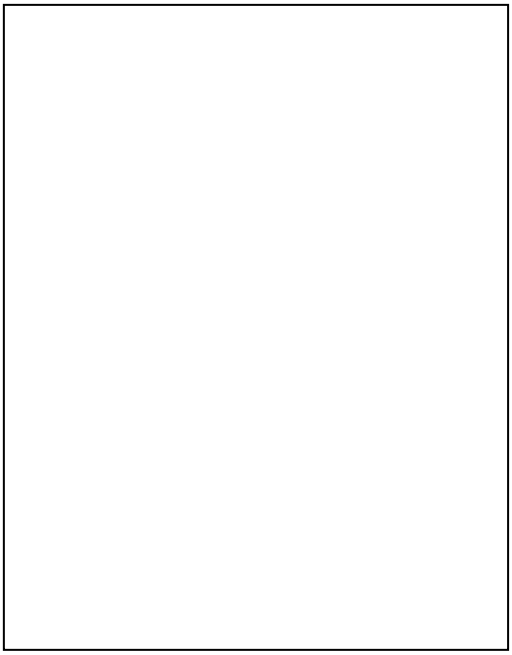
INRN230S.... Series

PHASE CONTROL THYRISTORS **Stud Version**



Features

- Hermetic ceramic -metal seal
- high dv/dt
- High surge capability
- Tested according to IEC standards
- Types up to 2000V V_{RRM}

Typical Applications

- AC controllers
- Battery charges
- DC motor controls
- Power supplies
- Controlled DC power supplies
- Machine tool controls
- Welding

Major Ratings and Characteristics

Parameters		**INRN230S..**	**Units**
$I_{T(AV)}$		230	A
	@ T_C	85	°C
$I_{T(RMS)}$		360	A
I_{TSM}	@ 50Hz	5700	A
	@ 60Hz	5970	A
I^2t	@ 50Hz	163	KA^2s
	@ 60Hz	149	KA^2s
V_{DRM}/V_{RRM}		400 to 2000	V
Tq	typical	150	µs
T_J	range	- 40 to 125	°C

ELECTRICAL SPECIFICATIONS

Voltage Ratings

Type number	Voltage Code	V_{RRM}, maximum repetitive peak reverse voltage V	V_{RSM}, maximum non-repetitive peak reverse voltage V	I_{RRM} max. @ $T_J = T_J$ max. mA
INRN230S..	04	400	500	15.00
	08	800	900	
	12	1200	1300	
	14	1400	1500	
	16	1600	1700	
	18	1800	1900	
	20	2000	2100	

Forward Conduction

Parameter		INRN230S..	Units	Conditions		
$I_{T(AV)}$	Maximum average on-state current	230	A	180° conduction, half sine wave		
	@ Case temperature	85	°C			
$I_{T(RMS)}$	Maximum RMS on-state current	360	A	180° conduction, half sine wave @ T_C = 80°C		
I_{TSM},	Maximum peak, one-cycle non-repetitive surge current	5700	A	t = 10ms	No voltage reapplied	Sinusoidal half wave, Initial $T_J = T_J$ max.
		5970		t = 8.3ms		
		4800		t = 10ms	100% V_{RRM} reapplied	
		5000		t = 8.3ms		
I^2t	Maximum I^2t for fusing	163	KA^2s	t = 10ms	No voltage reapplied	
		148		t = 8.3ms		
		115		t = 10ms	100% V_{RRM} reapplied	
		105		t = 8.3ms		
$I^2\sqrt{t}$	Maximum $I^2\sqrt{t}$ for fusing	1630	$KA^2\sqrt{s}$	t = 0.1 to 10ms, no voltage reapplied		
V_{TM}	Maximum on-state or forward	0.92	V	pk = 600A, T_J = 25°C, t p = 10ms sine pulse		
$V_{T(TO)1}$	Low level value of threshold voltage	0.98	V	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$, $T_J = T_J$ max.		
$V_{T(TO)2}$	High level value of threshold voltage	0.88		$(I > \pi \times I_{T(AV)})$, $T_J = T_J$ max.		
r_{t1}	Low level value of on-state slope resistance	0.81	mΩ	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$, $T_J = T_J$ max.		
r_{t2}	High level value of on-state slope resistance	1.55		$(I > \pi \times I_{T(AV)})$, $T_J = T_J$ max.		
I_H	Maximum holding current	600	mA	T_J = 25°C, anode supply 12V resistive load		
I_L	Typical latching current	1000 (300)				

