High Power Thyristor
Hockey Puk Version
A-PUK Series 400PA

Types : 400PA 20 to 400PA 160

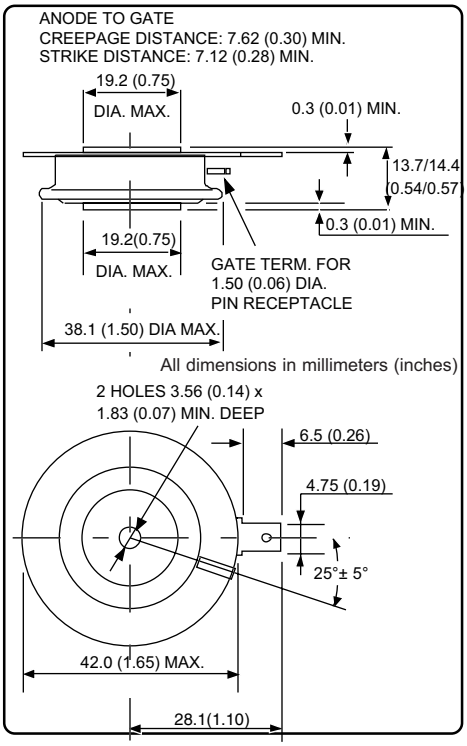
FEATURES

- *Center amplifying gate.*
- *International standard case TO-200AB (A-PUK)*

TYPICAL APPLICATIONS

- *DC motor control (e.g. for machine tools).*
- *Controlled rectifiers (e.g. for battery charging, UPS).*
- *AC controllers (e.g. for temperature control, lights control).*

400 PA ...



MAJOR RATINGS & CHARACTERISTICS

Parameters		400PA	Units
$I_{T(AV)}$		410	A
	@ T_{hs}	55	^{0}C
$I_{T(RMS)}$		780	A
	@ T_{hs}	25	^{0}C
I_{TSM}	@ 50 Hz	5700	A
I^2t	@ 50 Hz	163	KA^2s
V_{DRM} / V_{RRM}		200 to 1600	V
t_q	typical	100	µs
T_J		-40 to 125	^{0}C

SILICON CONTROLLED RECTIFIERS

400PA

ELECTRICAL SPECIFICATION

VOLTAGE RATINGS

Type Number	Voltage Code	V_{RRM} / V_{DRM}, max. repetitive peak and off-state voltage V	V_{RSM}, max. non-repetitive peak voltage V	I_{DRM} / I_{RRM} max. @ 125°C mA
400PA	20	200	300	30
	40	400	500	
	60	600	700	
	80	800	900	
	100	1000	1100	
	120	1200	1300	
	140	1400	1500	
	160	1600	1700	

ON-STATE CONDUCTION

	Parameter	400PA	Units	Conditions		
$I_{T(AV)}$	Max. average on-state current	410(165)	A	180° conduction, half sine wave		
	@ heat sink temperature	55(85)	°C	double side (single side) cooled		
$I_{T(RMS)}$	Max. RMS on-state current	780	A	@25°C heat sink temperature (double side cooled)		
I_{TSM}	Max. peak , one cycle non-repetitive surge current	5700	A	t = 10ms	No voltage reapplied	Sinusodial half wave, Initial $T_J = T_J$ max.
		4800		t = 10ms	100%V_{RRM} reapplied	
I^2t	Maximum I^2t for fusing	163	kA^2s	t = 10ms	No voltage reapplied	
		115		t = 10ms	100%V_{RRM} reapplied	
$I^2\sqrt{t}$	Maximum $I^2\sqrt{t}$ for fusing	1630	$kA^2\sqrt{s}$	t = 0.1 to 10ms. No voltage reapplied.		
$V_{T(TO)1}$	Low level value of threshold voltage	0.92	V	(16.7% x π x $I_{F(AV)}$ < I < π x $I_{F(AV)}$), $T_J = T_J$ max.		
$V_{T(TO)2}$	High level value of threshold voltage	0.98		(π x $I_{F(AV)}$ < I < 20 x π x $I_{F(AV)}$), $T_J = T_J$ max.		
r_{t1}	Low level value of on state slope resistance	0.88	mΩ	(16.7% x π x $I_{F(AV)}$ < I < π x $I_{F(AV)}$), $T_J = T_J$ max.		
r_{t2}	High level value of on state slope resistance	0.81		(π x $I_{F(AV)}$ < I < 20 x π x $I_{F(AV)}$), $T_J = T_J$ max.		
V_{TM}	Max. on state voltage	1.69	V	I_{pk} = 880A, T_J = 125°C, t_p = 10ms sine pulse		
I_H	Maximum holding current	300	mA	T_J = 25°C, anode supply 12V resistive load		
I_L	Latching current	600				

