

High Efficiency Thyristor

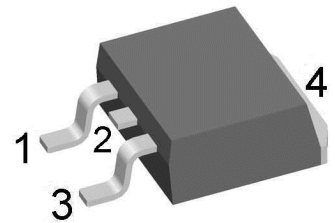
$$\begin{aligned} V_{RRM} &= 1200 \text{ V} \\ I_{TAV} &= 20 \text{ A} \\ V_T &= 1.54 \text{ V} \end{aligned}$$

SemiFast
Single Thyristor

Part number

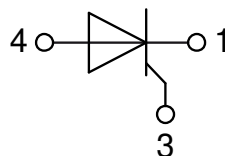
CLE20E1200PC

Marking on Product: CLE20E1200PC



Backside: anode

ESD Level: H3B



Features / Advantages:

- Thyristor for line and moderate frequencies
- Short turn-off time
- 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-263 (D2Pak)

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

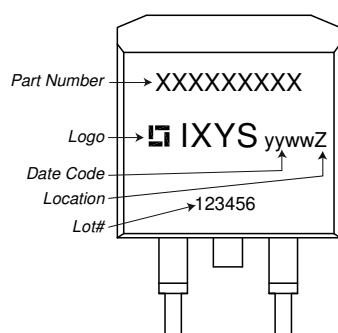
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Thyristor				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$				1300	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$				1200	V
$I_{R/D}$	reverse current, drain current	$V_{R/D} = 1200\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			100	μA
		$V_{R/D} = 1200\text{ V}$	$T_{VJ} = 125^{\circ}\text{C}$			2	mA
V_T	forward voltage drop	$I_T = 20\text{ A}$	$T_{VJ} = 25^{\circ}\text{C}$			1.54	V
		$I_T = 40\text{ A}$				2.03	V
		$I_T = 20\text{ A}$	$T_{VJ} = 125^{\circ}\text{C}$			1.54	V
		$I_T = 40\text{ A}$				2.17	V
I_{TAV}	average forward current	$T_C = 95^{\circ}\text{C}$ 180° sine	$T_{VJ} = 150^{\circ}\text{C}$			20	A
V_{T0}	threshold voltage	} for power loss calculation only	$T_{VJ} = 150^{\circ}\text{C}$			0.87	V
r_T	slope resistance					34	m Ω
R_{thJC}	thermal resistance junction to case					1	K/W
R_{thCH}	thermal resistance case to heatsink				0.25		K/W
P_{tot}	total power dissipation		$T_C = 25^{\circ}\text{C}$			125	W
I_{TSM}	max. forward surge current	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}\text{C}$			160	A
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			175	A
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 150^{\circ}\text{C}$			135	A
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			145	A
I^2t	value for fusing	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}\text{C}$			130	A ² s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			125	A ² s
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 150^{\circ}\text{C}$			91	A ² s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			87	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
		$t_p = 300\text{ }\mu\text{s}$				2.5	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, $I_T = 60\text{ A}$				100	A/ μs
		$t_p = 200\text{ }\mu\text{s}; di_G/dt = 0.15\text{ A}/\mu\text{s};$ $I_G = 0.15\text{ A}; V = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 20\text{ A}$				500	A/ μs
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V = \frac{2}{3} V_{DRM}$ $R_{GK} = \infty$; method 1 (linear voltage rise)	$T_{VJ} = 125^{\circ}\text{C}$			500	V/ μs
V_{GT}	gate trigger voltage	$V_D = 6\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			1.5	V
			$T_{VJ} = -40^{\circ}\text{C}$			2.5	V
I_{GT}	gate trigger current	$V_D = 6\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			40	mA
			$T_{VJ} = -40^{\circ}\text{C}$			70	mA
V_{GD}	gate non-trigger voltage	$V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 125^{\circ}\text{C}$			0.2	V
I_{GD}	gate non-trigger current					3	mA
I_L	latching current	$t_p = 10\text{ }\mu\text{s}$	$T_{VJ} = 25^{\circ}\text{C}$			60	mA
		$I_G = 0.1\text{ A}; di_G/dt = 0.1\text{ A}/\mu\text{s}$					
I_H	holding current	$V_D = 6\text{ V}$ $R_{GK} = \infty$	$T_{VJ} = 25^{\circ}\text{C}$			50	mA
t_{gd}	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$	$T_{VJ} = 25^{\circ}\text{C}$			2	μs
		$I_G = 0.1\text{ A}; di_G/dt = 0.1\text{ A}/\mu\text{s}$					
t_q	turn-off time	$V_R = 20\text{ V}; I_T = 20\text{ A}; V = \frac{2}{3} V_{DRM}$ $di/dt = 10\text{ A}/\mu\text{s}$ $dv/dt = 1000\text{ V}/\mu\text{s}$ $t_p = 200\text{ }\mu\text{s}$	$T_{VJ} = 125^{\circ}\text{C}$		100		μs

