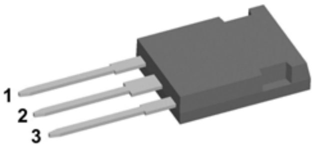
High Efficiency Thyristor

V_{RRM} = 1200 V
I_{TAV} = 80 A
V_T = 1.38 V

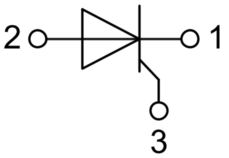
Single Thyristor

Part number

CLA80E1200HF



Backside: anode



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: PLUS247

- Industry standard outline
- RoHS compliant
- Epoxy meets UL 94V-0

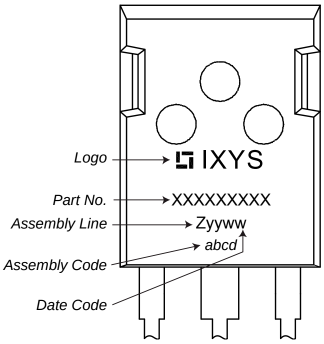
Thyristor

Symbol	Definition	Conditions		Ratings min.	Ratings typ.	Ratings 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			5	mA
V_T	*forward voltage drop*	I_T = 80 A	T_{VJ} = 25°C			1.40	V
		I_T = 160 A				1.77	V
		I_T = 80 A	T_{VJ} = 125°C			1.38	V
		I_T = 160 A				1.87	V
I_{TAV}	*average forward current*	T_C = 115°C	T_{VJ} = 150°C			80	A
$I_{T(RMS)}$	*RMS forward current*	180° sine				126	A
V_{T0}	*threshold voltage*	*for power loss calculation only*	T_{VJ} = 150°C			0.88	V
r_T	*slope resistance*					6.3	mΩ
R_{thJC}	*thermal resistance junction to case*					0.2	K/W
R_{thCH}	*thermal resistance case to heatsink*				0.25		K/W
P_{tot}	*total power dissipation*		T_C = 25°C			620	W
I_{TSM}	*max. forward surge current*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			900	A
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			970	A
		t = 10 ms; (50 Hz), sine	T_{VJ} = 150°C			765	A
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			825	A
I²t	*value for fusing*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			4.05	kA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			3.92	kA²s
		t = 10 ms; (50 Hz), sine	T_{VJ} = 150°C			2.93	kA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			2.83	kA²s
C_J	*junction capacitance*	V_R = 400 V f = 1 MHz	T_{VJ} = 25°C		36		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 = 240 A			150	A/µs
		t_P = 200 µs; di_G/dt = 0.3 A/µs;					
		I_G = 0.3 A; $V_D = \frac{2}{3} V_{DRM}$	non-repet., I_T = 80 A			500	A/µs
$(dv/dt)_{cr}$	*critical rate of rise of voltage*	$V_D = \frac{2}{3} V_{DRM}$	T_{VJ} = 150°C			1000	V/µs
		$R_{GK} = \infty$; 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			38	mA
			T_{VJ} = -40°C			80	mA
V_{GD}	*gate non-trigger voltage*	$V_D = \frac{2}{3} V_{DRM}$	T_{VJ} = 150°C			0.2	V
I_{GD}	*gate non-trigger current*					5	mA
I_L	*latching current*	t_p = 10 µs	T_{VJ} = 25°C			150	mA
		I_G = 0.3 A; di_G/dt = 0.3 A/µs					
I_H	*holding current*	V_D = 6 V $R_{GK} = \infty$	T_{VJ} = 25°C			100	mA
t_{gd}	*gate controlled delay time*	$V_D = \frac{1}{2} V_{DRM}$	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 = 80 A; $V_D = \frac{2}{3} V_{DRM}$	T_{VJ} = 150°C		150		µs
		di/dt = 20 A/µs; dv/dt = 20 V/µs; t_p = 200 µs					

