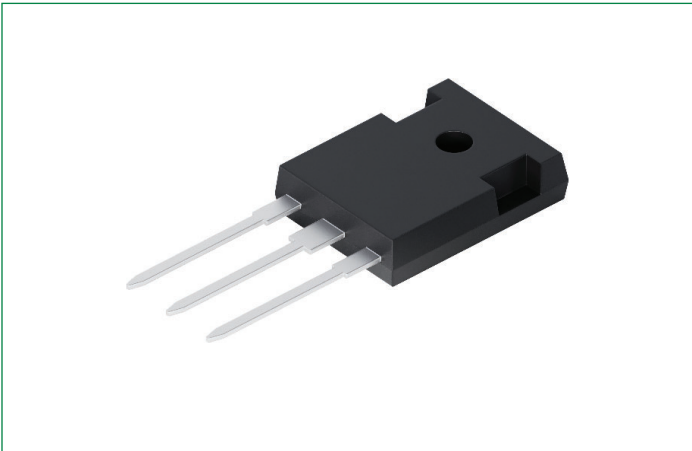


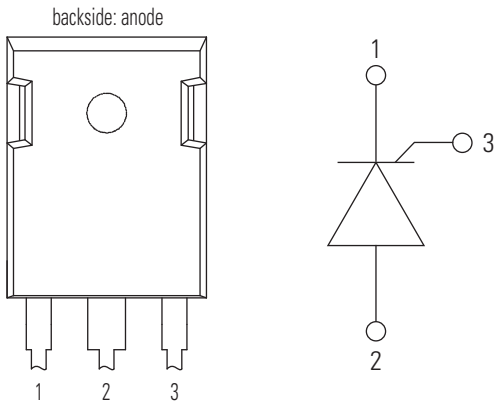
CLA120E1200HB

1200 V, 120 A High Efficiency Single Thyristor

RoHS



Pinout Diagram (TO-247-3L)



1: Cathode; 2: Anode; 3: Gate

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

Product Summary

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

Maximum Ratings

Symbol	Characteristics	Conditions		Value	Units
$I_{T(RMS)}$	RMS On-state Current	180° Sine, $T_c = 105\text{ }^{\circ}\text{C}$, $T_{vj} = 150\text{ }^{\circ}\text{C}$		190	A
$I_{T(AV)}$	Average On-state Current			120	A
$I_{R/D}$	Reverse Current/ Drain Current	$T_{vj} = 25\text{ }^{\circ}\text{C}$	$V_{R/D} = 1200\text{ V}$	10	μA
		$T_{vj} = 125\text{ }^{\circ}\text{C}$		5	mA
I_{TSM}	Surge (Non-repetitive) On-state Current	$T_{vj} = 45\text{ }^{\circ}\text{C}$	t = 10 ms, (50 Hz), sine $V_R = 0\text{ V}$	1.50	kA
			t = 8.3 ms; (60 Hz), sine $V_R = 0\text{ V}$	1.62	
		$T_{vj} = 150\text{ }^{\circ}\text{C}$	t = 10 ms, (50 Hz), sine $V_R = 0\text{ V}$	1.28	
			t = 8.3 ms; (60 Hz), sine $V_R = 0\text{ V}$	1.38	
I^2t	I^2t Value	$T_{vj} = 45\text{ }^{\circ}\text{C}$	t = 10 ms; (50 Hz), sine $V_R = 0\text{ V}$	11.30	kA ² s
			t = 8.3 ms; (60 Hz), sine $V_R = 0\text{ V}$	10.90	
		$T_{vj} = 150\text{ }^{\circ}\text{C}$	t = 10 ms; (50 Hz), sine $V_R = 0\text{ V}$	8.13	
			t = 8.3 ms; (60 Hz), sine $V_R = 0\text{ V}$	7.87	
V_{RSM}/V_{DSM}	Non-repetitive Peak Reverse Voltage/ Non-repetitive Peak Off-state Voltage	$T_{vj} = 25\text{ }^{\circ}\text{C}$		1300	V
V_{RRM}/V_{DRM}	Repetitive Peak Reverse Voltage/ Repetitive Peak Off-state Voltage	$T_{vj} = 25\text{ }^{\circ}\text{C}$		1200	V
di/dt_{cr}	Critical Rate of Rise of On-state Current	$t_p = 200\text{ }\mu\text{s}$; $di_G/dt = 0.45\text{ A}/\mu\text{s}$; $T_{vj} = 150\text{ }^{\circ}\text{C}$, $I_G = 0.45\text{ A}$; $V = 2/3 V_{DRM}$	Repetitive, $I_T = 360\text{ A}$	150	A/ μs
			Non-repetitive, $I_T = 120\text{ A}$	500	
dv/dt_{cr}	Critical Rate of Rise of Off-state Voltage	$T_{vj} = 150\text{ }^{\circ}\text{C}$, $R_{GK} = \infty$, $V = 2/3 V_{DRM}$		1000	V/ μs
P_{GM}	Peak Gate Power Dissipation	$T_c = 150\text{ }^{\circ}\text{C}$	$t_p = 30\text{ }\mu\text{s}$	10	W
			$t_p = 300\text{ }\mu\text{s}$	1	
$P_{G(AV)}$	Average Gate Power Dissipation	$T_c = 150\text{ }^{\circ}\text{C}$		0.5	W
P_{tot}	Total Power Dissipation	$T_c = 25\text{ }^{\circ}\text{C}$		780	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.	
$R_{th(j-c)}$	Thermal Resistance Junction to Case	–	–	0.16	K/W
$R_{th(c-h)}$	Thermal Resistance Case to Heatsink	–	0.15	–	K/W

