



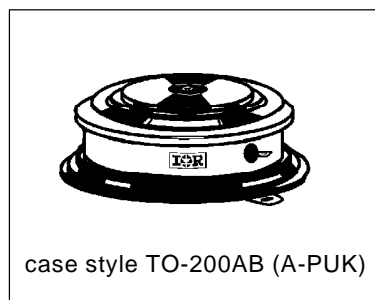
DISCRETE POWER DIODES and THYRISTORS
DATA BOOK

INVERTER GRADE THYRISTORS
Hockey Puk Version
Features

- Metal case with ceramic insulator
- International standard case TO-200AB (A-PUK)
- All diffused design
- Center amplifying gate
- Guaranteed high dV/dt
- Guaranteed high dI/dt
- High surge current capability
- Low thermal impedance
- High speed performance

Typical Applications

- Inverters
- Choppers
- Induction heating
- All types of force-commutated converters

370A


case style TO-200AB (A-PUK)

Major Ratings and Characteristics

Parameters	ST183C..C	Units
$I_{T(AV)}$	370	A
@ T_{hs}	55	°C
$I_{T(RMS)}$	690	A
@ T_{hs}	25	°C
I_{TSM}	@ 50Hz	4900
	@ 60Hz	5130
I^2t	@ 50Hz	120
	@ 60Hz	110
V_{DRM}/V_{RRM}	400 to 800	V
t_q range	10 to 20	μs
T_J	- 40 to 125	°C

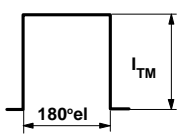
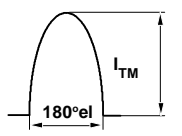
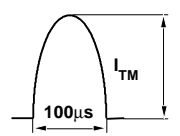
ST183C..C Series

ELECTRICAL SPECIFICATIONS

Voltage Ratings

Type number	Voltage Code	V_{DRM}/V_{RRM} , maximum repetitive peak voltage V	V_{RSM} , maximum non-repetitive peak voltage V	I_{DRM}/I_{RRM} max. @ $T_J = T_J$ max. mA
ST183C..C	04	400	500	40
	08	800	900	

Current Carrying Capability

Frequency							Units
	I_{TM}	$180^\circ eI$	I_{TM}	$180^\circ eI$	I_{TM}	$100\mu s$	
50Hz	770	660	1220	1160	5450	4960	A
400Hz	730	600	1270	1090	2760	2420	
1000Hz	600	490	1210	1040	1600	1370	
2500Hz	350	270	860	730	800	680	
Recovery voltage V_r	50	50	50	50	50	50	V
Voltage before turn-on V_d	V_{DRM}		V_{DRM}		V_{DRM}		
Rise of on-state current di/dt	50	50	-	-	-	-	A/ μs
Heatsink temperature	40	55	40	55	40	55	$^\circ C$
Equivalent values for RC circuit	47 Ω / 0.22 μF		47 Ω / 0.22 μF		47 Ω / 0.22 μF		

On-state Conduction

Parameter	ST183C..C	Units	Conditions		
$I_{T(AV)}$ Max. average on-state current @ Heatsink temperature	370 (130)	A	180° conduction, half sine wave		
	55 (85)	$^\circ C$	double side (single side) cooled		
$I_{T(RMS)}$ Max. RMS on-state current	690	A	DC @ 25 $^\circ C$ heatsink temperature double side cooled		
I_{TSM} Max. peak, one half cycle, non-repetitive surge current	4900		t = 10ms	No voltage	Sinusoidal half wave, Initial $T_J = T_J$ max
	5130		t = 8.3ms	reapplied	
	4120		t = 10ms	100% V_{RRM}	
	4310	t = 8.3ms	reapplied		
I^2t Maximum I^2t for fusing	120	KA 2s	t = 10ms	No voltage	
	110		t = 8.3ms	reapplied	
	85		t = 10ms	100% V_{RRM}	
	78		t = 8.3ms	reapplied	
$I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing	1200	KA $^2\sqrt{s}$	t = 0.1 to 10ms, no voltage reapplied		

