

# Thyristor

$$V_{RRM} = 1400 \text{ V}$$

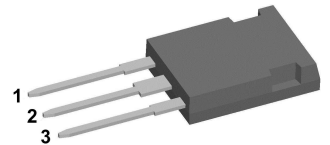
$$I_{TAV} = 60 \text{ A}$$

$$V_T = 1,14 \text{ V}$$

## Single Thyristor

### Part number

CS60-14io1



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: PLUS247

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

### Terms Conditions of usage:

The data contained in this product data sheet is exclusively intended for technically trained staff. The user will have to evaluate the suitability of the product for the intended application and the completeness of the product data with respect to his application. The specifications of our components may not be considered as an assurance of component characteristics. The information in the valid application- and assembly notes must be considered. Should you require product information in excess of the data given in this product data sheet or which concerns the specific application of your product, please contact the sales office, which is responsible for you.

Due to technical requirements our product may contain dangerous substances. For information on the types in question please contact the sales office, which is responsible for you.

Should you intend to use the product in aviation, in health or live endangering or life support applications, please notify. For any such application we urgently recommend

- to perform joint risk and quality assessments;

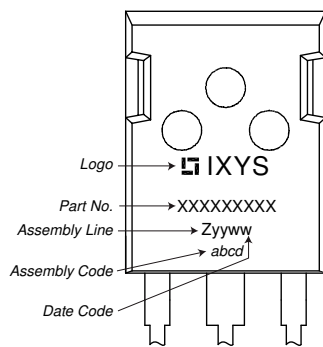
- the conclusion of quality agreements;

- to establish joint measures of an ongoing product survey, and that we may make delivery dependent on the realization of any such measures.

Thyristor			Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1500	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1400	V
$I_{RD}$	reverse current, drain current	$V_{R/D} = 1400\text{ V}$	$T_{VJ} = 25^{\circ}C$		200	$\mu A$
		$V_{R/D} = 1400\text{ V}$	$T_{VJ} = 140^{\circ}C$		10	mA
$V_T$	forward voltage drop	$I_T = 60\text{ A}$	$T_{VJ} = 25^{\circ}C$		1,18	V
		$I_T = 120\text{ A}$			1,44	V
		$I_T = 60\text{ A}$	$T_{VJ} = 125^{\circ}C$		1,14	V
		$I_T = 120\text{ A}$			1,46	V
$I_{TAV}$	average forward current	$T_C = 110^{\circ}C$	$T_{VJ} = 140^{\circ}C$		60	A
$I_{T(RMS)}$	RMS forward current	180° sine			75	A
$V_{T0}$	threshold voltage	} for power loss calculation only	$T_{VJ} = 140^{\circ}C$		0,82	V
$r_T$	slope resistance				5,3	m $\Omega$
$R_{thJC}$	thermal resistance junction to case				0,32	K/W
$R_{thCH}$	thermal resistance case to heatsink			0,15		K/W
$P_{tot}$	total power dissipation		$T_C = 25^{\circ}C$		360	W
$I_{TSM}$	max. forward surge current	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		1,40	kA
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		1,51	kA
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 140^{\circ}C$		1,19	kA
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		1,29	kA
$I^2t$	value for fusing	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		9,80	kA <sup>2</sup> s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		9,49	kA <sup>2</sup> s
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 140^{\circ}C$		7,08	kA <sup>2</sup> s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		6,87	kA <sup>2</sup> s
$C_J$	junction capacitance	$V_R = 400\text{ V } f = 1\text{ MHz}$	$T_{VJ} = 25^{\circ}C$		74	pF
$P_{GM}$	max. gate power dissipation	$t_p = 30\text{ }\mu s$	$T_C = 140^{\circ}C$		10	W
		$t_p = 300\text{ }\mu s$			5	W
$P_{GAV}$	average gate power dissipation				0,5	W
$(di/dt)_{cr}$	critical rate of rise of current	$T_{VJ} = 140^{\circ}C; f = 50\text{ Hz}$	repetitive, $I_T = 180\text{ A}$		150	A/ $\mu s$
		$t_p = 200\text{ }\mu s; di_G/dt = 0,3\text{ A}/\mu s;$	non-repet., $I_T = 60\text{ A}$		500	A/ $\mu s$
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V = \frac{2}{3} V_{DRM}$	$T_{VJ} = 140^{\circ}C$		1000	V/ $\mu s$
		$R_{GK} = \infty; \text{ method 1 (linear voltage rise)}$				
$V_{GT}$	gate trigger voltage	$V_D = 6\text{ V}$	$T_{VJ} = 25^{\circ}C$		1,5	V
			$T_{VJ} = -40^{\circ}C$		1,6	V
$I_{GT}$	gate trigger current	$V_D = 6\text{ V}$	$T_{VJ} = 25^{\circ}C$		100	mA
			$T_{VJ} = -40^{\circ}C$		200	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				10	mA
$I_L$	latching current	$t_p = 10\text{ }\mu s$	$T_{VJ} = 25^{\circ}C$		450	mA
		$I_G = 0,45\text{ A}; di_G/dt = 0,45\text{ A}/\mu s$				
$I_H$	holding current	$V_D = 6\text{ V } R_{GK} = \infty$	$T_{VJ} = 25^{\circ}C$		200	mA
$t_{gd}$	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$	$T_{VJ} = 25^{\circ}C$		2	$\mu s$
		$I_G = 0,45\text{ A}; di_G/dt = 0,45\text{ A}/\mu s$				
$t_q$	turn-off time	$V_R = 100\text{ V}; I_T = 60\text{ A}; V = \frac{2}{3} V_{DRM}$	$T_{VJ} = 125^{\circ}C$		150	$\mu s$
		$di/dt = 10\text{ A}/\mu s \quad dv/dt = 20\text{ V}/\mu s \quad t_p = 200\text{ }\mu s$				

