

Thyristor

$$V_{RRM} = 1600 \text{ V}$$

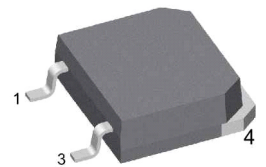
$$I_{TAV} = 50 \text{ A}$$

$$V_T = 1,31 \text{ V}$$

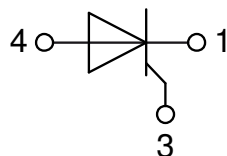
Single Thyristor

Part number

CMA50E1600TZ



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

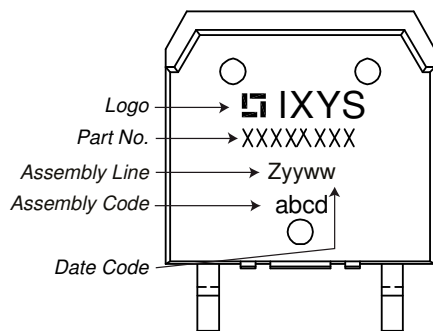
Package: TO-268AA (D3Pak-HV)

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

Thyristor			Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1700	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1600	V
I_{RD}	reverse current, drain current	$V_{R/D} = 1600 V$	$T_{VJ} = 25^{\circ}C$		50	μA
		$V_{R/D} = 1600 V$	$T_{VJ} = 125^{\circ}C$		5	mA
V_T	forward voltage drop	$I_T = 50 A$	$T_{VJ} = 25^{\circ}C$		1,30	V
		$I_T = 100 A$			1,66	V
		$I_T = 50 A$	$T_{VJ} = 125^{\circ}C$		1,31	V
		$I_T = 100 A$			1,77	V
I_{TAV}	average forward current	$T_C = 110^{\circ}C$	$T_{VJ} = 150^{\circ}C$		50	A
$I_{T(RMS)}$	RMS forward current	180° sine			79	A
V_{T0}	threshold voltage	} for power loss calculation only	$T_{VJ} = 150^{\circ}C$		0,83	V
r_T	slope resistance				9,6	m Ω
R_{thJC}	thermal resistance junction to case				0,4	K/W
R_{thCH}	thermal resistance case to heatsink			0,15		K/W
P_{tot}	total power dissipation		$T_C = 25^{\circ}C$		310	W
I_{TSM}	max. forward surge current	$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		550	A
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		595	A
		$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 150^{\circ}C$		470	A
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		505	A
I^2t	value for fusing	$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		1,52	kA ² s
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		1,48	kA ² s
		$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 150^{\circ}C$		1,11	kA ² s
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		1,06	kA ² s
C_J	junction capacitance	$V_R = 400 V \quad f = 1 \text{ MHz}$	$T_{VJ} = 25^{\circ}C$		26	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, $I_T = 150 A$		150	A/ μs
		$t_p = 200 \mu s; di_G/dt = 0,3 A/\mu s;$ $I_G = 0,3 A; V = \frac{2}{3} V_{DRM}$	non-repet., $I_T = 50 A$		500	A/ μs
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V = \frac{2}{3} V_{DRM}$ $R_{GK} = \infty; \text{ method 1 (linear voltage rise)}$	$T_{VJ} = 150^{\circ}C$		1000	V/ μs
V_{GT}	gate trigger voltage	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		1,5	V
			$T_{VJ} = -40^{\circ}C$		1,6	V
I_{GT}	gate trigger current	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		50	mA
			$T_{VJ} = -40^{\circ}C$		80	mA
V_{GD}	gate non-trigger voltage	$V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 140^{\circ}C$		0,2	V
I_{GD}	gate non-trigger current				5	mA
I_L	latching current	$t_p = 10 \mu s$	$T_{VJ} = 25^{\circ}C$		125	mA
		$I_G = 0,3 A; di_G/dt = 0,3 A/\mu s$				
I_H	holding current	$V_D = 6 V \quad R_{GK} = \infty$	$T_{VJ} = 25^{\circ}C$		100	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	$V_R = 100 V; I_T = 50 A; V = \frac{2}{3} V_{DRM}$ $di/dt = 10 A/\mu s \quad dv/dt = 20 V/\mu s \quad t_p = 200 \mu s$	$T_{VJ} = 125^{\circ}C$		150	μs

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

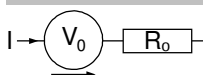
C = Thyristor (SCR)
 M = Thyristor
 A = (up to 1800V)
 50 = Current Rating [A]
 E = Single Thyristor
 1600 = Reverse Voltage [V]
 TZ = TO-268AA (D3Pak) (2HV)

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	CMA50E1600TZ	CMA50E1600TZ	Tube	30	513202

