

Thyristor

$$V_{RRM} = 1200V$$

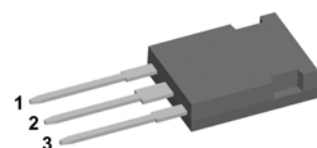
$$I_{TAV} = 60A$$

$$V_T = 1.14V$$

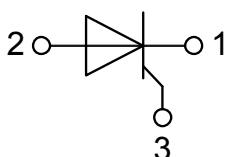
Single Thyristor

Part number

CS60-12io1



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

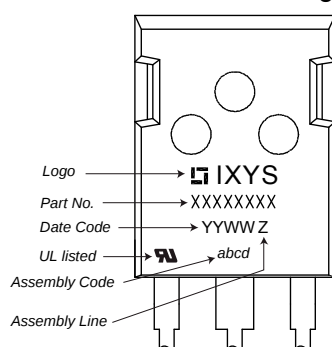
Package: PLUS247

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

Thyristor				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$				1300	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$				1200	V
I_{RD}	reverse current, drain current	$V_{RD} = 1200\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			200	μA
		$V_{RD} = 1200\text{ V}$	$T_{VJ} = 140^{\circ}\text{C}$			10	mA
V_T	forward voltage drop	$I_T = 60\text{ A}$	$T_{VJ} = 25^{\circ}\text{C}$			1.18	V
		$I_T = 120\text{ A}$				1.44	V
		$I_T = 60\text{ A}$	$T_{VJ} = 125^{\circ}\text{C}$			1.14	V
		$I_T = 120\text{ A}$				1.46	V
I_{TAV}	average forward current	$T_C = 110^{\circ}\text{C}$	$T_{VJ} = 140^{\circ}\text{C}$			60	A
$I_{T(RMS)}$	RMS forward current	180° sine				75	A
V_{T0}	threshold voltage	} for power loss calculation only	$T_{VJ} = 140^{\circ}\text{C}$			0.82	V
r_T	slope resistance					5.3	m Ω
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		$T_C = 25^{\circ}\text{C}$			360	W
I_{TSM}	max. forward surge current	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}\text{C}$			1.40	kA
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			1.51	kA
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 140^{\circ}\text{C}$			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	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}\text{C}$			9.80	kA ² s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			9.49	kA ² s
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 140^{\circ}\text{C}$			7.08	kA ² s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			6.87	kA ² s
C_J	junction capacitance	$V_R = 400\text{ V}$ $f = 1\text{ MHz}$	$T_{VJ} = 25^{\circ}\text{C}$		74		pF
P_{GM}	max. gate power dissipation	$t_p = 30\text{ }\mu\text{s}$	$T_C = 140^{\circ}\text{C}$			10	W
		$t_p = 300\text{ }\mu\text{s}$				5	W
P_{GAV}	average gate power dissipation					0.5	W
$(di/dt)_{cr}$	critical rate of rise of current	$T_{VJ} = 140^{\circ}\text{C}; f = 50\text{ Hz}$ repetitive, $I_T = 180\text{ A}$				150	A/ μs
		$t_p = 200\text{ }\mu\text{s}; di_G/dt = 0.3\text{ A}/\mu\text{s};$ $I_G = 0.3\text{ A}; V_D = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 60\text{ A}$				500	A/ μs
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V_D = \frac{2}{3} V_{DRM}$ $T_{VJ} = 140^{\circ}\text{C}$ $R_{GK} = \infty$; method 1 (linear voltage rise)				1000	V/ μs
V_{GT}	gate trigger voltage	$V_D = 6\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			1.5	V
			$T_{VJ} = -40^{\circ}\text{C}$			1.6	V
I_{GT}	gate trigger current	$V_D = 6\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			100	mA
			$T_{VJ} = -40^{\circ}\text{C}$			200	mA
V_{GD}	gate non-trigger voltage	$V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 140^{\circ}\text{C}$			0.2	V
I_{GD}	gate non-trigger current					10	mA
I_L	latching current	$t_p = 10\text{ }\mu\text{s}$	$T_{VJ} = 25^{\circ}\text{C}$			450	mA
		$I_G = 0.45\text{ A}; di_G/dt = 0.45\text{ A}/\mu\text{s}$					
I_H	holding current	$V_D = 6\text{ V}$ $R_{GK} = \infty$	$T_{VJ} = 25^{\circ}\text{C}$			200	mA
t_{gd}	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$	$T_{VJ} = 25^{\circ}\text{C}$			2	μs
		$I_G = 0.45\text{ A}; di_G/dt = 0.45\text{ A}/\mu\text{s}$					
t_q	turn-off time	$V_R = 100\text{ V}; I_T = 60\text{ A}; V_D = \frac{2}{3} V_{DRM}$ $T_{VJ} = 140^{\circ}\text{C}$ $di/dt = 10\text{ A}/\mu\text{s}; dv/dt = 20\text{ V}/\mu\text{s}; t_p = 200\text{ }\mu\text{s}$			150		μs

