



Thyristor

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

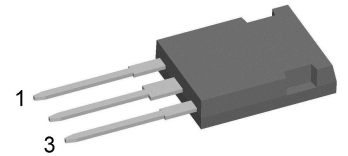
$$I_{TAV} = 60 \text{ A}$$

$$V_T = 1.14 \text{ V}$$

Single Thyristor

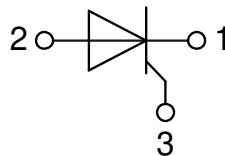
Part number

CS60-16io1R



Backside: isolated

E72873



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: ISOPLUS247

- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- Epoxy meets UL 94V-0

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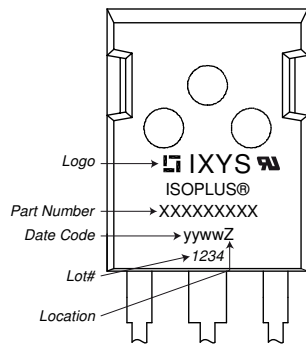


Thyristor			Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1700	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1600	V
I_{RD}	reverse current, drain current	$V_{R/D} = 1600 V$	$T_{VJ} = 25^{\circ}C$		200	μA
		$V_{R/D} = 1600 V$	$T_{VJ} = 140^{\circ}C$		10	mA
V_T	forward voltage drop	$I_T = 60 A$	$T_{VJ} = 25^{\circ}C$		1.18	V
		$I_T = 120 A$			1.44	V
		$I_T = 60 A$	$T_{VJ} = 125^{\circ}C$		1.14	V
		$I_T = 120 A$			1.46	V
I_{TAV}	average forward current	$T_C = 90^{\circ}C$	$T_{VJ} = 140^{\circ}C$		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 Ω
R_{thJC}	thermal resistance junction to case				0.45	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	$t = 10 ms$; (50 Hz), sine	$T_{VJ} = 45^{\circ}C$		1.40	kA
		$t = 8,3 ms$; (60 Hz), sine	$V_R = 0 V$		1.51	kA
		$t = 10 ms$; (50 Hz), sine	$T_{VJ} = 140^{\circ}C$		1.19	kA
		$t = 8,3 ms$; (60 Hz), sine	$V_R = 0 V$		1.29	kA
I^2t	value for fusing	$t = 10 ms$; (50 Hz), sine	$T_{VJ} = 45^{\circ}C$		9.80	kA ² s
		$t = 8,3 ms$; (60 Hz), sine	$V_R = 0 V$		9.49	kA ² s
		$t = 10 ms$; (50 Hz), sine	$T_{VJ} = 140^{\circ}C$		7.08	kA ² s
		$t = 8,3 ms$; (60 Hz), sine	$V_R = 0 V$		6.87	kA ² s
C_J	junction capacitance	$V_R = 400 V$ $f = 1 MHz$	$T_{VJ} = 25^{\circ}C$		74	pF
P_{GM}	max. gate power dissipation	$t_p = 30 \mu s$	$T_C = 140^{\circ}C$		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	$T_{VJ} = 140^{\circ}C$; $f = 50 Hz$ repetitive, $I_T = 180 A$			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., $I_T = 60 A$			500	A/ μs
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V = \frac{2}{3} V_{DRM}$ $R_{GK} = \infty$; method 1 (linear voltage rise)	$T_{VJ} = 140^{\circ}C$		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	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		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	$t_p = 10 \mu s$	$T_{VJ} = 25^{\circ}C$		450	mA
		$I_G = 0.45 A$; $di_G/dt = 0.45 A/\mu s$				
I_H	holding current	$V_D = 6 V$ $R_{GK} = \infty$	$T_{VJ} = 25^{\circ}C$		200	mA
t_{gd}	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$ $I_G = 0.45 A$; $di_G/dt = 0.45 A/\mu s$	$T_{VJ} = 25^{\circ}C$		2	μs
t_q	turn-off time	$V_R = 100 V$; $I_T = 60 A$; $V = \frac{2}{3} V_{DRM}$ $di/dt = 10 A/\mu s$ $dv/dt = 20 V/\mu s$ $t_p = 200 \mu s$	$T_{VJ} = 125^{\circ}C$		150	μs