Equivalent Circuits for Simulation

* on die level

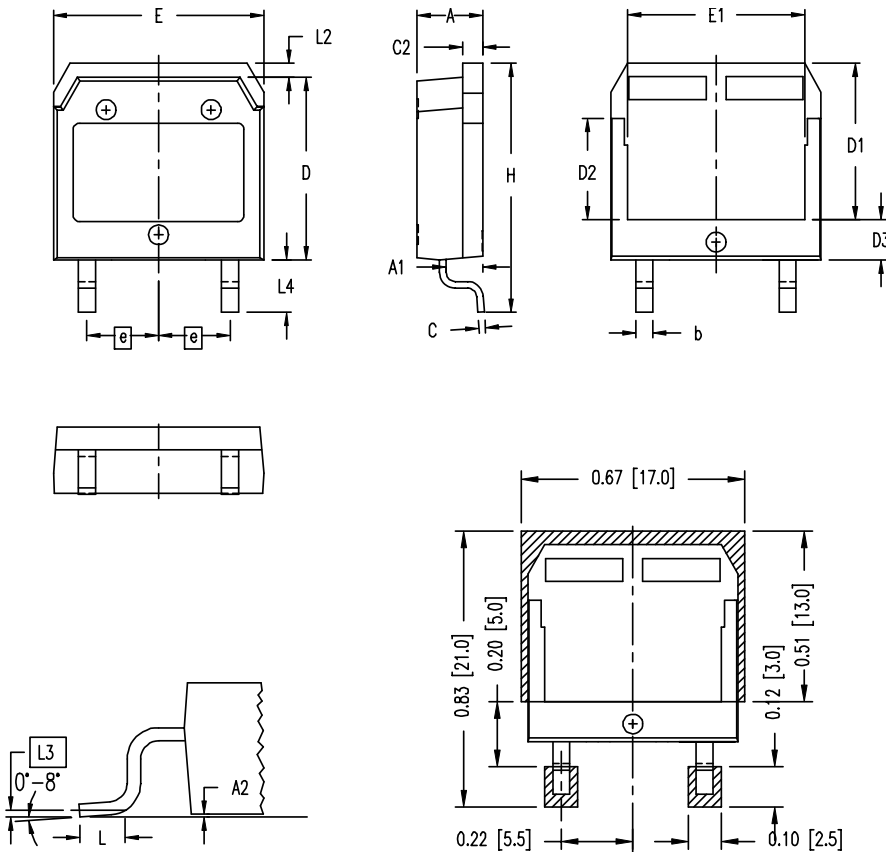
$T_{VJ} = 150\text{ °C}$



Thyristor

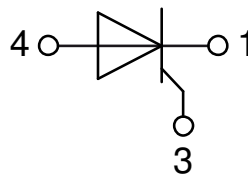
$V_{0\ max}$	threshold voltage	0,83	V
$R_{0\ max}$	slope resistance *	7	mΩ

Outlines TO-268AA (D3Pak-HV)



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

RECOMMENDED MINIMUM FOOT PRINT



Thyristor

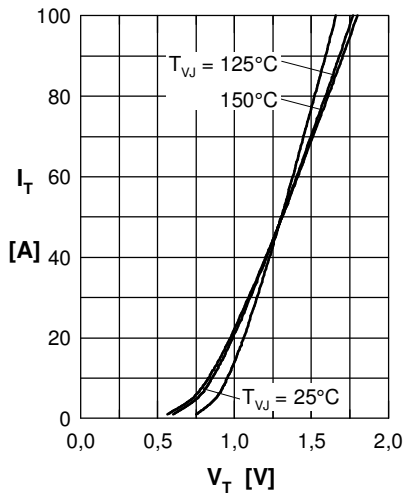


Fig. 1 Forward characteristics

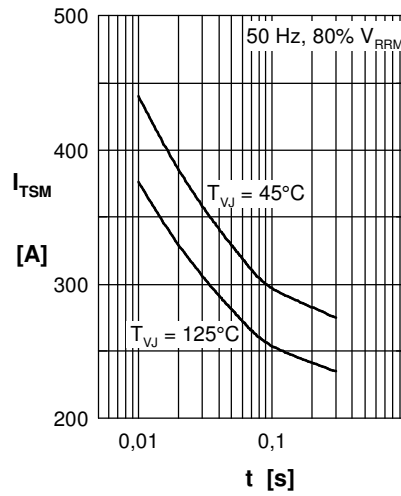


Fig. 2 Surge overload current
 I_{TSM} : crest value, t : duration

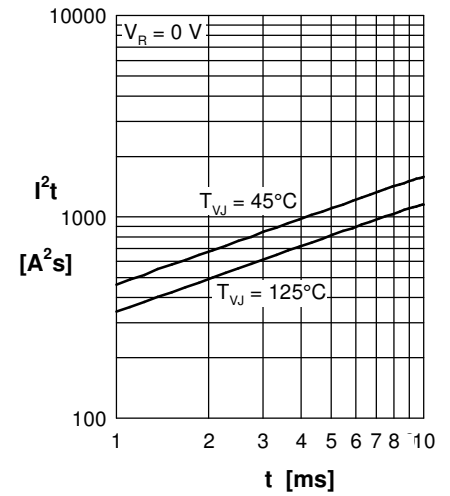


Fig. 3 I^2t versus time (1-10 s)