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
Weight				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
$d_{Spb/Apb}$		terminal to backside	5.5			mm

Product Marking



Ordering	Part Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	CS60-12io1	CS60-12io1	Tube	30	503202

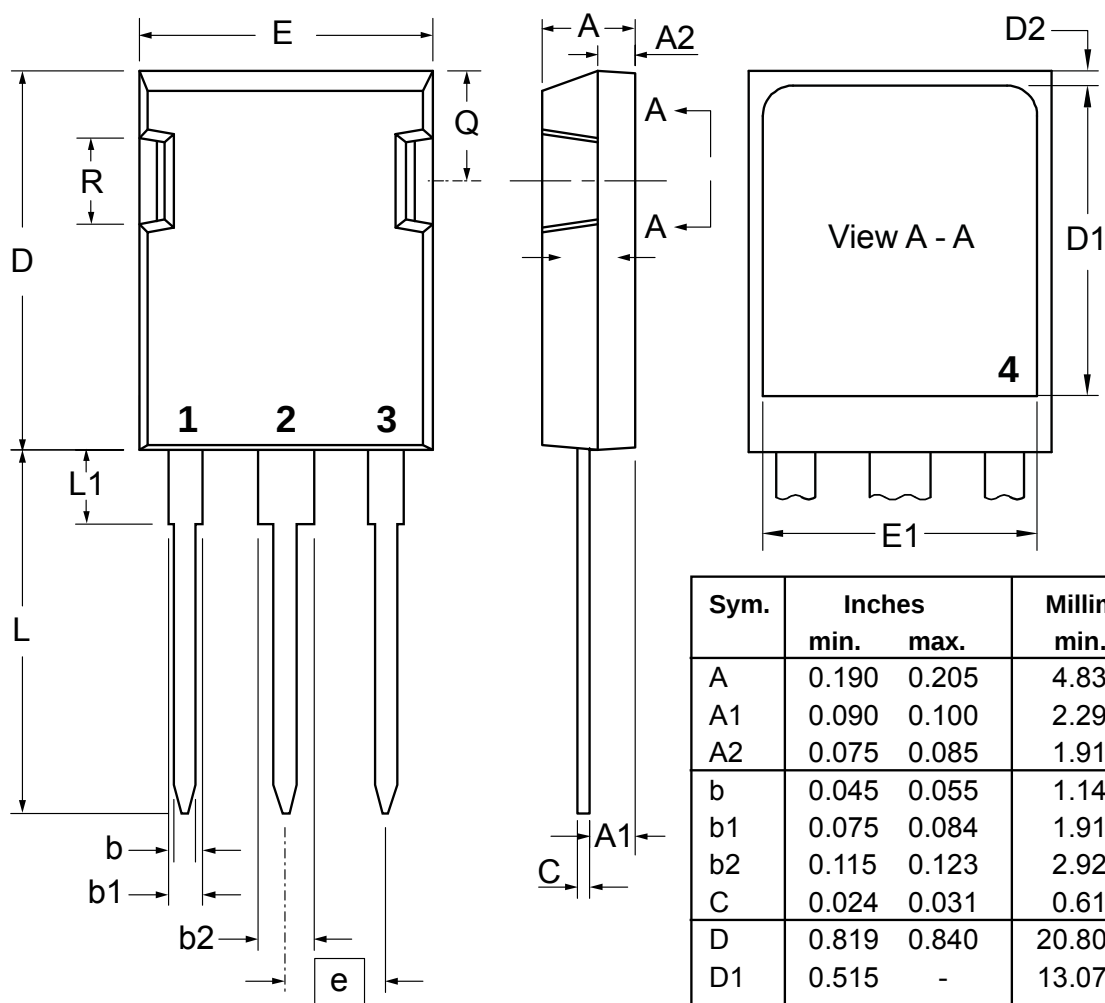
Similar Part	Package	Voltage class
CS60-14io1	PLUS247 (3)	1400
CS60-16io1	PLUS247 (3)	1600