Package PLUS247		Ratings				
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$I_{RMS}$	RMS current	per terminal			70	A
$T_{VJ}$	virtual junction temperature		-40		140	°C
$T_{op}$	operation temperature		-40		125	°C
$T_{stg}$	storage temperature		-40		140	°C
<b>Weight</b>				6		g
$F_C$	mounting force with clip		20		120	N
$d_{Spp/App}$	creepage distance on surface / striking distance through air	terminal to terminal	5,5			mm
$d_{Spb/Abp}$		terminal to backside	5,5			mm

### Product Marking



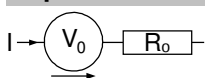
Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	CS60-14io1	CS60-14io1	Tube	30	507901

Similar Part	Package	Voltage class
CS60-12io1	PLUS247 (3)	1200
CS60-16io1	PLUS247 (3)	1600

### Equivalent Circuits for Simulation

\* on die level

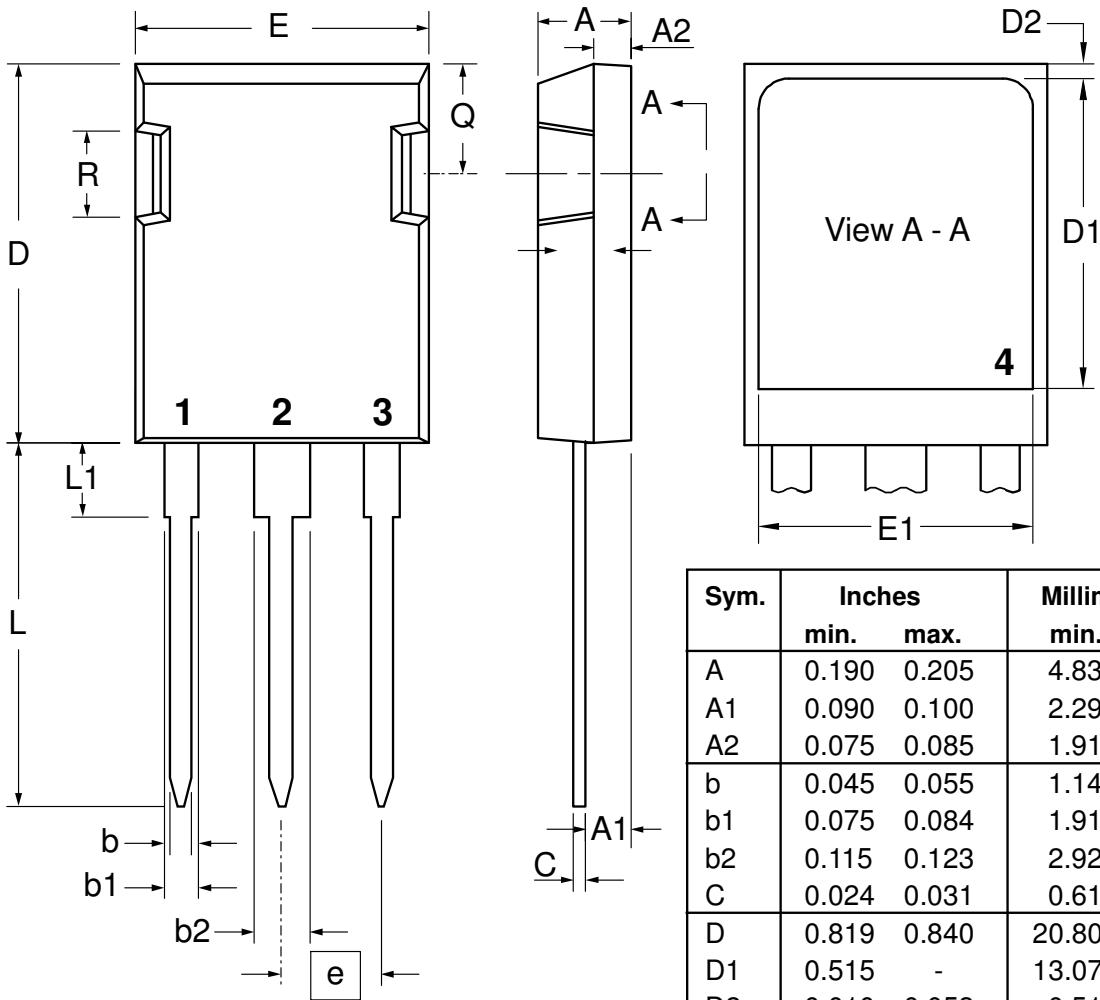
$T_{VJ} = 140\text{ °C}$



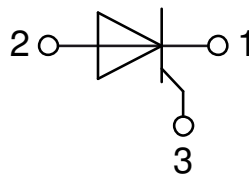