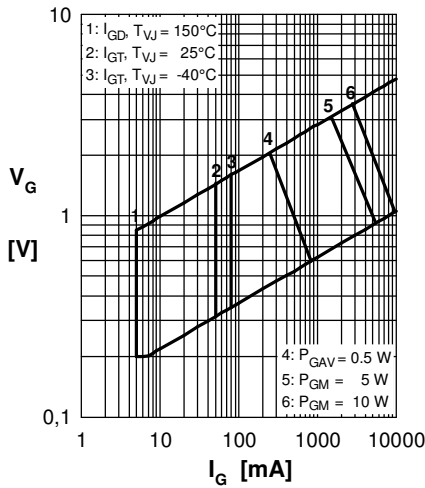


Fig. 4 Gate voltage & gate current

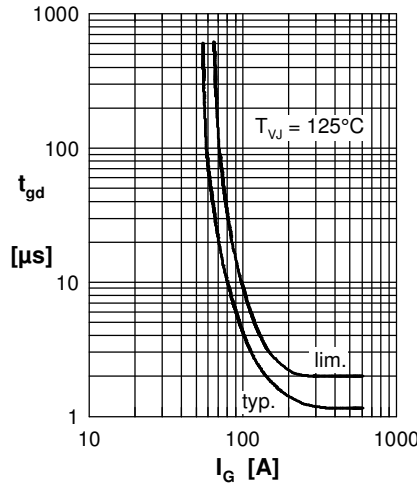


Fig. 5 Gate controlled delay time t_{gd}

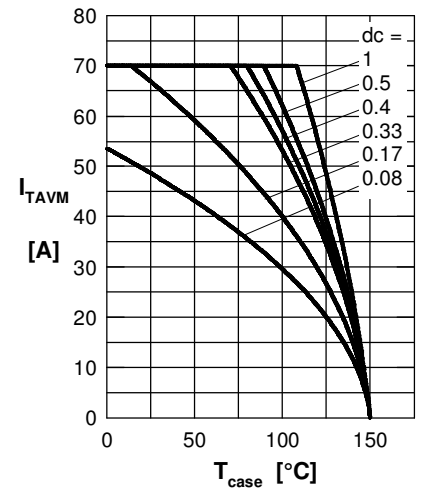


Fig. 6 Max. forward current at case temperature

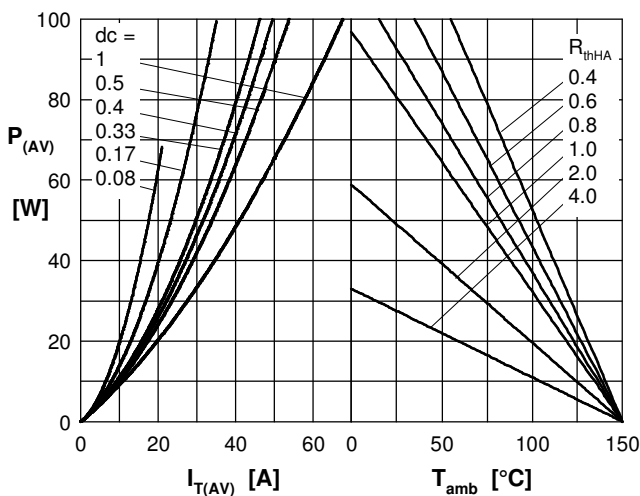


Fig. 7a Power dissipation versus direct output current
 Fig. 7b and ambient temperature

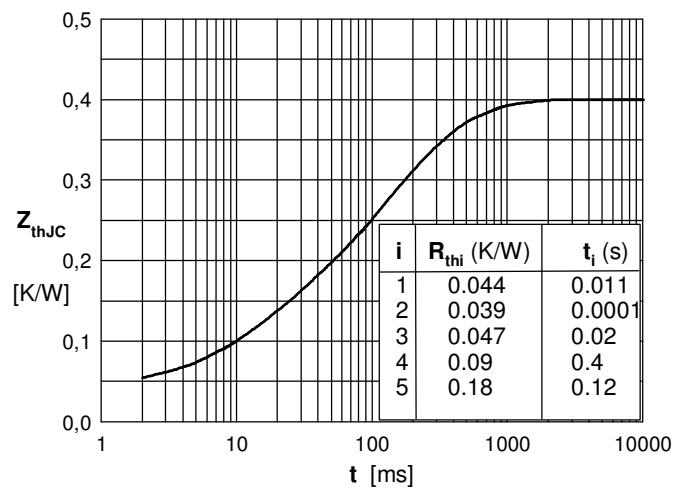


Fig. 7 Transient thermal impedance junction to case