Package ISOPLUS247		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	2.7			mm
$d_{Spb/Apb}$		terminal to backside	4.1			mm
V_{ISOL}	isolation voltage	t = 1 second	3600			V
		t = 1 minute	3000			V

Product Marking



Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	CS60-16io1R	CS60-16io1R	Tube	30	524774

Similar Part	Package	Voltage class
CS60-16io1	TO-247AD (2)	1600

Equivalent Circuits for Simulation

* on die level

$T_{VJ} = 140^{\circ}\text{C}$

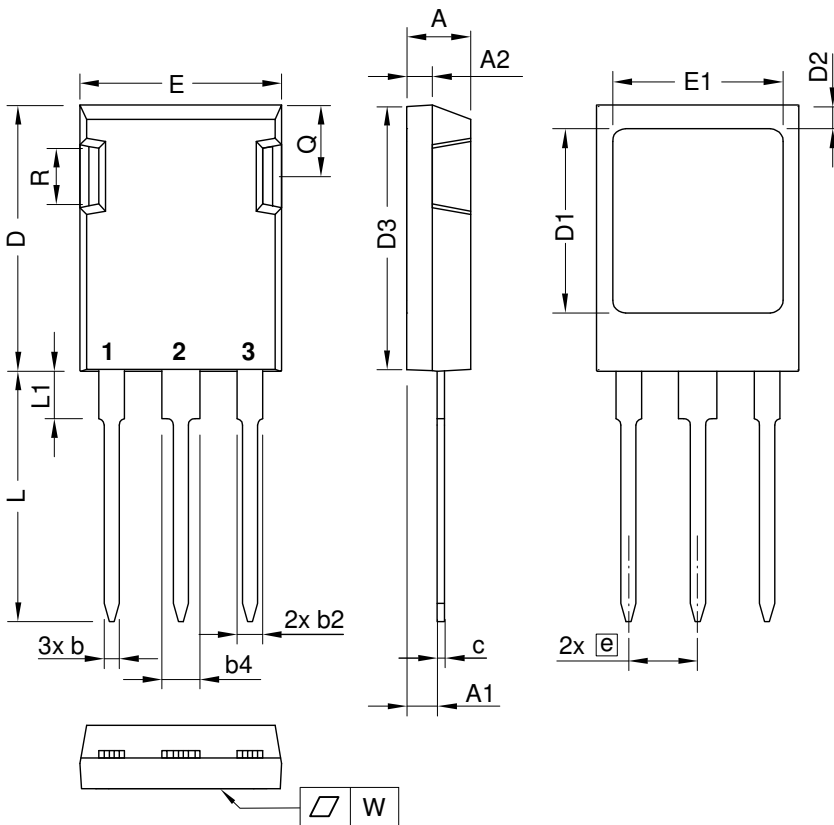


Thyristor

$V_{0 \max}$	threshold voltage	0.82	V
$R_{0 \max}$	slope resistance *	3	mΩ



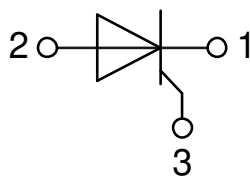
Outlines ISOPLUS247



Dim.	Millimeter		Inches	
	min	max	min	max
A	4.83	5.21	0.190	0.205
A1	2.29	2.54	0.090	0.100
A2	1.91	2.16	0.075	0.085
b	1.14	1.40	0.045	0.055
b2	1.91	2.20	0.075	0.087
b4	2.92	3.24	0.115	0.128
c	0.61	0.83	0.024	0.033
D	20.80	21.34	0.819	0.840
D1	15.75	16.26	0.620	0.640
D2	1.65	2.15	0.065	0.085
D3	20.30	20.70	0.799	0.815
E	15.75	16.13	0.620	0.635
E1	13.21	13.72	0.520	0.540
e	5.45 BSC		0.215 BSC	
L	19.81	20.60	0.780	0.811
L1	3.81	4.38	0.150	0.172
Q	5.59	6.20	0.220	0.244
R	4.25	5.50	0.167	0.217
W	-	0.10	-	0.004