SWITCHING

	Parameter	400PA	Units	Conditions
di/dt	Max. non-repetitive rate of rise of turned-on current	1000	A/µs	Gate drive 20V, 20Ω, tr ≤ 1 µs T_J = 125°C, anode voltage ≤ 80% V_{DRM}
t_d	Typical delay time	1.0	µs	Gate current 1A, di_g/dt = 1A/µs V_d = 0.67% V_{DRM}, T_J = 25°C
t_q	Typical turn-off time	100		I_{TM} = 300A, T_J = 125°C, di/dt = 20A/µs, V_R = 50V dv/dt = 20V/µs, Gate 0V 100Ω, t_p = 500µs

SILICON CONTROLLED RECTIFIERS

400PA

BLOCKING

	Parameter	400PA	Units	Conditions
dv/dt	Maximum critical rate of rise of off-state voltage	1000	V/µs	T_J = 125°C, linear to 80% rated V_{DRM}
I_{RRM} I_{DRM}	Max. peak reverse and off-state leakage current	30	mA	T_J = 125°C, rated V_{DRM}/V_{RRM} applied

TRIGGERING

	Parameter	400PA		Units	Conditions	
P_{GM}	Maximum peak gate power	10.0		W	T_J = 125°C, $t_p \leq$ 5ms	
$P_{G(AV)}$	Maximum average gate power	2.0			T_J = 125°C, f= 50Hz, d% = 50	
I_{GM}	Max. peak positive gate current	3.0		A	T_J = 125°C, $t_p \leq$ 5ms	
$+V_{GM}$	Max. peak positive gate voltage	20		V	T_J = 125°C, $t_p \leq$ 5ms	
$-V_{GM}$	Max. peak negative gate voltage	5.0				
		TYP.	MAX.			
I_{GT}	DC gate current required to trigger	180 90 40	-- 150 --	mA	T_J = -40°C T_J = 25°C T_J = 125°C	Max. required gate trigger/current / voltage are the lowest value which will trigger all units 12V anode-to-cathode applied.
V_{GT}	DC gate voltage required to trigger	2.9 1.8 1.2	-- 3.0 --	V	T_J = -40°C T_J = 25°C T_J = 125°C	
I_{GD}	DC gate current not to trigger	10		mA	T_J = 125°C	Max. gate current / voltage not to trigger is the max. value which will not trigger any unit with rated V_{DRM} anode-to-cathode applied.
V_{GD}	DC gate voltage not to trigger	0.25		V		

THERMAL AND MECHANICAL SPECIFICATION

	Parameter	400PA	Units	Conditions
T_J	Max. operating temperature range	-40 to 125	°C	
T_{stg}	Max. storage temperature range	-40 to 150		
$R_{thJ\text{-}hs}$	Max. thermal resistance, junction to heat sink	0.17	K/W	DC operation single side cooled
		0.08		DC operation double side cooled
F	Mounting force, ±10%	4900 (500)	N (kg)	
wt	Approximate weight	50	g	
	Case style	To - 200AB (A-PUK)		See outline