Thyristor

$V_{0\ max}$	threshold voltage	0,82	V
$R_{0\ max}$	slope resistance *	3	mΩ

**Outlines PLUS247**



Sym.	Inches		Millimeter	
	min.	max.	min.	max.
A	0.190	0.205	4.83	5.21
A1	0.090	0.100	2.29	2.54
A2	0.075	0.085	1.91	2.16
b	0.045	0.055	1.14	1.40
b1	0.075	0.084	1.91	2.13
b2	0.115	0.123	2.92	3.12
C	0.024	0.031	0.61	0.80
D	0.819	0.840	20.80	21.34
D1	0.515	-	13.07	-
D2	0.010	0.053	0.51	1.35
E	0.620	0.635	15.75	16.13
E1	0.530	-	13.45	-
e	0.215 BSC		5.45 BSC	
L	0.780	0.800	19.81	20.32
L1	0.150	0.170	3.81	4.32
Q	0.220	0.244	5.59	6.20
R	0.170	0.190	4.32	4.83



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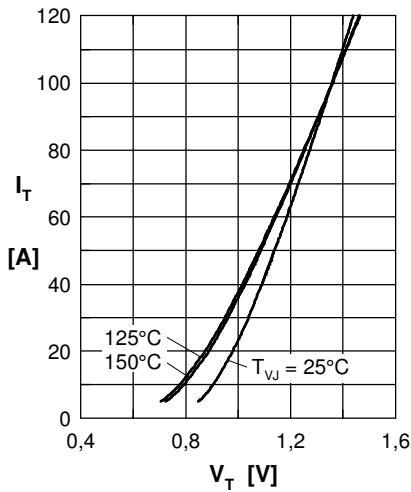


Fig. 1 Forward characteristics

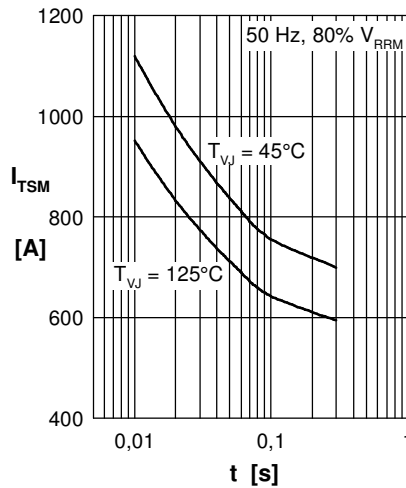


Fig. 2 Surge overload current

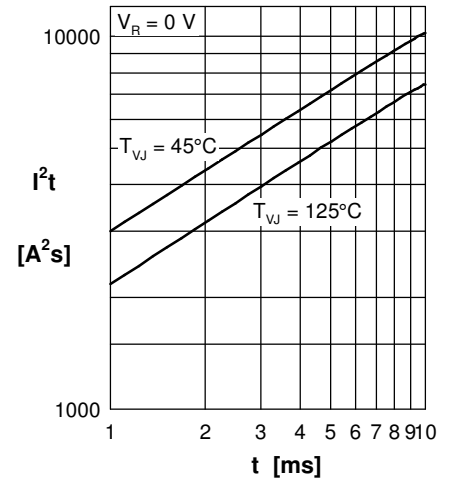


Fig. 3  $I^2t$  versus time (1-10 ms)