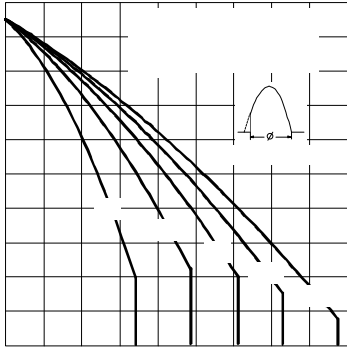


Fig. 3 - Current Ratings Characteristics

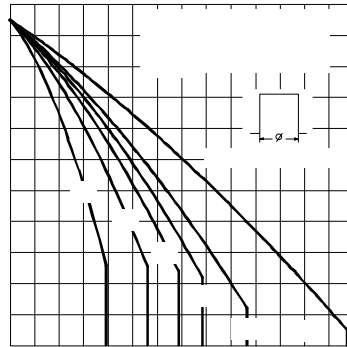


Fig. 4 - Current Ratings Characteristics

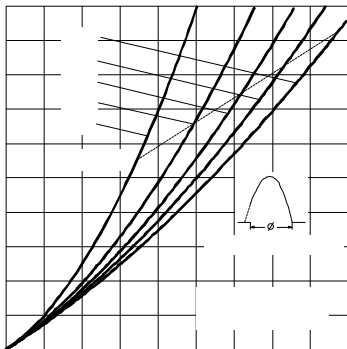


Fig. 5 - On-state Power Loss Characteristics

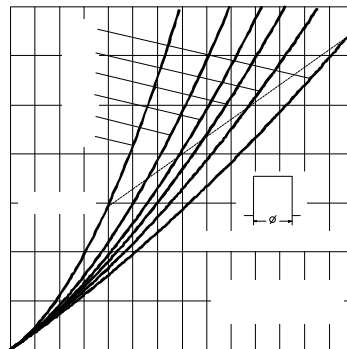


Fig. 6 - On-state Power Loss Characteristics

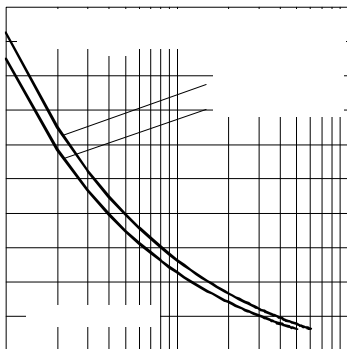


Fig. 7 - Maximum Non-repetitive Surge Current
Single and Double Side Cooled

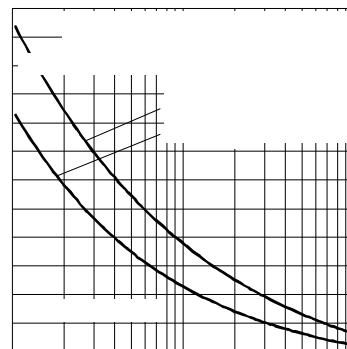


Fig. 8 - Maximum Non-repetitive Surge Current
Single and Double Side Cooled

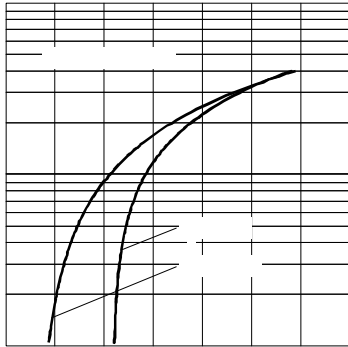


Fig. 9 - On-state Voltage Drop Characteristics

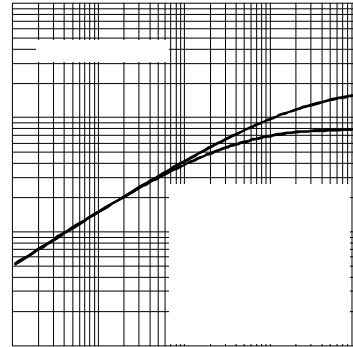


Fig. 10 - Thermal Impedance Z_{thJ-hs} Characteristics

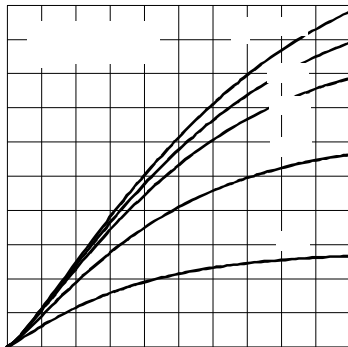


Fig. 11 - Reverse Recovered Charge Characteristics

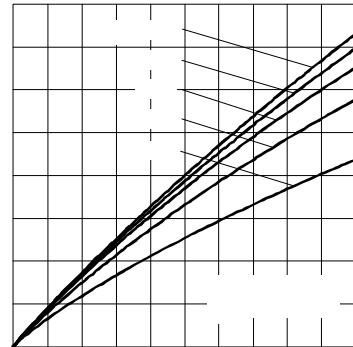


Fig. 12 - Reverse Recovery Current Characteristics

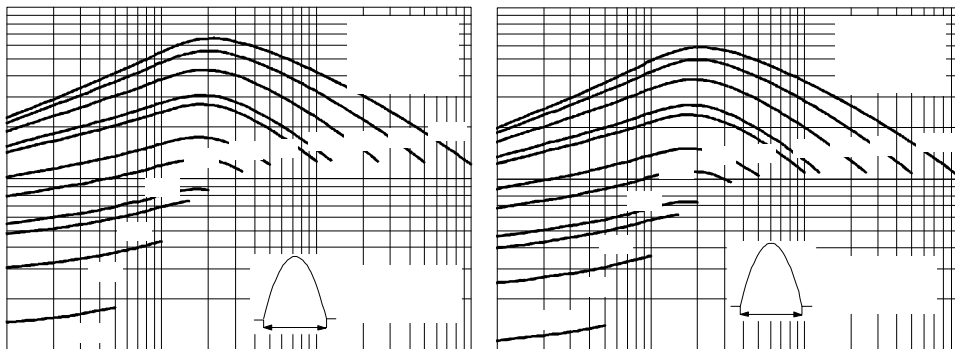


Fig. 13 - Frequency Characteristics