Equivalent Circuits for Simulation

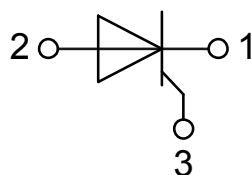
* on die level

$T_{VJ} = 140\text{ °C}$

$I \rightarrow$	V_0	R_0	Thyristor	
$V_{0\text{ max}}$	threshold voltage	0.82		V
$R_{0\text{ max}}$	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



Thyristor

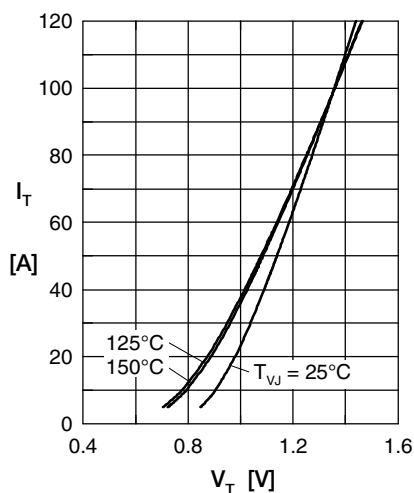


Fig. 1 Forward characteristics

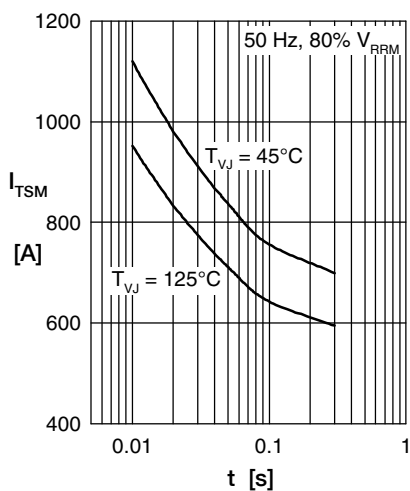


Fig. 2 Surge overload current

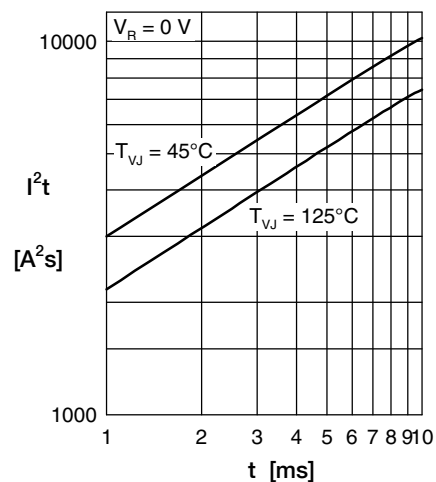


Fig. 3 I^2t versus time (1-10 ms)

