

Thyristor Module

V_{RRM} = 2x 1200 V

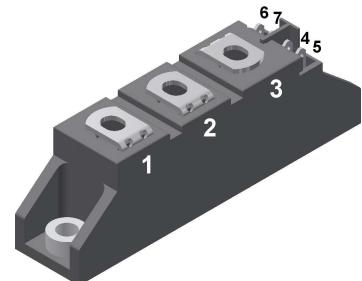
I_{TAV} = 18 A

V_T = 1.57 V

Phase leg

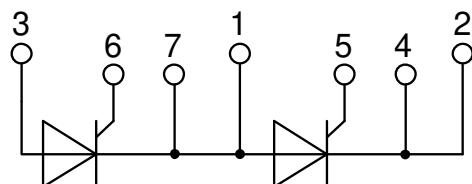
Part number

MCC19-12io1B



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: TO-240AA

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

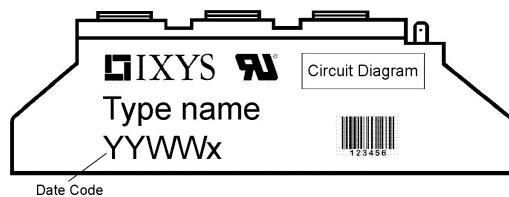
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Thyristor

Symbol	Definition	Conditions	Ratings			
			min.	typ.	max.	
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^\circ C$			1300	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^\circ C$			1200	V
$I_{R/D}$	reverse current, drain current	$V_{R/D} = 1200 \text{ V}$ $V_{R/D} = 1200 \text{ V}$	$T_{VJ} = 25^\circ C$ $T_{VJ} = 125^\circ C$		100 3	μA mA
V_T	forward voltage drop	$I_T = 40 \text{ A}$	$T_{VJ} = 25^\circ C$		1.56	V
		$I_T = 80 \text{ A}$			2.05	V
		$I_T = 40 \text{ A}$	$T_{VJ} = 125^\circ C$		1.57	V
		$I_T = 80 \text{ A}$			2.29	V
I_{TAV}	average forward current	$T_C = 85^\circ C$	$T_{VJ} = 125^\circ C$		18	A
$I_{T(RMS)}$	RMS forward current	180° sine			28	A
V_{T0}	threshold voltage	r_T slope resistance } for power loss calculation only	$T_{VJ} = 125^\circ C$		0.85	V
	slope resistance				18	$m\Omega$
R_{thJC}	thermal resistance junction to case				1.3	K/W
R_{thCH}	thermal resistance case to heatsink			0.2		K/W
P_{tot}	total power dissipation		$T_C = 25^\circ C$		77	W
I_{TSM}	max. forward surge current	$t = 10 \text{ ms}; (50 \text{ Hz}), \text{sine}$	$T_{VJ} = 45^\circ C$		400	A
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{sine}$	$V_R = 0 \text{ V}$		430	A
		$t = 10 \text{ ms}; (50 \text{ Hz}), \text{sine}$	$T_{VJ} = 125^\circ C$		340	A
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{sine}$	$V_R = 0 \text{ V}$		365	A
I^2t	value for fusing	$t = 10 \text{ ms}; (50 \text{ Hz}), \text{sine}$	$T_{VJ} = 45^\circ C$		800	$A^2\text{s}$
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{sine}$	$V_R = 0 \text{ V}$		770	$A^2\text{s}$
		$t = 10 \text{ ms}; (50 \text{ Hz}), \text{sine}$	$T_{VJ} = 125^\circ C$		580	$A^2\text{s}$
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{sine}$	$V_R = 0 \text{ V}$		555	$A^2\text{s}$
C_J	junction capacitance	$V_R = 400 \text{ V}$ $f = 1 \text{ MHz}$	$T_{VJ} = 25^\circ C$	22		pF
P_{GM}	max. gate power dissipation	$t_p = 30 \mu s$	$T_C = 125^\circ C$		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	$T_{VJ} = 125^\circ C; f = 50 \text{ Hz}$ repetitive, $I_T = 75 \text{ A}$			150	$A/\mu s$
		$t_p = 200 \mu s; di_G/dt = 0.45 \text{ A}/\mu s;$				
		$I_G = 0.45 \text{ A}; V = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 18 \text{ A}$			500	$A/\mu s$
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V = \frac{2}{3} V_{DRM}$	$T_{VJ} = 125^\circ C$		1000	$V/\mu s$
		$R_{GK} = \infty$; 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	$V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 125^\circ C$		0.2	V
I_{GD}	gate non-trigger current				5	mA
I_L	latching current	$t_p = 10 \mu s$	$T_{VJ} = 25^\circ C$		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	μs
		$I_G = 0.45 \text{ A}; di_G/dt = 0.45 \text{ A}/\mu s$				
t_q	turn-off time	$V_R = 100 \text{ V}; I_T = 20 \text{ A}; V = \frac{2}{3} V_{DRM}$ $T_{VJ} = 100^\circ C$		150		μs
		$di/dt = 10 \text{ A}/\mu s$ $dv/dt = 20 \text{ V}/\mu s$ $t_p = 200 \mu s$				

