



### SS541AT



**SS500 Series Unipolar Hall-Effect Sensor; SOT-89B surface mount package; available in 1,000/tape and reel**

*Actual product appearance may vary.*

#### Features

- Quad Hall design virtually eliminates mechanical stress effects
- Temperature compensated magnetics
- Super high sensitivity available
- Symmetry of operate/release points about zero gauss (bipolar/latching)
- Low current consumption
- High output current capability

#### Potential Applications

- Speed and RPM sensor
- Brushless DC motor commutation
- Motor and fan control
- Magnetic encoding
- Tachometer, counter pickup
- Disc speed, tape rotation sensing
- Flow-rate sensing

#### Description

The temperature compensated Hall effect sensor consists of a quad Hall sensing element in a square integrated circuit chip, which is then encapsulated in a glass-filled thermoset molding material. The small SOT89 style package surface mounts on PC boards and flexible circuits.

The integrated circuit is thermally balanced for predictable performance over specified temperature range. Built-in temperature compensation has a negative slope (operate and release points decrease as temperature increases). This slope is optimized to match the negative temperature coefficient of low cost magnets, to track their performance over temperature. Bipolar, unipolar and latching magnetics are available.

Band gap regulation provides extremely stable operation over the full supply voltage range. SS500 series sensors can use existing power supply sources in most applications, and can be directly interfaced with many electronic components without buffering or compensation circuitry.

**NOTE:** Do not wave solder this product. This process may negatively affect sensor performance and reliability, and will void Honeywell's warranty. Honeywell recommends a convection infrared reflow process with peak temperatures not to exceed 250 °C [482 °F] for 3 seconds maximum.

**NOTE:** Interruption of power to a latching device may cause the output to change state when power is restored. If a magnetic field of sufficient strength is present, the sensor output will be in the condition dictated by the magnetic field.

Product Specifications	
Product Type	Hall-Effect Digital Position Sensor IC
Package Quantity/Type	Available in 1,000/Tape and Reel
Package Style	SOT-89B
Supply Voltage	3.8 Vdc to 30.0 Vdc
Output Type	Sink
Termination Type	Surface Mount
Magnetic Actuation Type	Unipolar
Operating Temperature Range	-40 °C to 150 °C [-40 °F to 302 °F]
Storage Temperature	-65 °C to 160 °C [-85 °F to 320 °F]
Output Voltage	0.4 Vdc max.
Switching Time Rise (10 % to 90 %)	1.5 µs max.
Switching Time Fall (90 % to 10 %)	1.5 µs max.
Availability	Global
Supply Current (max. @ 25 °C)	8.7 mA @ 5 Vdc
Output Current (max.)	20 mA
Operate Point @ 25 °C	11.5 mT [115 G] max.
Release Point @ 25 °C	2.0 mT [20 G] min.
Leakage Current max.	10 µA
Differential	0.5 mT [5 G] min.
Series Name	SS500

