preliminary

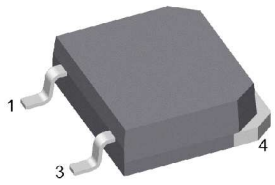
High Voltage Thyristor

V_{RRM}	=	2200 V
I_{TAV}	=	60 A
V_T	=	2,62 V

Single Thyristor

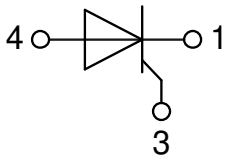
Part number

CNE60E2200TZ



Backside: anode

E72873



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-268AA (D3Pak-HV)

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

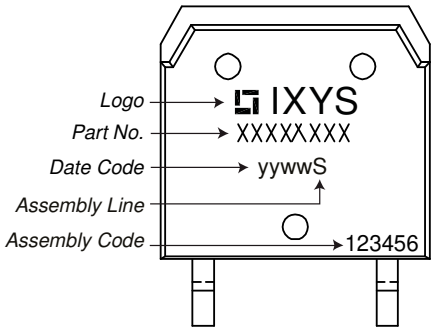
Rectifier

Symbol	Definition	Conditions		Ratings min.	typ.	max.	Unit
$V_{RSM/DSM}$	*max. non-repetitive reverse/forward blocking voltage*		T_{VJ} = 25°C			2300	V
$V_{RRM/DRM}$	*max. repetitive reverse/forward blocking voltage*		T_{VJ} = 25°C			2200	V
$I_{R/D}$	*reverse current, drain current*	$V_{R/D}$ = 2200 V	T_{VJ} = 25°C			20	µA
		$V_{R/D}$ = 2200 V	T_{VJ} = 125°C			2	mA
V_T	*forward voltage drop*	I_T = 60 A	T_{VJ} = 25°C			2,52	V
		I_T = 120 A				3,02	V
		I_T = 60 A	T_{VJ} = 125°C			2,62	V
		I_T = 120 A				3,33	V
I_{TAV}	*average forward current*	T_C = 80°C	T_{VJ} = 150°C			60	A
$I_{T(RMS)}$	*RMS forward current*	180° sine				94	A
V_{T0}	*threshold voltage* } *for power loss calculation only*		T_{VJ} = 150°C			1,90	V
r_T	*slope resistance* }					12,6	mΩ
R_{thJC}	*thermal resistance junction to case*					0,3	K/W
R_{thCH}	*thermal resistance case to heatsink*				0,15		K/W
P_{tot}	*total power dissipation*		T_C = 25°C			415	W
I_{TSM}	*max. forward surge current*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			850	A
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			920	A
		t = 10 ms; (50 Hz), sine	T_{VJ} = 150°C			725	A
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			780	A
I^2t	*value for fusing*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			3,62	kA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			3,52	kA²s
		t = 10 ms; (50 Hz), sine	T_{VJ} = 150°C			2,63	kA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			2,53	kA²s
C_J	*junction capacitance*	V_R = 400V f = 1 MHz	T_{VJ} = 25°C		17		pF
P_{GM}	*max. gate power dissipation*	t_P = 30 µs	T_C = 150°C			10	W
		t_P = 300 µs				5	W
P_{GAV}	*average gate power dissipation*					0,5	W
$(di/dt)_{cr}$	*critical rate of rise of current*	T_{VJ} = 150°C; f = 50 Hz repetitive,	I_T = 180 A			150	A/µs
		t_P = 200 µs; di_G/dt = 0,3 A/µs;					
		I_G = 0,45A; V_D = ⅔ V_{DRM} non-repet.,	I_T = 60 A			500	A/µs
$(dv/dt)_{cr}$	*critical rate of rise of voltage*	V_D = ⅔ V_{DRM}	T_{VJ} = 150°C			1000	V/µs
		R_{GK} = ∞; method 1 (linear voltage rise)					
V_{GT}	*gate trigger voltage*	V_D = 6 V	T_{VJ} = 25°C			1,4	V
			T_{VJ} = -40°C			1,6	V
I_{GT}	*gate trigger current*	V_D = 6 V	T_{VJ} = 25°C			± 80	mA
			T_{VJ} = -40°C			± 200	mA
V_{GD}	*gate non-trigger voltage*	V_D = ⅔ V_{DRM}	T_{VJ} = 150°C			0,2	V
I_{GD}	*gate non-trigger current*					± 5	mA
I_L	*latching current*	t_p = 10 µs	T_{VJ} = 25°C			450	mA
		I_G = 0,3A; di_G/dt = 0,3 A/µs					
I_H	*holding current*	V_D = 6 V R_{GK} = ∞	T_{VJ} = 25°C			100	mA
t_{gd}	*gate controlled delay time*	V_D = ½ V_{DRM}	T_{VJ} = 25°C			2	µs
		I_G = 0,5A; di_G/dt = 0,5 A/µs					
t_q	*turn-off time*	V_R = 100 V; I_T = 60A; V_D = ⅔ V_{DRM}	T_{VJ} =125 °C		150		µs
		di/dt = 15 A/µs; dv/dt = 20 V/µs; t_p = 200 µs					

preliminary

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



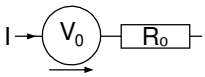
Part description

C = Thyristor (SCR)
N = High Voltage Thyristor
E = Semifast (>= 2000V)
60 = Current Rating [A]
E = Single Thyristor
2200 = Reverse Voltage [V]
TZ = TO-268AA (D3Pak) (2HV)

