g

Equivalent Circuits for Simulation (T_{vj} = 150 °C)



Symbol	Characteristics	Value	Units
$V_{0\,max}$	Threshold Voltage	0.82	V
$R_{0\,max}$	Slope Resistance[1]	2.5	mΩ

Note 1: On die level

Characteristic Curves

Figure 1. Forward Characteristics

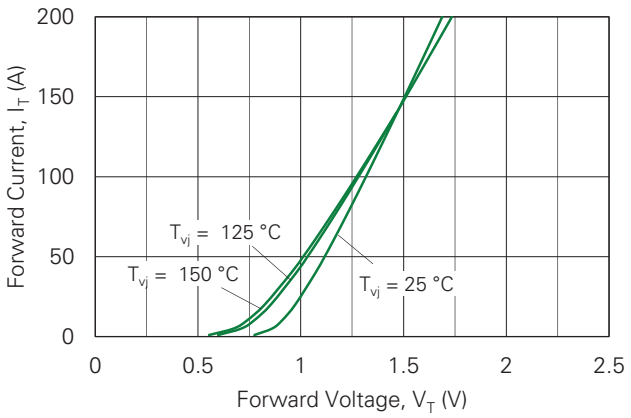


Figure 2. Surge Overload Current
I_{TSM}: Crest Value, t: duration

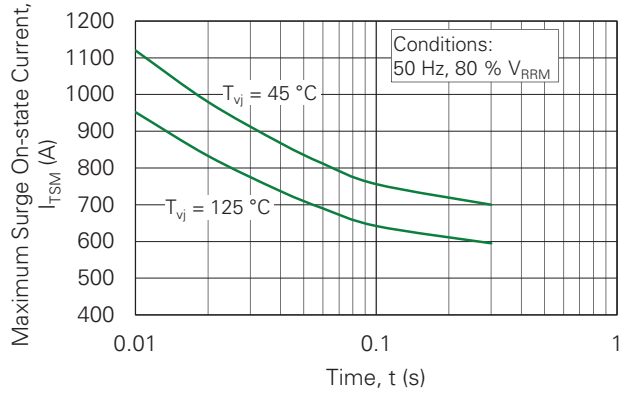


Figure 3. I^2t vs. Time (1-10 s)

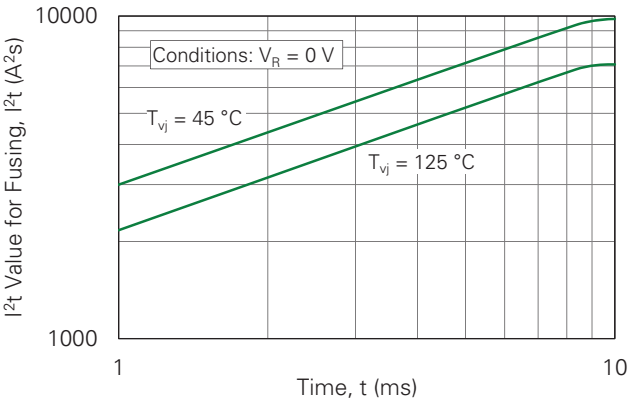


Figure 4. Gate Voltage and Gate Current

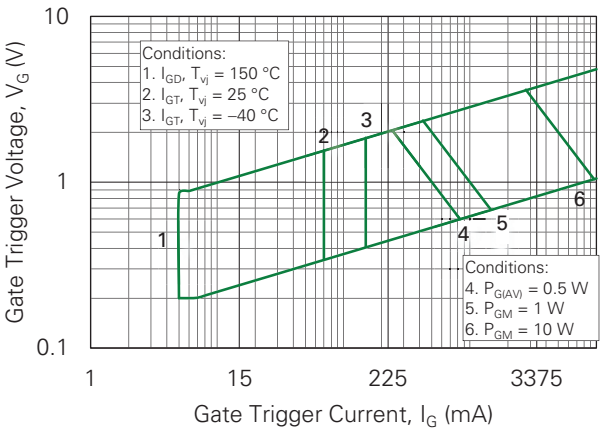


Figure 5. Gate Controlled Delay Time

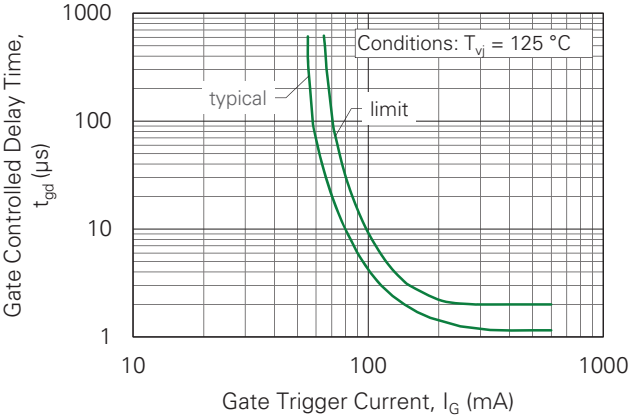


Figure 6. Max. Forward Current at Case Temperature

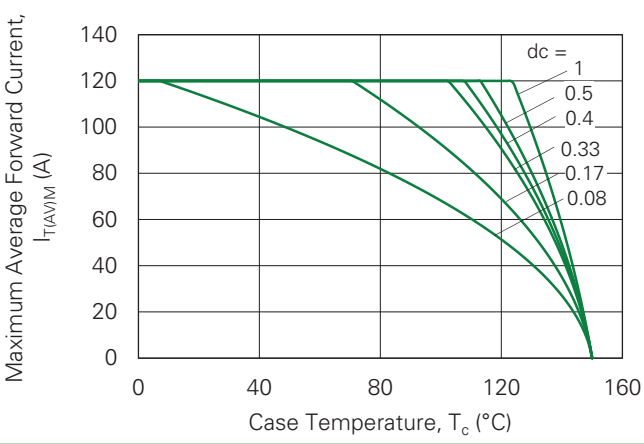


Figure 7a. Power Dissipation vs. Output Current **Figure 7b. Power Output vs. Ambient Temperature**