Package TO-240AA			Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit
I_{RMS}	RMS current	per terminal			200	A
T_{VJ}	virtual junction temperature		-40		125	°C
T_{op}	operation temperature		-40		100	°C
T_{stg}	storage temperature		-40		125	°C
Weight				81		g
M_D	mounting torque		2.5		4	Nm
M_T	terminal torque		2.5		4	Nm
$d_{Spp/App}$	creepage distance on surface / striking distance through air		terminal to terminal	13.0	9.7	mm
$d_{Spb/Apb}$			terminal to backside	16.0	16.0	mm
V_{ISOL}	isolation voltage	t = 1 second t = 1 minute 50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA		3600		V
				3000		V

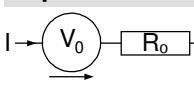


Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCC19-12io1B	MCC19-12io1B	Box	36	452831

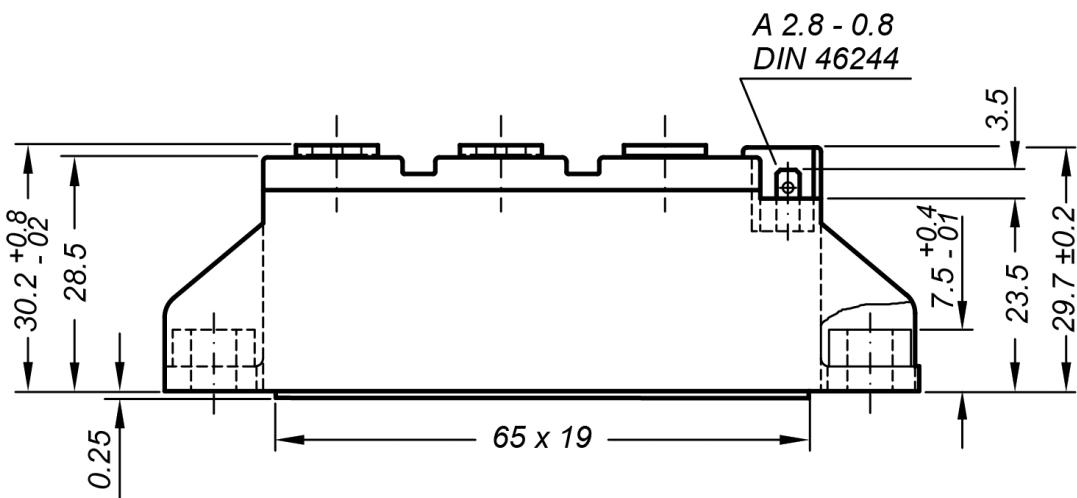
Similar Part	Package	Voltage class
MCMA25P1200TA	TO-240AA-1B	1200
MCMA35P1200TA	TO-240AA-1B	1200

Equivalent Circuits for Simulation

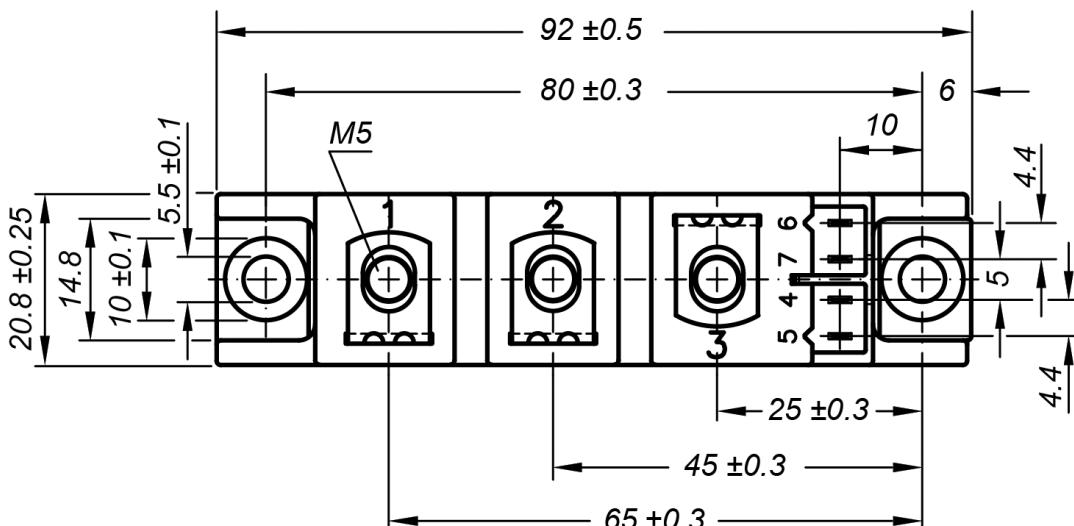
* on die level
 $T_{VJ} = 125^\circ\text{C}$

