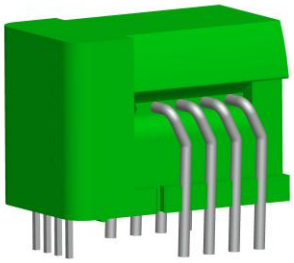
Current Transducer BSM3-SX44 series I_{PN}=6,15,25,50 A

Ref: BSM3-6IFV1H-SX44, BSM3-15IFV1H-SX44, BSM3-25IFV1H-SX44, BSM3-50IFV1H-SX44

Description

For the electronic measurement of current: DC, AC, pulsed…, with galvanic isolation between the primary (high power) and the secondary circuit (electronic circuit).



Features

- Closed loop (compensated) multi-range current transducer
- Voltage output
- Single supply
- Compact design for PCB mounting
- Isolated plastic case material recognized according to UL 94-V0

Advantages

- Very low temperature coefficient of offset
- Very good dv/dt immunity
- High creepage/clearance distances
- Reduce height
- Reference pin with tow modes: Ref IN and Ref OUT
- Extended measuring range for unipolar measurement

Applications

- AC variable speed and servo motor drives
- Battery supplied applications
- Uninterruptible Power Supplies (UPS)
- Power supplies for welding applications
- Static converters for DC motor drives
- Switched-Mode Power Supplies (SMPS)
- Solar inverters

Standards

- EN50178
- UL508-UR marking pending
- IEC 61010-1(safety)

Application Domain

- Industrial

Absolute maximum ratings

Parameter	Symbol	Unit	Value
Supply voltage	Vc	V	7
Primary conductor temperature		℃	110
ESD rating ,Human Body Model (HBM)		KV	4

Stresses above these ratings may cause permanent damage .Exposure to absolute maximum ratings for extended periods may degrade reliability.

Isolation characteristics (pri.-sec.)

Parameter	Symbol	Unit	Value	Comment
RMS voltage for AC isolation test 50/60Hz/1 min	V_d	KV	4.3	
Impulse withstand voltage 1.2/50 us	Vw	KV	8	
Partial discharge extinction voltage @10pc(rms)	Ve	V	1000	
Clearance distance (pri.-sec.)	dCI	mm	8.2	Shortest distance through air
Creepage distance (pri..-sec.)	dCP	mm	8.2	Shortest path along device body
Case material	-		V0 according to UL 94	
Comparative tracking index	CTI	V	600	
Application example	-	-	300V CAT Ⅲ PD2	Reinforced isolation ,non uniform field according to EN61010
Application example	-	-	600V CAT Ⅲ PD2	Reinforced isolation ,non uniform field according to EN50178
Application example	-	-	1000V CAT Ⅲ PD2	Simple isolation ,non uniform field according to EN50178

Environment and mechanical characteristics

Parameter	Symbol	Unit	Min	Type	Max	Comment
Ambient operating temperature	T_A	℃	-40		105	
Ambient storage temperature	T_S	℃	-55		125	
Mass	m	g		9		
Standards	EN 50178,IEC 60950-1,IEC 61010-1,IEC 61326-1,UL 508					

Electrical data BSM3-6IFV1H-SX44

At T_A=25℃，V_C=+5V，N_P=1 turn，R_L=10KΩ，internal reference, unless otherwise noted