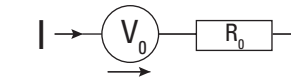
Electrical Characteristics

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

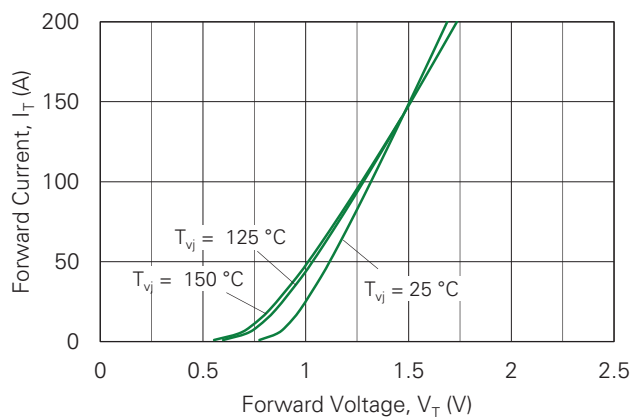
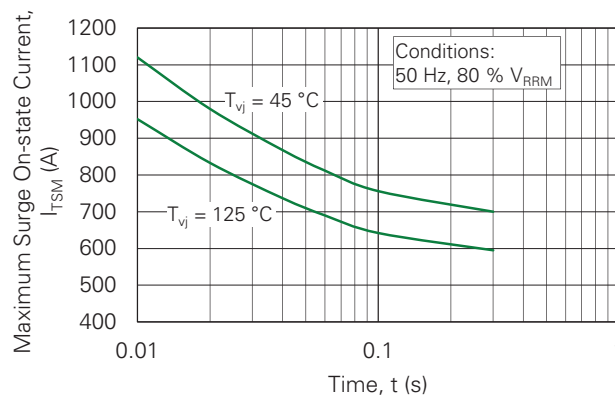
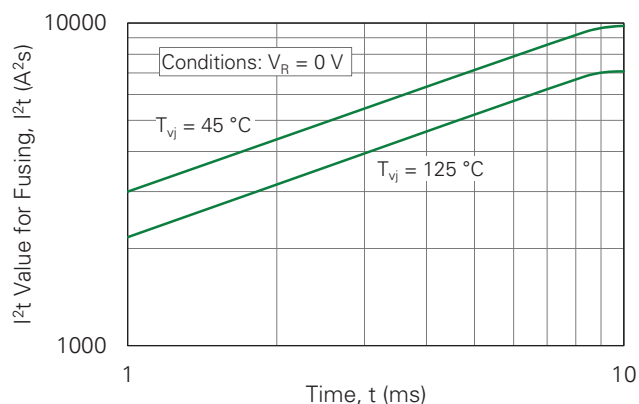
Figure 2. Surge Overload Current
 I_{TSM} : Crest Value, t: durationFigure 3. I^2t vs. Time (1-10 s)