400 PA

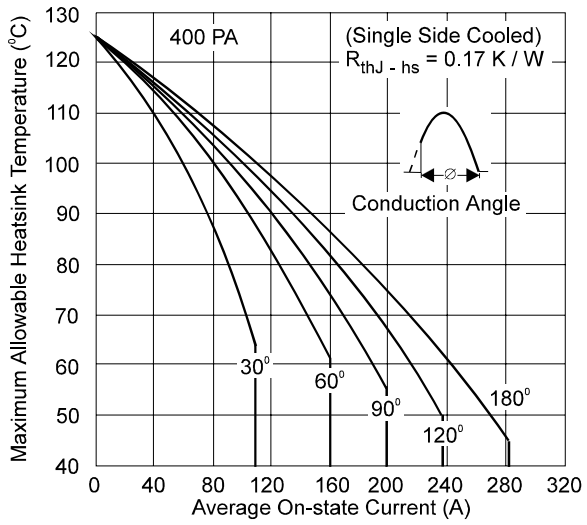


Fig. 1 - Current Ratings Characteristics

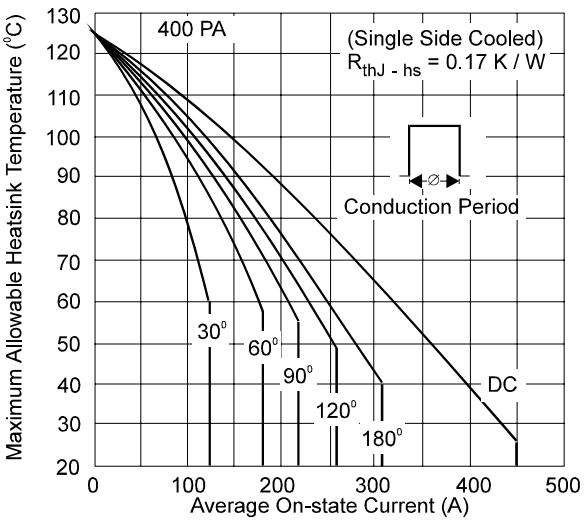


Fig. 2 - Current Ratings Characteristics

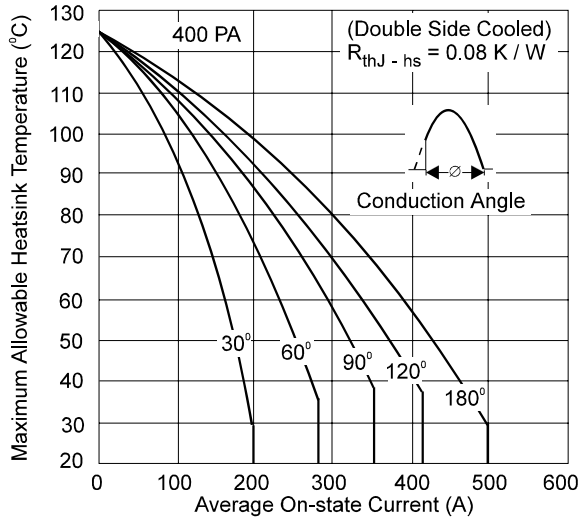


Fig. 3 - Current Ratings Characteristics

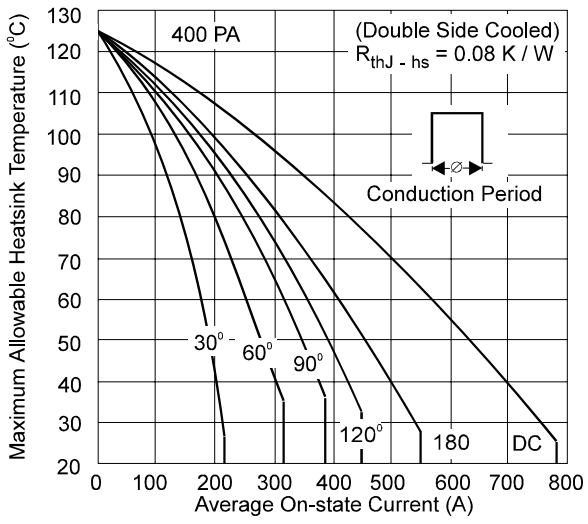


Fig. 4 - Current Ratings Characteristics