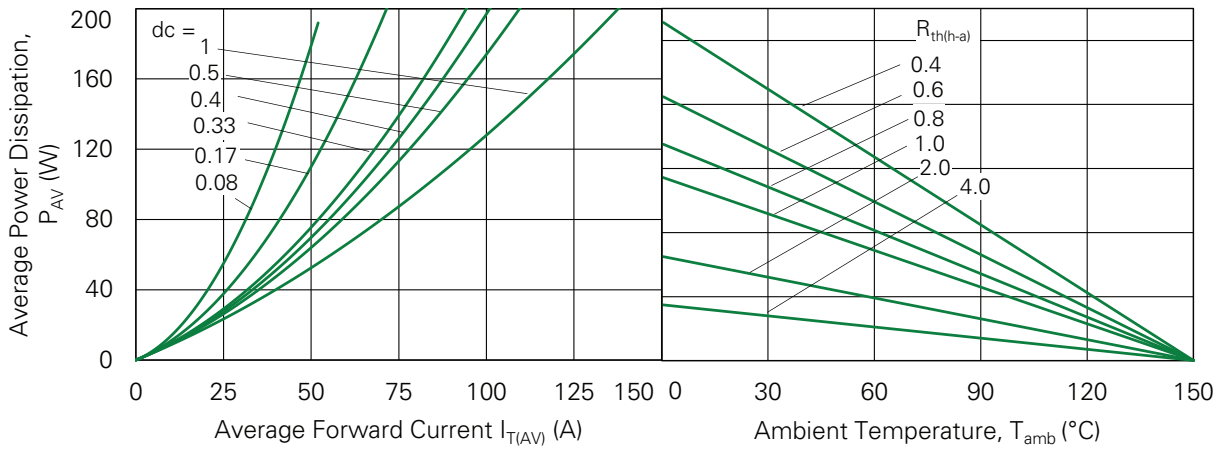
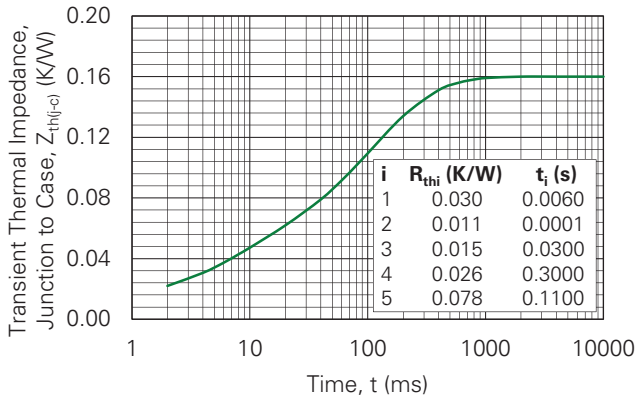
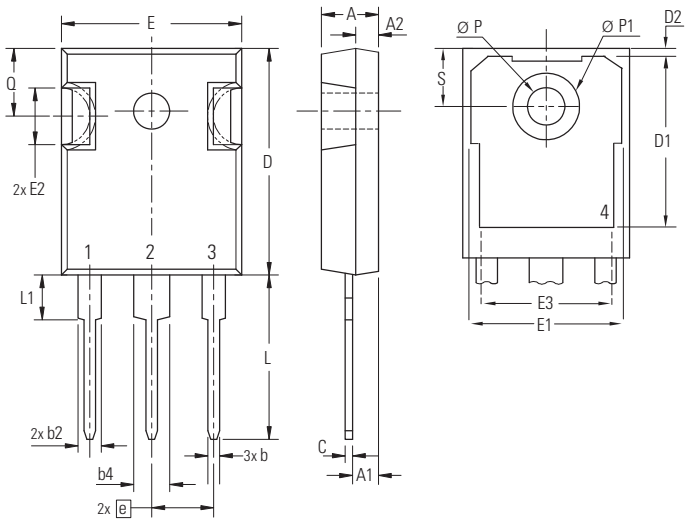


Figure 8. Transient Thermal Impedance, Junction to Case



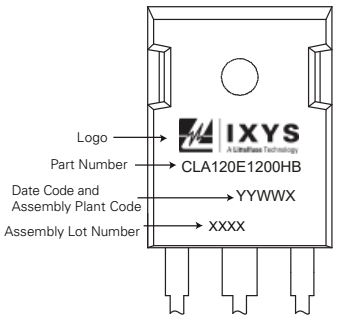
i	R_{thi} (K/W)	t_i (s)
1	0.030	0.0060
2	0.011	0.0001
3	0.015	0.0300
4	0.026	0.3000
5	0.078	0.1100

Package Dimensions (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	5.46 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
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

Part Numbering and Marking



C = Thyristor (SCR)
L = High Efficiency Tyristor
A = Voltage Class (up to 1200 V)
120 = Current Rating (A)
E = Single Thyristor
1200 = Reverse Voltage (V)
HB = Package (TO-247AD-3L)

Packing Options

Part Number	Marking	Packing Mode	Quantity
CLA120E1200HB	CLA120E1200HB	Tube	30 pcs