High Voltage Thyristor Module

|		
V_{RRM}	$=$	$2 \times 2200\,V$
I_{TAV}	$=$	$165\,A$
V_T	$=$	$1.08\,V$

Phase leg
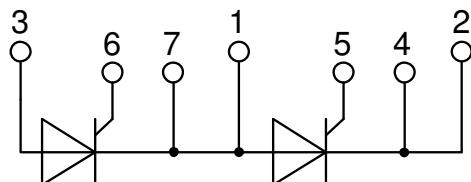
Part number

MCC161-22io1

Backside: isolated

E72873

Features / Advantages:
- Thyristor for line frequency
- Planar passivated chip
- Long-term stability
- Direct Copper Bonded Al2O3-ceramic

Applications:
- Line rectifying 50/60 Hz
- Softstart AC motor control
- DC Motor control
- Power converter
- AC power control
- Lighting and temperature control

Package: Y4
- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Base plate: DCB ceramic
- Reduced weight
- Advanced power cycling

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 your local sales office.
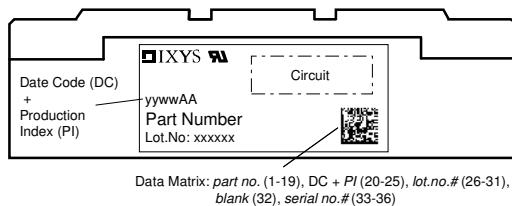
Due to technical requirements our product may contain dangerous substances. For information on the types in question please contact your local sales office.

Should you intend to use the product in aviation, in health or life 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.

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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°C				2300	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	T_{VJ} = 25°C				2200	V
$I_{R/D}$	reverse current, drain current	$V_{R/D}$ = 2200 V	T_{VJ} = 25°C			400	µA
		$V_{R/D}$ = 2200 V	T_{VJ} = 125°C			40	mA
V_T	forward voltage drop	I_T = 150 A	T_{VJ} = 25°C			1.14	V
		I_T = 300 A				1.36	V
		I_T = 150 A	T_{VJ} = 125°C			1.08	V
		I_T = 300 A				1.36	V
I_{TAV}	average forward current	T_C = 85°C	T_{VJ} = 125°C			165	A
$I_{T(RMS)}$	RMS forward current	180° sine				300	A
V_{T0}	threshold voltage } for power loss calculation only		T_{VJ} = 125°C			0.80	V
r_T	slope resistance }					1.6	mΩ
R_{thJC}	thermal resistance junction to case					0.155	K/W
R_{thCH}	thermal resistance case to heatsink				0.070		K/W
P_{tot}	total power dissipation	T_C = 25°C				645	W
I_{TSM}	max. forward surge current	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			6.00	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			6.48	kA
		t = 10 ms; (50 Hz), sine	T_{VJ} = 125°C			5.10	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			5.51	kA
I^2t	value for fusing	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			180.0	kA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			174.7	kA²s
		t = 10 ms; (50 Hz), sine	T_{VJ} = 125°C			130.1	kA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			126.3	kA²s
C_J	junction capacitance	V_R = 700 V f = 1 MHz	T_{VJ} = 25°C		195		pF
P_{GM}	max. gate power dissipation	t_P = 30 µs	T_C = 125°C			120	W
		t_P = 500 µs				60	W
P_{GAV}	average gate power dissipation					8	W
$(di/dt)_{cr}$	critical rate of rise of current	T_{VJ} = 125°C; f = 50 Hz repetitive, I_T = 500 A				150	A/µs
		t_P = 200 µs; di_G/dt = 0.5 A/µs;					
		I_G = 0.5 A; V = ⅔ V_{DRM} non-repet., I_T = 160 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			2	V
			T_{VJ} = -40°C			2.6	V
I_{GT}	gate trigger current	V_D = 6 V	T_{VJ} = 25°C			150	mA
			T_{VJ} = -40°C			200	mA
V_{GD}	gate non-trigger voltage	V_D = ⅔ V_{DRM}	T_{VJ} = 125°C			0.25	V
I_{GD}	gate non-trigger current					10	mA
I_L	latching current	t_p = 30 µs	T_{VJ} = 25°C			200	mA
		I_G = 0.45 A; di_G/dt = 0.45 A/µs					
I_H	holding current	V_D = 6 V R_{GK} = ∞	T_{VJ} = 25°C			200	mA
t_{gd}	gate controlled delay time	V_D = ½ V_{DRM}	T_{VJ} = 25°C			2	µs
		I_G = 0.5 A; di_G/dt = 0.5 A/µs					
t_q	turn-off time	V_R = 100 V; I_T = 160 A; V = ⅔ V_{DRM} T_{VJ} = 100 °C			150		µs
		di/dt = 10 A/µs dv/dt = 20 V/µs t_p = 200 µs					

