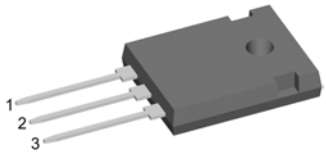
Thyristor

V_{RRM} = 1600 V
I_{TAV} = 30 A
V_T = 1,35 V

Three Quadrants operation: QI - QIII
1~ Triac

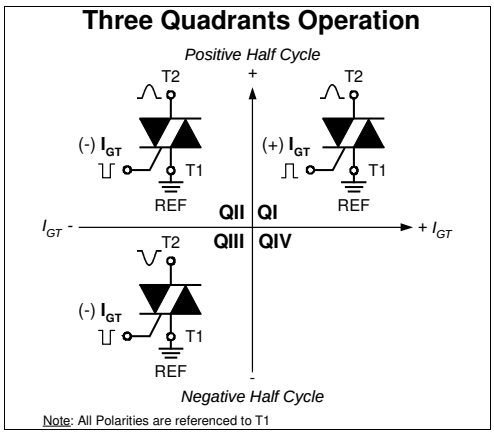
Part number

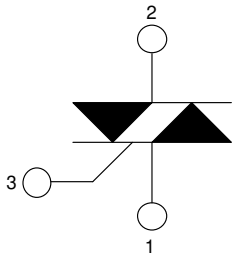
CMA60MT1600NHR



Backside: isolated

E72873





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: ISO247

- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- Epoxy meets UL 94V-0
- Soldering pins for PCB mounting
- Backside: DCB ceramic
- Reduced weight
- Advanced power cycling

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.

© 2020 IXYS all rights reserved

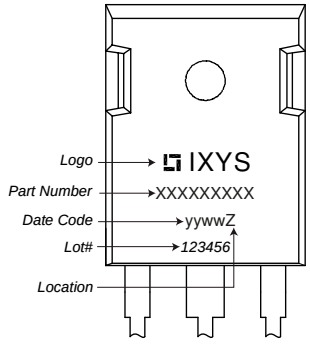
Rectifier

Symbol	Definition	Conditions		Ratings min.	typ.	max.	Unit
$V_{RSM/DSM}$	*max. non-repetitive reverse/forward blocking voltage*		T_{VJ} = 25°C			1700	V
$V_{RRM/DRM}$	*max. repetitive reverse/forward blocking voltage*		T_{VJ} = 25°C			1600	V
$I_{R/D}$	*reverse current, drain current*	$V_{R/D}$ = 1600 V	T_{VJ} = 25°C			10	µA
		$V_{R/D}$ = 1600 V	T_{VJ} = 125°C			2	mA
V_T	*forward voltage drop*	I_T = 30 A	T_{VJ} = 25°C			1,36	V
		I_T = 60 A				1,70	V
		I_T = 30 A	T_{VJ} = 125°C			1,35	V
		I_T = 60 A				1,79	V
I_{TAV}	*average forward current*	T_C = 90°C	T_{VJ} = 150°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°C			0,89	V
r_T	*slope resistance* }					15,1	mΩ
R_{thJC}	*thermal resistance junction to case*					0,9	K/W
R_{thCH}	*thermal resistance case to heatsink*				0,25		K/W
P_{tot}	*total power dissipation*		T_C = 25°C			140	W
I_{TSM}	*max. forward surge current*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°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°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°C			340	A²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			325	A²s
		t = 10 ms; (50 Hz), sine	T_{VJ} = 150°C			240	A²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			240	A²s
C_J	*junction capacitance*	V_R = 400V f = 1 MHz	T_{VJ} = 25°C		9		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} = 125°C; f = 50 Hz	repetitive, I_T = 90 A			150	A/µs
		t_P = 200 µs; di_G/dt = 0,2 A/µs;					
		I_G = 0,2A; V_D = ⅔ V_{DRM}	non-repet., I_T = 30 A			500	A/µs
$(dv/dt)_{cr}$	*critical rate of rise of voltage*	V_D = ⅔ V_{DRM}	T_{VJ} = 125°C			500	V/µs
		R_{GK} = ∞; method 1 (linear voltage rise)					
V_{GT}	*gate trigger voltage*	V_D = 6 V	T_{VJ} = 25°C			1,3	V
			T_{VJ} = -40°C			1,6	V
I_{GT}	*gate trigger current*	V_D = 6 V	T_{VJ} = 25°C			± 60	mA
			T_{VJ} = -40°C			± 80	mA
V_{GD}	*gate non-trigger voltage*	V_D = ⅔ V_{DRM}	T_{VJ} = 125°C			0,2	V
I_{GD}	*gate non-trigger current*					± 1	mA
I_L	*latching current*	t_p = 10 µs	T_{VJ} = 25°C			90	mA
		I_G = 0,2A; di_G/dt = 0,2 A/µs					
I_H	*holding current*	V_D = 6 V R_{GK} = ∞	T_{VJ} = 25°C			60	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 = 30A; V_D = ⅔ V_{DRM}	T_{VJ} =125 °C		150		µs
		di/dt = 10 A/µs; dv/dt = 20 V/µs; t_p = 200 µs					