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NOTES

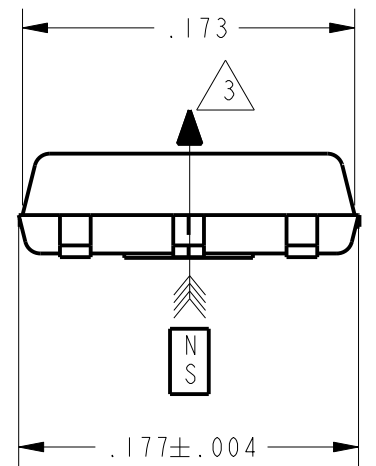
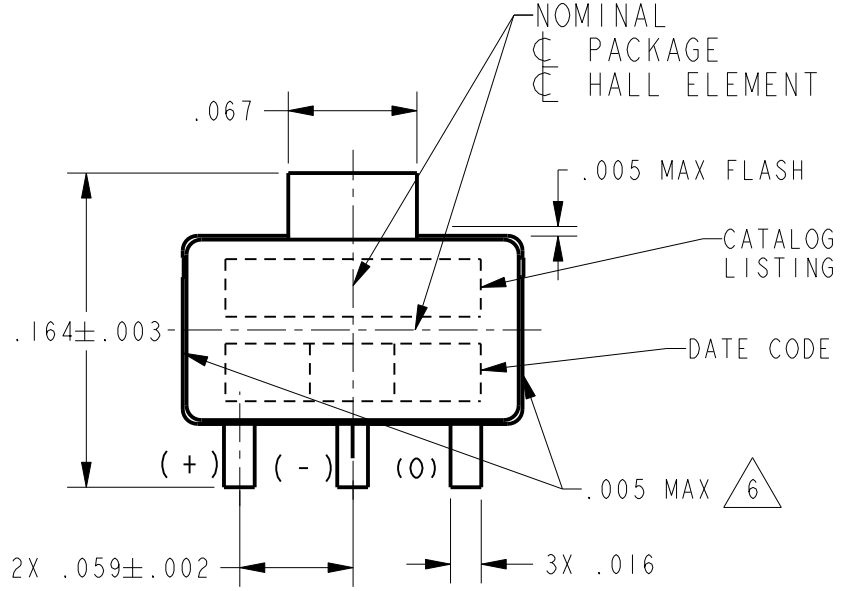
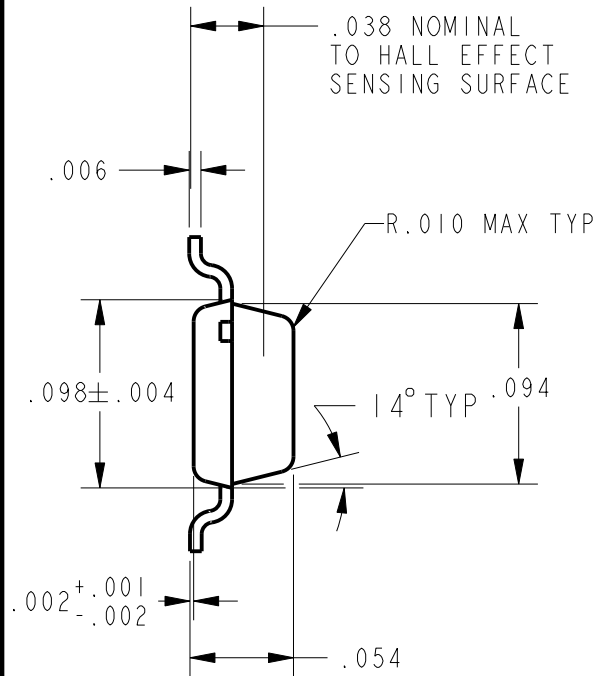
- 1 - SOLDERING INSTRUCTIONS: EXPOSURE TO HIGH TEMPERATURES SHOULD BE KEPT AT A MINIMUM MICRO SWITCH RECOMMENDS AN INFRARED REFLOW PROCESS WITH PEAK TEMPERATURES NOT EXCEEDING 230°C (446°F) FOR 10 SECONDS MAXIMUM. DO NOT WAVE SOLDER THIS PRODUCT, AS THIS PROCESS MAY NEGATIVELY AFFECT THE SENSOR'S PERFORMANCE AND RELIABILITY. SUBJECTING THESE PRODUCTS TO WAVE SOLDERING WILL VOID MICRO SWITCH'S WARRANTY
- 2 ABSOLUTE MAXIMUM RATINGS ARE THE EXTREME LIMITS THE DEVICE WILL MOMENTARILY WITHSTAND WITHOUT DAMAGE TO THE DEVICE. ELECTRICAL AND MAGNETIC CHARACTERISTICS ARE NOT GUARANTEED IF THE SPECIFIED VOLTAGE AND/OR CURRENTS ARE EXCEEDED NOR WILL THE DEVICE NECESSARILY OPERATE AT ABSOLUTE MAXIMUM RATING
- 3 THE MAGNETIC FLUX USED TO OPERATE THE SWITCH MUST BE IN THE DIRECTION AND LOCATION SHOWN. (THIS ASSUMES THE CONVENTION THAT THE DIRECTION OF THE EXTERNAL FLUX OF A MAGNET IS FROM THE NORTH TO THE SOUTH POLE OF THE MAGNET)
- 4 THE MAGNETIC FIELD STRENGTH (GAUSS) REQUIRED TO CAUSE THE SWITCH TO CHANGE STATE (OPERATE AND RELEASE) WILL BE AS SPECIFIED IN THE MAGNETIC CHARACTERISTICS. TO TEST THE SWITCH AGAINST THE SPECIFIED MAGNETIC CHARACTERISTICS, THE SWITCH MUST BE PLACED IN A UNIFORM MAGNETIC FIELD
- 5 A "T" SUFFIX ON ANY CATALOG LISTING DESIGNATES THE PRODUCT WILL BE SUPPLIED IN TAPE AND REEL FORM PER EIA STD 481. SS5 SERIES SOLD IN TAPE AND REEL ONLY. SOME BASIC LISTINGS MAY NOT BE AVAILABLE
- 6 GATE VESAGE PERMITTED IN THESE AREAS. UNDERFLUSH BREAKOUT LIMITED TO .007
- 7 THESE HALL EFFECT SENSORS MAY HAVE AN INITIAL OUTPUT IN EITHER THE ON OR OFF STATE IF POWERED UP WITH AN APPLIED MAGNETIC FIELD IN THE DIFFERENTIAL ZONE (APPLIED MAGNETIC FIELD > Brp AND < Bop). MICRO SWITCH RECOMMENDS THAT THE APPLICATION CIRCUIT DESIGNER ALLOW 10 MICROSECONDS AFTER SUPPLY VOLTAGE HAS REACHED 5 VOLTS FOR THE OUTPUT VOLTAGE TO STABILIZE