Package TO-263 (D2Pak)			Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit
I_{RMS}	RMS current	per terminal			35	A
T_{VJ}	virtual junction temperature		-40		150	°C
T_{op}	operation temperature		-40		125	°C
T_{stg}	storage temperature		-40		150	°C
Weight				1.5		g
F_c	mounting force with clip		20		60	N

Product Marking



Part description

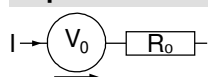
C = Thyristor (SCR)
 L = High Efficiency Thyristor
 E = Semifast (up to 1200V)
 20 = Current Rating [A]
 E = Single Thyristor
 1200 = Reverse Voltage [V]
 PC = TO-263AB (D2Pak) (2)

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	CLE20E1200PC-TRL	CLE20E1200PC	Tape & Reel	800	512774
Alternative	CLE20E1200PC-TUB	CLE20E1200PC	Tube	50	523602

Equivalent Circuits for Simulation

* on die level

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



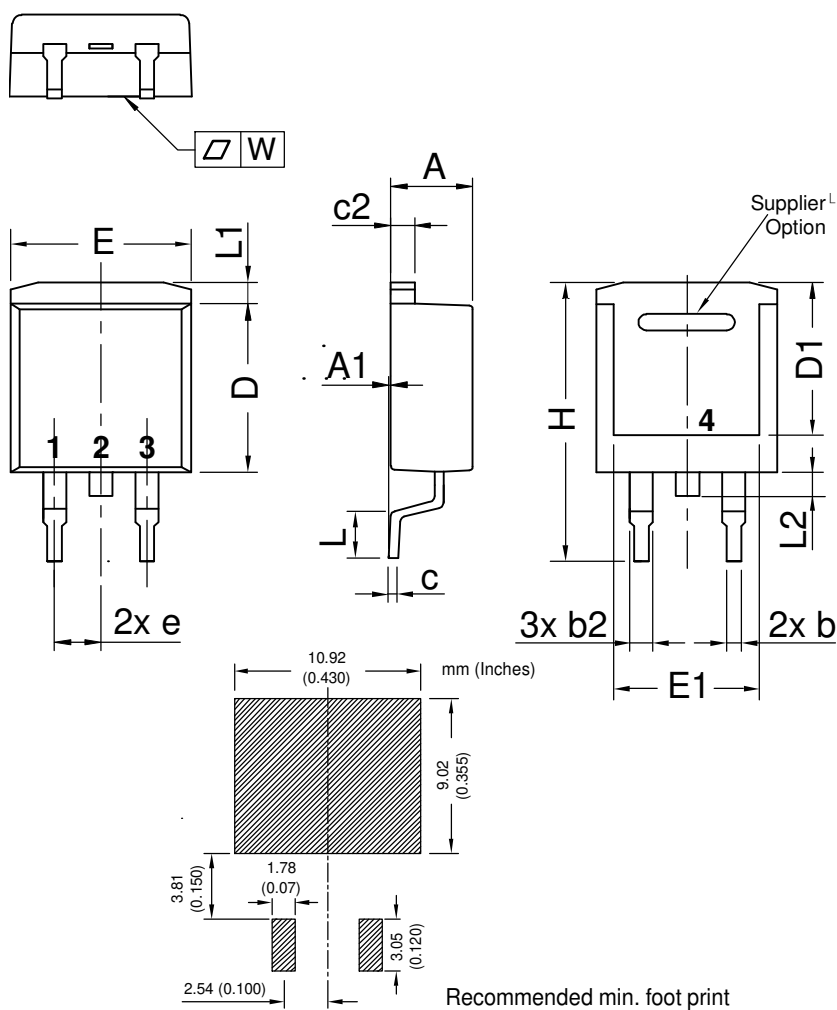
Thyristor

$V_{0\max}$ threshold voltage 0.87

$R_{0\max}$ slope resistance * 36

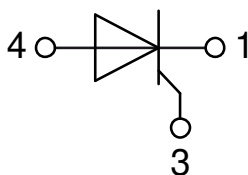
V

mΩ

Outlines TO-263 (D2Pak)