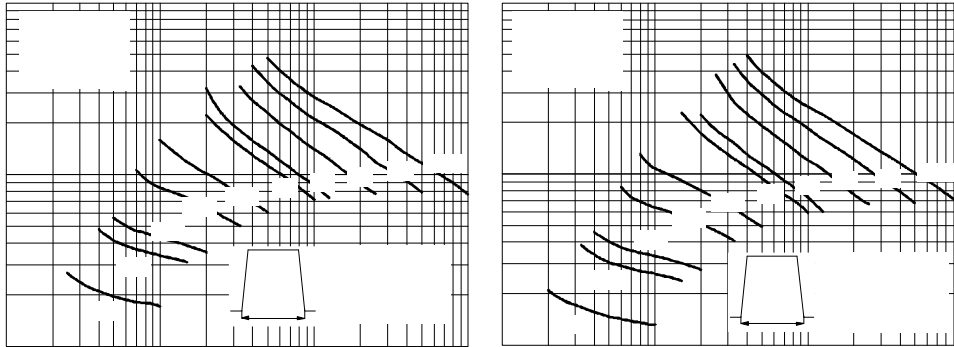


Fig. 14 - Frequency Characteristics

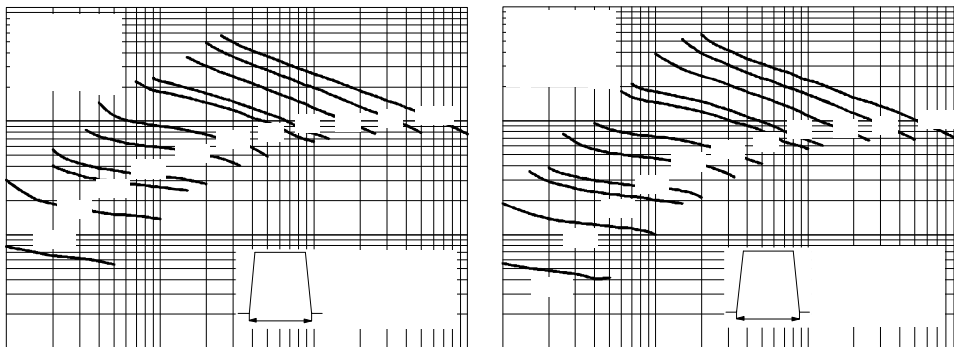


Fig. 15 - Frequency Characteristics

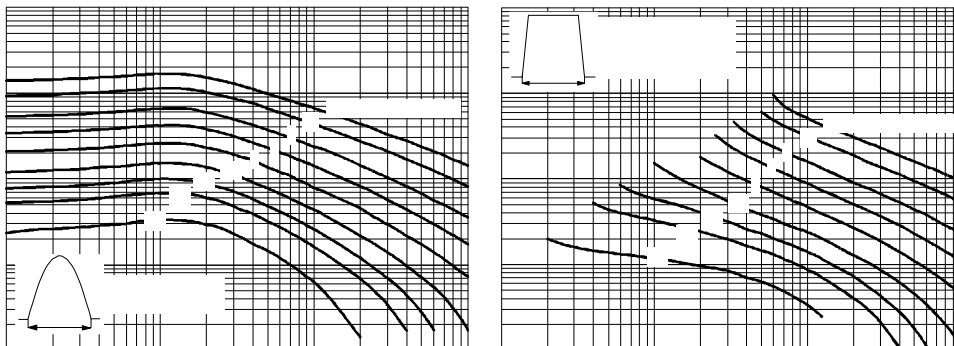


Fig. 16 - Maximum On-state Energy Power Loss Characteristics

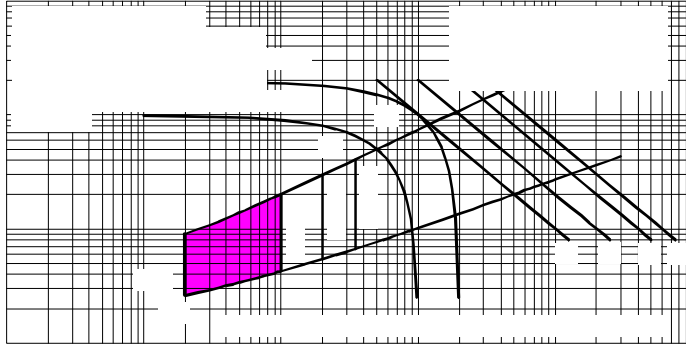


Fig. 17 - Gate Characteristics

On-state Conduction

Parameter	ST183C..C	Units	Conditions
V_{TM} Max. peak on-state voltage	1.80	V	$I_{TM} = 600A, T_J = T_J \text{ max}, t_p = 10\text{ms}$ sine wave pulse
$V_{T(TO)1}$ Low level value of threshold voltage	1.40		$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$
$V_{T(TO)2}$ High level value of threshold voltage	1.45		$(I > \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$
r_{t1} Low level value of forward slope resistance	0.67	m Ω	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$
r_{t2} High level value of forward slope resistance	0.58		$(I > \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$
I_H Maximum holding current	600	mA	$T_J = 25^\circ\text{C}, I_T > 30A$
