

Thyristor

$$V_{RRM} = 1600V$$

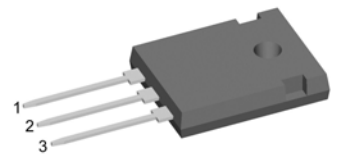
$$I_{TAV} = 20A$$

$$V_T = 1.23V$$

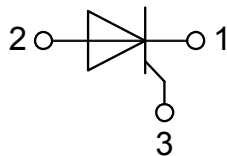
Single Thyristor

Part number

CS20-16io1



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

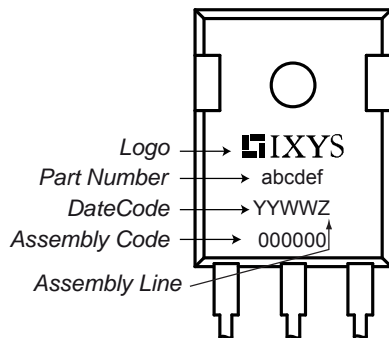
Package: TO-247

- Industry standard outline
- RoHS compliant
- Epoxy meets UL 94V-0

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	$V_{RD} = 1600 V$	$T_{VJ} = 25^{\circ}C$		20	μA	
		$V_{RD} = 1600 V$	$T_{VJ} = 125^{\circ}C$		2	mA	
V_T	forward voltage drop	$I_T = 20 A$	$T_{VJ} = 25^{\circ}C$		1.27	V	
		$I_T = 40 A$			1.53	V	
		$I_T = 20 A$	$T_{VJ} = 125^{\circ}C$		1.23	V	
		$I_T = 40 A$			1.57	V	
I_{TAV}	average forward current	$T_C = 130^{\circ}C$	$T_{VJ} = 150^{\circ}C$		20	A	
$I_{T(RMS)}$	RMS forward current	180° sine			31	A	
V_{T0}	threshold voltage	} for power loss calculation only	$T_{VJ} = 150^{\circ}C$		0.87	V	
r_T	slope resistance				17.3	m Ω	
R_{thJC}	thermal resistance junction to case				0.6	K/W	
R_{thCH}	thermal resistance case to heatsink			0.25		K/W	
P_{tot}	total power dissipation		$T_C = 25^{\circ}C$		200	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	$T_{VJ} = 25^{\circ}C$		16	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, $I_T = 60 A$		150	A/ μs	
		$t_p = 200 \mu s$; $di_G/dt = 0.3 A/\mu s$; $I_G = 0.3 A$; $V_D = \frac{2}{3} V_{DRM}$	non-repet., $I_T = 20 A$		500	A/ μs	
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V_D = \frac{2}{3} V_{DRM}$ $R_{GK} = \infty$; method 1 (linear voltage rise)	$T_{VJ} = 125^{\circ}C$		1000	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	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		80	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				5	mA	
I_L	latching current	$t_p = 10 \mu s$	$T_{VJ} = 25^{\circ}C$		150	mA	
		$I_G = 0.3 A$; $di_G/dt = 0.3 A/\mu s$					
I_H	holding current	$V_D = 6 V$ $R_{GK} = \infty$	$T_{VJ} = 25^{\circ}C$		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	$V_R = 100 V$; $I_T = 20 A$; $V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 150^{\circ}C$		150	μs	
		$di/dt = 15 A/\mu s$; $dv/dt = 20 V/\mu s$; $t_p = 200 \mu s$					

Package TO-247			Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit
I_{RMS}	RMS current	per terminal			70	A
T_{stg}	storage temperature		-55		150	°C
T_{vj}	virtual junction temperature		-40		150	°C
Weight				6		g
M_D	mounting torque		0.8		1.2	Nm
F_C	mounting force with clip		20		120	N

Product Marking



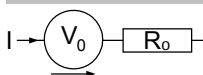
Ordering	Part Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	CS20-16io1	CS20-16io1	Tube	30	466530

Similar Part	Package	Voltage class
CS20-12io1	TO-247AD (3)	1200
CS20-14io1	TO-247AD (3)	1400