Figure 4. Gate Voltage and Gate Current

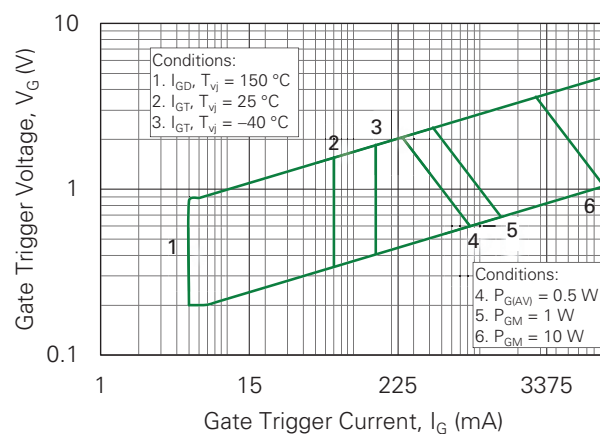


Figure 5. Gate Controlled Delay Time

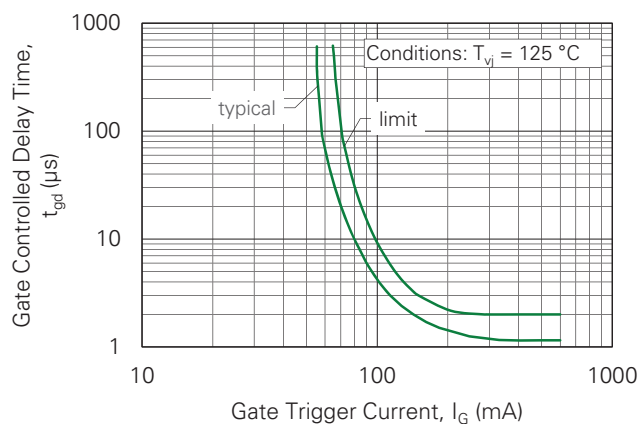


Figure 6. Max. Forward Current at Case Temperature

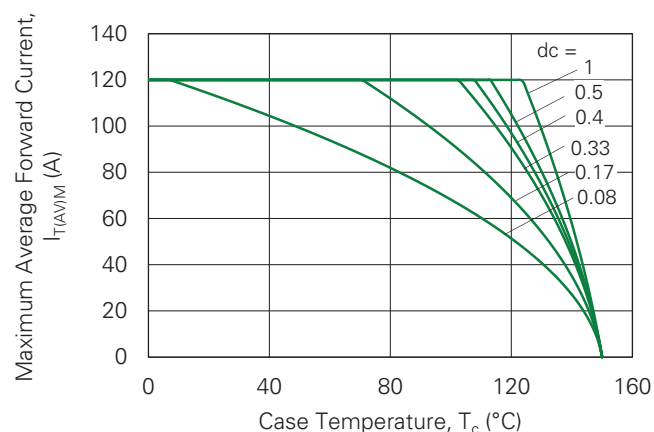


Figure 7a. Power Dissipation vs. Output Current Figure 7b. Power Output vs. Ambient Temperature