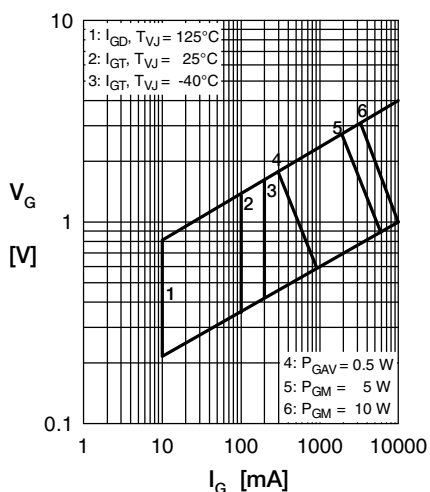


Fig. 4 Gate trigger characteristics

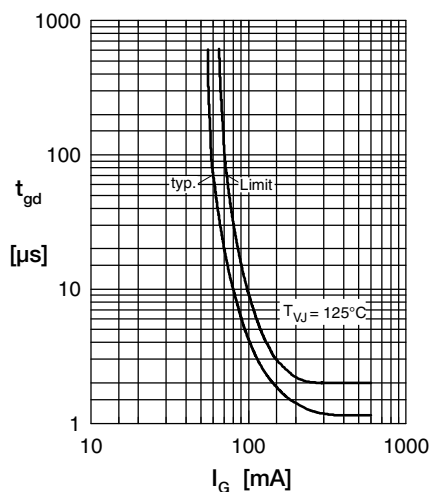


Fig. 5 Gate controlled delay time

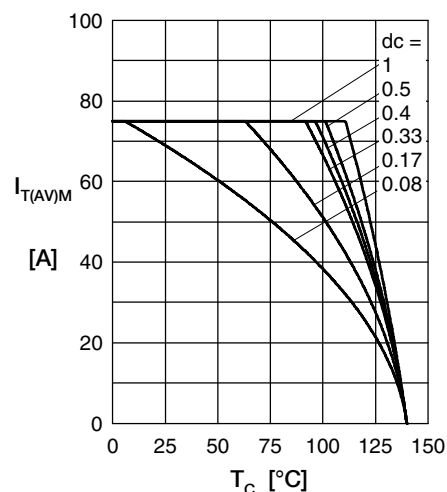


Fig. 6 Max. forward current at case temperature

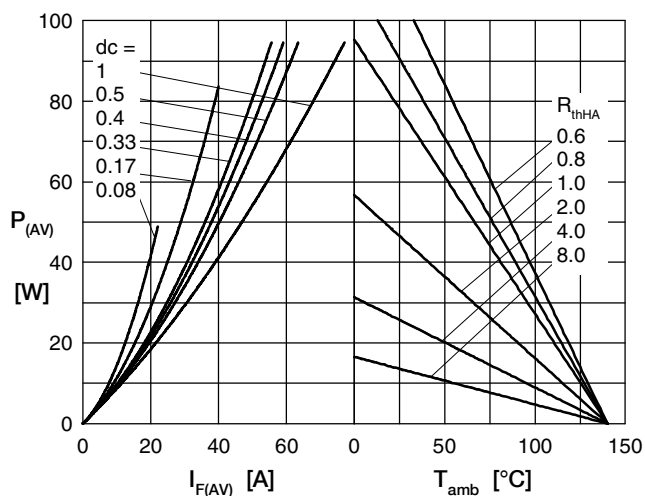


Fig. 7a Power dissipation versus direct output current
Fig. 7b and ambient temperature

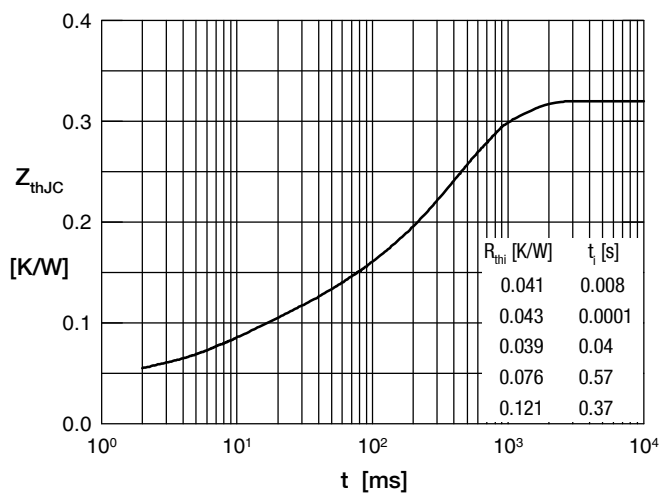


Fig. 8 Transient thermal impedance