Dim.	Millimeter		Inches	
	min	max	min	max
A	4.06	4.83	0.160	0.190
A1	typ. 0.10		typ. 0.004	
A2	2.41		0.095	
b	0.51	0.99	0.020	0.039
b2	1.14	1.40	0.045	0.055
c	0.40	0.74	0.016	0.029
c2	1.14	1.40	0.045	0.055
D	8.38	9.40	0.330	0.370
D1	8.00	8.89	0.315	0.350
D2	2.5		0.098	
E	9.65	10.41	0.380	0.410
E1	6.22	8.50	0.245	0.335
e	2.54 BSC		0.100 BSC	
e1	4.28		0.169	
H	14.61	15.88	0.575	0.625
L	1.78	2.79	0.070	0.110
L1	1.02	1.68	0.040	0.066
W	typ. 0.02	0.040	typ. 0.0008	0.002

All dimensions conform with and/or within JEDEC standard.



Thyristor

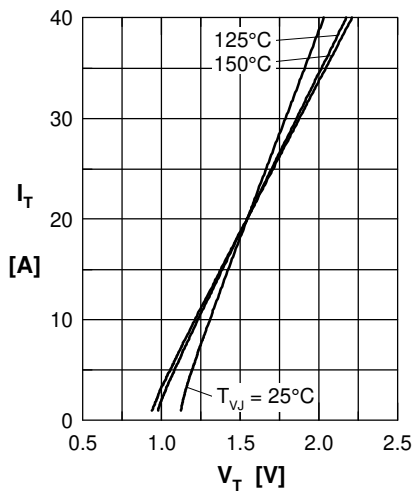


Fig. 1 Forward characteristics

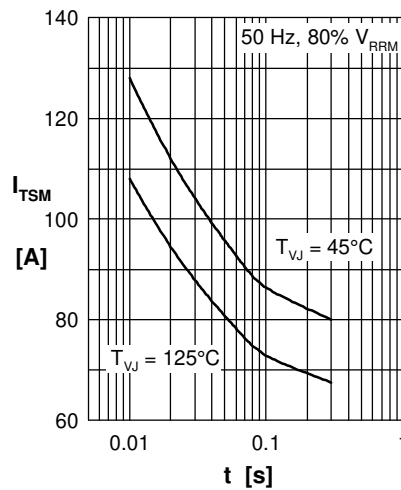


Fig. 2 Surge overload current

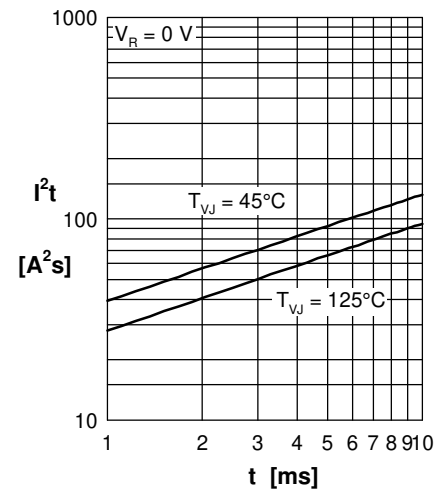


Fig. 3 I^2t versus time (1-10 ms)