© 2020 IXYS all rights reserved

Package ISO247				Ratings			
Symbol	**Definition**	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
I_{RMS}	*RMS current*	per terminal				70	A
T_{VJ}	*virtual junction temperature*			-55		150	°C
T_{op}	*operation temperature*			-55		125	°C
T_{stg}	*storage temperature*			-55		150	°C
Weight					6		g
M_D	*mounting torque*			0,8		1,2	Nm
F_C	*mounting force with clip*			20		120	N
$d_{Spp/App}$	*creepage distance on surface | striking distance through air*		*terminal to terminal*	2,7			mm
$d_{Spb/Apb}$			*terminal to backside*	4,1			mm
V_{ISOL}	*isolation voltage*	t = 1 second	50/60 Hz, RMS; I_{ISOL} ≤ 1 mA	3600			V
		t = 1 minute		3000			V

Product Marking



Part description

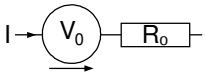
C = Thyristor (SCR)
M = Thyristor
A = (up to 1800V)
60 = Current Rating [A]
MT = 1~ Triac
1600 = Reverse Voltage [V]
N = Three Quadrants operation: QI - QIII
HR = ISO247 (3)

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	CMA60MT1600NHR	CMA60MT1600NHR	Tube	30	517853

Similar Part	Package	Voltage class
CMA60MT1600NHB	TO-247AD (3)	1600

Equivalent Circuits for Simulation

** on die level* T_{VJ} = 150°C

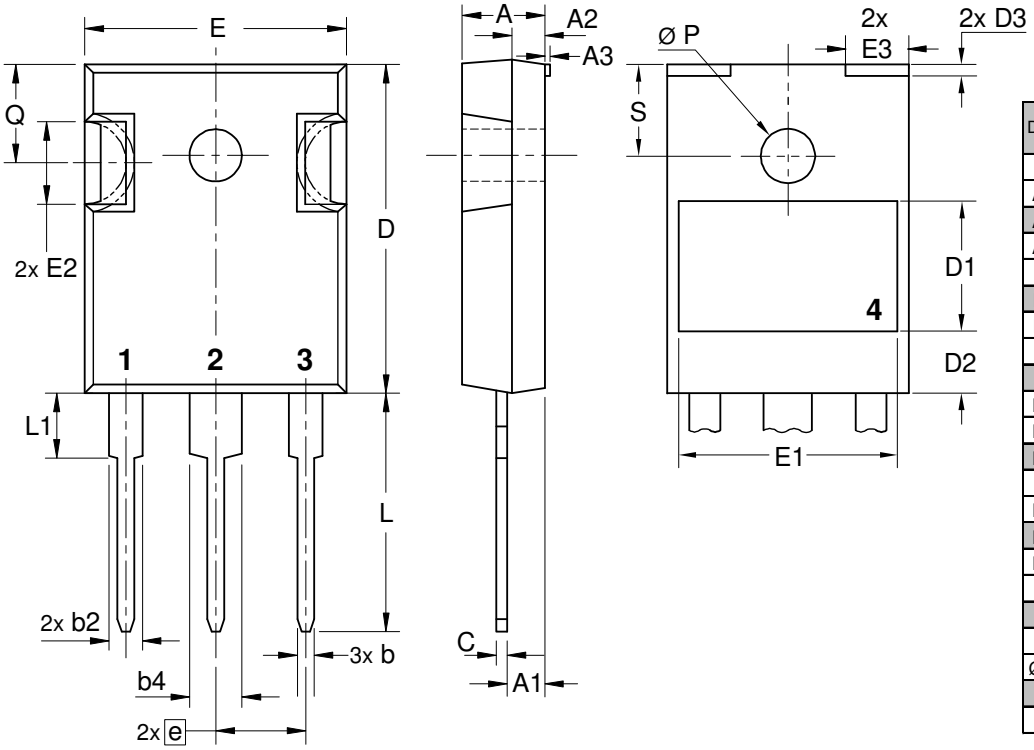


Thyristor

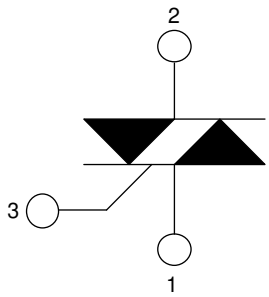
$V_{0\,max}$	*threshold voltage*	0,89	V
$R_{0\,max}$	*slope resistance **	12,6	mΩ