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	CNE60E2200TZ-TUB	CNE60E2200TZ-TUB	Tube	30	524086

Equivalent Circuits for Simulation

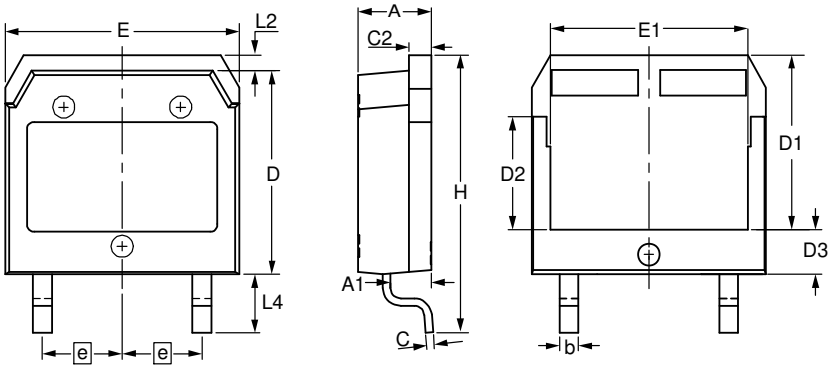
** on die level* T_{VJ} = 150°C

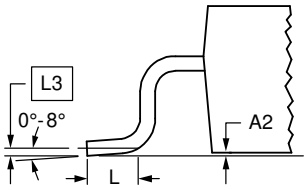


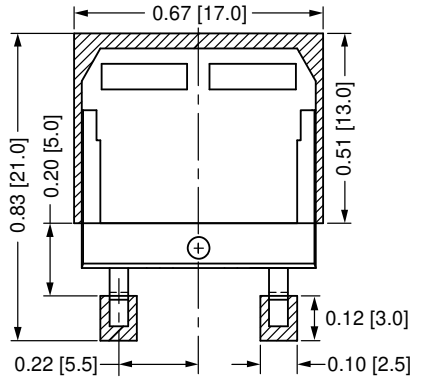
Thyristor

$V_{0\,max}$	*threshold voltage*	1,9	V
$R_{0\,max}$	*slope resistance **	10	mΩ

Outlines TO-268AA (D3Pak-HV)

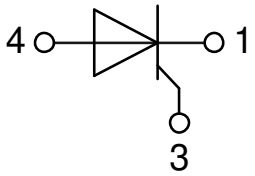






RECOMMENDED MINIMUM FOOT PRINT

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

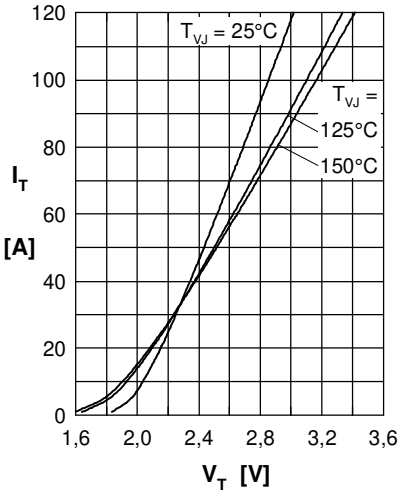


Fig. 1 Forward characteristics

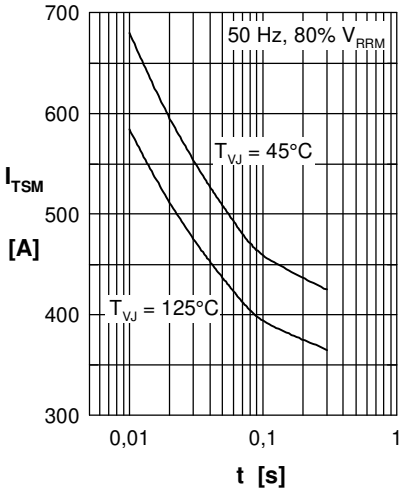


Fig. 2 Surge overload current
I_{TSM}: crest value, t: duration

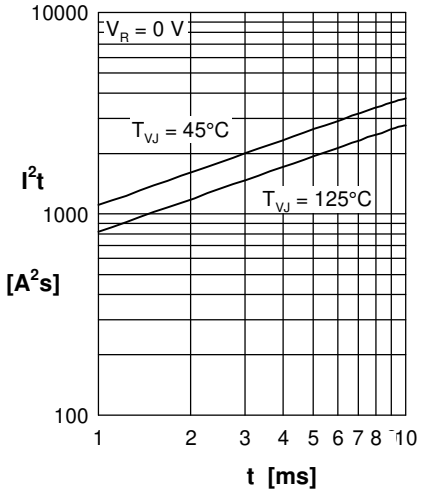


Fig. 3 I^2t versus time (1-10 s)