CATALOG LISTING  
**SS5 SERIES CHART 1**

ISSUE  
**12**

REVISIONS	DATE	BY	CHKD	DESCRIPTION
B	27 JUL 98	WJC	PR	REL DWG PR 23390
C	06 OCT 98	PPF	CO	93692
D	03 NOV 98	KED	CO	93789
E	14 JAN 99	KED	CO	93816
F	1 MAR 99	WJC	CO	94183
G	19 JAN 98	200505	TSM	31MAY00
H	19 JAN 98	201747	LJK	20NOV00
J	19 JAN 98	206174	GLH	8AUG02
K	19 JAN 98	207146	GLH	6JAN03
12	18 JAN 06	SR		0018451

RELEASE NO. DR-4996  
PAGE 1 OF 5  
CHECK 18 JAN 06  
CHECK 18 JAN 06  
CHECK 19 JAN 98  
CHECK 19 JAN 98  
CHECK 18 JAN 06  
DRAWN 5 JAN 98  
PTC/CAD 3D



**CAUTION**  
ELECTROSTATIC SENSITIVE DEVICES  
DO NOT OPEN OR HANDLE EXCEPT AT A STATIC FREE WORKSTATION

**ESD SENSITIVITY: CLASS 3**

DIMENSION IN INCHES	METRIC REFERENCE EQUIVALENT, MM	DIMENSION IN INCHES	METRIC REFERENCE EQUIVALENT, MM
.001	0,025	.095	2,413
.002	0,051	.098	2,489
.003	0,076	.157	3,988
.004	0,102	.164	4,166
.005	0,127	.173	4,394
.006	0,152	.177	4,496
.007	0,178	.181	4,597
.008	0,203	.197	5,004
.015	0,381	.217	5,512
.016	0,406	.230	5,842
.030	0,762	.314	7,976
.031	0,787	.315	8,001
.038	0,965	.472	11,989
.050	1,270	.480	12,192
.059	1,499	.512	13,005
.067	1,702	.724	18,390
.069	1,753	1.300	33,020
.078	1,981	1.970	50,038
.079	2,007	7.010	178,054
.094	2,388	10.000	254,000