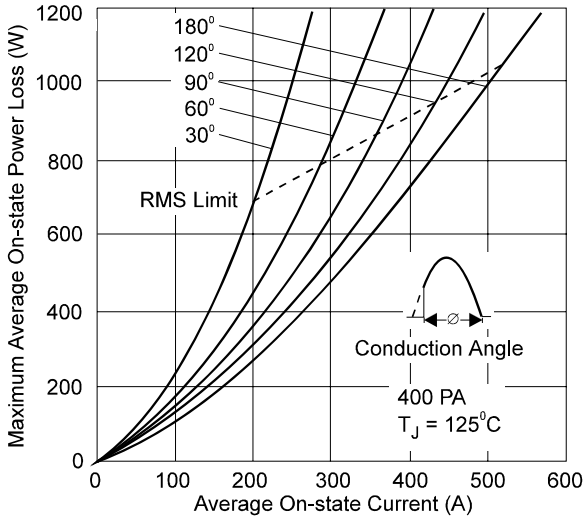


Fig. 5 - On-state Power Loss Characteristics

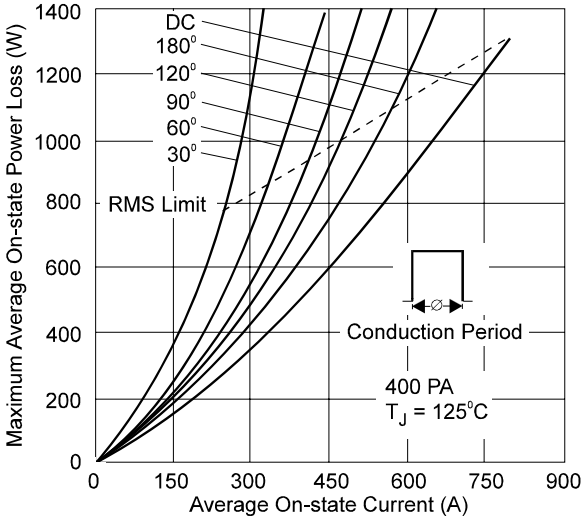


Fig. 6 - On-state Power Loss Characteristics

400 PA

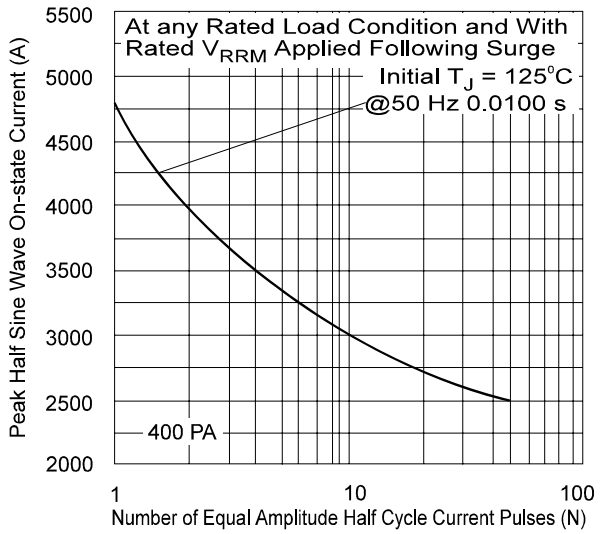


Fig. 7 - Maximum Non-Repetitive Surge Current

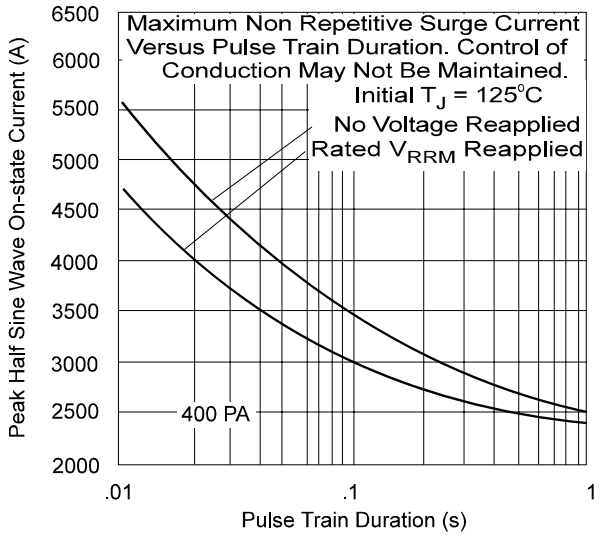


Fig. 8 - Maximum Non-Repetitive Surge Current