I_L Typical latching current	1000		$T_J = 25^\circ\text{C}, V_A = 12V, R_a = 6\Omega, I_G = 1A$

Switching

Parameter	ST183C..C	Units	Conditions
di/dt Max. non-repetitive rate of rise of turned-on current	1000	A/ μs	$T_J = T_J \text{ max}, V_{DRM} = \text{rated } V_{DRM}$ $I_{TM} = 2 \times di/dt$
t_d Typical delay time	1.1	μs	$T_J = 25^\circ\text{C}, V_{DM} = \text{rated } V_{DRM}, I_{TM} = 50A \text{ DC}, t_p = 1\mu\text{s}$ Resistive load, Gate pulse: 10V, 5 Ω source
t_q Max. turn-off time	Min: 10 Max: 20		$T_J = T_J \text{ max}, I_{TM} = 300A, \text{commutating } di/dt = 20A/\mu\text{s}$ $V_R = 50V, t_p = 500\mu\text{s}, dv/dt: \text{ see table in device code}$

Blocking

Parameter	ST183C..C	Units	Conditions
dv/dt Maximum critical rate of rise of off-state voltage	500	V/ μs	$T_J = T_J \text{ max. linear to } 80\% V_{DRM}, \text{ higher value available on request}$
I_{RRM} I_{DRM} Max. peak reverse and off-state leakage current	40	mA	$T_J = T_J \text{ max, rated } V_{DRM}/V_{RRM} \text{ applied}$