THIRD ANGLE PROJECTION

SCALE NONE

DO NOT SCALE PRINT

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE

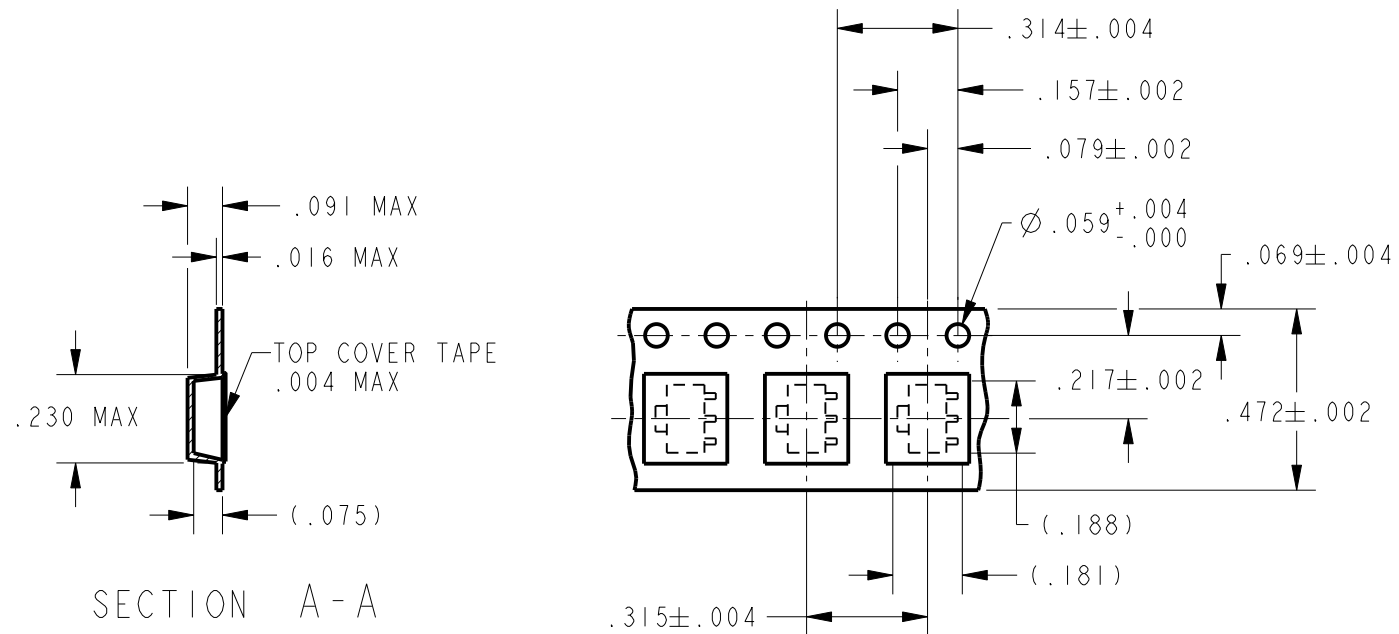
ONE PLACE	(.0)	±.030
TWO PLACE	(.00)	±.015
THREE PLACE	(.000)	±.005
ANGLES		±
WEIGHT		

