



High Efficiency Thyristor

$$V_{RRM} = 1200\text{ V}$$

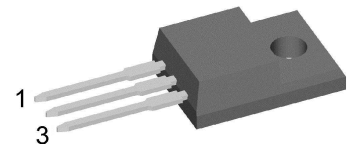
$$I_{TAV} = 10\text{ A}$$

$$V_T = 1.07\text{ V}$$

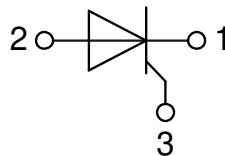
Single Thyristor

Part number

CLA16E1200PN



Backside: isolated



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: TO-220FP

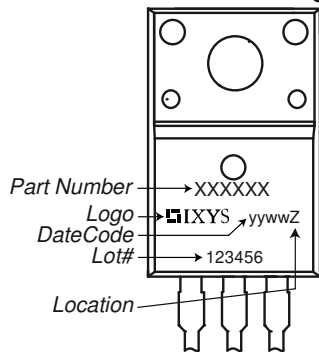
- Isolation Voltage: 2500 V~
- Industry standard outline
- RoHS compliant
- Epoxy meets UL 94V-0
- Soldering pins for PCB mounting
- Base plate: Plastic overmolded tab
- Reduced weight

Disclaimer Notice

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Thyristor			Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$			1300	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$			1200	V
I_{RD}	reverse current, drain current	$V_{R/D} = 1200\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$		10	μA
		$V_{R/D} = 1200\text{ V}$	$T_{VJ} = 125^{\circ}\text{C}$		1	mA
V_T	forward voltage drop	$I_T = 10\text{ A}$	$T_{VJ} = 25^{\circ}\text{C}$		1.14	V
		$I_T = 20\text{ A}$			1.32	V
		$I_T = 10\text{ A}$	$T_{VJ} = 125^{\circ}\text{C}$		1.07	V
		$I_T = 20\text{ A}$			1.31	V
I_{TAV}	average forward current	$T_C = 90^{\circ}\text{C}$	$T_{VJ} = 150^{\circ}\text{C}$		10	A
$I_{T(RMS)}$	RMS forward current	180° sine			16	A
V_{T0}	threshold voltage	} for power loss calculation only	$T_{VJ} = 150^{\circ}\text{C}$		0.81	V
r_T	slope resistance				24	m Ω
R_{thJC}	thermal resistance junction to case				4	K/W
R_{thCH}	thermal resistance case to heatsink			0.5		K/W
P_{tot}	total power dissipation		$T_C = 25^{\circ}\text{C}$		31	W
I_{TSM}	max. forward surge current	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}\text{C}$		180	A
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		195	A
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 150^{\circ}\text{C}$		155	A
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		165	A
I^2t	value for fusing	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}\text{C}$		160	A ² s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		160	A ² s
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 150^{\circ}\text{C}$		120	A ² s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		115	A ² s
C_J	junction capacitance	$V_R = 400\text{ V}$ $f = 1\text{ MHz}$	$T_{VJ} = 25^{\circ}\text{C}$		7	pF
P_{GM}	max. gate power dissipation	$t_p = 30\text{ }\mu\text{s}$	$T_C = 150^{\circ}\text{C}$		5	W
		$t_p = 300\text{ }\mu\text{s}$			2.55	W
P_{GAV}	average gate power dissipation				0.5	W
$(di/dt)_{cr}$	critical rate of rise of current	$T_{VJ} = 125^{\circ}\text{C}; f = 50\text{ Hz}$ repetitive, $I_T = 60\text{ A}$			150	A/ μs
		$t_p = 200\text{ }\mu\text{s}; di_G/dt = 0.3\text{ A}/\mu\text{s};$ $I_G = 0.3\text{ A}; V = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 20\text{ A}$			500	A/ μs
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V = \frac{2}{3} V_{DRM}$	$T_{VJ} = 125^{\circ}\text{C}$		500	V/ μs
		$R_{GK} = \infty$; method 1 (linear voltage rise)				
V_{GT}	gate trigger voltage	$V_D = 6\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$		1.3	V
			$T_{VJ} = -40^{\circ}\text{C}$		1.6	V
I_{GT}	gate trigger current	$V_D = 6\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$		30	mA
			$T_{VJ} = -40^{\circ}\text{C}$		50	mA
V_{GD}	gate non-trigger voltage	$V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 150^{\circ}\text{C}$		0.2	V
I_{GD}	gate non-trigger current				1	mA
I_L	latching current	$t_p = 10\text{ }\mu\text{s}$	$T_{VJ} = 25^{\circ}\text{C}$		60	mA
		$I_G = 0.3\text{ A}; di_G/dt = 0.3\text{ A}/\mu\text{s}$				
I_H	holding current	$V_D = 6\text{ V}$ $R_{GK} = \infty$	$T_{VJ} = 25^{\circ}\text{C}$		60	mA
t_{gd}	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$	$T_{VJ} = 25^{\circ}\text{C}$		2	μs
		$I_G = 0.3\text{ A}; di_G/dt = 0.3\text{ A}/\mu\text{s}$				
t_q	turn-off time	$V_R = 100\text{ V}; I_T = 20\text{ A}; V = \frac{2}{3} V_{DRM}$ $T_{VJ} = 125^{\circ}\text{C}$ $di/dt = 10\text{ A}/\mu\text{s}$ $dv/dt = 20\text{ V}/\mu\text{s}$ $t_p = 200\text{ }\mu\text{s}$		150		μs

