

High Efficiency Thyristor

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

$$I_{TAV} = 30\text{ A}$$

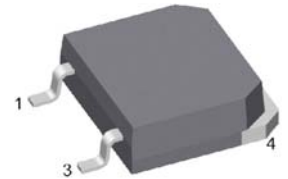
$$V_T = 1,25\text{ V}$$

Three Quadrants operation: QI - QIII
 1~ Triac

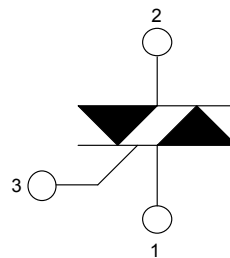
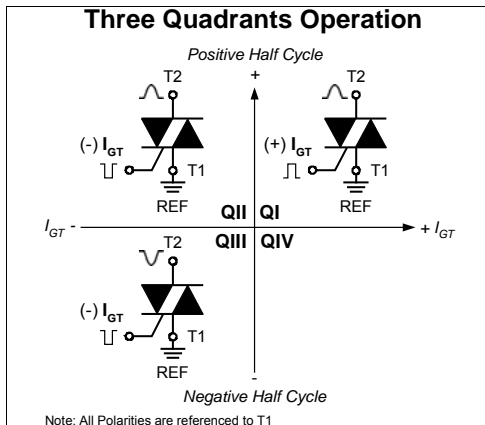
Part number

CLA60MT1200NTZ

Marking on Product: CLA60MT1200NTZ



Backside: anode/cathode



Features / Advantages:

- Triac for line frequency
- Three Quadrants Operation
 - QI - QIII
- Planar passivated chip
- Long-term stability of blocking currents and voltages

Applications:

- Line rectifying 50/60 Hz
- Softstart AC motor control
- DC Motor control
- Power converter
- AC power control
- Lighting and temperature control

Package: TO-268AA (D3Pak-HV)

- Industry standard outline
- RoHS compliant
- Epoxy meets UL 94V-0
- High creepage distance between terminals

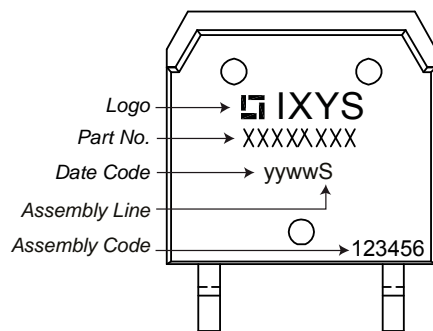
Disclaimer Notice

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.

Rectifier			Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1300	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1200	V
I_{RD}	reverse current, drain current	$V_{RD} = 1200 V$	$T_{VJ} = 25^{\circ}C$		10	μA
		$V_{RD} = 1200 V$	$T_{VJ} = 125^{\circ}C$		2	mA
V_T	forward voltage drop	$I_T = 30 A$	$T_{VJ} = 25^{\circ}C$		1,28	V
		$I_T = 60 A$			1,56	V
		$I_T = 30 A$	$T_{VJ} = 125^{\circ}C$		1,25	V
		$I_T = 60 A$			1,61	V
I_{TAV}	average forward current	$T_C = 120^{\circ}C$	$T_{VJ} = 150^{\circ}C$		30	A
I_{RMS}	RMS forward current per phase	180° sine			66	A
V_{T0}	threshold voltage	} for power loss calculation only	$T_{VJ} = 150^{\circ}C$		0,86	V
r_T	slope resistance				12,5	m Ω
R_{thJC}	thermal resistance junction to case				0,55	K/W
R_{thCH}	thermal resistance case to heatsink			0,15		K/W
P_{tot}	total power dissipation		$T_C = 25^{\circ}C$		230	W
I_{TSM}	max. forward surge current	$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		380	A
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		410	A
		$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 150^{\circ}C$		325	A
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		350	A
I^2t	value for fusing	$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		720	A ² s
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		700	A ² s
		$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 150^{\circ}C$		530	A ² s
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		510	A ² s
C_J	junction capacitance	$V_R = 400 V \quad f = 1 \text{ MHz}$	$T_{VJ} = 25^{\circ}C$		25	pF
P_{GM}	max. gate power dissipation	$t_p = 30 \mu s$	$T_C = 150^{\circ}C$		10	W
		$t_p = 300 \mu s$			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, $I_T = 90 A$		150	A/ μs
		$t_p = 200 \mu s; di_G/dt = 0,3 A/\mu s;$				
		$I_G = 0,3 A; V_D = \frac{2}{3} V_{DRM}$	non-repet., $I_T = 30 A$		500	A/ μs
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 150^{\circ}C$		500	V/ μs
		$R_{GK} = \infty$; method 1 (linear voltage rise)				
V_{GT}	gate trigger voltage	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		1,7	V
			$T_{VJ} = -40^{\circ}C$		1,9	V
I_{GT}	gate trigger current	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		± 60	mA
			$T_{VJ} = -40^{\circ}C$		± 80	mA
V_{GD}	gate non-trigger voltage	$V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 150^{\circ}C$		0,2	V
I_{GD}	gate non-trigger current				± 1	mA
I_L	latching current	$t_p = 10 \mu s$	$T_{VJ} = 25^{\circ}C$		90	mA
		$I_G = 0,3 A; di_G/dt = 0,3 A/\mu s$				
I_H	holding current	$V_D = 6 V \quad R_{GK} = \infty$	$T_{VJ} = 25^{\circ}C$		60	mA
t_{gd}	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$	$T_{VJ} = 25^{\circ}C$		2	μs
		$I_G = 0,3 A; di_G/dt = 0,3 A/\mu s$				
t_q	turn-off time	$V_R = 100 V; I_T = 30 A; V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 125^{\circ}C$		150	μs
		$di/dt = 10 A/\mu s \quad dv/dt = 20 V/\mu s \quad t_p = 200 \mu s$				