Package PLUS247

Symbol	Definition	Conditions	Ratings 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
F_C	*mounting force with clip*		20		120	N
$d_{Spp/App}$	*creepage distance on surface | striking distance through air*	*terminal to terminal*	5.5			mm
$d_{Spb/Apb}$		*terminal to backside*	5.5			mm

Product Marking



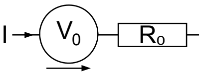
Part description

C = Thyristor (SCR)
L = High Efficiency Thyristor
A = (up to 1200V)
80 = Current Rating [A]
E = Single Thyristor
1200 = Reverse Voltage [V]
HF = PLUS247 (3)

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	CLA80E1200HF	CLA80E1200HF	Tube	30	508680

Equivalent Circuits for Simulation

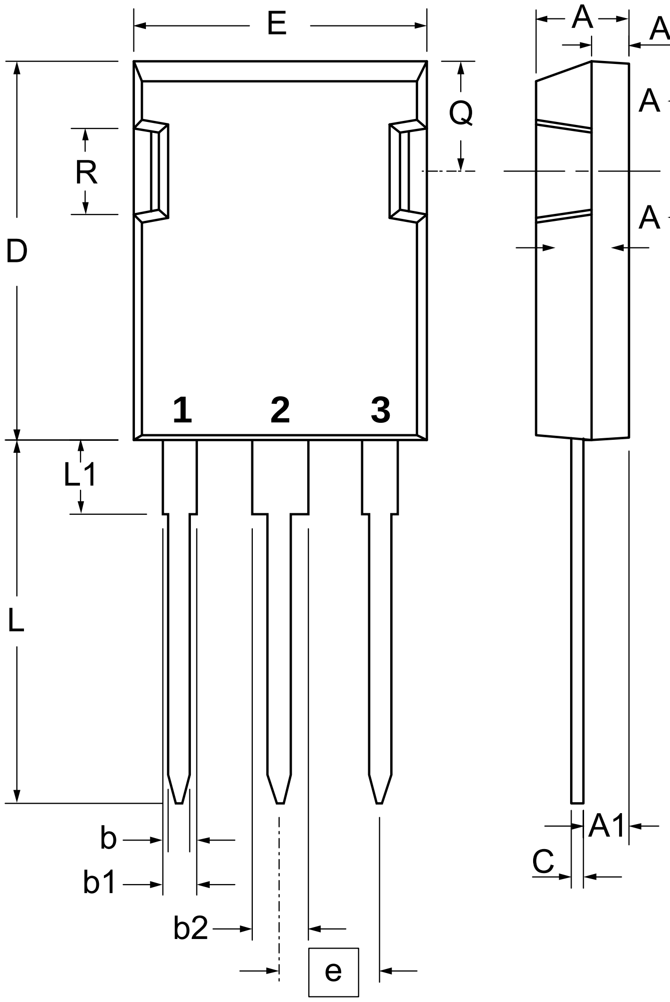
* on die level $T_{VJ} = 150\,°C$

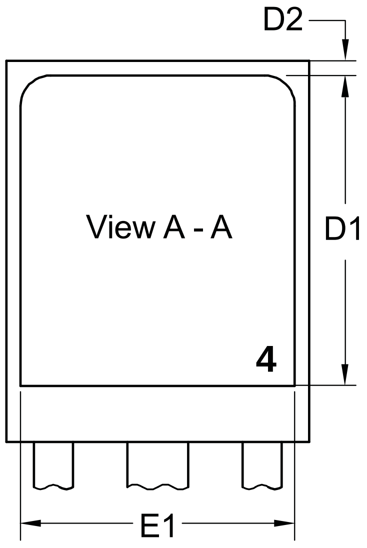


Thyristor

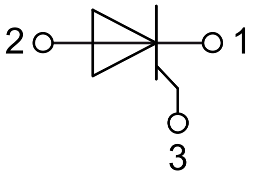
$V_{0\,max}$	*threshold voltage*	0.88	V
$R_{0\,max}$	*slope resistance **	3.8	mΩ