Switching

	Parameter	INRN230S..	Units	Conditions
di/dt	ax. non-repetitive rate of rise of turned-on current	1000	A/µs	Gate drive 20V, 20Ω, $t_r \leq 1\mu s$ $T_J = T_J$ max, anode voltage ≤ 80% V_{DRM}
td	ical delay time	1.0	µs	Gate current 1A, di_g/dt = 1A/µs V_d = 0.67% V_{DRM}, T_J = 25°C
Tq	pical turn-off time	100	µs	I_{TM} = 600A, $T_J = T_J$ max, di/dt = 20A/µs, V_R = 50V dv/dt = 20V/µs, Gate 0V 100Ω, t_p = 500µs

Blocking

	Parameter	INRN230S..	Units	Conditions
dv/dt	Maximum critical rate of rise of off-state voltage	400	V/µs	TJ = TJ max linear to 80% rated VDRM
I_{DRM} I_{RRM}	Max. peak reverse and off-state leakage current	15	mA	TJ = TJ max, rated VDRM/VRRM applied

Triggering

	Parameter	INRN230S..		Units	Conditions	
M	Maximum peak gate power	10.0		W	TJ = TJ max, tp 5ms	
$P_{G(AV)}$	Maximum average gate power	2.0			TJ = TJ max, f = 50Hz, d% = 50	
I_{GM}	Max. peak positive gate current	3.0		A	TJ = TJ max, tp 5ms	
$+V_{GM}$	Maximum peak positive gate voltage	20		V	TJ = TJ max, tp 5ms	
-VGM	Maximum peak negative gate voltage	5.0		mA		
		TYP	MAX			
I_{GT}	DC gate current required	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 valuewhich 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	Max. gate current/ voltage not to trigger is the max. value which will not trigger any unit with rated V anode-to-cathode applied
I_{GD}	DC gate current not to trigger	10		mA		
V_{GD}	DC gate voltage not to trigger	0.25		V		

Thermal and Mechanical Specifications

	Parameter	INRN230S....	Units	Conditions
T_J	Max. junction operating temperature range	-40 to 125	°C	Junction to case
T_{Stg}	Max. storage temperature range	-40 to 150	°C	
R_{thJC}	Max. thermal resistance, junction to case	0.10	K/W	DC operation
R_{thSC}	Max. thermal resistance, case to heatsink	0.04	K/W	Mounting surface, smooth, flat and greased
T	Max. allowed mounting torque +0 -20%	31	Nm	Not lubricated threads
		275	lbf.in	
		24.5	Nm	Lubricated threads
		210	lbf.in	
wt	Approximate weight	280(2512)	g (oz)	
	Case style	TO - 209AB (TO-93)		See Outline Table