CATALOG LISTING  
**SS5 SERIES CHART 1**

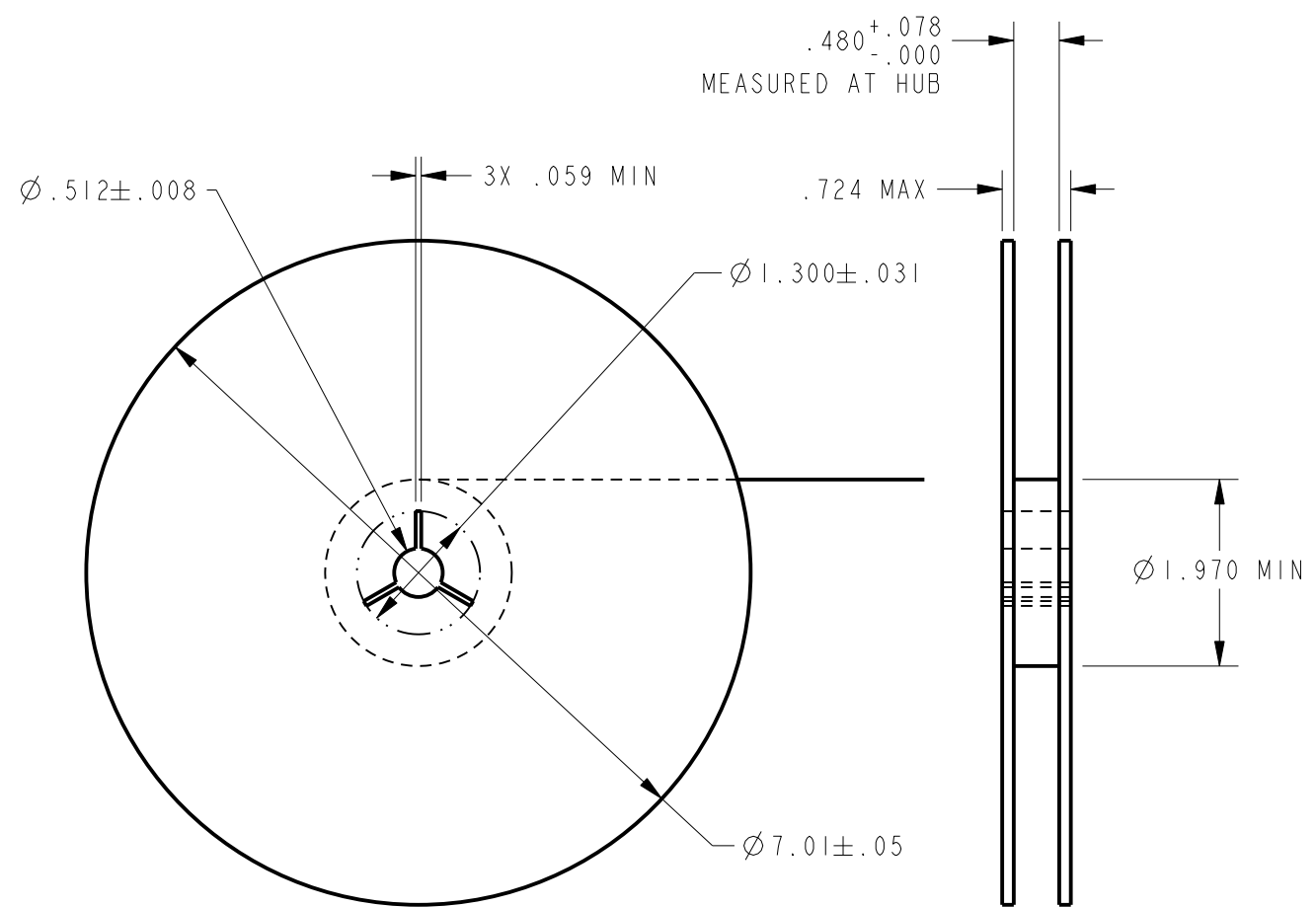
ISSUE  
**12**

REV	DATE	BY	CHK	DESCRIPTION
B	27 JUL 98	WJC	PR-23390	REL DWG
C	06 OCT 98	CO-93692	PPF	CO-93789
D	03 NOV 98	CO-93789	RED	CO-93816
E	14 JAN 99	CO-93816	RED	CO-94183
F	01 MAR 99	WJC	1 MAR 99	200505
G	31 MAY 00	TSM	19 JAN 98	201747
H	20 NOV 00	LJK	19 JAN 98	206174
J	08 AUG 02	GLH	19 JAN 98	207146
K	06 JAN 03	GLH	19 JAN 98	0018451
12	18 JAN 06	SR	18 JAN 06	

