Thyristor

|		
V_{RRM}	=	**1600** V
I_{TAV}	=	**45** A
V_T	=	**1,37** V

Single Thyristor

Part number

CS45-16io1R

1

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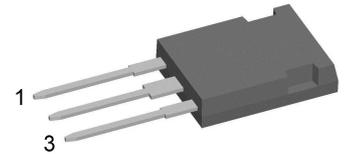
Backside: isolated

E72873

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3
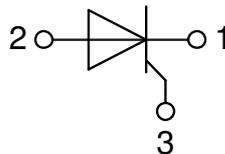
Features / Advantages:
- Thyristor for line frequency
- Planar passivated chip
- Long-term stability

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
- Soldering pins for PCB mounting
- Backside: DCB ceramic
- Reduced weight
- Advanced power cycling

Thyristor | | | | | Ratings | | |

Symbol	Definition	Conditions		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	$T_{VJ} = 25°C$			50	µA
		$V_{R/D} = 1600$ V	$T_{VJ} = 125°C$			3	mA
V_T	forward voltage drop	$I_T = 45$ A	$T_{VJ} = 25°C$			1,36	V
		$I_T = 90$ A				1,73	V
		$I_T = 45$ A	$T_{VJ} = 125°C$			1,37	V
		$I_T = 90$ A				1,85	V
I_{TAV}	average forward current	$T_C = 90°C$	$T_{VJ} = 150°C$			45	A
$I_{T(RMS)}$	RMS forward current	180° sine				71	A
V_{T0}	threshold voltage	} for power loss calculation only	$T_{VJ} = 150°C$			0,88	V
r_T	slope resistance					11	mΩ
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	$T_C = 25°C$				208	W
I_{TSM}	max. forward surge current	t = 10 ms; (50 Hz), sine	$T_{VJ} = 45°C$			520	A
		t = 8,3 ms; (60 Hz), sine	$V_R = 0$ V			560	A
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 150°C$			440	A
		t = 8,3 ms; (60 Hz), sine	$V_R = 0$ V			475	A
I^2t	value for fusing	t = 10 ms; (50 Hz), sine	$T_{VJ} = 45°C$			1,35	kA²s
		t = 8,3 ms; (60 Hz), sine	$V_R = 0$ V			1,31	kA²s
		t = 10 ms; (50 Hz), sine	$T_{VJ} = 150°C$			970	A²s
		t = 8,3 ms; (60 Hz), sine	$V_R = 0$ V			940	A²s
C_J	junction capacitance	$V_R = 400$ V f = 1 MHz	$T_{VJ} = 25°C$		22		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, $I_T = 135$ A				150	A/µs
		$t_P = 200$ µs; $di_G/dt = 0,3$ A/µs;					
		$I_G = 0,3$ A; V = ⅔ V_{DRM} non-repet., $I_T = 45$ A				500	A/µs
$(dv/dt)_{cr}$	critical rate of rise of voltage	V = ⅔ V_{DRM}	$T_{VJ} = 125°C$			1000	V/µs
		$R_{GK} = ∞$; method 1 (linear voltage rise)					
V_{GT}	gate trigger voltage	$V_D = 6$ V	$T_{VJ} = 25°C$			1,5	V
			$T_{VJ} = -40°C$			1,6	V
I_{GT}	gate trigger current	$V_D = 6$ V	$T_{VJ} = 25°C$			80	mA
			$T_{VJ} = -40°C$			200	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					10	mA
I_L	latching current	$t_p = 10$ µs	$T_{VJ} = 25°C$			150	mA
		$I_G = 0,3$ A; $di_G/dt = 0,3$ A/µs					
I_H	holding current	$V_D = 6$ V $R_{GK} = ∞$	$T_{VJ} = 25°C$			100	mA
t_{gd}	gate controlled delay time	$V_D = ½ V_{DRM}$	$T_{VJ} = 25°C$			2	µs
		$I_G = 0,3$ A; $di_G/dt = 0,3$ A/µs					
t_q	turn-off time	$V_R = 100$ V; $I_T = 45$ A; V = ⅔ V_{DRM} $T_{VJ} = 125$ °C			150		µs
		di/dt = 15 A/µs dv/dt = 20 V/µs $t_p = 200$ 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		150	°C
T_{op}	*operation temperature*		-40		125	°C
T_{stg}	*storage temperature*		-40		150	°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
		50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA t = 1 minute	3000			V