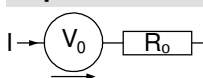
Package TO-220FP				Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit	
I_{RMS}	RMS current	per terminal			35	A	
T_{VJ}	virtual junction temperature		-55		150	°C	
T_{op}	operation temperature		-55		125	°C	
T_{stg}	storage temperature		-55		150	°C	
Weight				2		g	
M_D	mounting torque		0.4		0.6	Nm	
F_C	mounting force with clip		20		60	N	
$d_{Spp/App}$	creepage distance on surface striking distance through air	terminal to terminal	1.6	1.0		mm	
$d_{Spb/Apb}$		terminal to backside	2.5	2.5		mm	
V_{ISOL}	isolation voltage	t = 1 second	50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA	2500		V	
		t = 1 minute		2100		V	

Product Marking

Part description

C = Thyristor (SCR)
 L = High Efficiency Thyristor
 A = (up to 1200V)
 16 = Current Rating [A]
 E = Single Thyristor
 1200 = Reverse Voltage [V]
 PN = TO-220ABFP (3)

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	CLA16E1200PN	CLA16E1200PN	Tube	50	517734

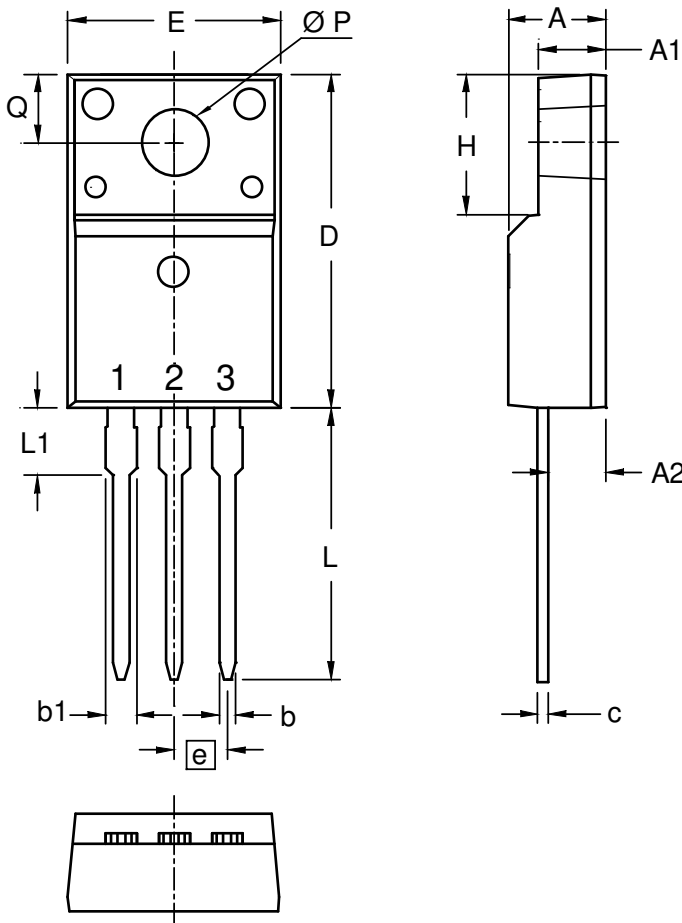
Similar Part	Package	Voltage class
CLA16E800PN	TO-220ABFP (3)	800
CS22-12io1M	TO-220ABFP (3)	1200
CS22-08io1M	TO-220ABFP (3)	800
CMA30E1600PN	TO-220ABFP (3)	1600

