



advanced

# High Efficiency Thyristor

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

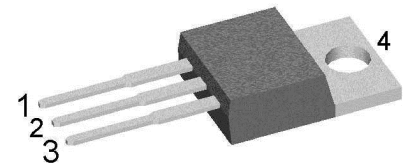
$I_{TAV} = 20\text{ A}$

$V_T = 1.9\text{ V}$

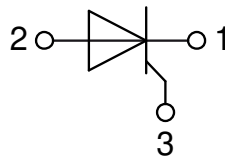
Fast  
Single Thyristor

Part number

**CLF20E1200PB**



Backside: Terminal 2



**Features / Advantages:**

- Thyristor for line and moderate frequencies
- Short turn-off time
- Planar passivated chip
- Long-term stability

**Applications:**

- Softstart AC motor control
- Power converter
- AC power control
- Lighting and temperature control

**Package: TO-220**

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

**Disclaimer Notice**

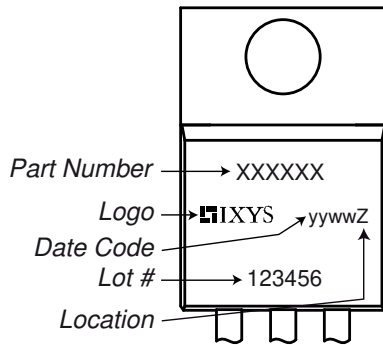
Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at [www.littelfuse.com/disclaimer-electronics](http://www.littelfuse.com/disclaimer-electronics).

Rectifier			Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1200	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1200	V
$I_{RD}$	reverse current, drain current	$V_{R/D} = 1200\text{ V}$	$T_{VJ} = 25^{\circ}C$		100	$\mu A$
		$V_{R/D} = 1200\text{ V}$	$T_{VJ} = 125^{\circ}C$		0.5	mA
$V_T$	forward voltage drop	$I_T = 20\text{ A}$	$T_{VJ} = 25^{\circ}C$		1.90	V
		$I_T = 40\text{ A}$			2.50	V
		$I_T = 20\text{ A}$	$T_{VJ} = 125^{\circ}C$		1.90	V
		$I_T = 40\text{ A}$			2.68	V
$I_{TAV}$	average forward current	$T_C = 85^{\circ}C$	$T_{VJ} = 150^{\circ}C$		20	A
$I_{T(RMS)}$	RMS forward current	180° sine			31	A
$V_{T0}$	threshold voltage	} for power loss calculation only	$T_{VJ} = 150^{\circ}C$		1.07	V
$r_T$	slope resistance				42	m $\Omega$
$R_{thJC}$	thermal resistance junction to case				1	K/W
$R_{thCH}$	thermal resistance case to heatsink			0.5		K/W
$P_{tot}$	total power dissipation		$T_C = 25^{\circ}C$		125	W
$I_{TSM}$	max. forward surge current	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		160	A
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		175	A
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 150^{\circ}C$		135	A
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		145	A
$I^2t$	value for fusing	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		130	A <sup>2</sup> s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		125	A <sup>2</sup> s
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 150^{\circ}C$		91	A <sup>2</sup> s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		87	A <sup>2</sup> s
$C_J$	junction capacitance	$V_R = 400\text{ V } f = 1\text{ MHz}$	$T_{VJ} = 25^{\circ}C$	2		pF
$P_{GM}$	max. gate power dissipation	$t_p = 30\text{ }\mu s$	$T_C = 150^{\circ}C$		5	W
		$t_p = 300\text{ }\mu s$			2.5	W
$P_{GAV}$	average gate power dissipation				0.5	W
$(di/dt)_{cr}$	critical rate of rise of current	$T_{VJ} = 150^{\circ}C; f = 50\text{ Hz}$ repetitive, $I_T = 60\text{ A}$			100	A/ $\mu s$
		$t_p = 200\text{ }\mu s; di_G/dt = 0.15\text{ A}/\mu s;$ $I_G = 0.15\text{ A}; V = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 20\text{ A}$			500	A/ $\mu s$
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V = \frac{2}{3} V_{DRM}$ $R_{GK} = \infty; \text{ method 1 (linear voltage rise)}$	$T_{VJ} = 150^{\circ}C$		500	V/ $\mu s$
$V_{GT}$	gate trigger voltage	$V_D = 6\text{ V}$	$T_{VJ} = 25^{\circ}C$		1.5	V
			$T_{VJ} = -40^{\circ}C$		2	V
$I_{GT}$	gate trigger current	$V_D = 6\text{ V}$	$T_{VJ} = 25^{\circ}C$		40	mA
			$T_{VJ} = -40^{\circ}C$		55	mA
$V_{GD}$	gate non-trigger voltage	$V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 70^{\circ}C$		0.2	V
$I_{GD}$	gate non-trigger current				3	mA
$I_L$	latching current	$t_p = 10\text{ }\mu s$	$T_{VJ} = 25^{\circ}C$		150	mA
		$I_G = 0.1\text{ A}; di_G/dt = 0.1\text{ A}/\mu s$				
$I_H$	holding current	$V_D = 6\text{ V } R_{GK} = \infty$	$T_{VJ} = 25^{\circ}C$		70	mA
$t_{gd}$	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$	$T_{VJ} = 25^{\circ}C$		2	$\mu s$
		$I_G = 0.1\text{ A}; di_G/dt = 0.1\text{ A}/\mu s$				
$t_q$	turn-off time	$V_R = 10\text{ V}; I_T = 20\text{ A}; V = \frac{2}{3} V_{DRM}$ $di/dt = 20\text{ A}/\mu s \quad dv/dt = 20\text{ V}/\mu s \quad t_p = 300\text{ }\mu s$	$T_{VJ} = 125^{\circ}C$	80		$\mu s$



