

Thyristor

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

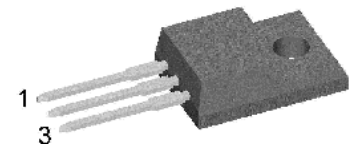
$$I_{TAV} = 23 \text{ A}$$

$$V_T = 1.42 \text{ V}$$


Single Thyristor

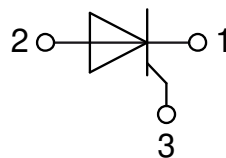
Part number

CMA30E1600PN



Backside: Isolated

 E72873



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-220FP

- Isolation Voltage: 2500 V~
- Industry standard outline
- RoHS compliant
- Epoxy meets UL 94V-0
- Soldering pins for PCB mounting
- Base plate: Plastic overmolded tab
- Reduced weight

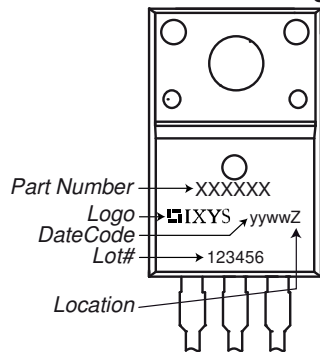
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Thyristor			Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1700	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1600	V
I_{RD}	reverse current, drain current	$V_{R/D} = 1600 V$	$T_{VJ} = 25^{\circ}C$		10	μA
		$V_{R/D} = 1600 V$	$T_{VJ} = 125^{\circ}C$		2	mA
V_T	forward voltage drop	$I_T = 30 A$	$T_{VJ} = 25^{\circ}C$		1.42	V
		$I_T = 60 A$			1.80	V
		$I_T = 30 A$	$T_{VJ} = 125^{\circ}C$		1.42	V
		$I_T = 60 A$			1.92	V
I_{TAV}	average forward current	$T_C = 40^{\circ}C$	$T_{VJ} = 150^{\circ}C$		23	A
$I_{T(RMS)}$	RMS forward current	180° sine			36	A
V_{T0}	threshold voltage	} for power loss calculation only	$T_{VJ} = 150^{\circ}C$		0.90	V
r_T	slope resistance				17	m Ω
R_{thJC}	thermal resistance junction to case				2.5	K/W
R_{thCH}	thermal resistance case to heatsink			0.5		K/W
P_{tot}	total power dissipation		$T_C = 25^{\circ}C$		50	W
I_{TSM}	max. forward surge current	$t = 10 ms; (50 Hz), sine$	$T_{VJ} = 45^{\circ}C$		260	A
		$t = 8,3 ms; (60 Hz), sine$	$V_R = 0 V$		280	A
		$t = 10 ms; (50 Hz), sine$	$T_{VJ} = 150^{\circ}C$		220	A
		$t = 8,3 ms; (60 Hz), sine$	$V_R = 0 V$		240	A
I^2t	value for fusing	$t = 10 ms; (50 Hz), sine$	$T_{VJ} = 45^{\circ}C$		340	A ² s
		$t = 8,3 ms; (60 Hz), sine$	$V_R = 0 V$		325	A ² s
		$t = 10 ms; (50 Hz), sine$	$T_{VJ} = 150^{\circ}C$		240	A ² s
		$t = 8,3 ms; (60 Hz), sine$	$V_R = 0 V$		240	A ² s
C_J	junction capacitance	$V_R = 400 V f = 1 MHz$	$T_{VJ} = 25^{\circ}C$		9	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	$T_{VJ} = 125^{\circ}C; f = 50 Hz$ repetitive, $I_T = 90 A$			150	A/ μs
		$t_p = 200 \mu s; di_G/dt = 0.2 A/\mu s;$ $I_G = 0.2 A; V = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 30 A$			500	A/ μs
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V = \frac{2}{3} V_{DRM}$ $R_{GK} = \infty; method 1 (linear voltage rise)$	$T_{VJ} = 125^{\circ}C$		500	V/ μs
V_{GT}	gate trigger voltage	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		1.3	V
			$T_{VJ} = -40^{\circ}C$		1.6	V
I_{GT}	gate trigger current	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		28	mA
			$T_{VJ} = -40^{\circ}C$		50	mA
V_{GD}	gate non-trigger voltage	$V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 125^{\circ}C$		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
		$I_G = 0.2 A; di_G/dt = 0.2 A/\mu s$				
I_H	holding current	$V_D = 6 V R_{GK} = \infty$	$T_{VJ} = 25^{\circ}C$		80	mA
t_{gd}	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$ $I_G = 0.5 A; di_G/dt = 0.5 A/\mu s$	$T_{VJ} = 25^{\circ}C$		2	μs
t_q	turn-off time	$V_R = 100 V; I_T = 30 A; V = \frac{2}{3} V_{DRM}$ $di/dt = 10 A/\mu s dv/dt = 20 V/\mu s t_p = 200 \mu s$	$T_{VJ} = 125^{\circ}C$	150		μs