Equivalent Circuits for Simulation

* on die level

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



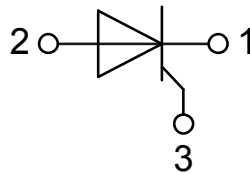
Thyristor

$V_{0\max}$	threshold voltage	0.87	V
$R_{0\max}$	slope resistance *	14.8	mΩ

Outlines TO-247



Sym.	Inches		Millimeter	
	min.	max.	min.	max.
A	0.185	0.209	4.70	5.30
A1	0.087	0.102	2.21	2.59
A2	0.059	0.098	1.50	2.49
D	0.819	0.845	20.79	21.45
E	0.610	0.640	15.48	16.24
E2	0.170	0.216	4.31	5.48
e	0.215 BSC		5.46 BSC	
L	0.780	0.800	19.80	20.30
L1	-	0.177	-	4.49
Ø P	0.140	0.144	3.55	3.65
Q	0.212	0.244	5.38	6.19
S	0.242 BSC		6.14 BSC	
b	0.039	0.055	0.99	1.40
b2	0.065	0.094	1.65	2.39
b4	0.102	0.135	2.59	3.43
c	0.015	0.035	0.38	0.89
D1	0.515	-	13.07	-
D2	0.020	0.053	0.51	1.35
E1	0.530	-	13.45	-
Ø P1	-	0.29	-	7.39



Thyristor

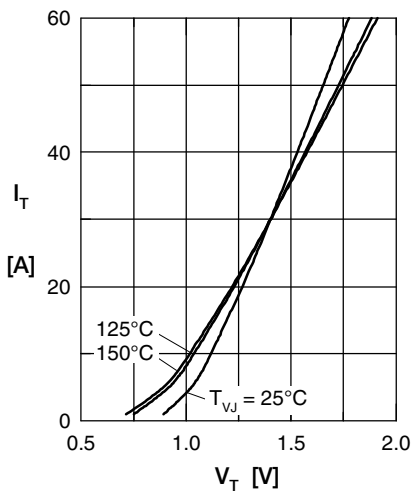


Fig. 1 Forward characteristics

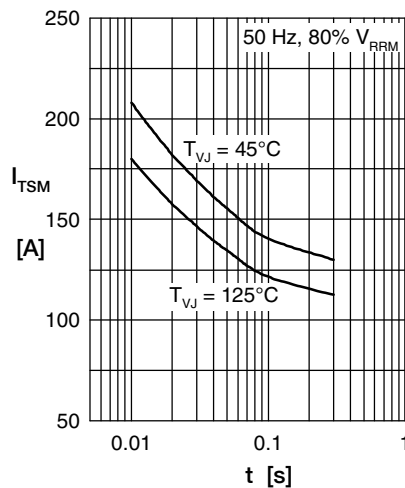


Fig. 2 Surge overload current

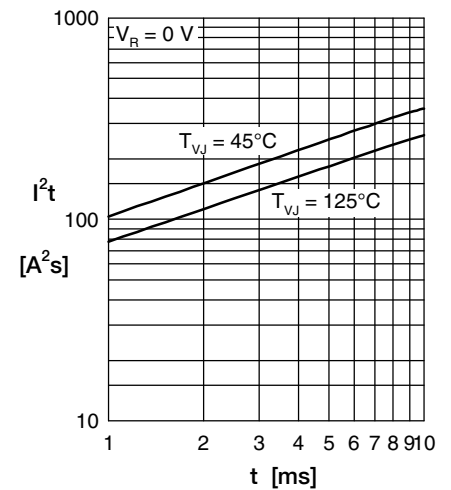


Fig. 3 I^2t versus time (1-10 ms)