Package	Y4					Ratings	
Symbol	Definition	Conditions		min.	typ.	max.	Unit
I_{RMS}	RMS current	per terminal				300	A
T_{VJ}	virtual junction temperature			-40		125	°C
T_{op}	operation temperature			-40		100	°C
T_{stg}	storage temperature			-40		125	°C
Weight					150		g
M_D	mounting torque			2.25		2.75	Nm
M_T	terminal torque			4.5		5.5	Nm
$d_{Spp/App}$	creepage distance on surface | striking distance through air	terminal to terminal	14.0	10.0			mm
$d_{Spb/Apb}$		terminal to backside	16.0	16.0			mm
V_{ISOL}	isolation voltage	t = 1 second		3600			V
		t = 1 minute	50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA	3000			V

Date Code (DC) + Production Index (PI)

yywwAA
Part Number
Lot.No: xxxxxx

Circuit

Data Matrix: *part no.* (1-19), DC + *PI* (20-25), *lot.no.#* (26-31), *blank* (32), *serial no.#* (33-36)
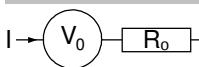
Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCC161-22io1	MCC161-22io1	Box	6	463515

Equivalent Circuits for Simulation   *on die level* $T_{VJ} = 125\,°C$
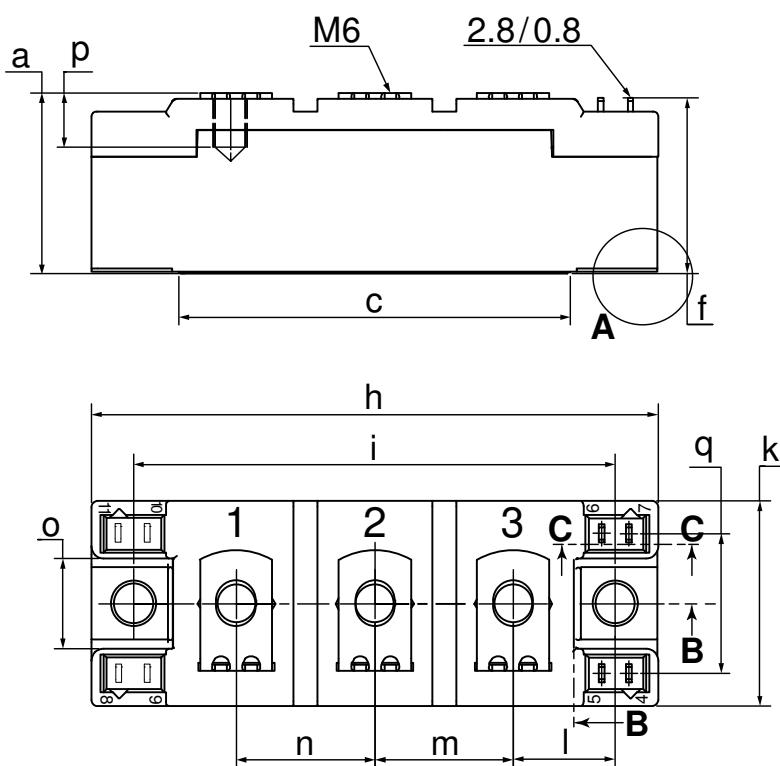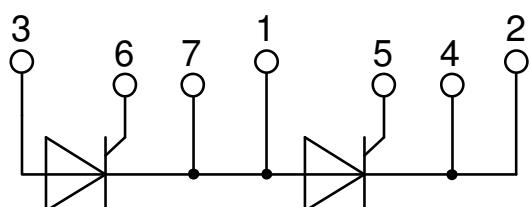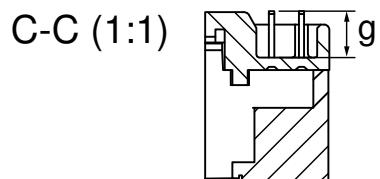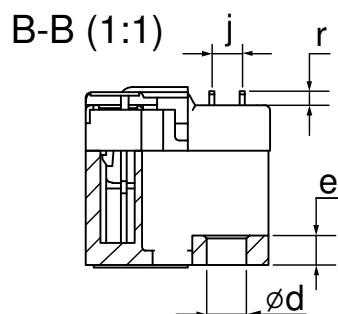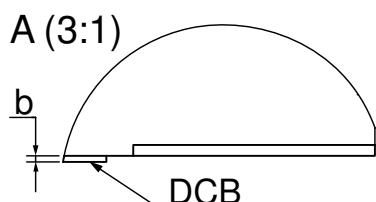