Product Marking

Logo → IXYS ®
ISOPLUS®
Part No. → XXXXXXXXX
Assembly Line → Zyyww
Assembly Code → abcd
Date Code →
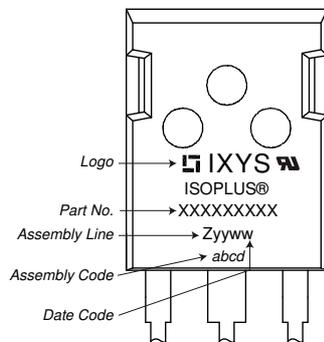
Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	CS45-16io1R	CS45-16io1R	Tube	30	480312

Similar Part	Package	Voltage class
CS45-08io1	TO-247AD (3)	800
CS45-12io1	TO-247AD (3)	1200
CS45-16io1	TO-247AD (3)	1600

Equivalent Circuits for Simulation   *on die level* $T_{VJ} = 150\,°C$
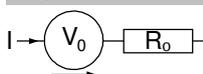
Thyristor

$V_{0\,max}$	*threshold voltage*	0,88	V
$R_{0\,max}$	*slope resistance**	8,5	mΩ

IXYS reserves the right to change limits, conditions and dimensions.   Data according to IEC 60747 and per semiconductor unless otherwise specified   20150827d