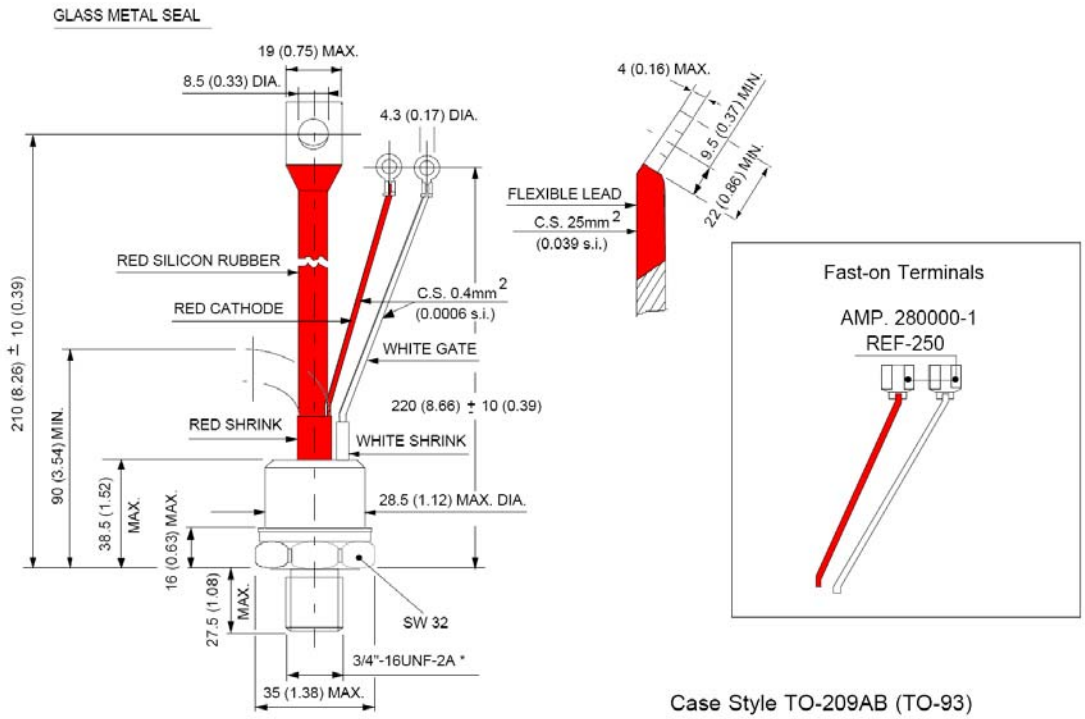
Ordering Information Table

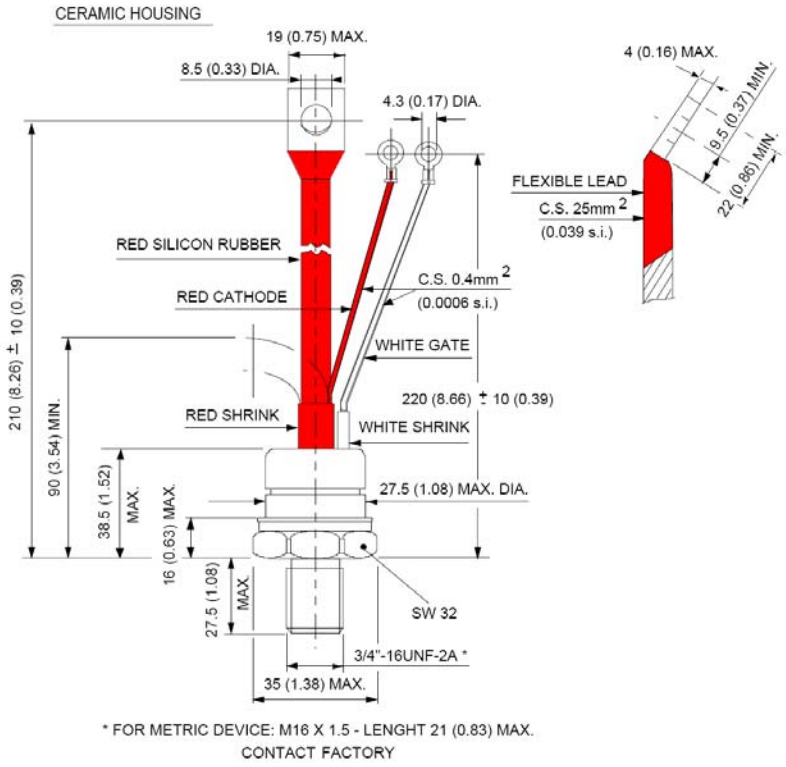
Device Code

INR	N	230	S	120	PO
1	2	3	4	5	6

1	INR = Company
2	A = Thyristor
3	Current rating: Code = IF(AV
4	S = Stud Normal Polarity (Cathode to Stud)
5	Voltage code: Code x 10 = VRRM (See Voltage Ratings table)
6	P = Stud base 3/4"-16UNF2A threads 0 = Eyelet terminals (Gate and Auxiliary Cathode Leads) 1 = Fast - on terminals (Gate and Auxiliary Cathode Leads)

Outline


GLASS METAL SEAL
19 (0.75) MAX.
8.5 (0.33) DIA.
4.3 (0.17) DIA.
4 (0.16) MAX.
9.5 (0.37) MIN.
22 (0.86) MIN.
FLEXIBLE LEAD
C.S. 25mm 2
(0.039 s.i.)
RED SILICON RUBBER
RED CATHODE
C.S. 0.4mm 2
(0.0006 s.i.)
WHITE GATE
220 (8.66) ± 10 (0.39)
RED SHRINK
WHITE SHRINK
210 (8.26) ± 10 (0.39)
90 (3.54) MIN.
38.5 (1.52) MAX.
16 (0.63) MAX.
28.5 (1.12) MAX. DIA.
27.5 (1.08) MAX.
SW 32
3/4"-16UNF-2A *
35 (1.38) MAX.
Fast-on Terminals
AMP. 280000-1
REF-250
* FOR METRIC DEVICE: M16 X 1.5 - LENGHT 21 (0.83) MAX.
CONTACT FACTORY
Case Style TO-209AB (TO-93)
All dimensions in millimeters (inches)


CERAMIC HOUSING
19 (0.75) MAX.
8.5 (0.33) DIA.
4.3 (0.17) DIA.
4 (0.16) MAX.
9.5 (0.37) MIN.
22 (0.86) MIN.
FLEXIBLE LEAD
C.S. 25mm 2
(0.039 s.i.)
RED SILICON RUBBER
RED CATHODE
C.S. 0.4mm 2
(0.0006 s.i.)
WHITE GATE
220 (8.66) ± 10 (0.39)
RED SHRINK
WHITE SHRINK
210 (8.26) ± 10 (0.39)
90 (3.54) MIN.
38.5 (1.52) MAX.
16 (0.63) MAX.
27.5 (1.08) MAX. DIA.
27.5 (1.08) MAX.
SW 32
3/4"-16UNF-2A *
35 (1.38) MAX.
* FOR METRIC DEVICE: M16 X 1.5 - LENGHT 21 (0.83) MAX.
CONTACT FACTORY