Parameter	Symbol	Unit	Min	Type	Max	Comment
Primary nominal current rms	I_{PN}	A		6		
Primary current , measuring range	I_{PM}	A	-20		20	
Number of primary turns	Np	-		1,2,3,4		
Supply voltage	V_C	V	4.75	5	5.25	
Current consumption	I_C	mA		15+I_P(mA)/N_S	20+I_P(mA)/N_S	N_S=1731 turns
Reference voltage @ Ip=0A	V_{REF}	V	2.495	2.5	2.505	Internal reference
External reference voltage	V_{REF}	V	0		4	
Output voltage	V_{OUT}	V	0.375		4.625	
Output voltage @ I_P=0	V_{OUT}	V		V_{REF}		
Electrical offset voltage	V_{OE}	mV	-5.3		5.3	100% tested V_{OUT}- V_{REF}
Electrical offset current referred to primary	I_{OE}	mA	-51		51	100% tested
Temperature coefficient of V_{REF}	TCV_{REF}	ppm/K		±5	±50	Internal reference
Temperature coefficient of V_{OUT}@I_P=0A	TCV_{OUT}	ppm/K		±6	±30	ppm/K of 2.5V -40℃…105℃
Theoretical sensitivity	G_{th}	mV/A		104.2		625mV/I_{PN}
Sensitivity error	ε_G	%	-0.7		0.7	100% tested
Temperature coefficient of G	TCG	ppm/K			±40	-40℃…105℃
Linearity error	ε_L	% of I_{PN}	-0.1		0.1	
Magnetic offset current(10*I_{PN}) referred to primary	I_{OM}	A	-0.1		0.1	
Output current noise (spectral density) rms 100Hz…100KHz referred to primary	i_{nO}	uA/Hz$^{1/2}$		20		R_L=1K
Peak-peak output ripple at oscillator frequency f=450KHz (typ.)	-	mV		40	160	R_L=1K
Reaction time @10% of I_{PN}	t_{ra}	μs			0.3	R_L=1K di/dt=18A/us
Response time @ 90%of I_{PN}	t_r	μs			0.3	R_L=1K di/dt=18A/us
Frequency bandwidth (±1dB)	BW	KHz	200			R_L=1K
Frequency bandwidth (±3dB)	BW	KHz	300			R_L=1K
Overall accuracy	X_G	% of I_{PN}			1.7	
Overall accuracy @T_A=85℃	X_G	% of I_{PN}			2.6(2.9)	
Accuracy	X	% of I_{PN}			0.8	
Accuracy @ T_A=85℃	X	% of I_{PN}			1.8(2.1)	

Electrical data BSM3-15IFV1H-SX44

At TA=25℃，VC=+5V，NP=1 turn，RL=10K，internal reference, unless otherwise noted

Parameter	Symbol	Unit	Min	Type	Max	Comment
Primary nominal current rms	I_{PN}	A		15		
Primary current , measuring range	I_{PM}	A	-51		51	
Number of primary turns	Np	-		1,2,3,4		
Supply voltage	V_C	V	4.75	5	5.25	
Current consumption	I_C	mA		15+I_P(mA)/N_S	20+I_P(mA)/N_S	N_S=1731 turns
Reference voltage @ Ip=0A	V_{REF}	V	2.495	2.5	2.505	Internal reference
External reference voltage	V_{REF}	V	0		4	
Output voltage	V_{OUT}	V	0.375		4.625	
Output voltage @ I_P=0	V_{OUT}	V		V_{REF}		
Electrical offset voltage	V_{OE}	mV	-2.21		2.21	100% tested V_{OUT}- V_{REF}
Electrical offset current referred to primary	I_{OE}	mA	-53		53	100% tested
Temperature coefficient of V_{REF}	TCV_{REF}	ppm/K		±5	±50	Internal reference
Temperature coefficient of V_{OUT}@I_P=0A	TCV_{OUT}	ppm/K		±2.3	±20	ppm/K of 2.5V -40℃…105℃
Theoretical sensitivity	G_{th}	mV/A		41.67		625mV/I_{PN}
Sensitivity error	ε_G	%	-0.7		0.7	100% tested
Temperature coefficient of G	TCG	ppm/K			±40	-40℃…105℃
Linearity error	ε_L	% of I_{PN}	-0.1		0.1	
Magnetic offset current(10*I_{PN}) referred to primary	I_{OM}	A	-0.1		0.1	
Output current noise (spectral density) rms 100…100KHzreferred to primary	I_{no}	uA/$Hz^{1/2}$		20		R_L=1K
Peak-peak output ripple at oscillator frequency f=450KHz (typ.)	-	mV		15	60	R_L=1K
Reaction time @10% of I_{PN}	t_{ra}	μs			0.3	R_L=1K di/dt=44A/us
Response time @ 90%of I_{PN}	t_r	μs			0.3	R_L=1K di/dt=44A/us
Frequency bandwidth (±1dB)	BW	KHz	200			R_L=1K
Frequency bandwidth (±3dB)	BW	KHz	300			R_L=1K
Overall accuracy	X_G	% of I_{PN}			1.2	
Overall accuracy @T_A=85℃	X_G	% of I_{PN}			1.9(2.1)	
Accuracy	X	% of I_{PN}			0.8	
Accuracy @ T_A=85℃	X	% of I_{PN}			1.5(1.8)	