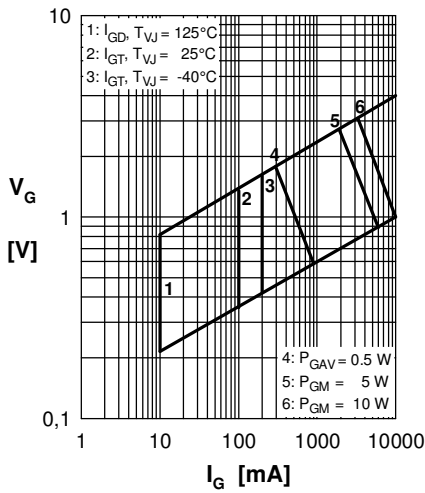


Fig. 4 Gate trigger characteristics

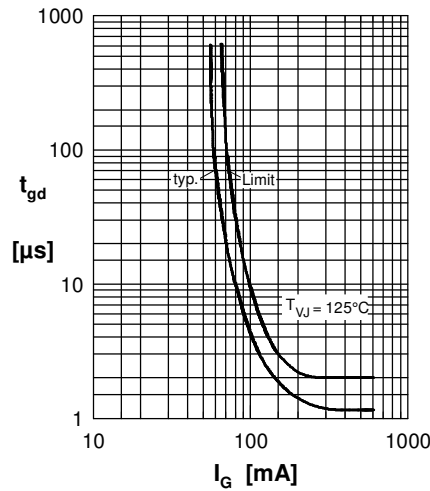


Fig. 5 Gate controlled delay time

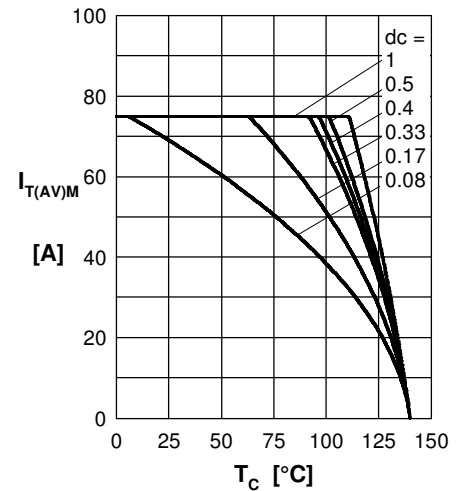


Fig. 6 Max. forward current at case temperature

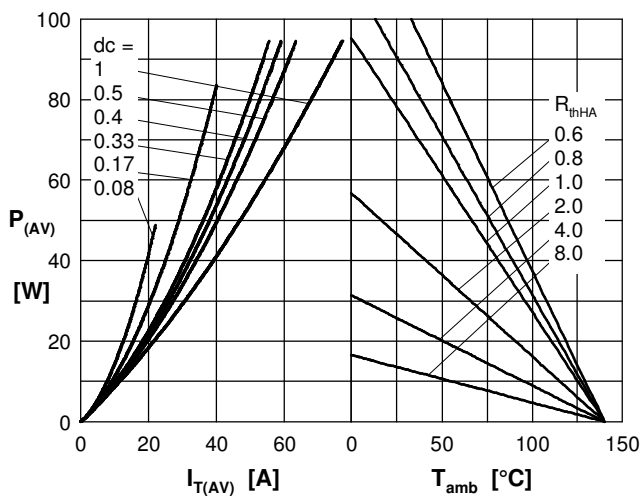


Fig. 7a Power dissipation versus direct output current  
Fig. 7b and ambient temperature

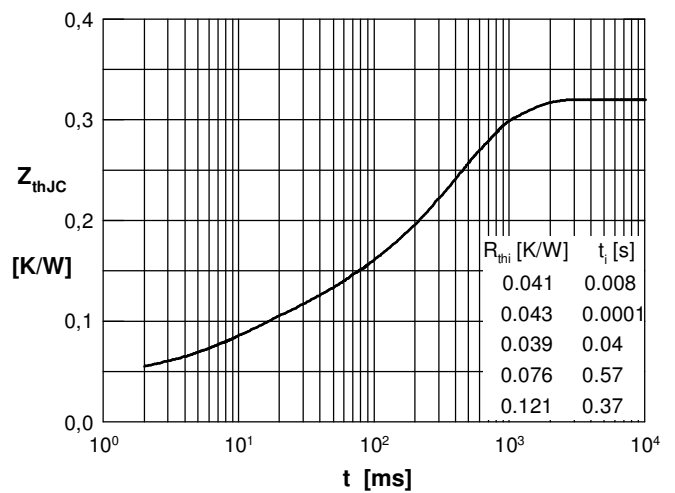


Fig. 8 Transient thermal impedance junction to case