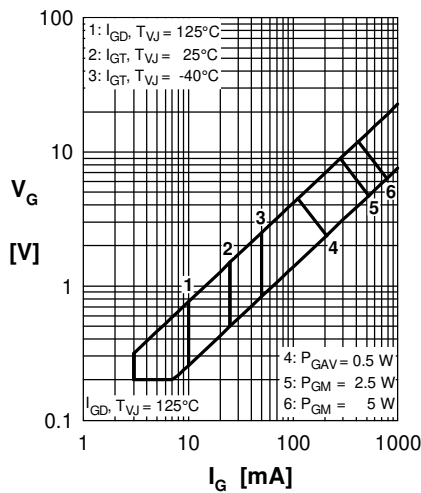


Fig. 4 Gate trigger characteristics

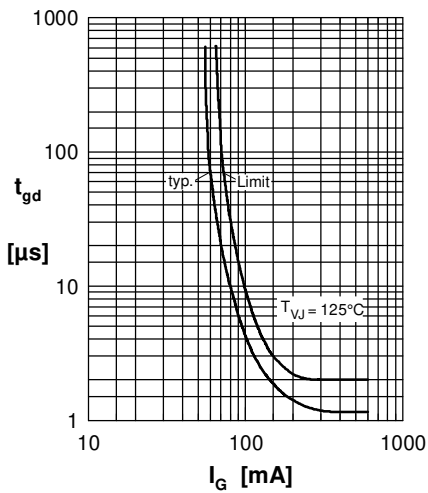


Fig. 5 Gate controlled delay time

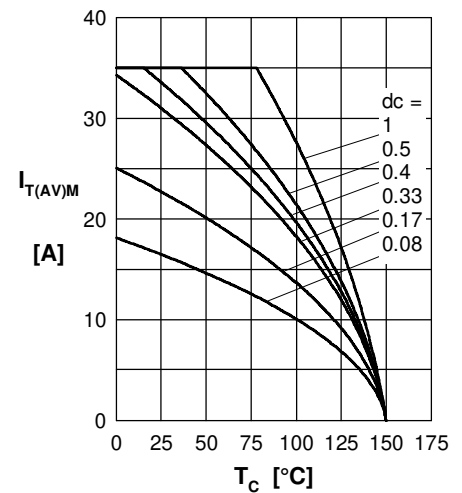


Fig. 6 Max. forward current at case temperature

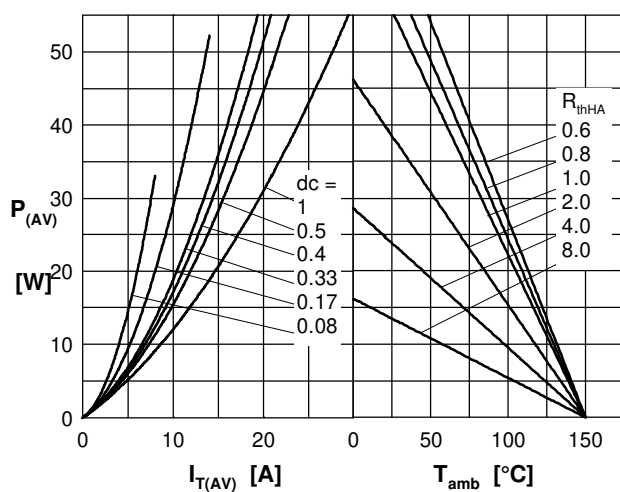


Fig. 7a Power dissipation versus direct output current
Fig. 7b and ambient temperature

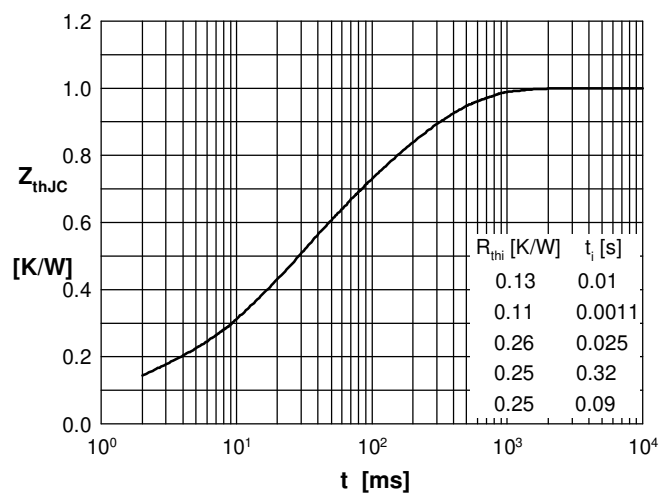


Fig. 8 Transient thermal impedance junction to case