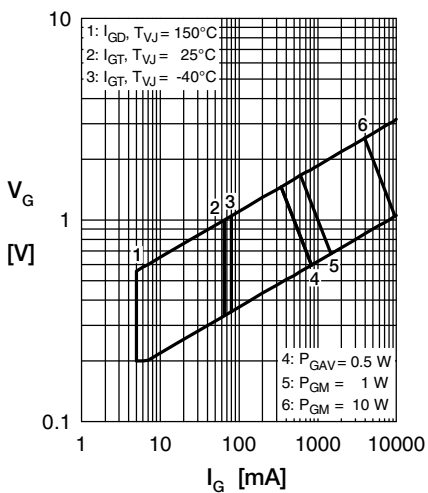


Fig. 4 Gate trigger characteristics

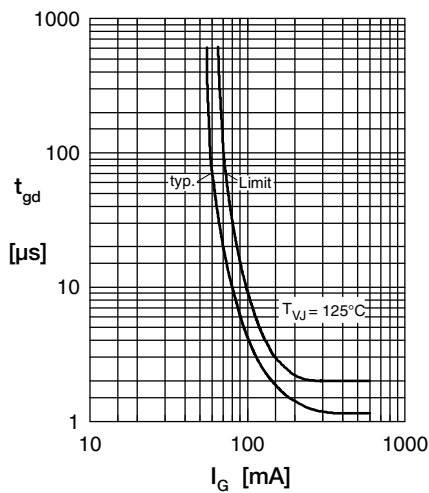


Fig. 5 Gate controlled delay time

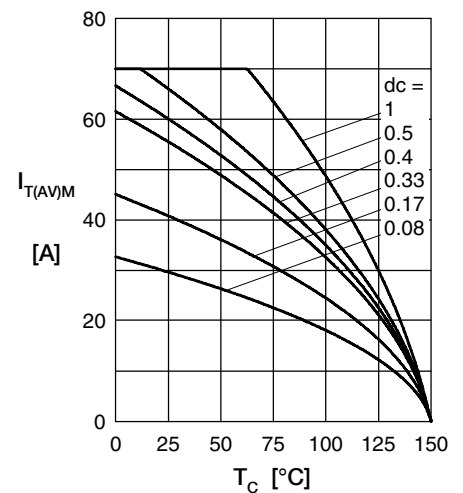


Fig. 6 Max. forward current at case temperature

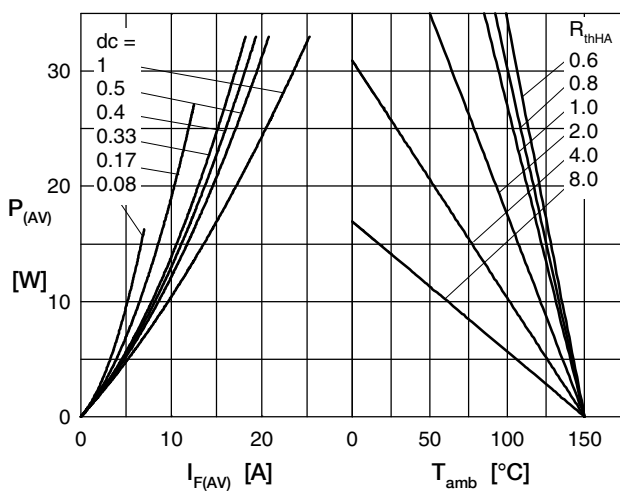


Fig. 7a Power dissipation versus direct output current
 Fig. 7b and ambient temperature

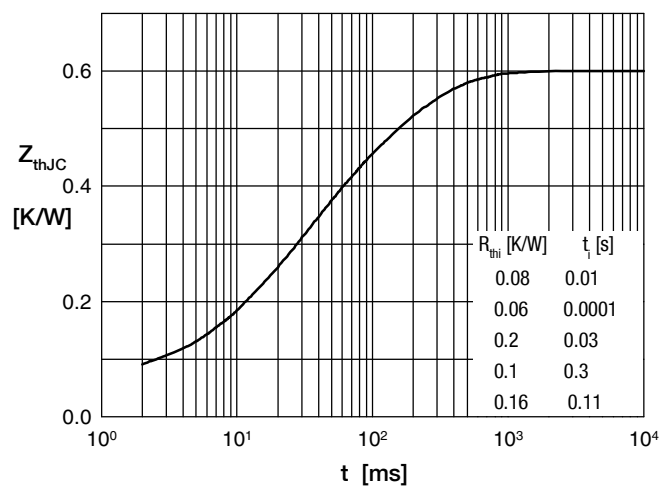


Fig. 8 Transient thermal impedance