Outlines PLUS247





Sym.	Inches		Millimeter	
	min.	max.	min.	max.
A	0.190	0.205	4.83	5.21
A1	0.090	0.100	2.29	2.54
A2	0.075	0.085	1.91	2.16
b	0.045	0.055	1.14	1.40
b1	0.075	0.084	1.91	2.13
b2	0.115	0.123	2.92	3.12
C	0.024	0.031	0.61	0.80
D	0.819	0.840	20.80	21.34
D1	0.515	-	13.07	-
D2	0.010	0.053	0.51	1.35
E	0.620	0.635	15.75	16.13
E1	0.530	-	13.45	-
e	0.215 BSC		5.45 BSC	
L	0.780	0.800	19.81	20.32
L1	0.150	0.170	3.81	4.32
Q	0.220	0.244	5.59	6.20
R	0.170	0.190	4.32	4.83



Thyristor

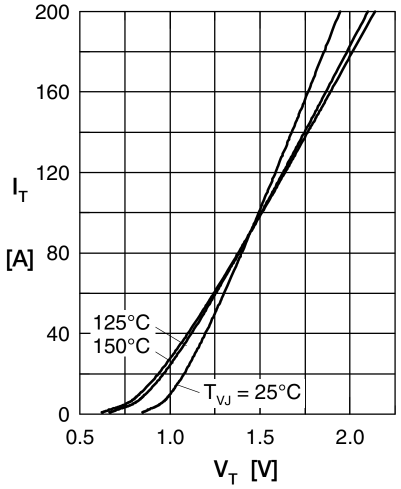


Fig. 1 Forward characteristics

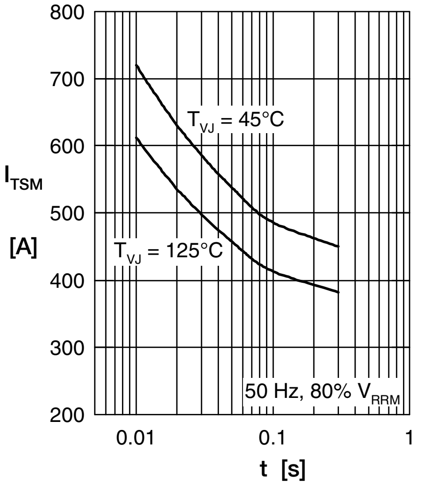


Fig. 2 Surge overload current

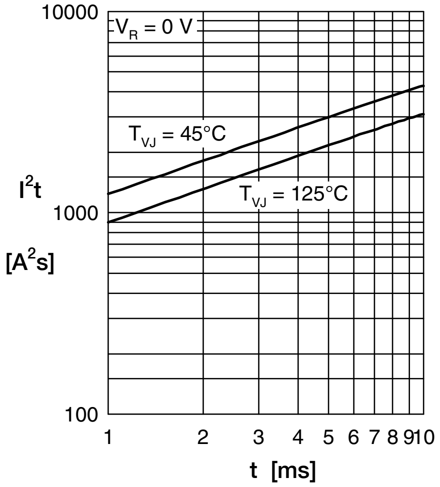


Fig. 3 I^2t versus time (1-10 ms)

