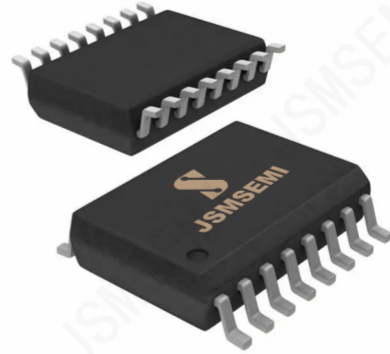


DESCRIPTION

The ACS724 series is an open-loop Hall current sensing chip that combines high accuracy, high bandwidth, high response, high linearity, and low temperature drift. ACS724 provides 0~65A large current measurement range. ACS724 can also do -40 °C ~ 125 °C full temperature range of typical sensitivity temperature drift $\pm 0.2\%$ of the performance indicators. It provides a new solution for the high accuracy and high performance current sensor area. ACS724 adapts to strong electromagnetic and high isolation current detection environment.

In addition, ACS724 series products have passed ROHS and other certifications.



FEATURES

High Accuracy、Large Current

- 0~65A Current sensor
- Low primary conductor resistance: 0.9mΩ
- Typical V_{OE} temperature drift: $\pm 5\text{mV}$
- Typical sensitivity temperature drift: $\pm 0.5\%$
- Typical linearity error: $\pm 0.1\%$

High Bandwidth, Fast Response

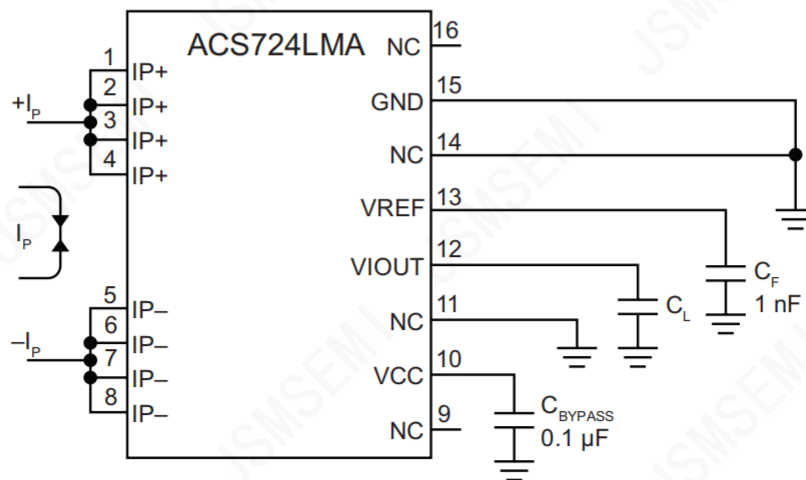
- Typical bandwidth: 250kHz
- Typical response time: 1.6μs

High Anti-interference, High Insulation

- Differential hall effectively resists external magnetic field interference
- Isolated voltage: 3000Vrms
- Compatible with 3.3V/5V power supply
- Ratiometric/fixed output

TYPICAL APPLICATIONS

- White Goods
- Microinverter
- Power Supply
- Motor Control



Typical Application

SELECTION GUIDE

Part Number	Output Mode	IPR(A)	Sensitivity (mV/A)		Rating MSL	Temperature Operating	Packing
			V _{CC} =3.3V(*=3.3)	V _{CC} =5V(*=5)			
ACS724LMATR-12FB-T	Fixed Output Mode	±12	110	166.7	3	-40°C to 150°C	Tape and reel, 1000 pieces per reel
ACS724LMATR-20FB-T		±20	66	100			
ACS724LMATR-30FB-T		±30	44	66.7			
ACS724LMATR-30FU-T		30	88	133.3			
ACS724LMATR-40FB-T		±40	33	50			
ACS724LMATR-50FB-T		±50	26.4	40			
ACS724LMATR-65FB-T		±65	20.3	30.8			
ACS724LMATR-12AB-T	Ratiometric Output Mode	±12	110	166.7			
ACS724LMATR-20AB-T		±20	66	100			
ACS724LMATR-30AB-T		±30	44	66.7			
ACS724LMATR-30AU-T		30	88	133.3			
ACS724LMATR-40AB-T		±40	33	50			
ACS724LMATR-50AB-T		±50	26.4	40			
ACS724LMATR-65AB-T		±65	20.3	30.8			

Note: Continuous testing at 25°C supports 50A, if the test range increases or the ambient temperature rises, please refer to the derating curve in application manuals to take heat dissipation measures. Take 30Abipolar as an example, 20Aand above have unipolar output mode with 5V supply, new range will be added without notice.