Equivalent Circuits for Simulation
** on die level*
 $T_{VJ} = 150^{\circ}\text{C}$

Thyristor

$V_{0\ max}$	threshold voltage	0.81	V
$R_{0\ max}$	slope resistance *	21	mΩ



Outlines TO-220FP



Dim.	Millimeters		Inches	
	min	max	min	max
A	4.50	4.90	0.177	0.193
A1	2.34	2.74	0.092	0.108
A2	2.56	2.96	0.101	0.117
b	0.70	0.90	0.028	0.035
c	0.45	0.60	0.018	0.024
D	15.67	16.07	0.617	0.633
E	9.96	10.36	0.392	0.408
e	2.54 BSC		0.100 BSC	
H	6.48	6.88	0.255	0.271
L	12.68	13.28	0.499	0.523
L1	3.03	3.43	0.119	0.135
ØP	3.08	3.28	0.121	0.129
Q	3.20	3.40	0.126	0.134



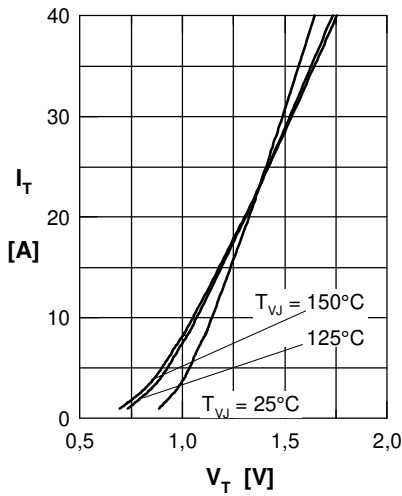
Thyristor


Fig. 1 Forward characteristics

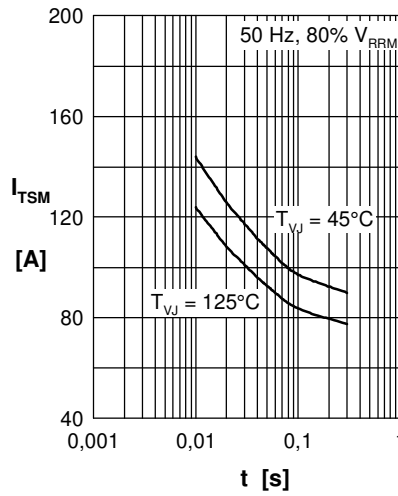
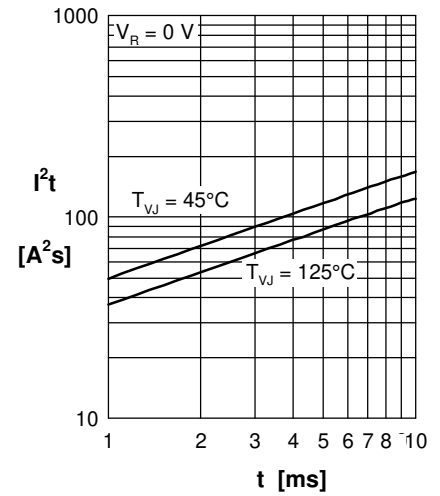