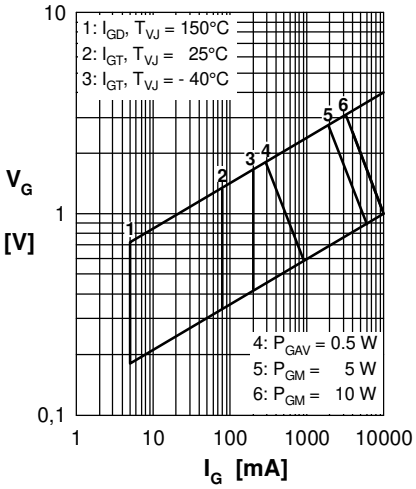


Fig. 4 Gate voltage & gate current

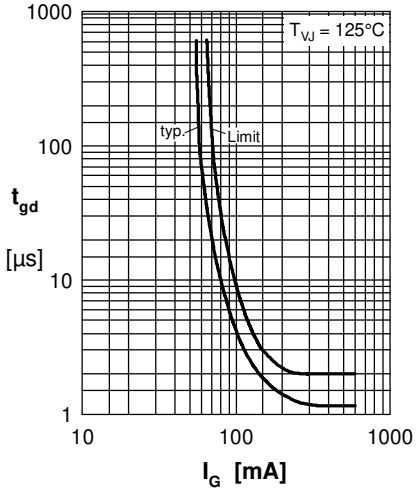


Fig. 5 Gate controlled delay time t_{gd}

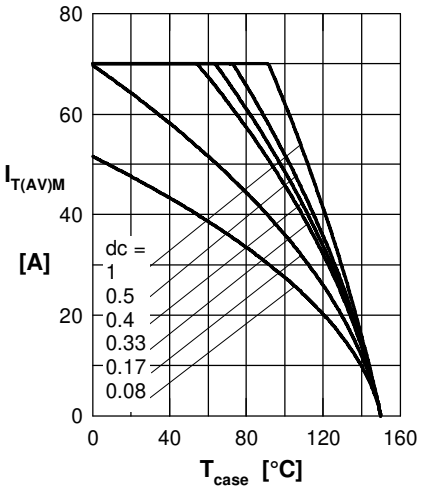


Fig. 6 Max. forward current at case temperature

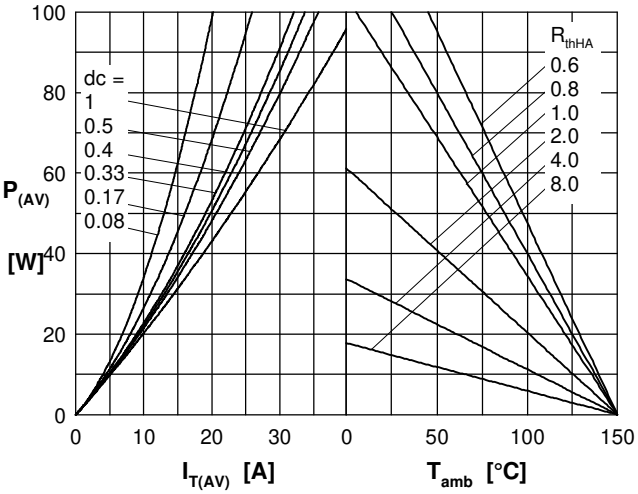
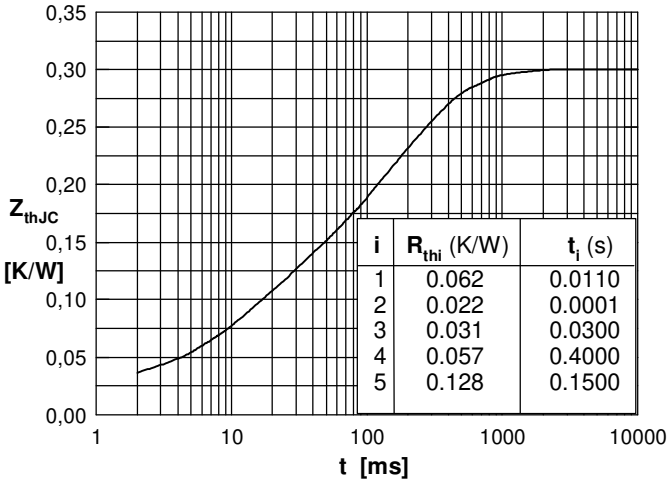


Fig. 7a Power dissipation versus direct output current
Fig. 7b and ambient temperature



i	R_{thi} (K/W)	t_i (s)
1	0.062	0.0110
2	0.022	0.0001
3	0.031	0.0300
4	0.057	0.4000
5	0.128	0.1500

Fig. 7 Transient thermal impedance junction to case