



Thyristor

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

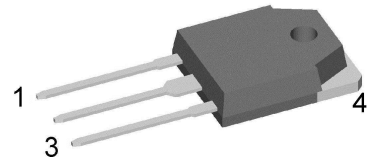
$$I_{TAV} = 50 \text{ A}$$

$$V_T = 1.31 \text{ V}$$

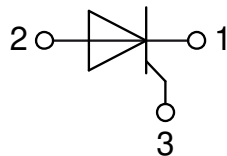
Single Thyristor

Part number

CMA50E1600QB



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-3P

- 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.

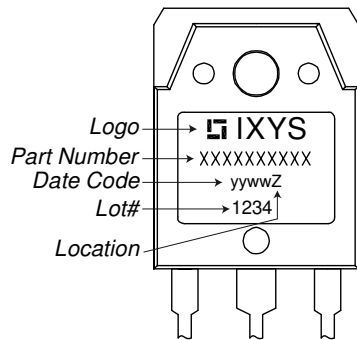


Thyristor			Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1700	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1600	V
I_{RD}	reverse current, drain current	$V_{R/D} = 1600 V$	$T_{VJ} = 25^{\circ}C$		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			0.3		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	$V_D = \frac{1}{2} V_{DRM}$ $I_G = 0.3 A; di_G/dt = 0.3 A/\mu s$	$T_{VJ} = 25^{\circ}C$		2	μs
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-3P			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				5		g
M_D	mounting torque		0.8		1.2	Nm
F_C	mounting force with clip		20		120	N

Product Marking



Part description

- C = Thyristor (SCR)
- M = Thyristor
- A = (up to 1800V)
- 50 = Current Rating [A]
- E = Single Thyristor
- 1600 = Reverse Voltage [V]
- QB = TO-3P (3)

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	CMA50E1600QB	CMA50E1600QB	Tube	30	514998