© 2020 IXYS all rights reserved

Outlines ISO247



Dim.	Millimeter		Inches	
	min	max	min	max
A	4.70	5.30	0.185	0.209
A1	2.21	2.59	0.087	0.102
A2	1.50	2.49	0.059	0.098
A3	typ. 0.05		typ. 0.002	
b	0.99	1.40	0.039	0.055
b2	1.65	2.39	0.065	0.094
b4	2.59	3.43	0.102	0.135
c	0.38	0.89	0.015	0.035
D	20.79	21.45	0.819	0.844
D1	typ. 8.90		typ. 0.350	
D2	typ. 2.90		typ. 0.114	
D3	typ. 1.00		typ. 0.039	
E	15.49	16.24	0.610	0.639
E1	typ. 13.45		typ. 0.530	
E2	4.31	5.48	0.170	0.216
E3	typ. 4.00		typ. 0.157	
e	5.46 BSC		0.215 BSC	
L	19.80	20.30	0.780	0.799
L1	-	4.49	-	0.177
Ø P	3.55	3.65	0.140	0.144
Q	5.38	6.19	0.212	0.244
S	6.14 BSC		0.242 BSC	



© 2020 IXYS all rights reserved

Thyristor

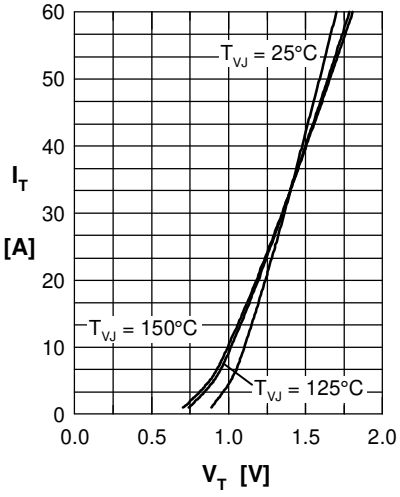


Fig. 1 Forward characteristics

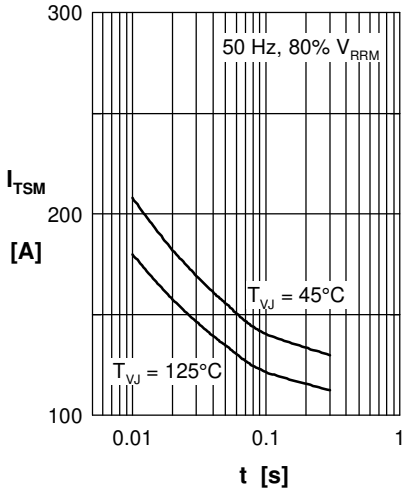


Fig. 2 Surge overload current
I_{TSM}: crest value, t: duration

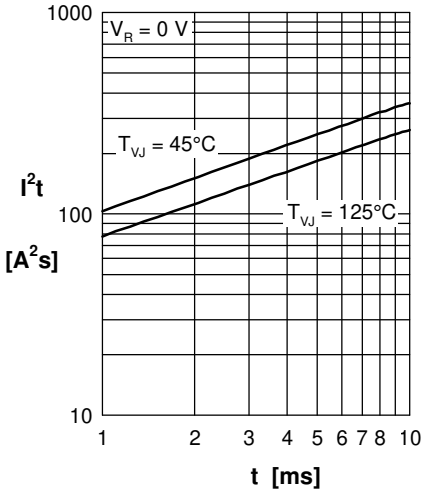


Fig. 3 I^2t versus time (1-10 s)