Package TO-268AA (D3Pak-HV)			Ratings			
Symbol	Definition	Conditions	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				4		g
F_C	mounting force with clip		20		120	N
$d_{Spp/App}$	creepage distance on surface striking distance through air	terminal to terminal	9,4			mm
$d_{Spb/Apb}$		terminal to backside	5,6			mm

Product Marking



Part description

C = Thyristor (SCR)
 L = High Efficiency Thyristor
 A = (up to 1200V)
 60 = Current Rating [A]
 MT = 1~ Triac
 1200 = Reverse Voltage [V]
 N = Three Quadrants operation: QI - QIII
 TZ = TO-268AA (D3Pak) (2HV)

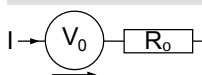
Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	CLA60MT1200NTZ-TUB	CLA60MT1200NTZ	Tube	30	512767
Alternative	CLA60MT1200NTZ-TRL	CLA60MT1200NTZ	Tape & Reel	400	525122

Similar Part	Package	Voltage class
CLA60MT1200NHB	TO-247AD (3)	1200
CLA60MT1200NHR	ISO247 (3)	1200

Equivalent Circuits for Simulation

* on die level

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

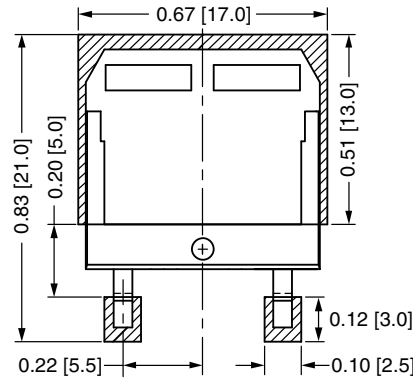
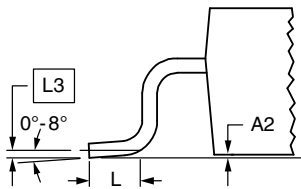
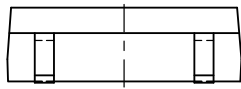
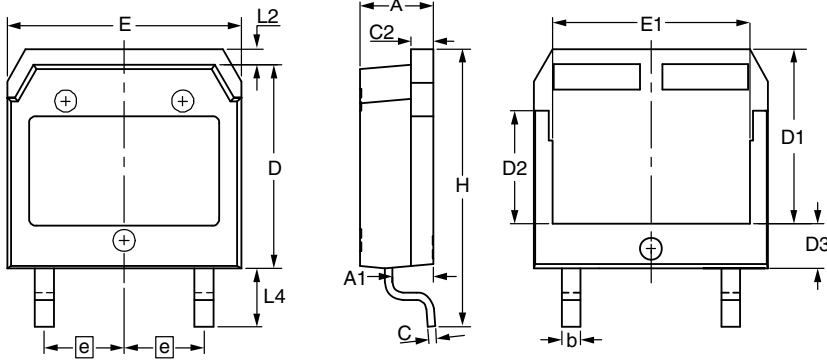