RELEASE NO. DR-4996  
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CHECK 18 JAN 06  
CHECK 18 JAN 06  
CHECK 19 JAN 98  
CHECK 19 JAN 98  
CHECK 5 JAN 98  
DRAWN



TAPE AND REEL DIMENSIONS 5



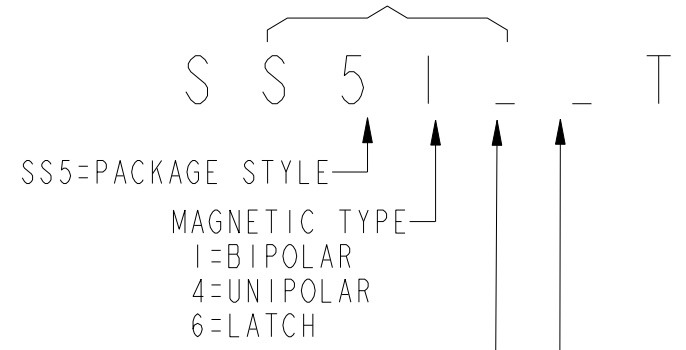
DIRECTION OF FEED FROM REEL

ANSI Y14.5M-1982 APPLIES

**SS5 CATALOG SYSTEM** 5

PREFIX  
BASIC CATALOG LISTING:  
PACKAGE STYLE, MAGNETIC TYPE,  
ELECTRICAL/MAGNETIC SPECS

CHARACTERS IN THESE POSITIONS OF THE LISTING ARE BRANDED ON THE PRODUCT



RELATIVE GAUSS OPERATING RANGE  
(BLANK, 0-9, 9=HIGH GAUSS)  
ELECTRICAL/MAGNETIC OPTIONS  
(BLANK, A-K & U-Z)  
A=STANDARD  
B-K & U-Z=SPECIALS

**CAUTION**  
ELECTROSTATIC SENSITIVE DEVICES  
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ESD SENSITIVITY:  
CLASS 3

THIRD ANGLE PROJECTION	
SCALE	NONE
DO NOT SCALE PRINT	
UNLESS OTHERWISE SPECIFIED TOLERANCES ARE	
ONE PLACE	(.0) ±.030
TWO PLACE	(.00) ±.015
THREE PLACE	(.000) ±.005
ANGLES	±
WEIGHT	