Electrical data BSM3-25IFV1H-SX44

At TA=25℃，VC=+5V，NP=1 turn，RL=10K，internal reference, unless otherwise noted

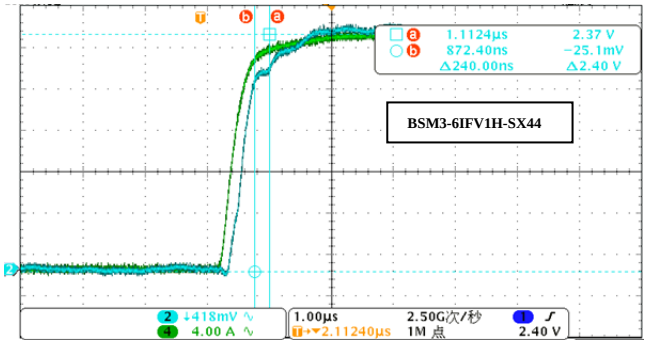
Parameter	Symbol	Unit	Min	Type	Max	Comment
Primary nominal current rms	I_{PN}	A		25		
Primary current , measuring range	I_{PM}	A	-85		85	
Number of primary turns	Np	-		1,2,3,4		
Supply voltage	V_C	V	4.75	5	5.25	
Current consumption	I_C	mA		15+I_P(mA)/N_S	20+I_P(mA)/N_S	N_S=1731 turns
Reference voltage @ Ip=0A	V_{REF}	V	2.495	2.5	2.505	Internal reference
External reference voltage	V_{REF}	V	0		4	
Output voltage	V_{OUT}	V	0.375		4.625	
Output voltage @ I_P=0	V_{OUT}	V		V_{REF}		
Electrical offset voltage	V_{OE}	mV	-1.35		1.35	100% tested V_{OUT}- V_{REF}
Electrical offset current referred to primary	I_{OE}	mA	-54		54	100% tested
Temperature coefficient of V_{REF}	TCV_{REF}	ppm/K		±5	±50	Internal reference
Temperature coefficient of V_{OUT}@I_P=0A	TCV_{OUT}	ppm/K		±1.4	±10	ppm/K of 2.5V -40℃…105℃
Theoretical sensitivity	G_{th}	mV/A		25		625mV/I_{PN}
Sensitivity error	ε_G	%	-0.7		0.7	100% tested
Temperature coefficient of G	TCG	ppm/K			±40	-40℃…105℃
Linearity error	ε_L	% of I_{PN}	-0.1		0.1	
Magnetic offset current(10*IPN) referred to primary	I_{OM}	A	-0.1		0.1	
Output current noise (spectral density) rms 100Hz…100KHz referred to primary	i_{nO}	uA/$Hz^{1/2}$		20		R_L=1K
Peak-peak output ripple at oscillator frequency f=450KHz (typ.)	-	mV		10	40	R_L=1K
Reaction time @10% of I_{PN}	t_{ra}	μs			0.3	R_L=1K di/dt=68A/us
Response time @ 90%of I_{PN}	t_r	μs			0.3	R_L=1K di/dt=68A/us
Frequency bandwidth (±1dB)	BW	KHz	200			R_L=1K
Frequency bandwidth (±3dB)	BW	KHz	300			R_L=1K
Overall accuracy	X_G	% of I_{PN}			1	
Overall accuracy @T_A=85℃	X_G	% of I_{PN}			1. 5(1.7)	
Accuracy	X	% of I_{PN}			0.8	
Accuracy @ T_A=85℃	X	% of I_{PN}			1.3(1.4)	