Die konvexe Form des Substrates ist typ. < 0.04 mm über der Kunststoffoberfläche der Bauteilunterseite
The convex bow of substrate is typ. < 0.04 mm over plastic surface level of device bottom side

Die Gehäuseabmessungen entsprechen dem Typ TO-247 AD gemäß JEDEC außer Schraubloch und L_{max}.
This drawing will meet all dimensions requirement of JEDEC outline TO-247 AD except screw hole and except L_{max}.



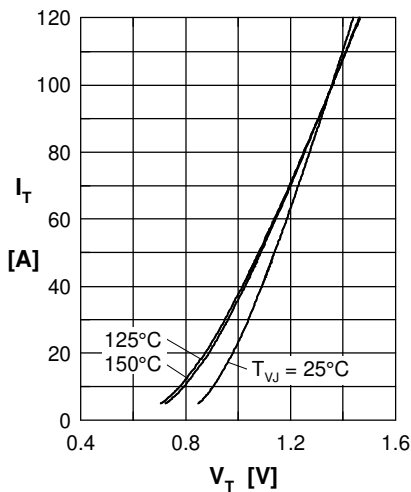
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Fig. 1 Forward characteristics

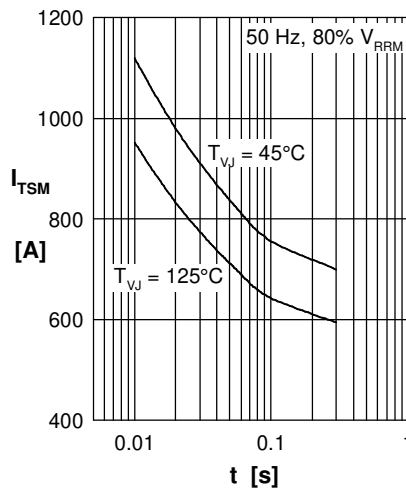


Fig. 2 Surge overload current

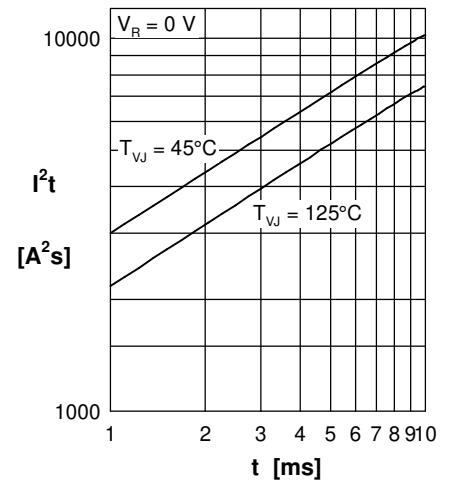
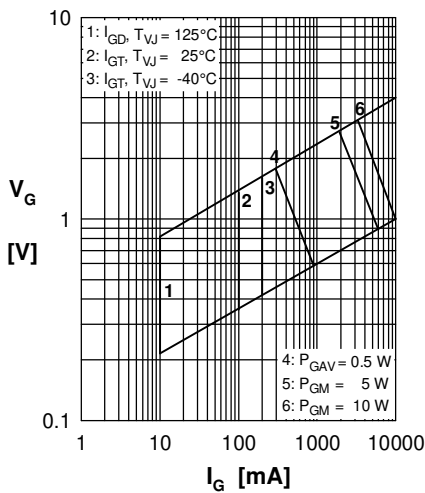

 Fig. 3 I^2t versus time (1-10 ms)