Thyristor

$V_{0\ max}$	threshold voltage	0,86	V
$R_{0\ max}$	slope resistance *	10	mΩ

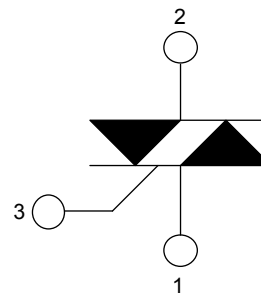


Outlines TO-268AA (D3Pak-HV)



RECOMMENDED MINIMUM FOOT PRINT

Dim.	Millimeter		Inches	
	min	max	min	max
A	4.90	5.10	0.193	0.201
A1	2.70	2.90	0.106	0.114
A2	0.02	0.25	0.001	0.010
b	1.15	1.45	0.045	0.057
C	0.40	0.65	0.016	0.026
C2	1.45	1.60	0.057	0.063
D	13.80	14.00	0.543	0.551
D1	11.80	12.10	0.465	0.476
D2	7.50	7.80	0.295	0.307
D3	2.90	3.20	0.114	0.126
E	15.85	16.05	0.624	0.632
E1	13.30	13.60	0.524	0.535
e	5.450 BSC		0.215 BSC	
H	18.70	19.10	0.736	0.752
L	1.70	2.00	0.067	0.079
L2	1.00	1.15	0.039	0.045
L3	0.250 BSC		0.010 BSC	
L4	3.80	4.10	0.150	0.161



Thyristor

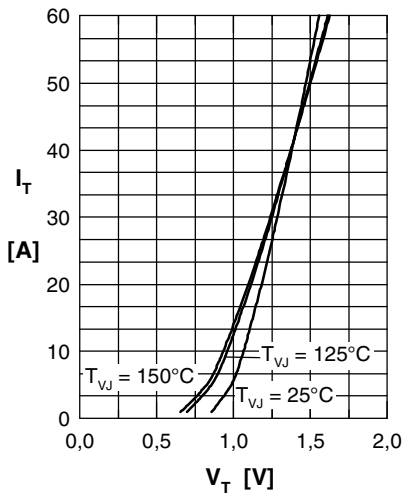


Fig. 1 Forward characteristics

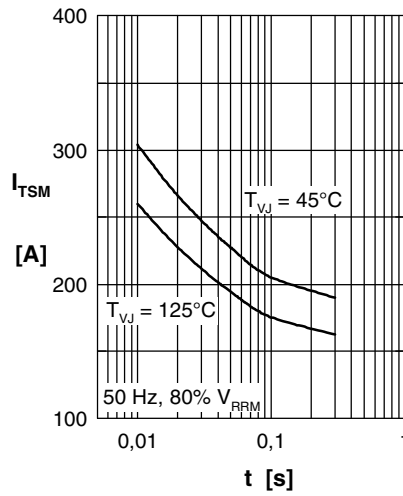


Fig. 2 Surge overload current
 I_{TSM} : crest value, t : duration

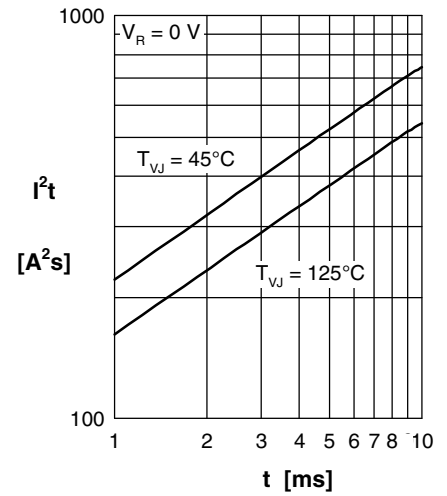


Fig. 3 I^2t versus time (1-10 s)