 Fig. 2 Surge overload current
 I_{TSM} : crest value, t : duration

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

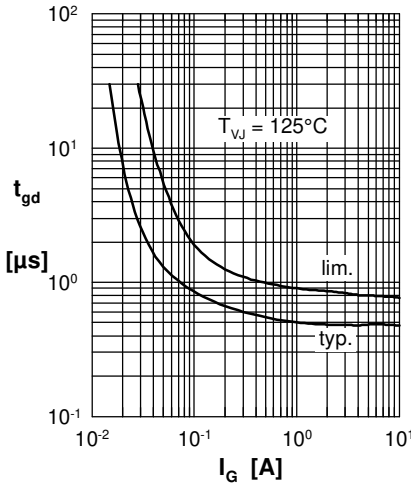
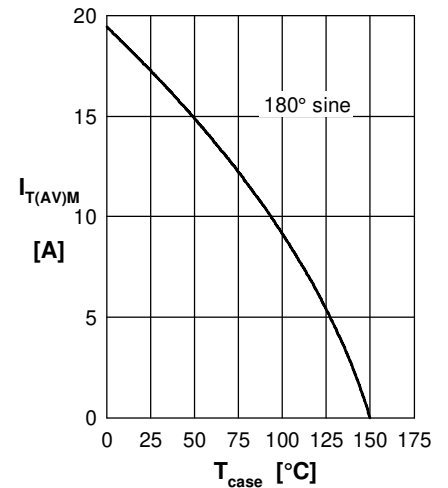
 Fig. 4 Gate voltage & gate current
 Triggering: A = no; B = possible; C = safe

 Fig. 5 Gate controlled delay time t_{gd}


Fig. 6 Max. forward current at case temperature

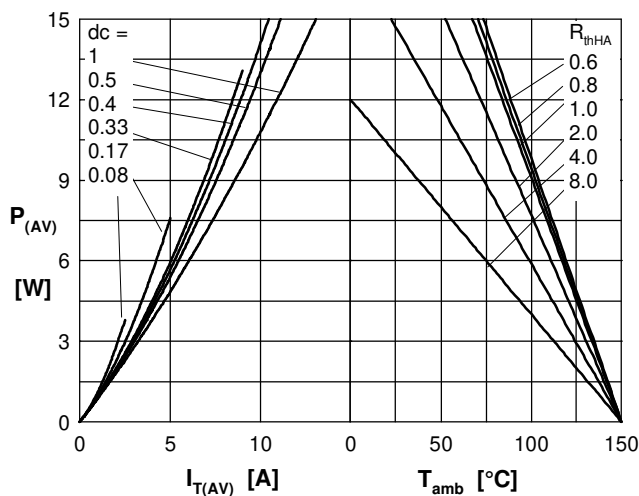
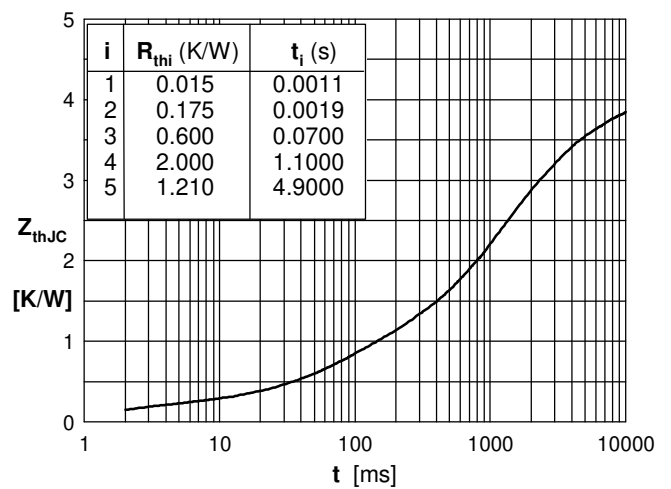

 Fig. 7a Power dissipation versus direct output current
 Fig. 7b and ambient temperature


Fig. 8 Transient thermal impedance junction to case