Outlines   ISOPLUS247
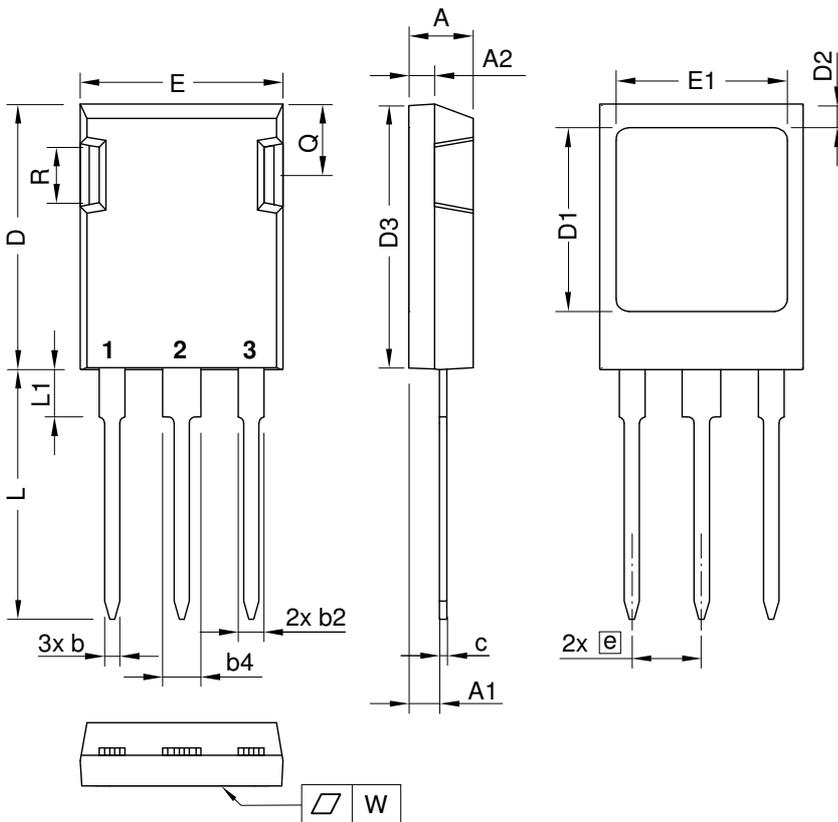
Dim.	Millimeter		Inches	
	min	max	min	max
A	4.83	5.21	0.190	0.205
A1	2.29	2.54	0.090	0.100
A2	1.91	2.16	0.075	0.085
b	1.14	1.40	0.045	0.055
b2	1.91	2.20	0.075	0.087
b4	2.92	3.24	0.115	0.128
c	0.61	0.83	0.024	0.033
D	20.80	21.34	0.819	0.840
D1	15.75	16.26	0.620	0.640
D2	1.65	2.15	0.065	0.085
D3	20.30	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 requiarement of JEDEC outline TO-247 AD except screw hole and except L_{max}.
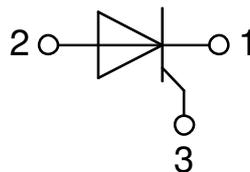
**Thyristor**
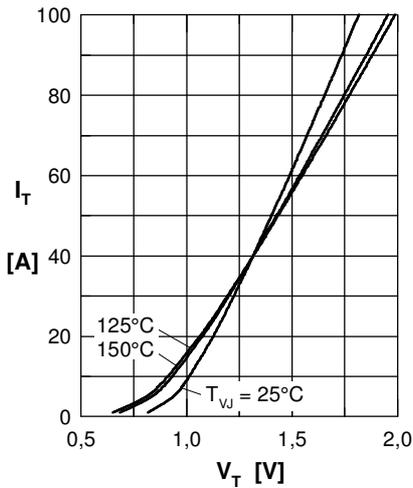
Fig. 1 Forward characteristics
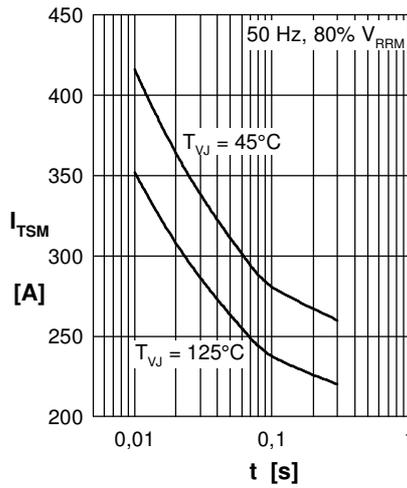