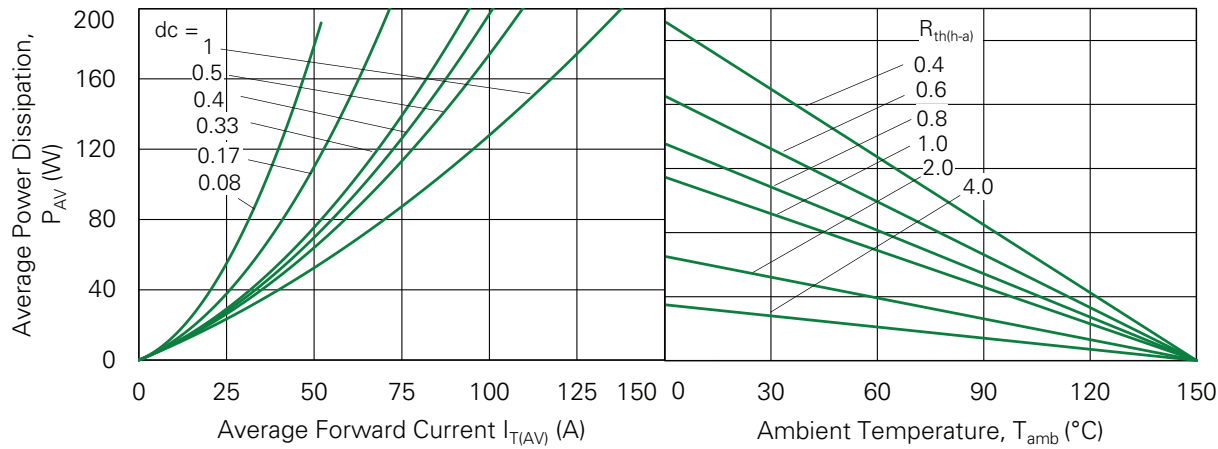
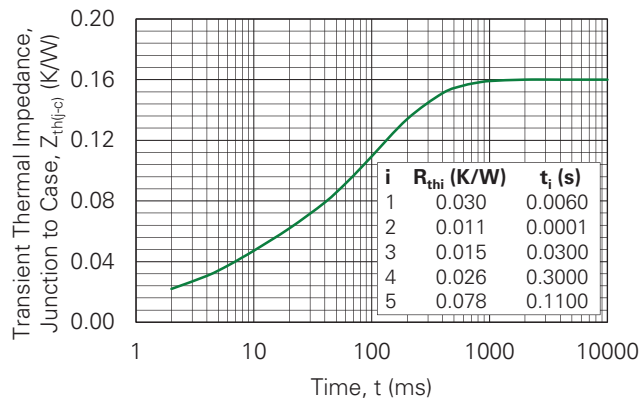
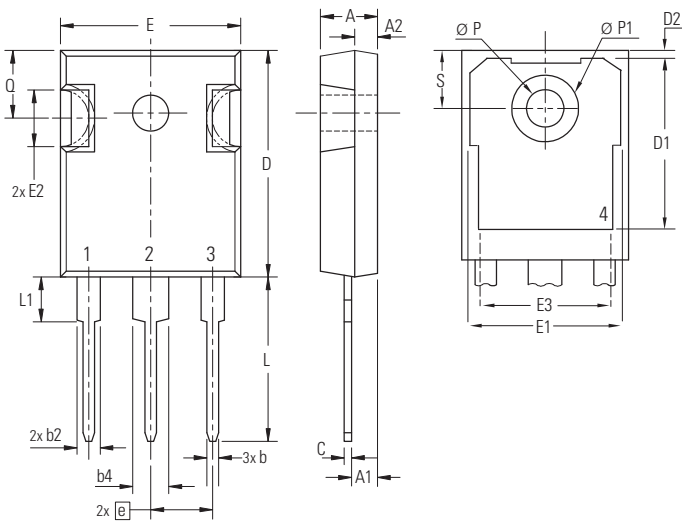


Figure 8. Transient Thermal Impedance, Junction to Case

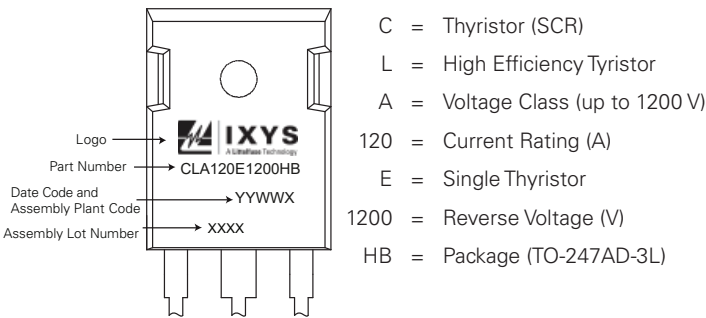


Package Dimensions (TO-247-3L)



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



Packing Options

Part Number	Marking	Packing Mode	Quantity
CLA120E1200HB	CLA120E1200HB	Tube	30 pcs

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