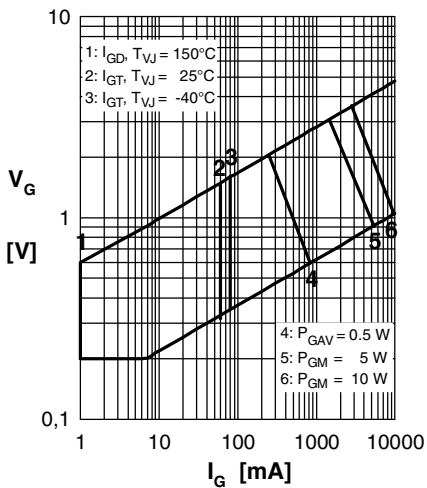


Fig. 4 Gate voltage & gate current

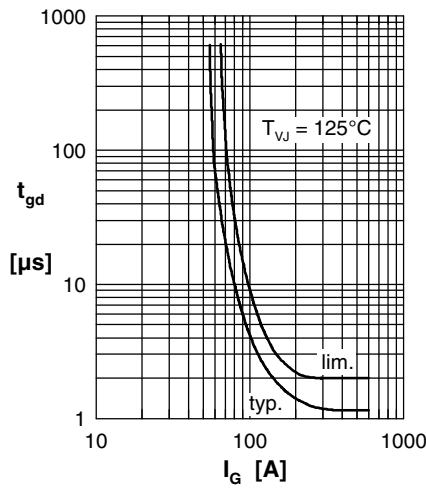


Fig. 5 Gate controlled delay time t_{gd}

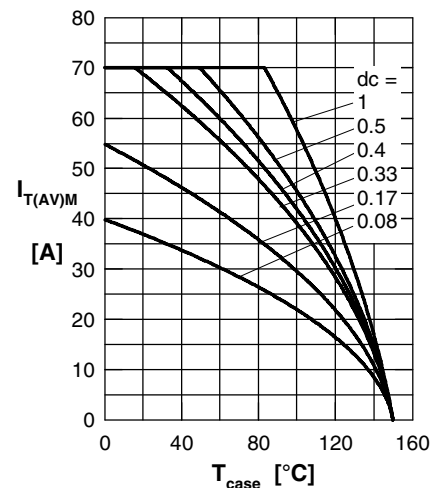


Fig. 6 Max. forward current at case temperature

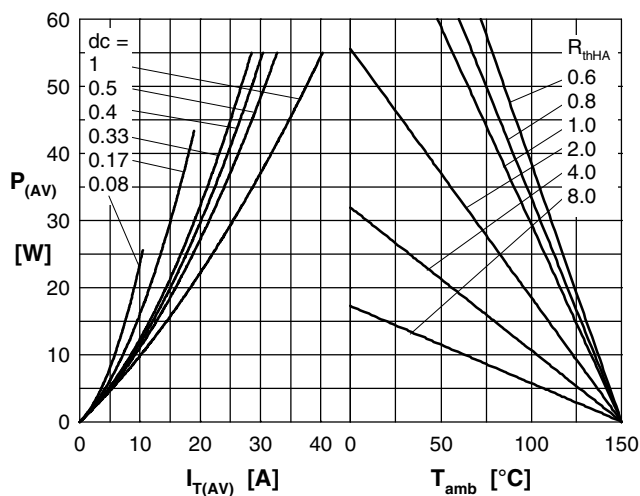


Fig. 7a Power dissipation versus direct output current
 Fig. 7b and ambient temperature

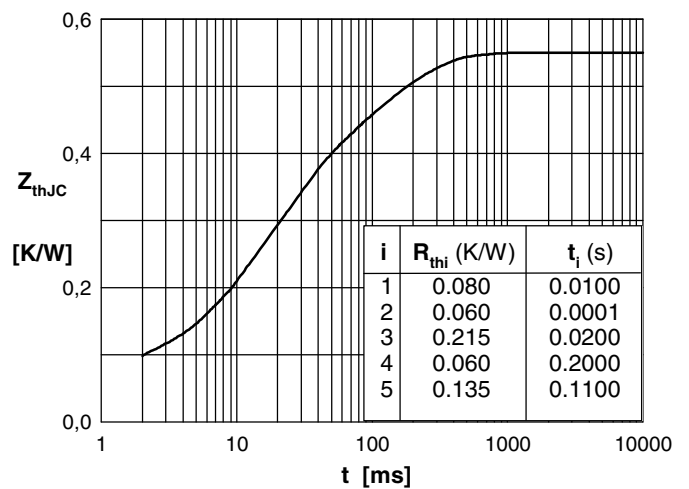


Fig. 7 Transient thermal impedance junction to case