Package TO-220			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
<b>Weight</b>				2		g
$M_D$	mounting torque		0.4		0.6	Nm
$F_C$	mounting force with clip		20		60	N

**Product Marking**



**Part description**

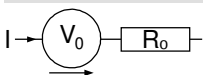
- C = Thyristor (SCR)
- L = High Efficiency Thyristor
- F = Fast (up to 1200V)
- 20 = Current Rating [A]
- E = Single Thyristor
- 1200 = Reverse Voltage [V]
- PB = TO-220AB (3)

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	CLF20E1200PB	CLF20E1200PB	Tube	50	512710

**Equivalent Circuits for Simulation**

\* on die level

$T_{VJ} = 150^{\circ}C$

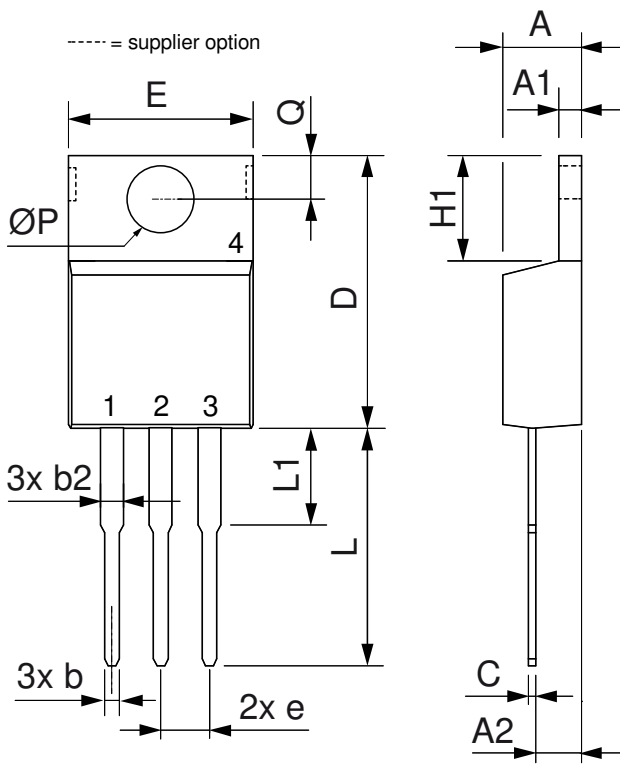


Thyristor

$V_{0\ max}$	threshold voltage	1.07	V
$R_{0\ max}$	slope resistance *		mΩ



**Outlines TO-220**



Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.32	4.82	0.170	0.190
A1	1.14	1.39	0.045	0.055
A2	2.29	2.79	0.090	0.110
b	0.64	1.01	0.025	0.040
b2	1.15	1.65	0.045	0.065
C	0.35	0.56	0.014	0.022
D	14.73	16.00	0.580	0.630
E	9.91	10.66	0.390	0.420
e	2.54	BSC	0.100	BSC
H1	5.85	6.85	0.230	0.270
L	12.70	13.97	0.500	0.550
L1	2.79	5.84	0.110	0.230
ØP	3.54	4.08	0.139	0.161
Q	2.54	3.18	0.100	0.125