Thyristor

$V_{0\ max}$	threshold voltage	0.8	V
$R_{0\ max}$	slope resistance *	0.9	mΩ

Outlines   Y4

Dim.	MIN [mm]	MAX [mm]	MIN [inch]	MAX [inch]
a	30.0	30.6	1.181	1.205
b	typ. 0.25		typ. 0.010	
c	64.0	65.0	2.520	2.559
d	6.5	7.0	0.256	0.275
e	4.9	5.1	0.193	0.201
f	28.6	29.2	1.126	1.150
g	7.3	7.7	0.287	0.303
h	93.5	94.5	3.681	3.720
i	79.5	80.5	3.130	3.169
j	4.8	5.2	0.189	0.205
k	33.4	34.0	1.315	1.339
l	16.7	17.3	0.657	0.681
m	22.7	23.3	0.894	0.917
n	22.7	23.3	0.894	0.917
o	14.0	15.0	0.551	0.591
p	typ. 10.5		typ. 0.413	
q	22.8	23.3	0.898	0.917
r	1.8	2.4	0.071	0.041

A (3:1)

B-B (1:1)

C-C (1:1)

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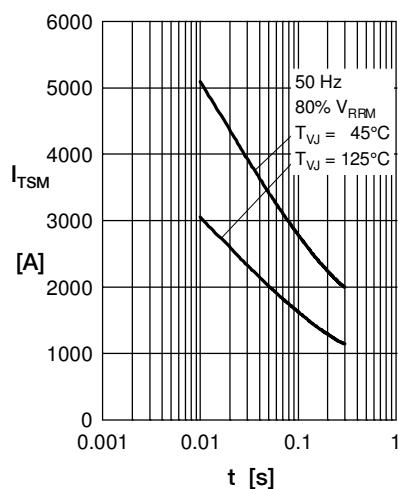
Thyristor

Fig. 1 Surge overload current I_{TSM}, I_{FSM}: Crest value, t: duration
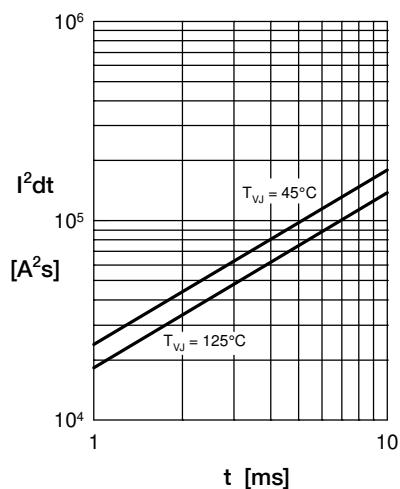

Fig. 2 I^2t versus time (1-10 ms)
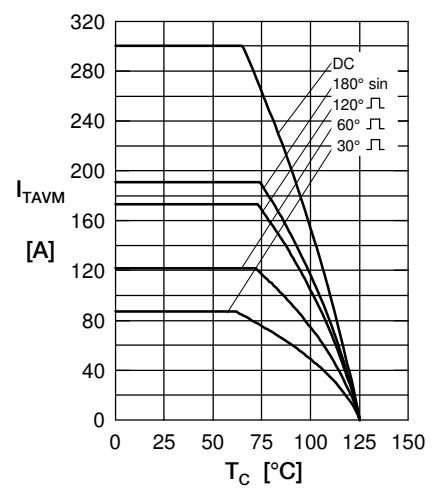
Fig. 3 Max. forward current at case temperature
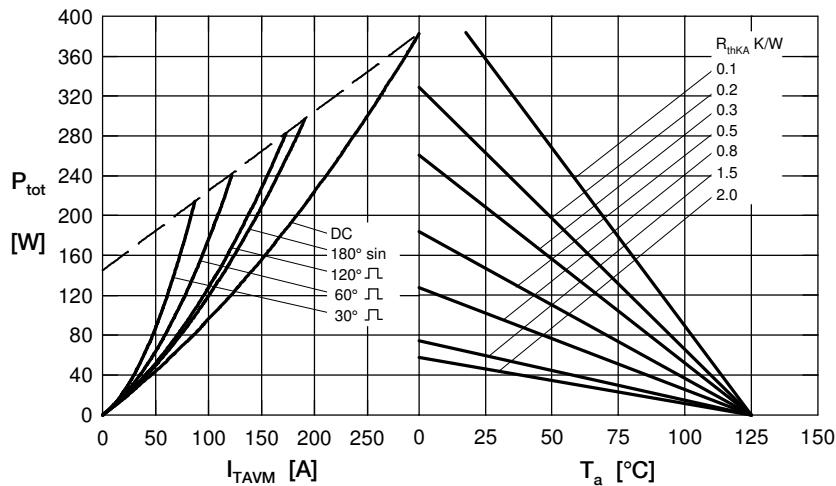
Fig. 4 Power dissipation vs. on-state current & ambient temperature (per thyristor or diode)
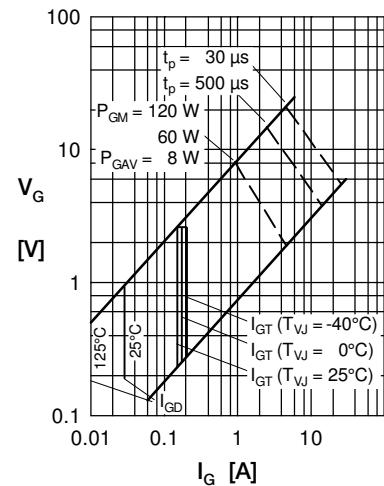