Fig. 4 Gate trigger characteristics

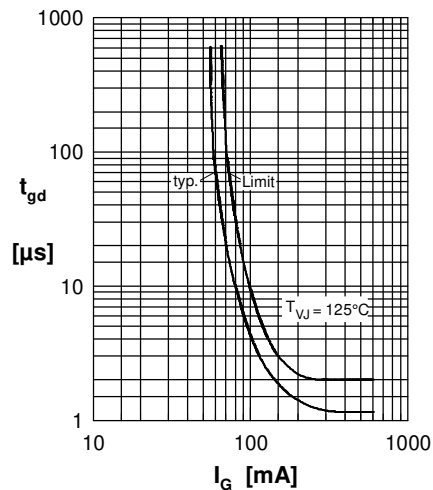


Fig. 5 Gate controlled delay time

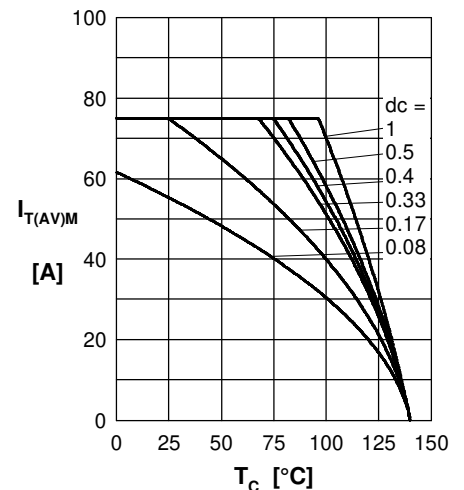


Fig. 6 Max. forward current at case temperature

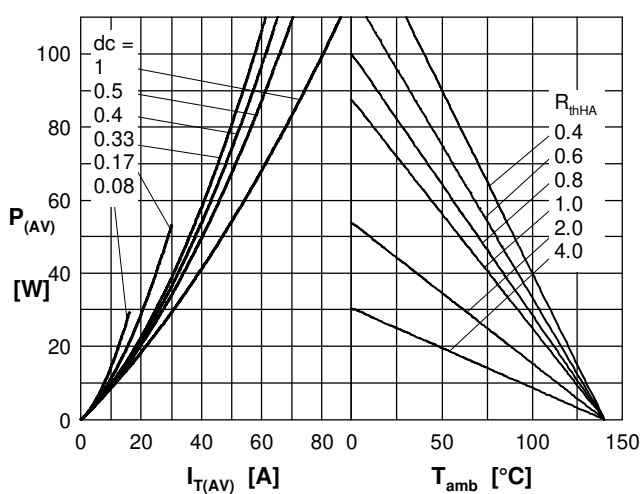
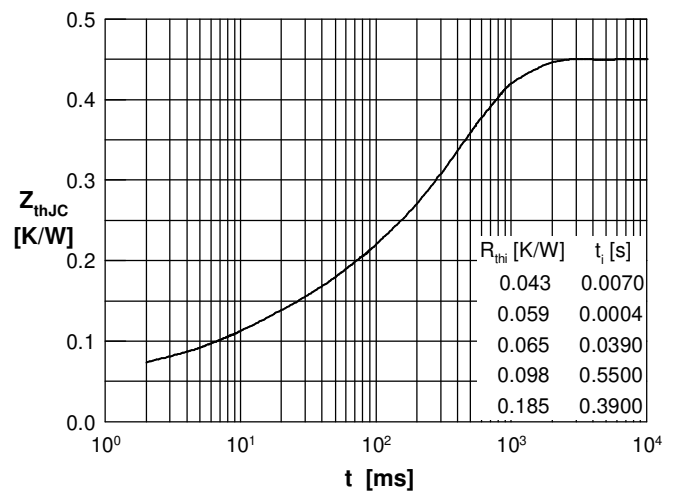

 Fig. 7a Power dissipation versus direct output current
 Fig. 7b and ambient temperature


Fig. 8 Transient thermal impedance junction to case