Triggering

Parameter	ST183C..C	Units	Conditions
P_{GM} Maximum peak gate power	60	W	$T_J = T_J \text{ max, } f = 50\text{Hz, } d\% = 50$
$P_{G(AV)}$ Maximum average gate power	10		
I_{GM} Max. peak positive gate current	10	A	$T_J = T_J \text{ max, } t_p \leq 5\text{ms}$
$+V_{GM}$ Maximum peak positive gate voltage	20	V	$T_J = T_J \text{ max, } t_p \leq 5\text{ms}$
$-V_{GM}$ Maximum peak negative gate voltage	5		
I_{GT} Max. DC gate current required to trigger	200	mA	$T_J = 25^\circ\text{C}, V_A = 12V, R_a = 6\Omega$
V_{GT} Max. DC gate voltage required to trigger	3		
I_{GD} Max. DC gate current not to trigger	20	mA	$T_J = T_J \text{ max, rated } V_{DRM} \text{ applied}$
V_{GD} Max. DC gate voltage not to trigger	0.25		

ST183C..C Series

Thermal and Mechanical Specification

Parameter	ST183C..C	Units	Conditions
T _J Max. operating temperature range	-40 to 125	°C	
T _{stg} Max. storage temperature range	-40 to 150		
R _{thJ-hs} Max. thermal resistance, junction to heatsink	0.17 0.08	K/W	DC operation single side cooled DC operation double side cooled
R _{thC-hs} Max. thermal resistance, case to heatsink	0.033 0.017	K/W	DC operation single side cooled 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 Table

ΔR_{thJ-hs} Conduction

(The following table shows the increment of thermal resistance R_{thJ-hs} when devices operate at different conduction angles than DC)

Conduction angle	Sinusoidal conduction		Rectangular conduction		Units	Conditions
	Single Side	Double Side	Single Side	Double Side		
180°	0.015	0.016	0.011	0.011	K/W	T _J = T _J max.
120°	0.018	0.019	0.019	0.019		
90°	0.024	0.024	0.026	0.026		
60°	0.035	0.035	0.036	0.037		
30°	0.060	0.060	0.060	0.061		

Ordering Information Table

Device Code																																													
ST	18	3	C	08	C	H	K	1																																					
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩																																				
1 - Thyristor	2 - Essential part number	3 - 3 = Fast turn off	4 - C = Ceramic Puk	5 - Voltage code: Code x 100 = V _{RRM} (See Voltage Rating Table)	6 - C = Puk Case TO-200AB (A-PUK)	7 - Reapplied dv/dt code (for t _q test condition)	dv/dt - t_q combinations available																																						
8 - t _q code					<table border="1"> <thead> <tr> <th>dv/dt (V/μs)</th> <th>20</th> <th>50</th> <th>100</th> <th>200</th> <th>400</th> </tr> </thead> <tbody> <tr> <td>10</td> <td>CN</td> <td>DN</td> <td>EN</td> <td>FN*</td> <td>HN</td> </tr> <tr> <td>12</td> <td>CM</td> <td>DM</td> <td>EM</td> <td>FM</td> <td>HM</td> </tr> <tr> <td>15</td> <td>CL</td> <td>DL</td> <td>EL</td> <td>FL*</td> <td>HL</td> </tr> <tr> <td>18</td> <td>CP</td> <td>DP</td> <td>EP</td> <td>FP</td> <td>HP</td> </tr> <tr> <td>20</td> <td>CK</td> <td>DK</td> <td>EK</td> <td>FK</td> <td>HK</td> </tr> </tbody> </table>					dv/dt (V/μs)	20	50	100	200	400	10	CN	DN	EN	FN*	HN	12	CM	DM	EM	FM	HM	15	CL	DL	EL	FL*	HL	18	CP	DP	EP	FP	HP	20	CK	DK	EK	FK	HK
dv/dt (V/μs)	20	50	100	200	400																																								
10	CN	DN	EN	FN*	HN																																								
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18	CP	DP	EP	FP	HP																																								
20	CK	DK	EK	FK	HK																																								
9 - 0 = Eyelet term. (Gate and Aux. Cathode Unsoldered Leads) 1 = Fast-on term. (Gate and Aux. Cathode Unsoldered Leads) 2 = Eyelet term. (Gate and Aux. Cathode Soldered Leads) 3 = Fast-on term. (Gate and Aux. Cathode Soldered Leads)					*Standard part number. All other types available only on request.																																								
10 - Critical dv/dt: None = 500V/μsec (Standard value) L = 1000V/μsec (Special selection)																																													