Fig. 2 Surge overload current
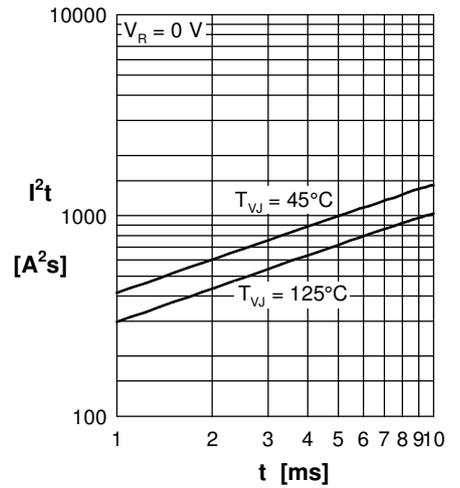
Fig. 3 I^2t versus time (1-10 ms)
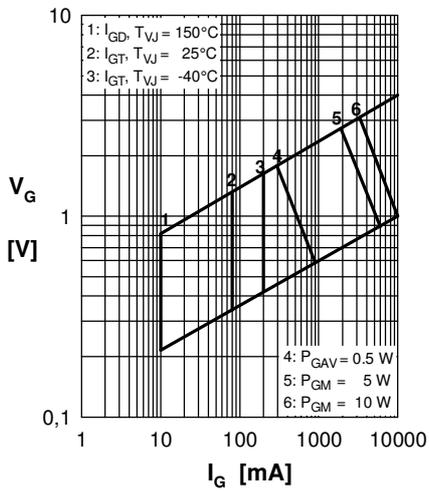
Fig. 4 Gate trigger characteristics
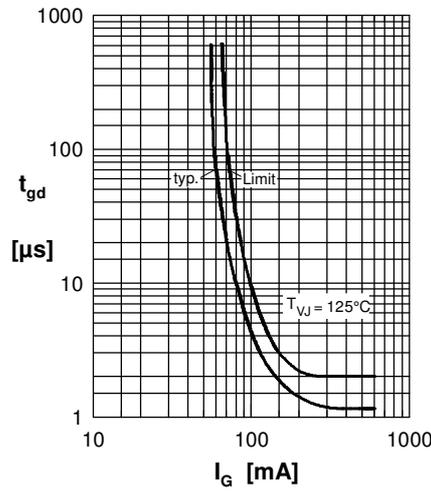
Fig. 5 Gate controlled delay time
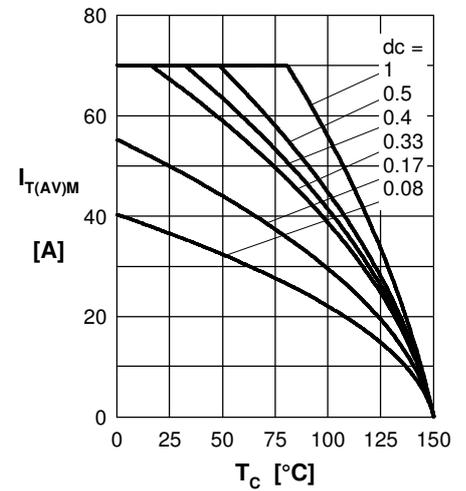
Fig. 6 Max. forward current
at case temperature
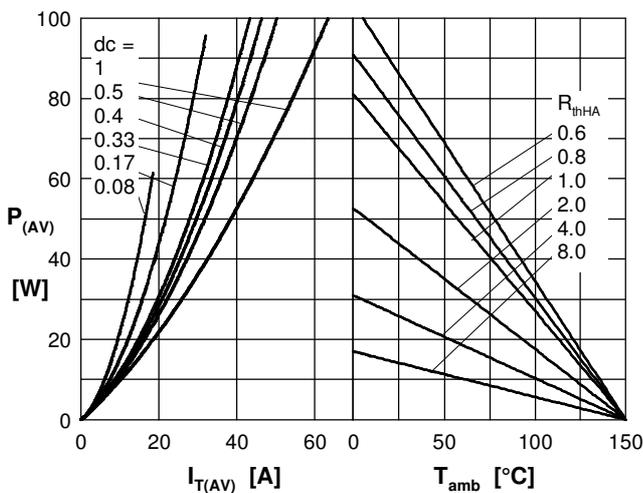
Fig. 7a Power dissipation versus direct output current
Fig. 7b and ambient temperature
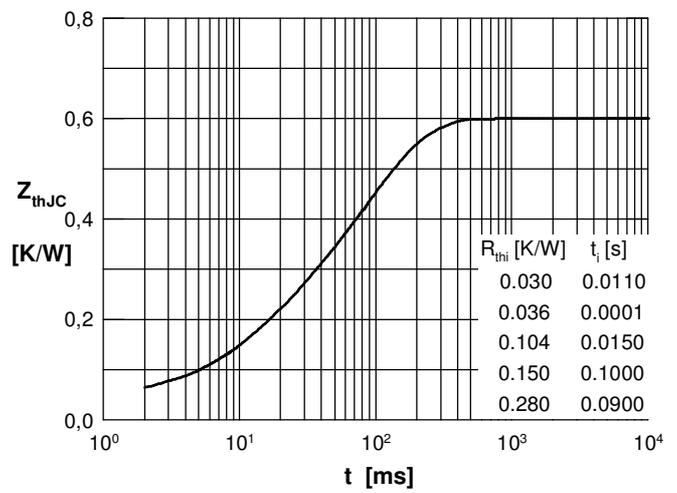
Fig. 8 Transient thermal impedance junction to case

R_{thi} [K/W]	t_i [s]
0.030	0.0110
0.036	0.0001
0.104	0.0150
0.150	0.1000
0.280	0.0900

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