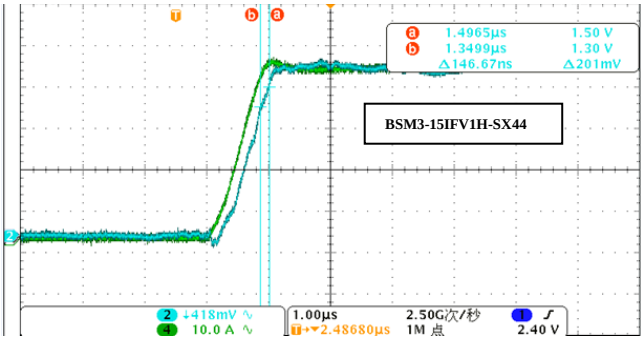
Electrical data BSM3-50IFV1H-SX44

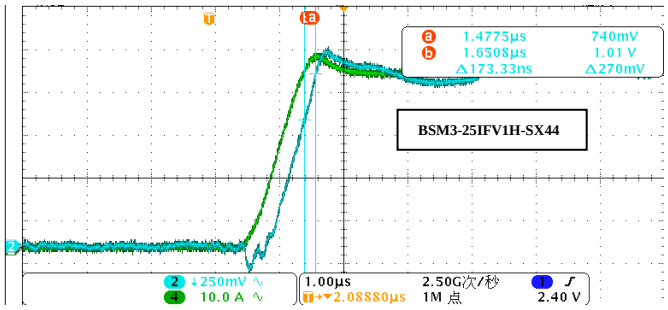
At TA=25℃，VC=+5V，NP=1 turn，RL=10K，internal reference, unless otherwise noted

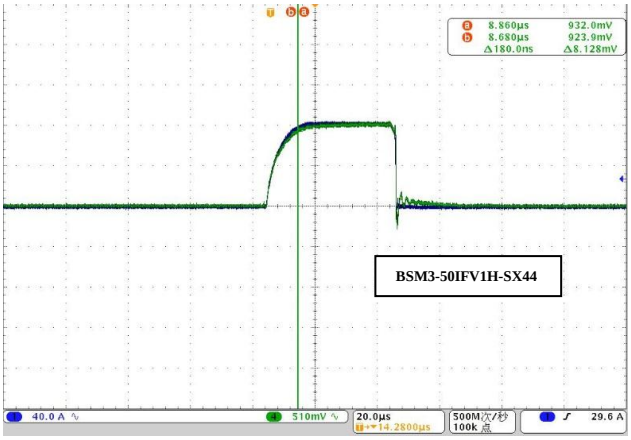
Parameter	Symbol	Unit	Min	Type	Max	Comment
Primary nominal current rms	I_{PN}	A		50		
Primary current , measuring range	I_{PM}	A	-150		150	
Number of primary turns	Np	-		1,2,3,4		
Supply voltage	V_C	V	4.75	5	5.25	
Current consumption	I_C	mA		15+I_P(mA)/N_S	20+I_P(mA)/N_S	N_S=966 turns
Reference voltage @ Ip=0A	V_{REF}	V	2.495	2.5	2.505	Internal reference
External reference voltage	V_{REF}	V	0		4	
Output voltage	V_{OUT}	V	0.375		4.625	
Output voltage @ I_P=0	V_{OUT}	V		V_{REF}		
Electrical offset voltage	V_{OE}	mV	-0.725		0.725	100% tested V_{OUT}- V_{REF}
Electrical offset current referred to primary	I_{OE}	mA	-58		58	100% tested
Temperature coefficient of V_{REF}	TCV_{REF}	ppm/K		±5	±50	Internal reference
Temperature coefficient of V_{OUT}@I_P=0A	TCV_{OUT}	ppm/K		±0.7	±7	ppm/K of 2.5V -40℃…105℃
Theoretical sensitivity	G_{th}	mV/A		12.5		625mV/I_{PN}
Sensitivity error	ε_G	%	-0.7		0.7	100% tested
Temperature coefficient of G	TCG	ppm/K			±40	-40℃…105℃
Linearity error	ε_L	% of I_{PN}	-0.1		0.1	
Magnetic offset current(10*IPN) referred to primary	I_{OM}	A	-0.1		0.1	
Output current noise (spectral density) rms 100…100KHzreferred to primary	i_{nO}	uA/$Hz^{1/2}$		20		R_L=1K
Peak-peak output ripple at oscillator frequency f=450KHz (typ.)	-	mV		5	20	R_L=1K
Reaction time @10% of I_{PN}	t_{ra}	μs			0.3	R_L=1K di/dt=100A/us
Response time @ 90%of I_{PN}	t_r	μs			0.3	R_L=1K di/dt=100A/us
Frequency bandwidth (±1dB)	BW	KHz	200			R_L=1K
Frequency bandwidth (±3dB)	BW	KHz	300			R_L=1K
Overall accuracy	X_G	% of I_{PN}			0.9	
Overall accuracy @T_A=85℃	X_G	% of I_{PN}			1.3(1.5)	
Accuracy	X	% of I_{PN}			0.8	
Accuracy @ T_A=85℃	X	% of I_{PN}			1.2(1.3)	