CATALOG LISTING  
**SS5 SERIES CHART 1**

ISSUE  
**12**

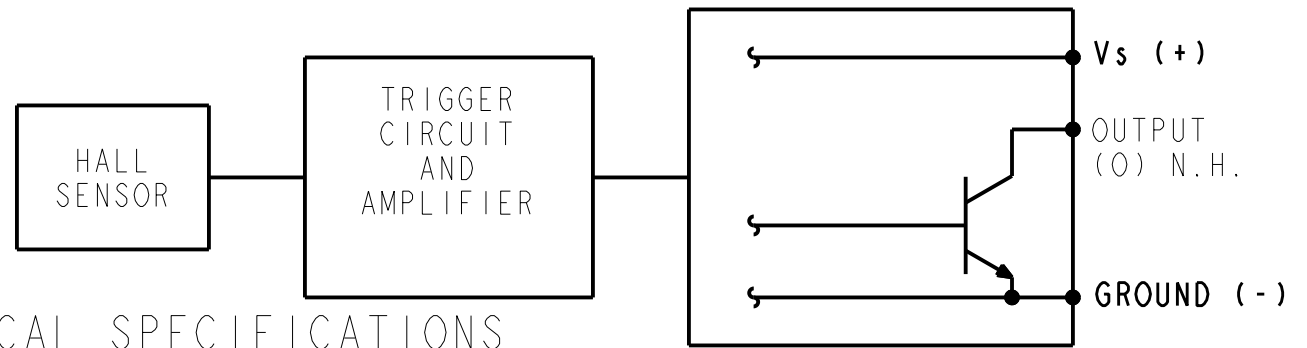
REVISIONS

B	REL DWG PR-23390	27 JUL 98
C	WJC	3 NOV 98
D	CO-93789	3 NOV 98
E	KED	14 JAN 99
F	CO-93816	1 MAR 99
G	WJC	200505
H	TSM	31 MAY 00
I	LJK	20 NOV 00
J	GLH	206174
K	GLH	6 JAN 03
L	GLH	6 JAN 03
M	SR	0018451
N	SR	18 JAN 06

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CHECK 5 JAN 98

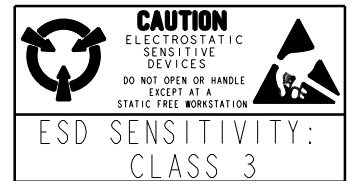
TABLE 1 - MAGNETIC SPECIFICATIONS  $\triangle 4 \triangle 7$

LISTING	-40°C	0°C	25°C	85°C	125°C	150°C
MIN OPERATE GAUSS						
SS5IT	NS	NS	NS	NS	NS	NS
SS511AT	NS	NS	NS	NS	NS	NS
SS513AT	NS	NS	NS	NS	NS	NS
SS541AT	50	53	55	45	40	35
SS543AT	110	110	110	90	80	65
SS549AT	285	305	310	290	270	260
SS561AT	5	5	10	10	5	5
SS566AT	100	100	100	95	80	70
MAX OPERATE GAUSS						
SS5IT	145	145	140	150	200	250
SS511AT	70	65	60	60	65	70
SS513AT	140	140	140	140	140	140
SS541AT	135	117	115	120	123	125
SS543AT	215	190	180	180	190	200
SS549AT	435	400	390	400	410	420
SS561AT	110	90	85	85	100	110
SS566AT	200	185	180	180	180	185
MIN RELEASE GAUSS						
SS5IT	-145	-145	-140	-150	-200	-250
SS511AT	-70	-65	-60	-60	-65	-70
SS513AT	-140	-140	-140	-140	-140	-140
SS541AT	20	20	20	15	15	10
SS543AT	80	80	75	70	60	55
SS549AT	210	230	235	215	200	185
SS561AT	-110	-90	-85	-85	-100	-110
SS566AT	-200	-185	-180	-180	-180	-185
MAX RELEASE GAUSS						
SS5IT	NS	NS	NS	NS	NS	NS
SS511AT	NS	NS	NS	NS	NS	NS
SS513AT	NS	NS	NS	NS	NS	NS
SS541AT	120	99	95	105	115	120
SS543AT	190	165	155	165	180	195
SS549AT	360	325	315	325	340	345
SS561AT	-5	-5	-10	-10	-5	-5
SS566AT	-100	-100	-100	-95	-80	-70
MIN DIFF GAUSS						
SS5IT	40	50	50	50	60	NS
SS511AT	15	15	15	12	12	10
SS513AT	20	20	20	20	20	20
SS541AT	15	15	20	15	8	5
SS543AT	25	25	25	15	10	5
SS549AT	30	30	30	30	30	30
SS561AT	50	50	50	50	50	50
SS566AT	200	200	200	190	160	140