	Thyristor
V_0	
$V_{0\max}$	threshold voltage 0.85 V
$R_{0\max}$	slope resistance * 16.8 mΩ

Outlines TO-240AA

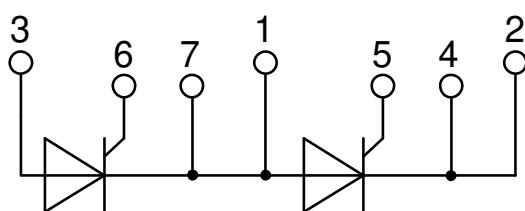


General tolerance: DIN ISO 2768 class „c“



Optional accessories for modules

Keyed gate/cathode twin plugs with wire length = 350 mm, gate = white, cathode = red
Type ZY 200L (L = Left for pin pair 4/5) } UL 758, style 3751
Type ZY 200R (R = Right for pin pair 6/7) }



Thyristor

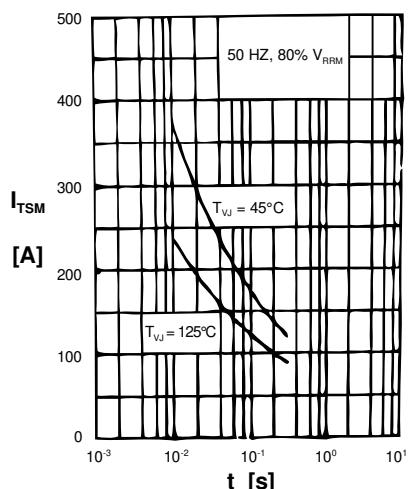


Fig. 1 Surge overload current
 I_{TSM} : Crest value, t : duration

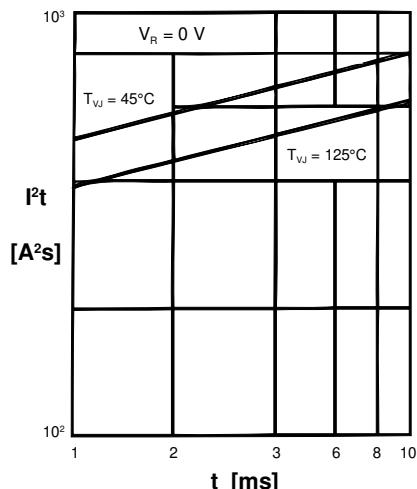


Fig. 2 I^2t versus time (1-10 ms)