Package TO-220FP		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				2		g
M_D	mounting torque		0.4		0.6	Nm
F_C	mounting force with clip		20		60	N
$d_{Spp/App}$	creepage distance on surface striking distance through air	terminal to terminal	1.6	1.0		mm
$d_{Spb/Apb}$		terminal to backside	2.5	2.5		mm
V_{ISOL}	isolation voltage	t = 1 second	2500			V
		t = 1 minute	2100			V
		50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA				

Product Marking

Part description

C = Thyristor (SCR)
 M = Thyristor
 A = (up to 1800V)
 30 = Current Rating [A]
 E = Single Thyristor
 1600 = Reverse Voltage [V]
 PN = TO-220ABFP (3)

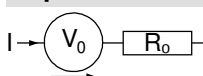
Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	CMA30E1600PN	CMA30E1600PN	Tube	50	505254

Similar Part	Package	Voltage class
CMA30E1600PB	TO-220AB (3)	1600
CMA30E1600PZ	TO-263AB (D2Pak) (2HV)	1600
CS22-12Io1M	TO-220ABFP (3)	1200
CLA30E1200PB	TO-220AB (3)	1200

CLA30E1200PC	TO-263AB (D2Pak) (2)	1200
CLA30E1200HB	TO-247AD (3)	1200
CS22-08Io1M	TO-220ABFP (3)	800

Equivalent Circuits for Simulation

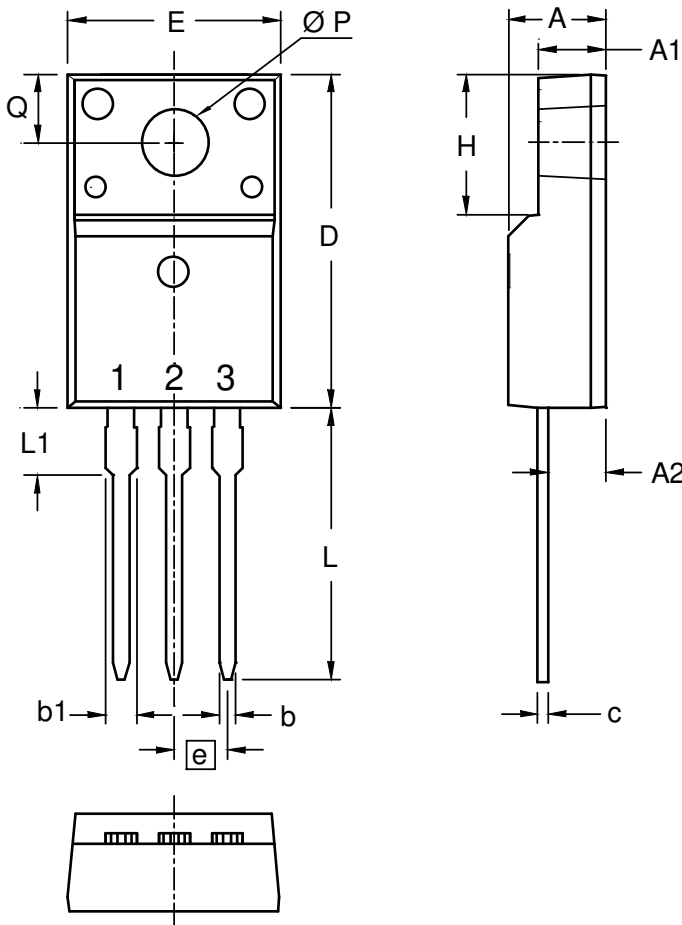
* on die level

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

Thyristor

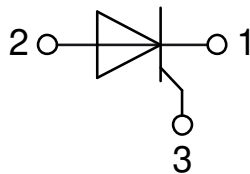
$V_{0\ max}$	threshold voltage	0.9	V
$R_{0\ max}$	slope resistance *	14	mΩ