SS5XT ELECTRICAL SPECIFICATIONS

CHARACTERISTIC	TEST CONDITIONS	VALUES	UNITS
VOLTAGE RANGE		4.5 TO 24	VOLTS
MAX I <sub>on</sub>	V <sub>cc</sub> = 24V, -40°C < T < 150°C, B > MAX OP	10.0	mA
MAX I <sub>off</sub>	V <sub>cc</sub> = 24V, V <sub>out</sub> = 24V, -40°C < T < 150°C, B < MIN REL	11.3	mA
SINK CURRENT		20	mA
MAX V <sub>sat</sub>	V <sub>cc</sub> = 4.5V TO 24V, T = 25°C, B > MAX OP	0.4	VOLTS
MAX LEAKAGE		10	μA
RISE TIME 10% TO 90%	V <sub>cc</sub> = 12V, R <sub>L</sub> = 1.6KΩ, C <sub>L</sub> = 20pf	1.5	μS
FALL TIME 90% TO 10%	V <sub>cc</sub> = 12V, R <sub>L</sub> = 1.6KΩ, C <sub>L</sub> = 20pf	1.5	μS



ABSOLUTE MAXIMUM RATINGS SS5XT  $\triangle 2$

TEMPERATURE	-40°C TO +150°C
SUPPLY VOLTAGE	-28 VDC 28 VDC
VOLTAGE EXTERNALLY APPLIED TO OUTPUT	28.0 VDC MAX WITH SWITCH IN OFF COND. ONLY -0.5 VDC WITH SWITCH IN ON OR OFF COND.
OUTPUT CURRENT	20 mA
MAGNETIC FLUX	NO LIMIT

TABLE 2  
SS5XX  
OUTPUT CURRENT  
ABSOLUTE LIMITS

SUPPLY VOLTAGE	OUTPUT CURRENT MAX, mA
-1 TO 24	50
24 TO 25	37
25 TO 26	33
26 TO 27	28
27 TO 28	24
28 TO 29	19
29 TO 30	15

SS5XXAT ELECTRICAL SPECIFICATIONS

CHARACTERISTIC	TEST CONDITIONS	VALUES	UNITS
VOLTAGE RANGE		3.8 TO 30	VOLTS
MAX I <sub>on</sub>	V <sub>cc</sub> = 30V, -40°C < T < 150°C, B > MAX OP	10.0	mA
MAX I <sub>off</sub>	V <sub>cc</sub> = 30V, V <sub>out</sub> = 30V, -40°C < T < 150°C, B < MIN REL	10.0	mA
SINK CURRENT		20	mA
MAX V <sub>sat</sub>	V <sub>cc</sub> = 3.8V, B > MAX OP	0.4	VOLTS
MAX LEAKAGE		10	μA
RISE TIME 10% TO 90%	V <sub>cc</sub> = 12V, R <sub>L</sub> = 1.6KΩ, C <sub>L</sub> = 20pf	1.5	μS
FALL TIME 90% TO 10%	V <sub>cc</sub> = 12V, R <sub>L</sub> = 1.6KΩ, C <sub>L</sub> = 20pf	1.5	μS

ABSOLUTE MAXIMUM RATING SS5XXAT  $\triangle 2$

CHARACTERISTIC	SYMBOL	MIN	MAX	UNITS
POWER SUPPLY	VCC	-1	30	VOLTS
OUTPUT VOLTAGE (OFF)	VOUT		30	VOLTS
OUTPUT ON CURRENT	I SINK		SEE TABLE 2	mA
OPERATING TEMPERATURE	T	-50	160	°C
STORAGE TEMPERATURE	T <sub>s</sub>	-65	160	°C
MAGNETIC FLUX				

LISTING	TYPE	BRAND
SS5IT	BIPOLAR	SS5I
SS511AT	BIPOLAR	S511A
SS513AT	BIPOLAR	S513A
SS541AT	UNIPOLAR	S541A
SS543AT	UNIPOLAR	S543A
SS549AT	UNIPOLAR	S549A
SS561AT	LATCH	S561A
SS566AT	LATCH	S566A

THIRD ANGLE PROJECTION

SCALE NONE

DO NOT SCALE PRINT

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE

ONE PLACE (.0)	±.030
TWO PLACE (.00)	±.015
THREE PLACE (.000)	±.005
ANGLES	±

WEIGHT

PTC/CAD  
DRAWN