Fig. 5 Gate trigger characteristics
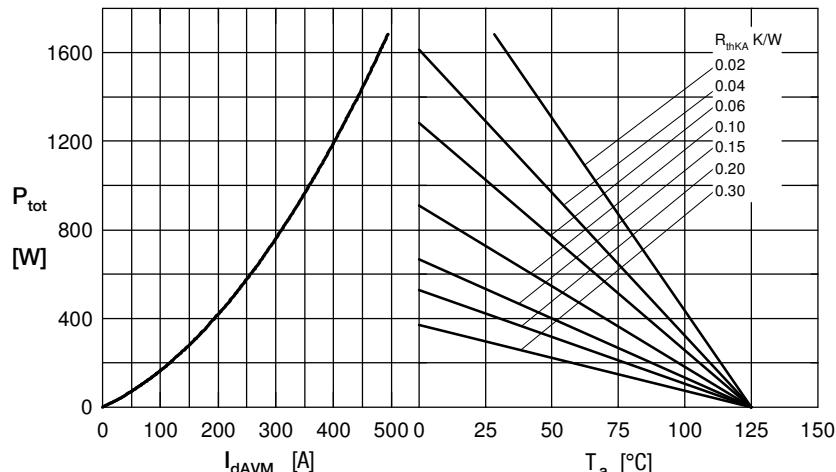
Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature
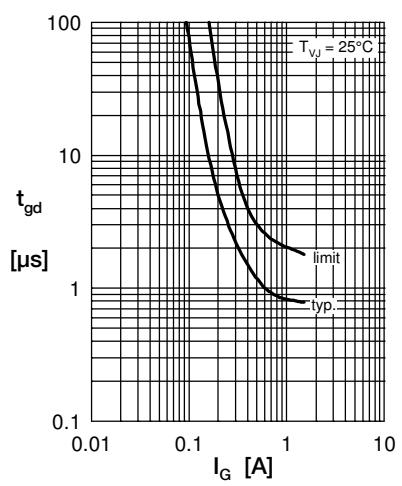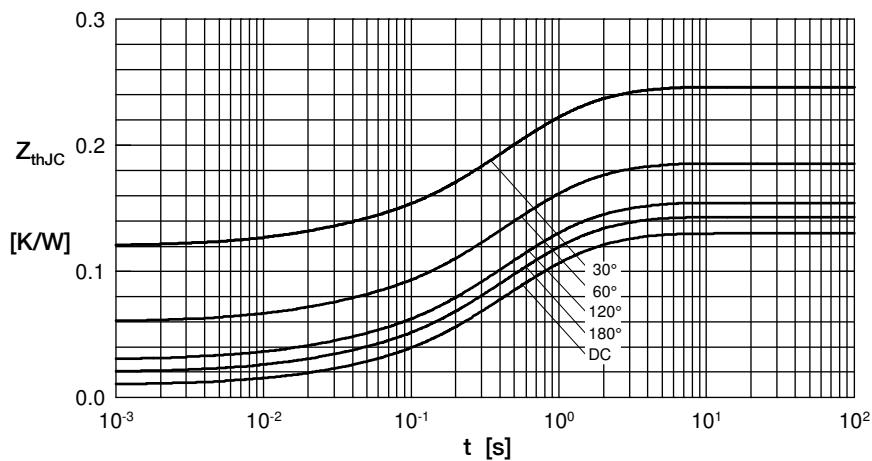

Fig. 7 Gate trigger delay time

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Thyristor

Z_{thJC}

[K/W]

Fig. 8 Transient thermal impedance junction to case at various conduction angles

R_{thJC} for various conduction angles d:

d	R_{thJC} [K/W]
DC	0.155
180°	0.171
120°	0.184
60°	0.222
30°	0.294

Constants for Z_{thJC} calculation:

i	R_{thi} [K/W]	t_i [s]
1	0.012	0.00014
2	0.008	0.019
3	0.030	0.180
4	0.073	0.520
5	0.032	1.600