Outlines TO-220FP



Dim.	Millimeters		Inches	
	min	max	min	max
A	4.50	4.90	0.177	0.193
A1	2.34	2.74	0.092	0.108
A2	2.56	2.96	0.101	0.117
b	0.70	0.90	0.028	0.035
c	0.45	0.60	0.018	0.024
D	15.67	16.07	0.617	0.633
E	9.96	10.36	0.392	0.408
e	2.54 BSC		0.100 BSC	
H	6.48	6.88	0.255	0.271
L	12.68	13.28	0.499	0.523
L1	3.03	3.43	0.119	0.135
ØP	3.08	3.28	0.121	0.129
Q	3.20	3.40	0.126	0.134



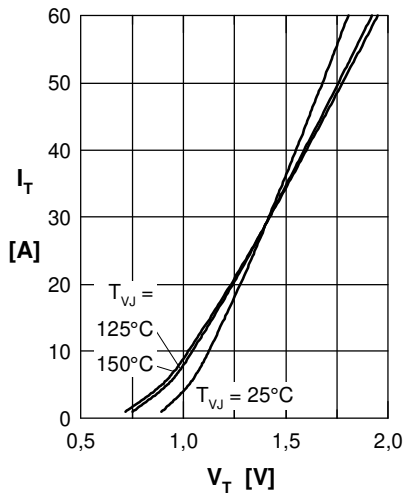
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Fig. 1 Forward characteristics

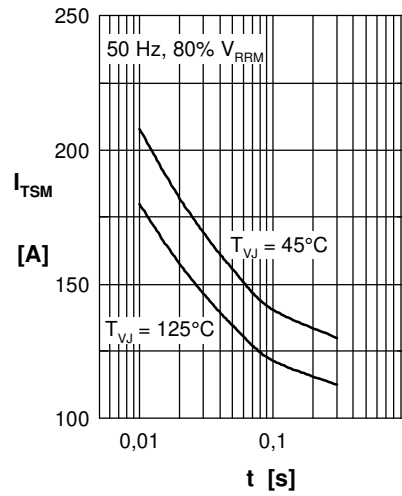
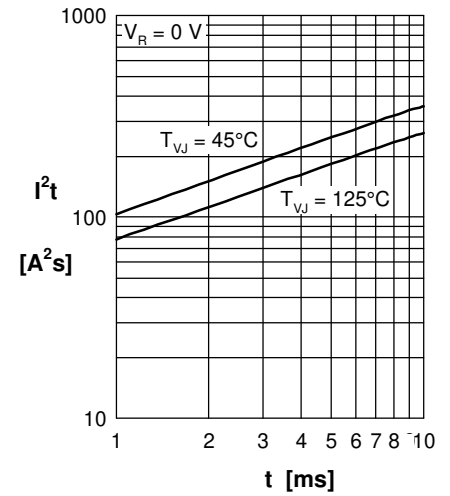
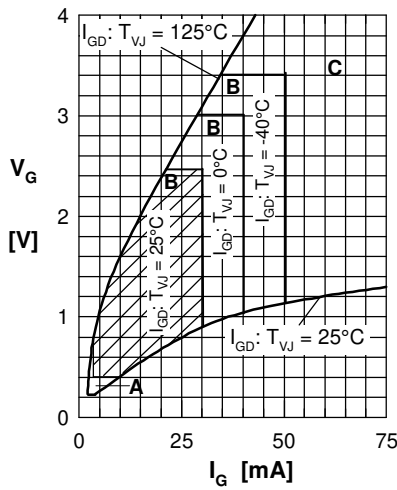
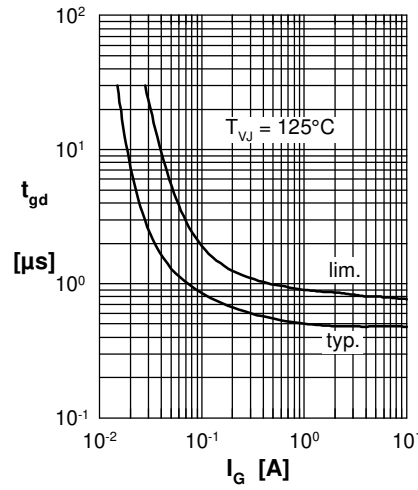
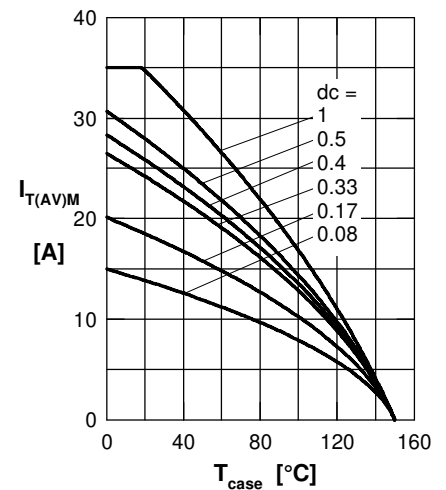