Equivalent Circuits for Simulation

** on die level*

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

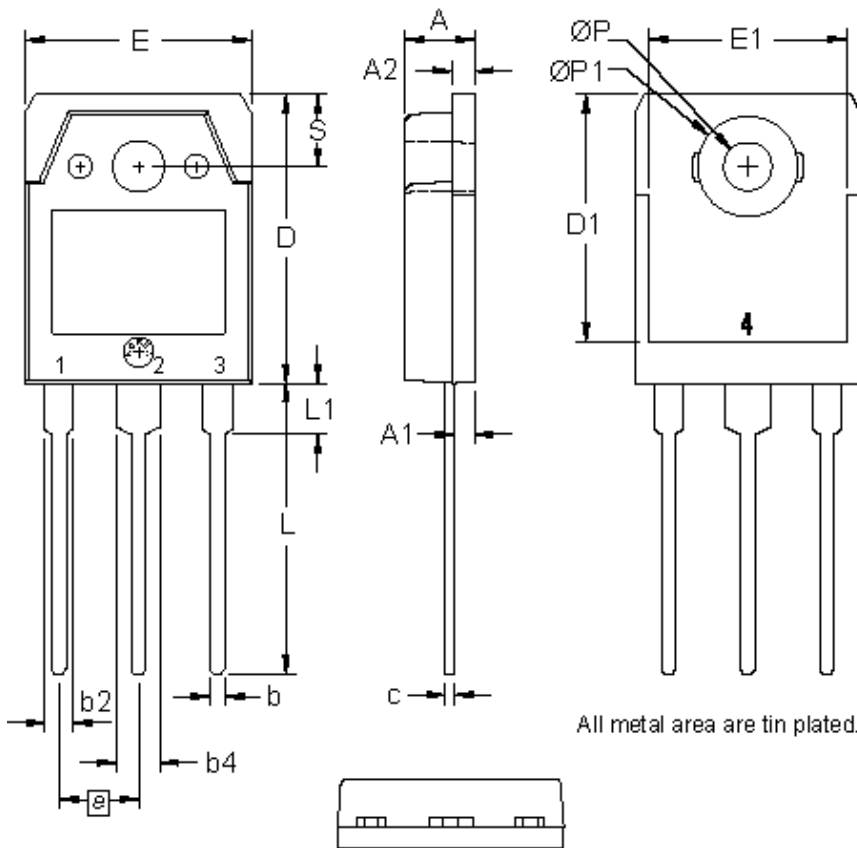


Thyristor

$V_{0\ max}$	threshold voltage	0.83	V
$R_{0\ max}$	slope resistance *	7	mΩ



Outlines TO-3P



Dim.	Millimeter		Inches	
	min	max	min	max
A	4.70	4.90	0.185	0.193
A1	1.30	1.50	0.051	0.059
A2	1.45	1.65	0.057	0.065
b	0.90	1.15	0.035	0.045
b2	1.90	2.20	0.075	0.087
b4	2.90	3.20	0.114	0.126
c	0.55	0.80	0.022	0.031
D	19.80	20.10	0.780	0.791
D1	16.90	17.20	0.665	0.677
E	15.50	15.80	0.610	0.622
E1	13.50	13.70	0.531	0.539
e	5.45 BSC		0.215 BSC	
L	19.80	20.20	0.780	0.795
L1	3.40	3.60	0.134	0.142
Ø P	3.20	3.40	0.126	0.134
ØP1	6.90	7.10	0.272	0.280
S	4.90	5.10	0.193	0.201



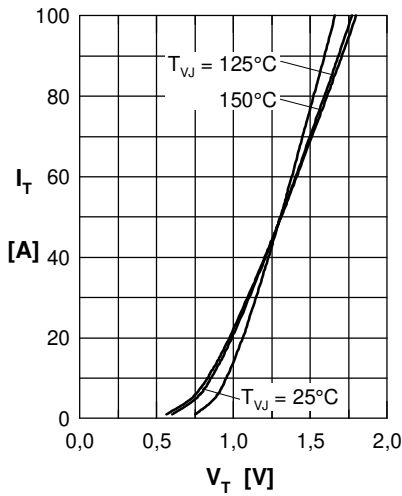
Thyristor


Fig. 1 Forward characteristics

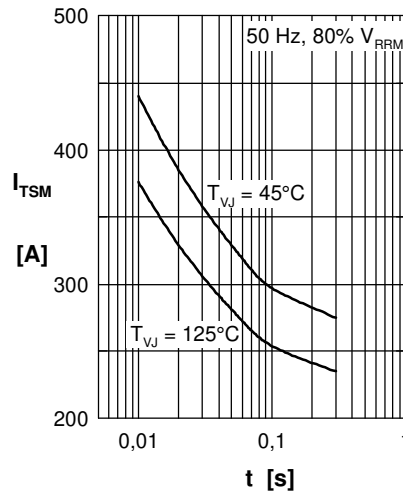
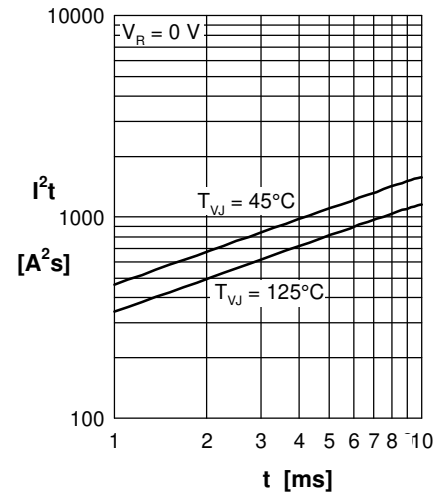
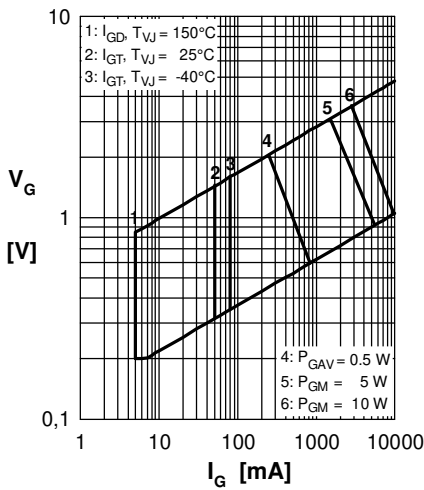