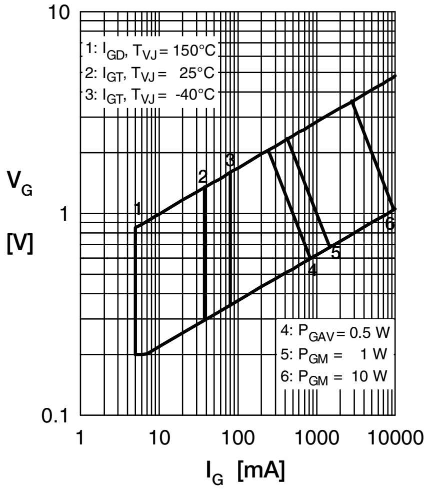


Fig. 4 Gate trigger characteristics

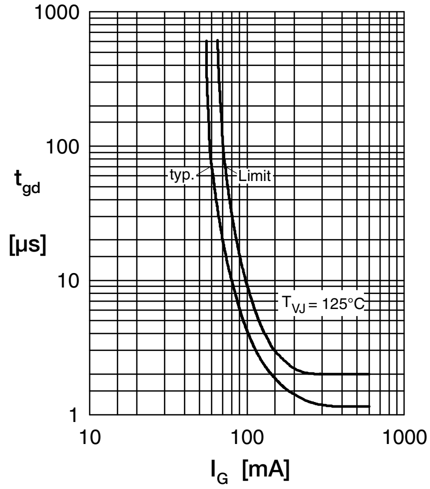


Fig. 5 Gate controlled delay time

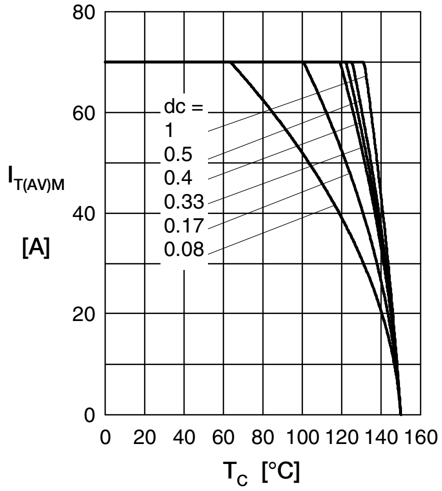


Fig. 6 Max. forward current at case temperature

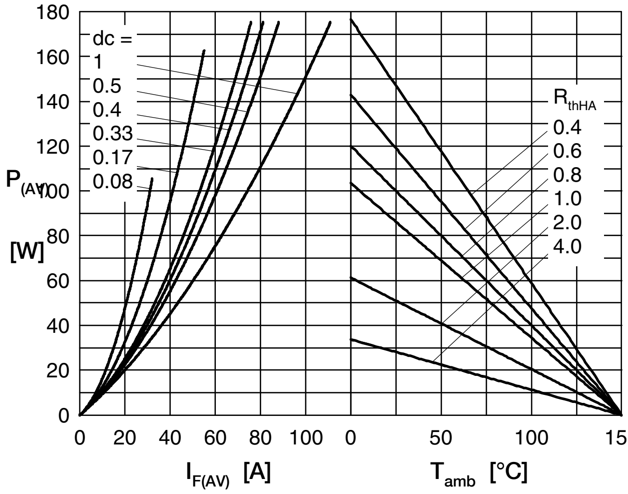
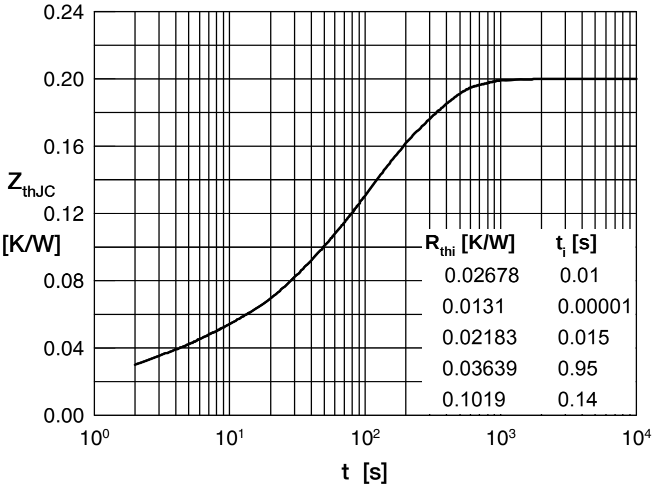


Fig. 7a Power dissipation versus direct output current
Fig. 7b and ambient temperature



R_{thi} [K/W]	t_i [s]
0.02678	0.01
0.0131	0.00001
0.02183	0.015
0.03639	0.95
0.1019	0.14

Fig. 8 Transient thermal impedance