Response and reaction time

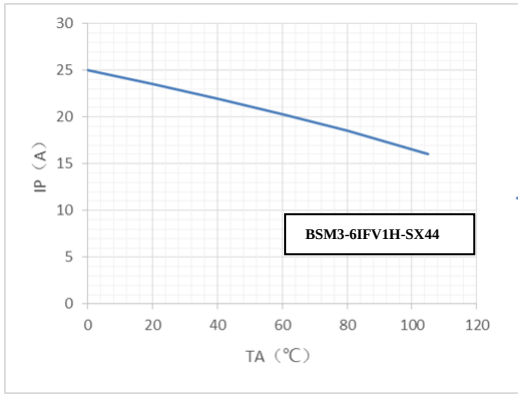


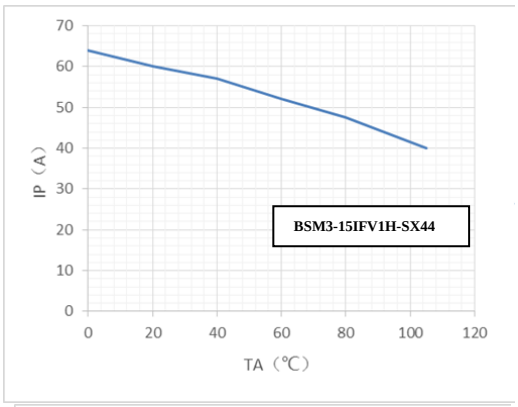


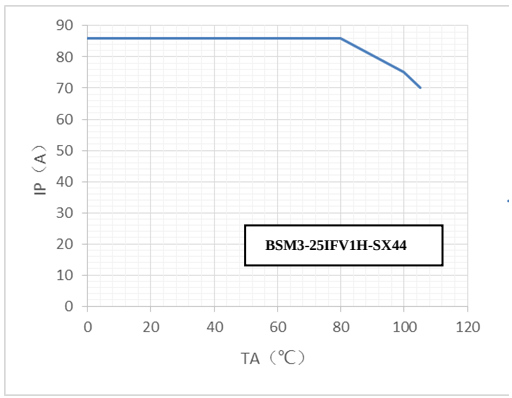


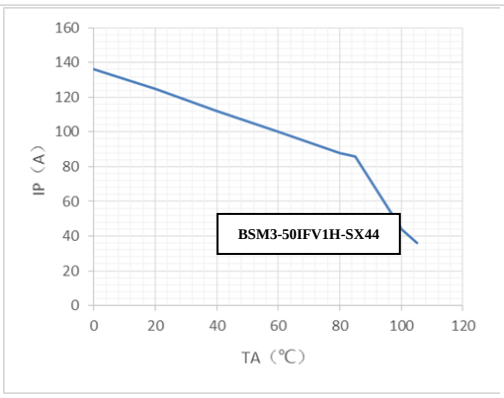


Maximum continuous DC primary current derating Vs. Ambient temperature

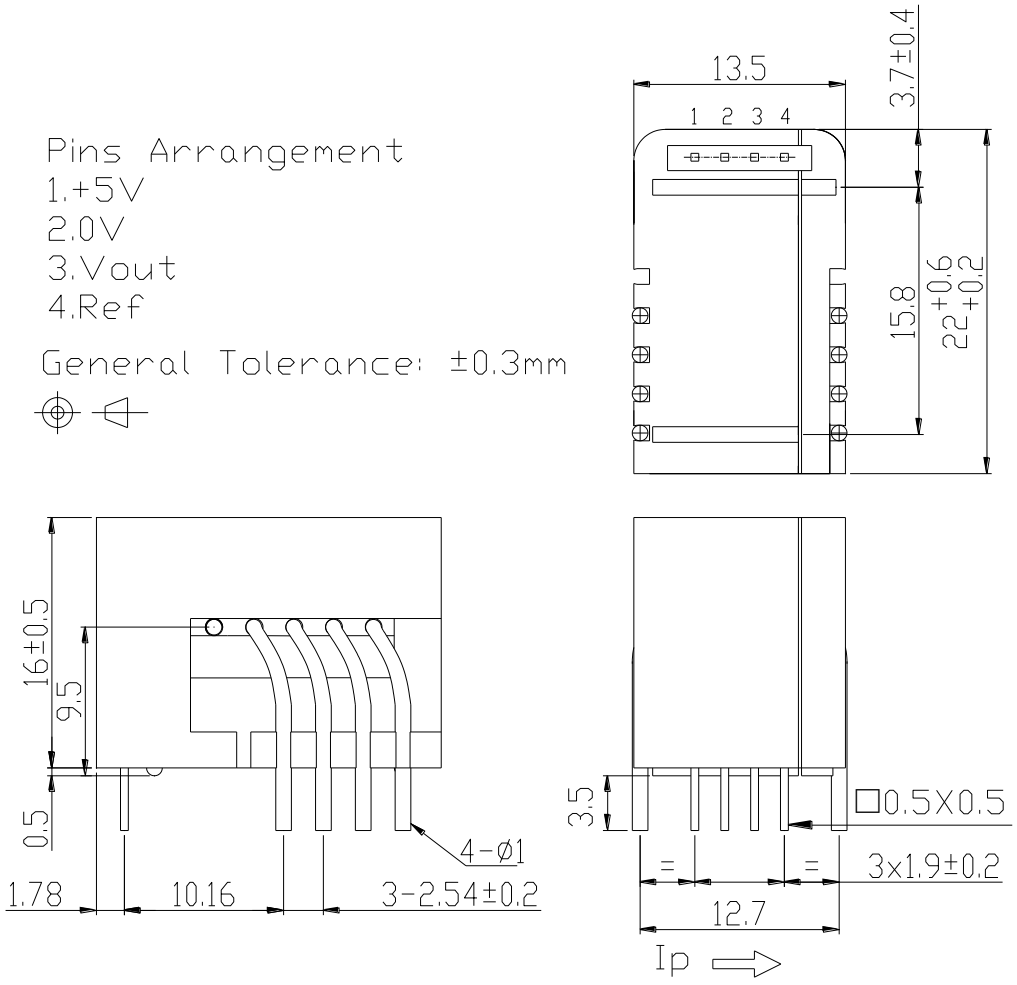


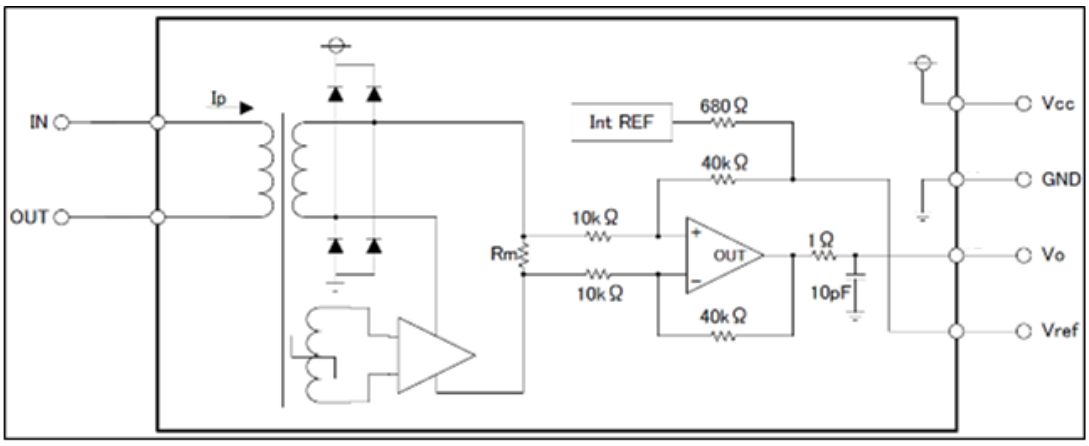




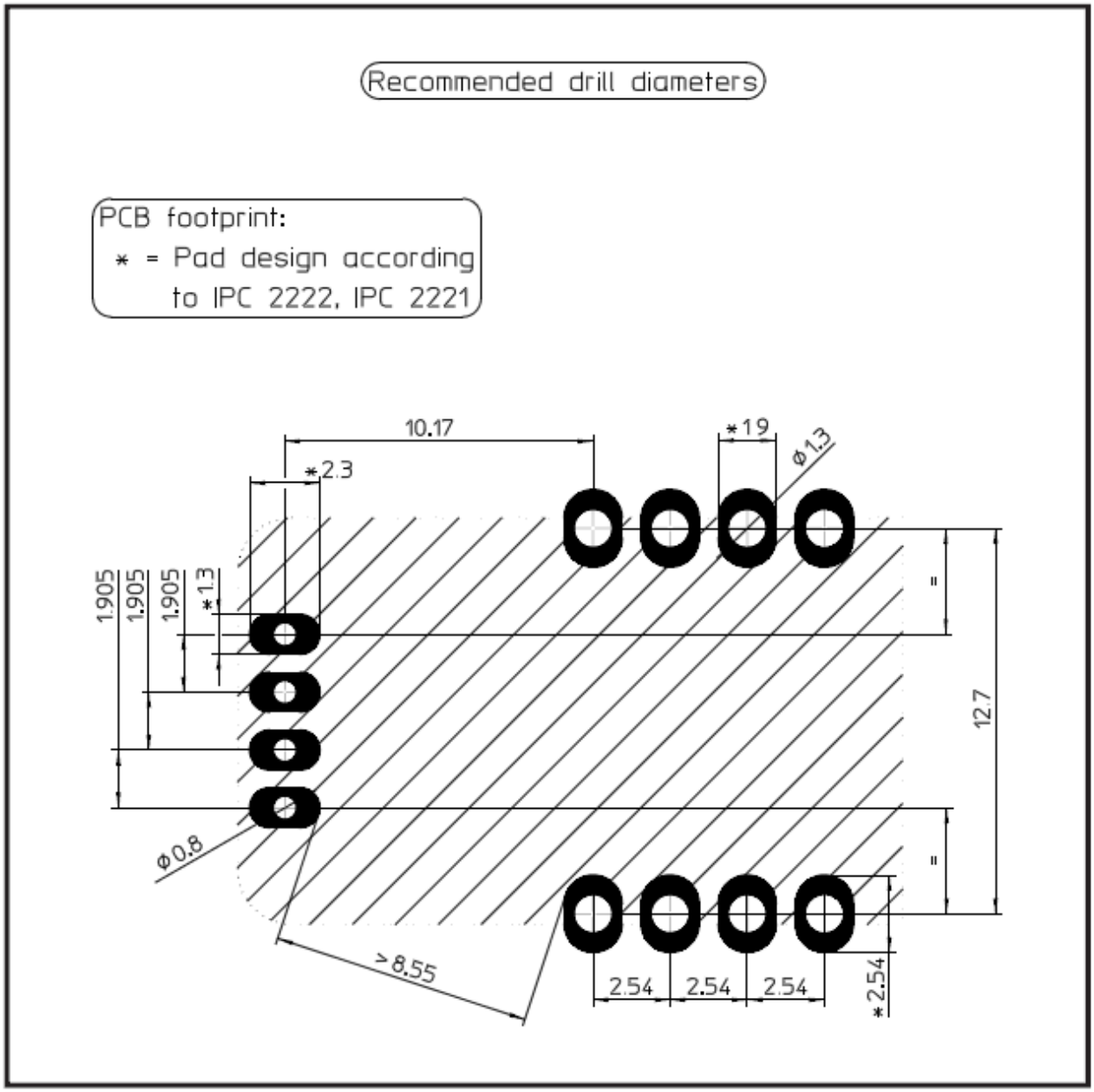


Dimensions BSM3-SX44 Series (in mm. 1 mm = 0.0394 inch)





BSM3-SX44 Series, PCB footprint



Assembly on PCB

- Recommended PCB hole diameter 1.3 mm for primary pin
  0.8 mm for secondary pin
- Maximum PCB thickness 2.4 mm
- Wave soldering profile maximum 260℃ for 10 s
  No clean process only

Instructions of use

1. When the test current passes through the sensor, you can get the size of the output current. (Warning: wrong connection may lead to sensors damage)
2. I_s is positive when I_p flows in the direction of the arrow.
3. In order to achieve the best magnetic coupling, the primary windings have to be wound over the top edge of the device.
4. According to user needs, different rated input currents and output currents of the sensors can be customized.

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- The information contained herein is subject to change without notice.

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