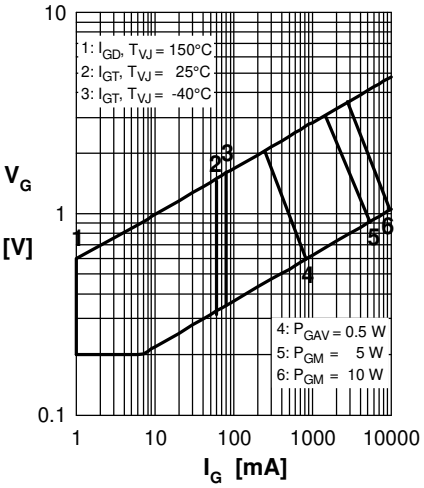


Fig. 4 Gate voltage & gate current

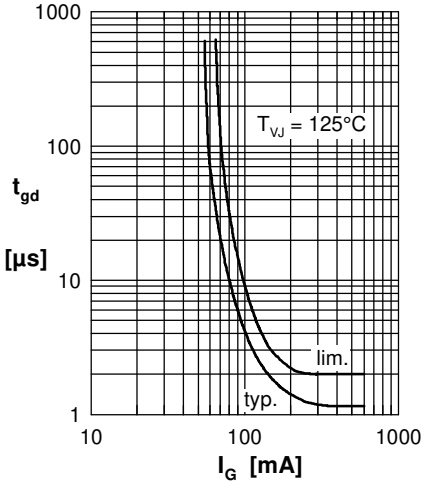


Fig. 5 Gate controlled delay time t_{gd}

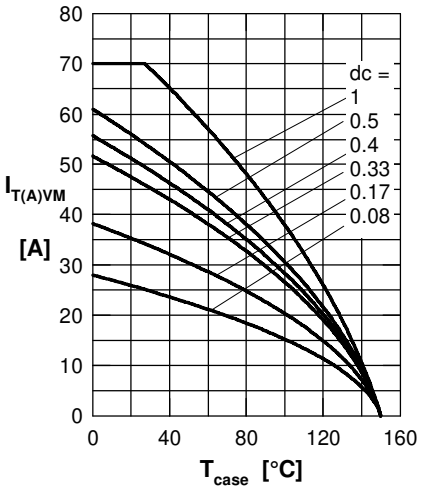


Fig. 6 Max. forward current at case temperature

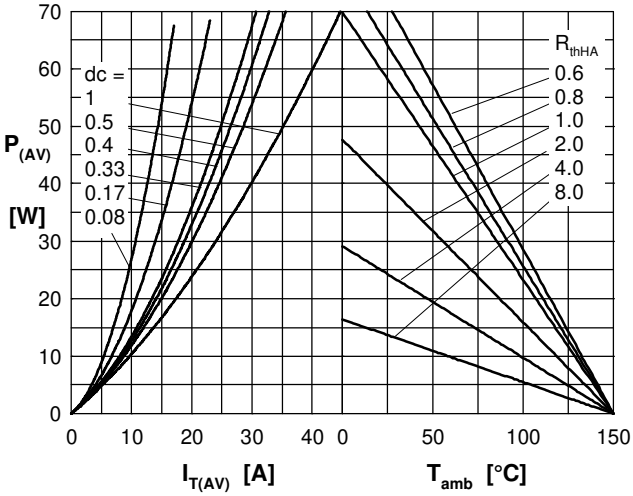
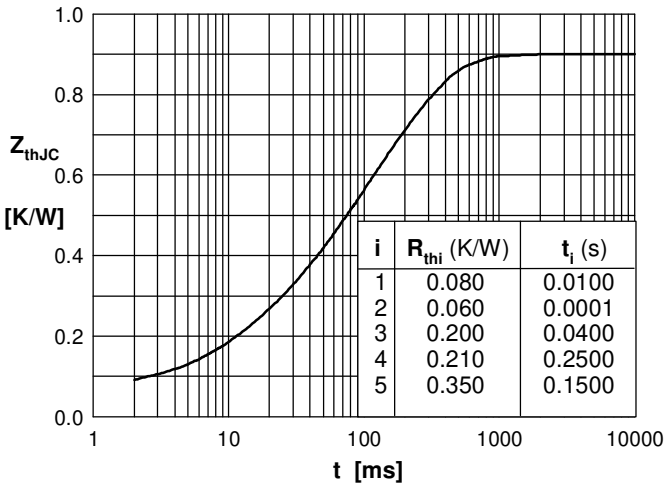


Fig. 7a Power dissipation versus direct output current
Fig. 7b and ambient temperature



i	R_{thi} (K/W)	t_i (s)
1	0.080	0.0100
2	0.060	0.0001
3	0.200	0.0400
4	0.210	0.2500
5	0.350	0.1500

Fig. 8 Transient thermal impedance junction to case

© 2020 IXYS all rights reserved