1 ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	Unit	Min.	Typ.	Max.
Supply Voltage	V _{CC}	V	-0.3	/	6.5
Maximun Output Current	I _{OUTmax}	mA	-45	/	45
Maximun Output Voltage	V _{OUTmax}	V	0.1	/	V _{CC} -0.1
Storage temperature	T _S	°C	-55	/	150
OperatingAmbient Temperature	T _A	°C	-40	/	150
Maximum Junction Temperature	T _{Jmax}	°C	/	/	165

Note: Operation outside the absolute maximum ratings may cause permanent device damage.Absolute maximum ratings do not imply functional operation of the device at these or any other conditions beyond those listed under recommended operating conditions. If used outside the recommended operating conditions but within the absolute maximum ratings, the device may not be fully functional, and this may affect device reliability, functionality, performance, and shorten the device lifetime.

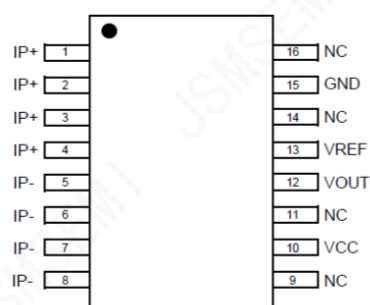
2 ESD RATINGS

Characteristic	Symbol	Unit	Notes	Value
Human Body Model	V _{HBM}	kV	ESD between any two pins	±6
Charged Device Model	V _{CDM}	kV		±1

3 ISOLATION CHARACTERISTICS

Characteristic	Symbol	Unit	Notes	Value
Dielectric Surge Voltage	V _{SURGE}	V	Test method refers to IEC61000-4-5, 1.2μs/50μs waveform.	TBD
Dielectric Strength Test Voltage	V _{ISO}	V _{RMS}	60s, 50Hz isolation withstand voltage parameters, according to UL62368-1, test 1.2V _{ISO} /1s before delivery to verify the insulation performance, and verify the partial discharge is less than 5pc.	TBD
Working Voltage for Basic Isolation	V _{WVBI}	V _{PK} or V _{CC}	Maximum approved working voltage for basic (single) isolation according to UL60950-1.	TBD
		V _{RMS}		TBD
Creepage	D _{CR}	mm	Minimum distance along package body from IP leads to signal leads.	7.5
Comparative Tracking Index	CTI	V	Material Group II	400~599

4 PINOUT DIAGRAM & FUNCTIONAL BLOCK DIAGRAM



Number	Name	Description
1,2,3,4	IP+	Current flows into the chip, positive direction
5,6,7,8	IP-	Current flows out of the chip, negative direction
9,11,14,16	NC	No connect
10	VCC	Device power supply terminal pin
12	VOUT	Analog output signal pin
13	VREF	Zero current reference voltage pin
15	GND	Signal ground terminal

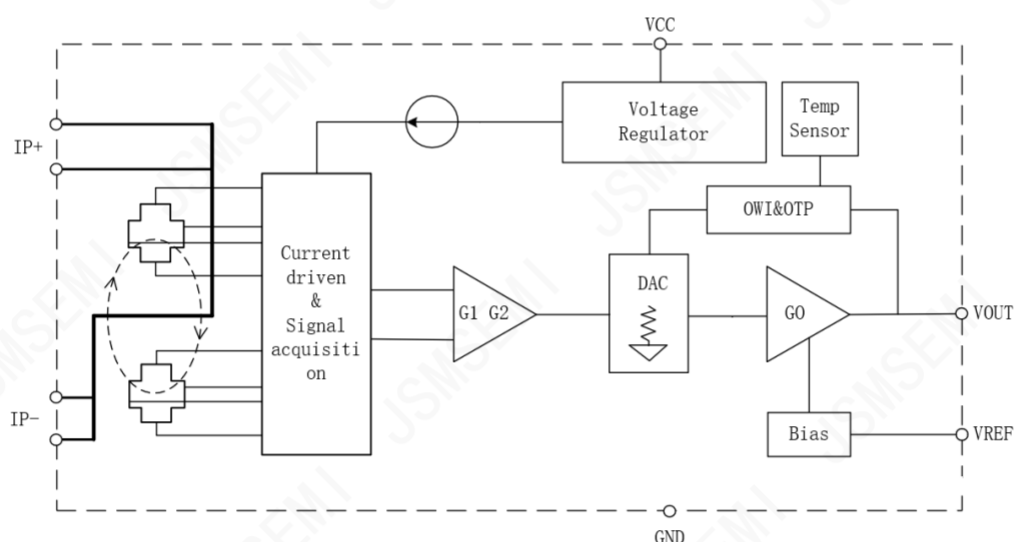


Figure 1. Functional Block Diagram

5 ELECTRICAL CHARACTERISTICS

$T_A=25^{\circ}\text{C}$, $V_{CC}=5\text{V}/3.3\text{V}$, $C_{REF}=1\text{nF}$, $C_L=1\text{nF}$, $C_{VCC}=100\text{nF}$ (Unless otherwise noted)