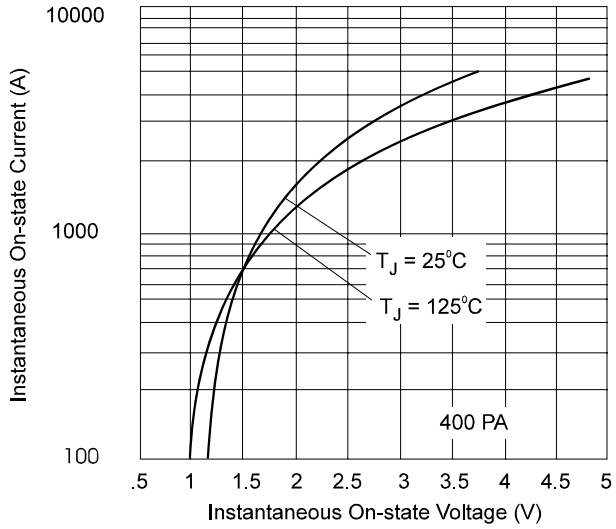


Fig. 9 - On-state Voltage Drop Characteristics

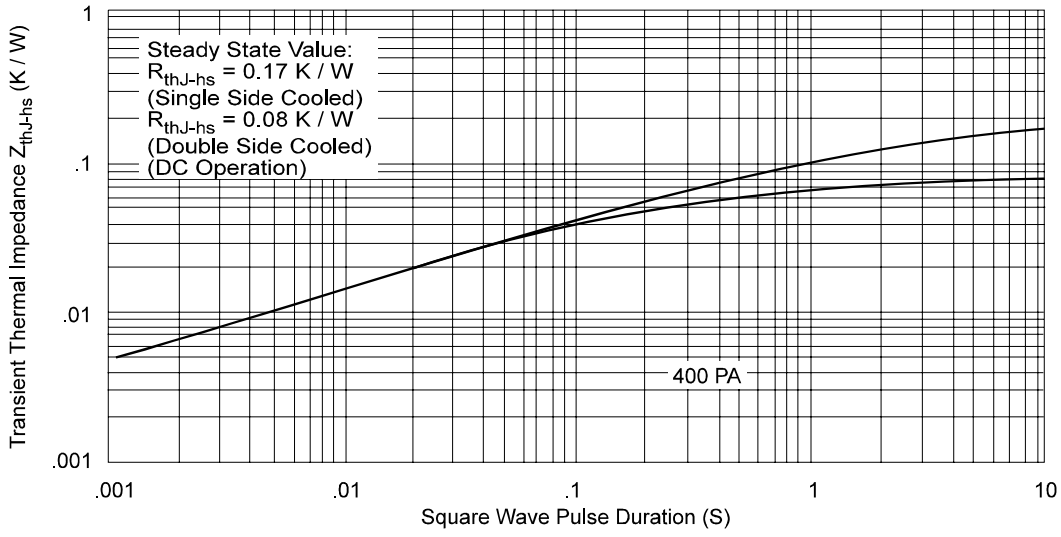


Fig. 10 - Thermal Impedance Z_{thJ-hs} Characteristics

400 PA

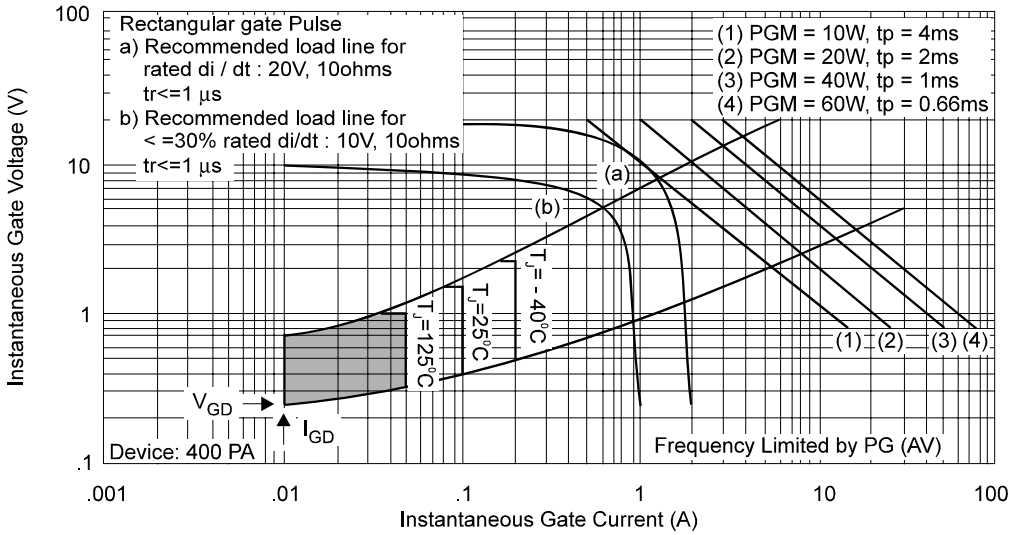


Fig.11 - Gate Characteristics

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