Outline Table

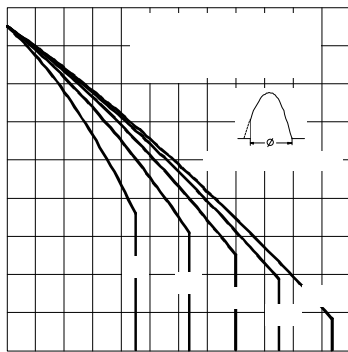
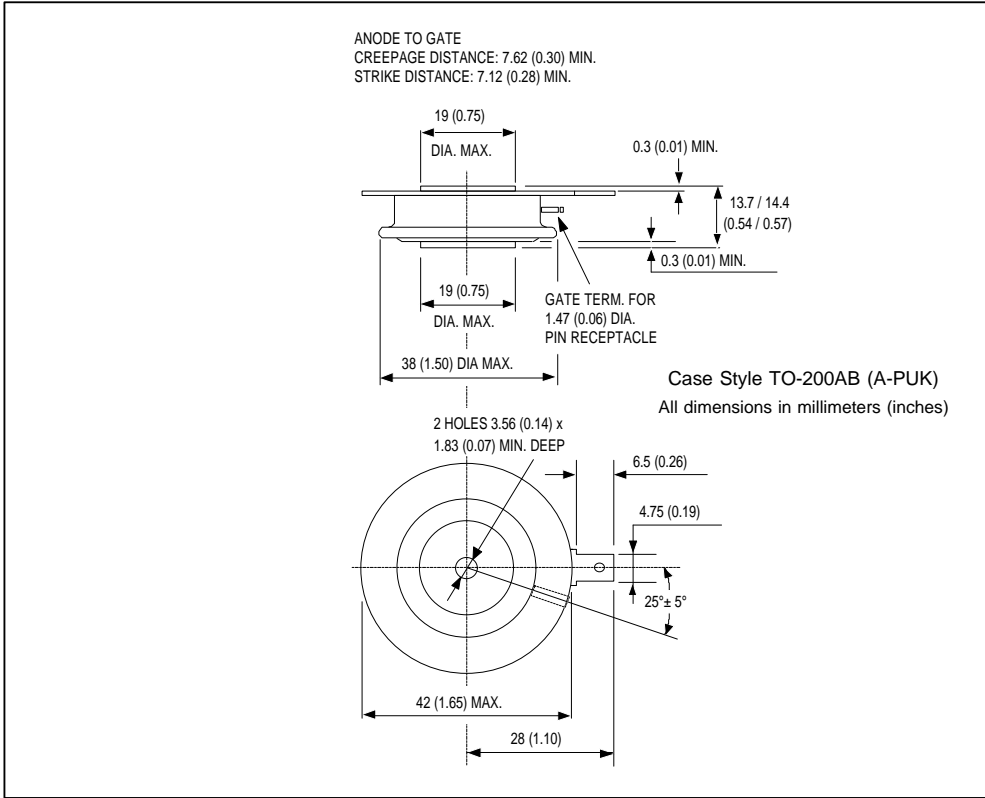


Fig. 1 - Current Ratings Characteristics

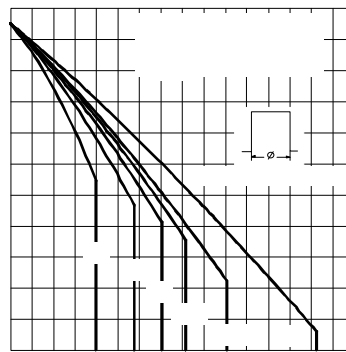


Fig. 2 - Current Ratings Characteristics