Characteristic	Symbol	Unit	Test Conditions	Min.	Typ.	Max.
Supply Voltage	V_{CC}	V	3.3V	3	3.3	3.6
			5.0V	4.5	5	5.5
Supply Current ^{Note1}	I_{CC}	mA	no-load, $V_{CC}=3.3\text{V}$	/	7.5	10
			no-load, $V_{CC}=5\text{V}$	/	10	15
Primary Conductor Resistance ^{Note1}	R_P	m Ω	/	/	0.9	/
Power-On Time ^{Note2}	T_{PO}	ms	Chip power-on ($V_{CC}>3.0\text{V}$), V_{OUT} and V_{REF} stable time Chip power-on ($V_{CC}>4.5\text{V}$), V_{OUT} and V_{REF} stable time	/	1	/
Output Capacitive Load ^{Note2}	C_L	nF	/	/	1	10
Output Resistive Load ^{Note2}	R_L	k Ω	/	4.7	/	/
Reference Resistive Load ^{Note2}	R_{LREF}	k Ω	/	10	/	/
Output Voltage Range ^{Note2}	V_S	V	$R_L=10\text{k}\Omega$ to V_{CC} or V_{GND}	0.1	/	$V_{CC}-0.1$
Common Mode Field Rejection ^{Note2}	CMFR	dB	/	/	40	/
Rise Time	T_r	μs	ACS724LMATR-30FB-T	/	1.2	/
Response Time	$T_{RESPONSE}$	μs	ACS724LMATR-30FB-T	/	1.6	/
Internal Bandwidth	BW	kHz	ACS724LMATR-30FB-T, 基于小信号测量	/	250	/
Output Noise	V_N	mVrms	ACS724LMATR-30FB-T	/	8	/
Nonlinearity ^{Note1}	E_{LIN}	%	/	/	± 0.1	± 0.3
Reference Voltage ^{Note1}	V_{REF}	V	Fixed output, Bipolar, $V_{CC}=5\text{V}$	2.49	2.5	2.51
			Fixed output, Bipolar, $V_{CC}=3.3\text{V}$	1.64	1.65	1.66
			Fixed output, Unipolar, $V_{CC}=5\text{V}$	0.49	0.5	0.51
			Ratiometric output, Bipolar	/	$V_{CC}\times 0.5$	/
			Ratiometric output, Unipolar	/	$V_{CC}\times 0.1$	/
Ratiometric Output Sensitivity Error ^{Note1}	S_{ERR}	%	$V_{CC}=3.15\sim 3.45\text{V}$ or $V_{CC}=4.75\sim 5.25\text{V}$	/	0.6	/
Sensitivity Temperature Drift ^{Note1}	dS_{ERR}	%	$I_P=I_{PRmax}$, $T_A=-40^{\circ}\text{C}\sim 125^{\circ}\text{C}$	-1.5	± 0.5	1.5
Offset Temperature Drift ^{Note1}	$V_{IOUT(Q)/TC}$	mV	$I_P=0\text{A}$, $T_A=-40^{\circ}\text{C}\sim 125^{\circ}\text{C}$	-10	± 5	10

Note1: These parameters are obtained from laboratory testing with 3σ data.

Note2: These parameters are guaranteed by design.

ACS724LMATR-12yB-T DEVICE PERFORMANCE CHARACTERISTICS

$T_A=25^{\circ}\text{C}$, $V_{CC}=5\text{V}/3.3\text{V}$, $C_{REF}=1\text{nF}$, $C_L=1\text{nF}$, $C_{VCC}=100\text{nF}$ (Unless otherwise noted)