 Fig. 2 Surge overload current
 I_{TSM} : crest value, t : duration

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

 Fig. 4 Gate voltage & gate current
 Triggering: A = no; B = possible; C = safe

 Fig. 5 Gate controlled delay time t_{gd}


Fig. 6 Max. forward current at case temperature

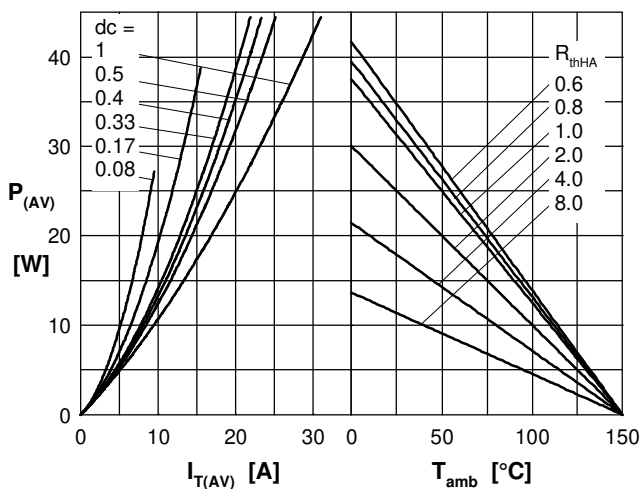
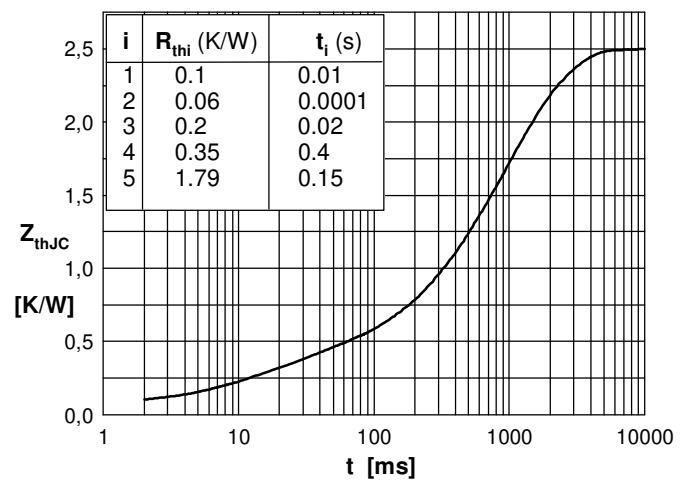

 Fig. 7a Power dissipation versus direct output current
 Fig. 7b and ambient temperature


Fig. 7 Transient thermal impedance junction to case