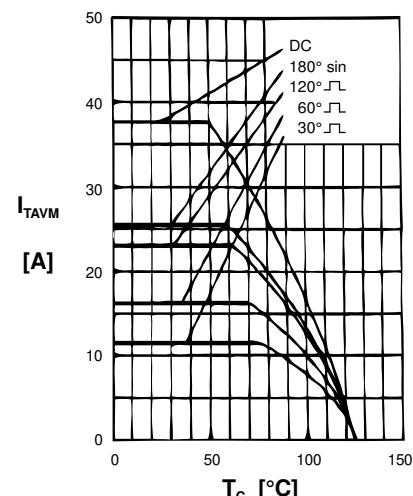


Fig. 3 Max. forward current
at case temperature

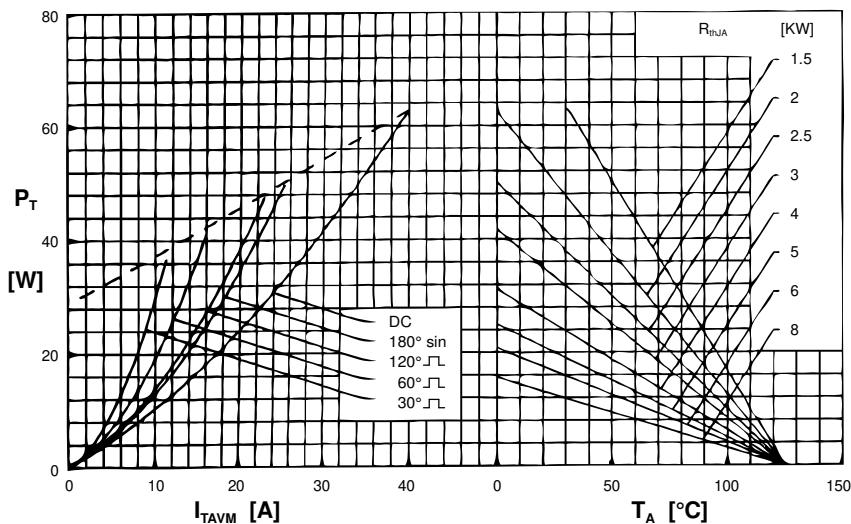


Fig. 4 Power dissipation versus onstate current & ambient temp. (per thyristor)

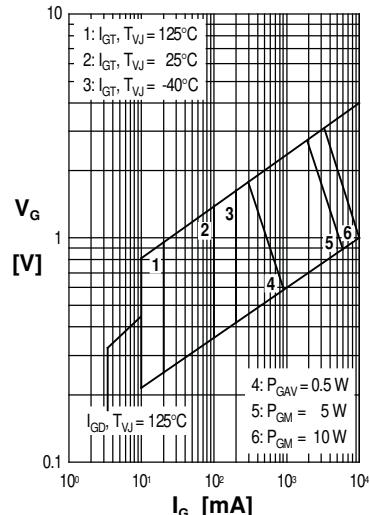


Fig. 5 Gate trigger charact.

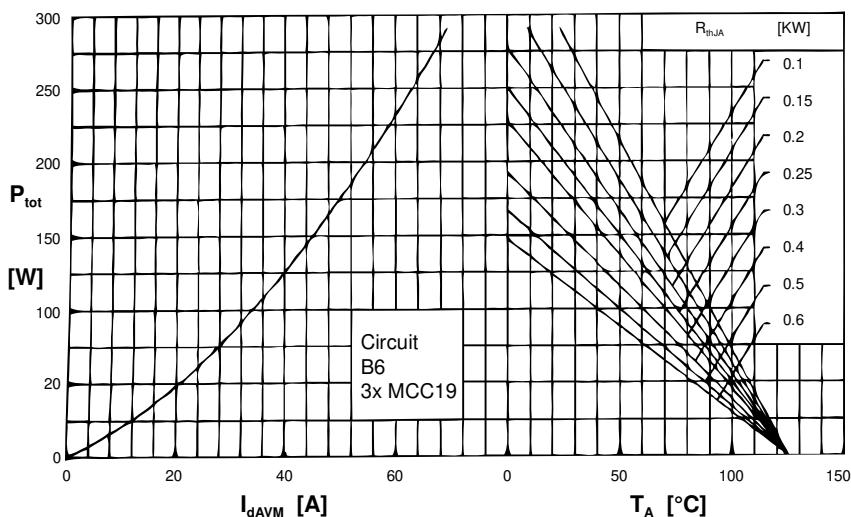


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

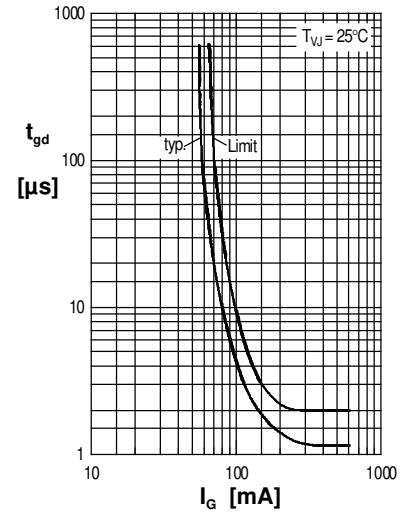


Fig. 7 Gate trigger delay time

Thyristor

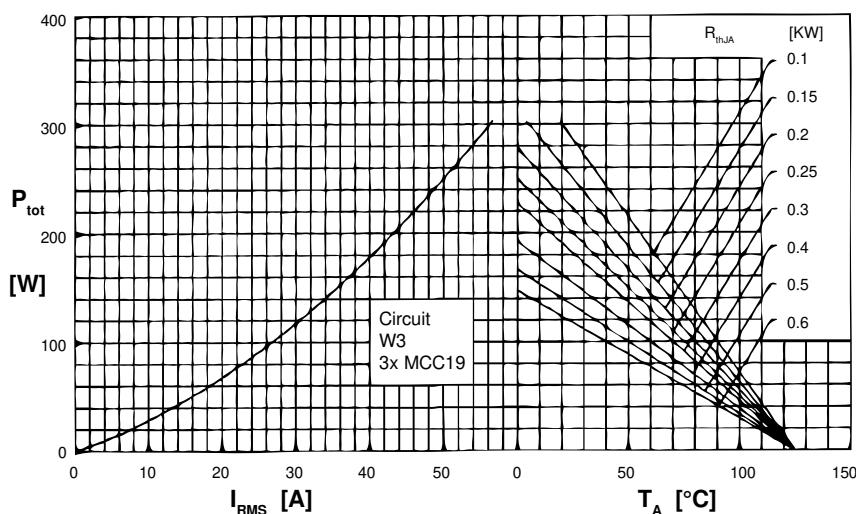


Fig. 8 Three phase AC-controller: Power dissipation vs. RMS output current and ambient temperature