 Fig. 2 Surge overload current
 I_{TSM} : crest value, t : duration

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


Fig. 4 Gate voltage & gate current

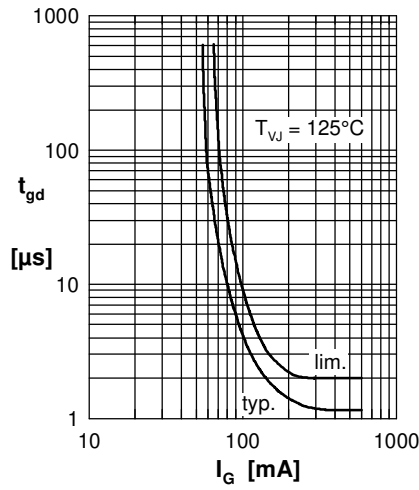
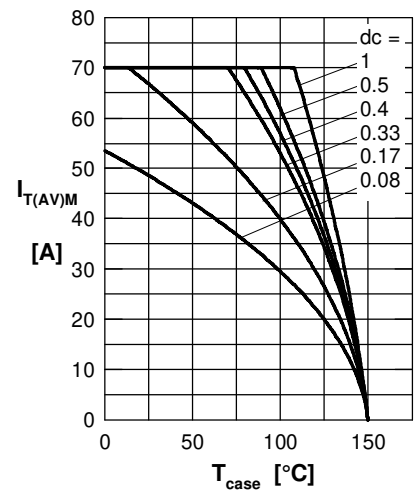

 Fig. 5 Gate controlled delay time t_{gd}


Fig. 6 Max. forward current at case temperature

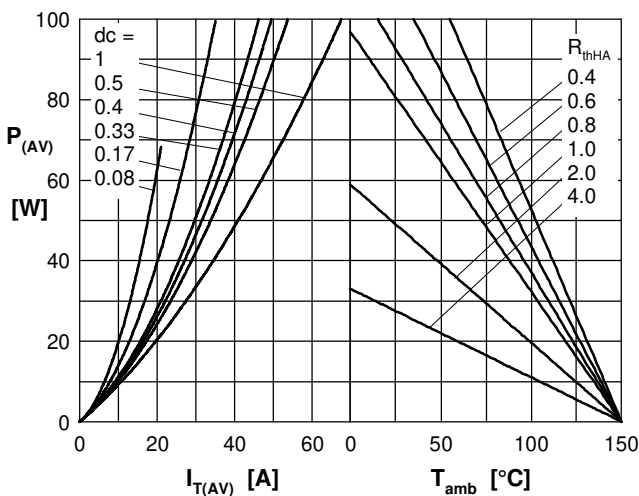
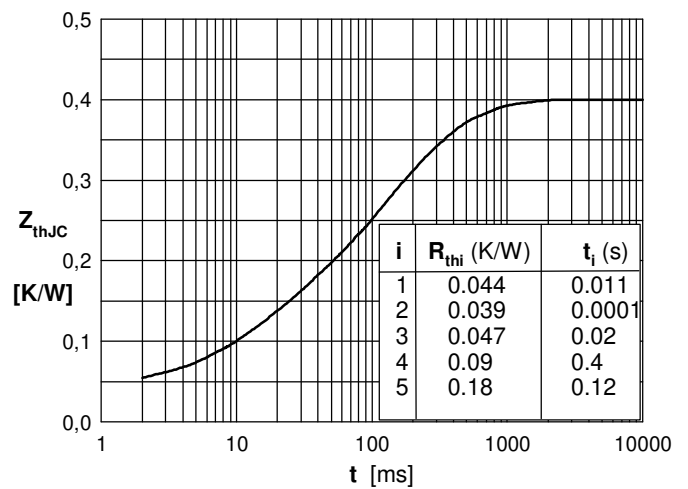

 Fig. 7a Power dissipation versus direct output current
 Fig. 7b and ambient temperature


Fig. 7 Transient thermal impedance junction to case