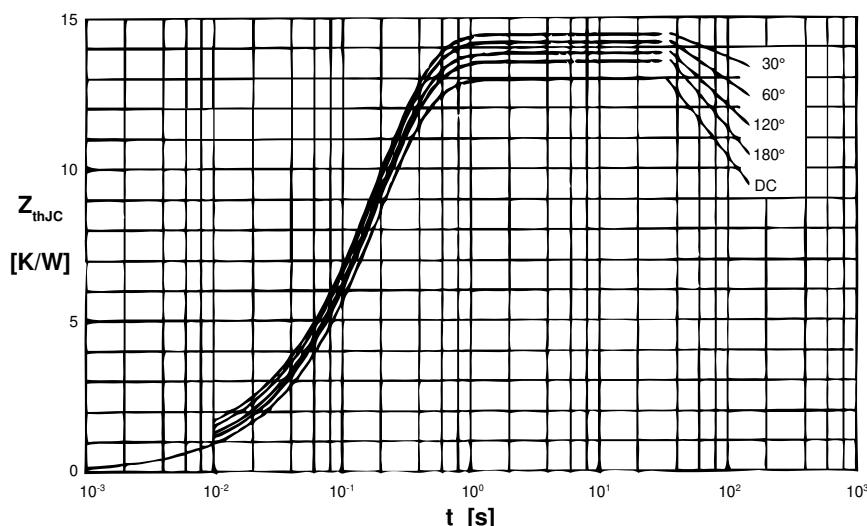


Fig. 9 Transient thermal impedance junction to case (per thyristor)

R_{thJC} for various conduction angles d:

d	R_{thJC} [K/W]
DC	1.30
180°	1.35
120°	1.39
60°	1.42
30°	1.45

Constants for Z_{thJC} calculation:

i	R_{thi} [K/W]	t_i [s]
1	0.018	0.0033
2	0.041	0.0216
3	1.241	0.1910

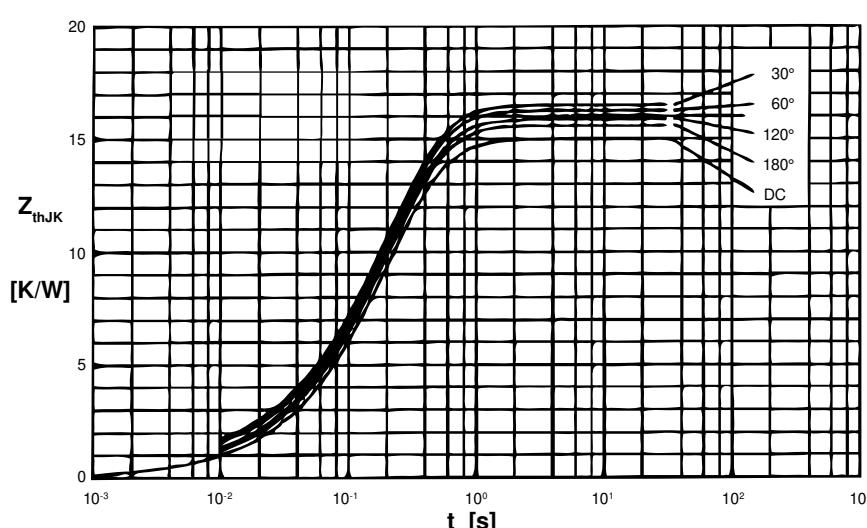


Fig. 10 Transient thermal impedance junction to heatsink (per thyristor)

R_{thJK} for various conduction angles d:

d	R_{thJK} [K/W]
DC	1.50
180°	1.55
120°	1.59
60°	1.62
30°	1.65

Constants for Z_{thJK} calculation:

i	R_{thi} [K/W]	t_i [s]
1	0.018	0.0033
2	0.041	0.0216
3	1.241	0.1910
4	0.200	0.4600

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Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

moschip.ru
moschip.ru_4

moschip.ru_6
moschip.ru_9