Characteristic	Symbol	Unit	Test Conditions	Min.	Typ. ^{Note1}	Max.
NOMINAL PERFORMANCE						
Current Sensing Range	I _{PR}	A	/	-12	/	12
Sensitivity(*=3)	Sens	mV/A	I _{PRmin} < I _{PR} < I _{PRmax}	/	110	/
Sensitivity(*=5)	Sens	mV/A	I _{PRmin} < I _{PR} < I _{PRmax}	/	166.7	/
Zero Current Output Voltage	V _{IOUT(Q)}	V	Bipolar, I _{PR} =0A, V _{CC} =3.3V, Fixed output	1.64	1.65	1.66
			Bipolar, I _{PR} =0A, V _{CC} =5V, Fixed output	2.49	2.5	2.51
			Bipolar, I _{PR} =0A, Ratiometric output	/	V _{CC} *0.5	/
ACCURACY PERFORMANCE						
Total Output Error	E _{TOT}	%	I _P =I _{PRmax} , T _A =-40°C ~ 125°C	-1.6	±0.6	1.6
TOTAL OUTPUT ERROR COMPONENTS: E _{TOT} = (V _{IOUT} -V _{IOUT Ideal})/(Sens _{Ideal} ×I _P)×100%, E _{TOT} = ((V _{IOUT Meas} -V _{REF Meas})-(V _{IOUT Ideal} -V _{REF Ideal}))/(Sens _{Ideal} ×I _P)×100%						
Sensitivity Error	E _{SENS}	%	I _P =I _{PRmax} , T _A =25°C ~ 125°C	-1.4	±0.6	1.4
			I _P =I _{PRmax} , T _A =-40°C ~ 25°C	-1.0	±0.6	1.0
Offset Error ^{Note2}	V _{OE}	mV	I _P =0A, T _A =25°C ~ 125°C	-10	±2	10
			I _P =0A, T _A =25°C	-5	±2	5
			I _P =0 A, T _A =-40°C ~ 125°C	-10	±2	10
LIFETIME DRIFT CHARACTERISTICS						
Sensitivity Error Lifetime Drift	E _{SENS_drift}	%	After reliability test, T _A =25°C	/	±0.5	/
Total Output Error Lifetime Drift	E _{TOT_drift}	%	After reliability test, T _A =25°C	/	±0.5	/

Note1: These parameters are obtained from laboratory testing with 3 σ data.

Note2: Offset error refers to ratiometric output mode of unipolar output or fixed output mode of differential output.

ACS724LMATR-20yB-T DEVICE PERFORMANCE CHARACTERISTICS

$T_A=25^{\circ}\text{C}$, $V_{CC}=5\text{V}/3.3\text{V}$, $C_{REF}=1\text{nF}$, $C_L=1\text{nF}$, $C_{VCC}=100\text{nF}$ (Unless otherwise noted)

Characteristic	Symbol	Unit	Test Conditions	Min.	Typ. ^{Note1}	Max.
NOMINAL PERFORMANCE						
Current Sensing Range	I _{PR}	A	/	-20	/	20
Sensitivity(V _{CC} =3.3V)	Sens	mV/A	I _{PRmin} < I _{PR} < I _{PRmax}	/	66	/
Sensitivity(V _{CC} =5V)	Sens	mV/A	I _{PRmin} < I _{PR} < I _{PRmax}	/	100	/
Zero Current Output Voltage	V _{IOUT(Q)}	V	Bipolar, I _{PR} =0A, V _{CC} =3.3V, Fixed output	1.64	1.65	1.66
			Bipolar, I _{PR} =0A, V _{CC} =5V, Fixed output	2.49	2.5	2.51
			Bipolar, I _{PR} =0A, Ratiometric output	/	V _{CC} *0.5	/
ACCURACY PERFORMANCE						
Total Output Error	E _{TOT}	%	I _P =I _{PRmax} , T _A =-40°C ~ 125°C	-1.6	±0.5	1.6
TOTAL OUTPUT ERROR COMPONENTS: E _{TOT} = (V _{IOUT} -V _{IOUT Ideal})/(Sens _{Ideal} ×I _P)×100%, E _{TOT} = ((V _{IOUT Meas} -V _{REF Meas})-(V _{IOUT Ideal} -V _{REF Ideal}))/(Sens _{Ideal} ×I _P)×100%						
Sensitivity Error	E _{SENS}	%	I _P =I _{PRmax} , T _A =25°C ~ 125°C	-1.5	±0.5	1.5
			I _P =I _{PRmax} , T _A =-40°C ~ 25°C	-1.0	±0.5	1.0
Offset Error ^{Note2}	V _{OE}	mV	I _P =0A, T _A =25°C ~ 125°C	-10	±2	10
			I _P =0A, T _A =25°C	-5	±2	5
			I _P =0A, T _A =-40°C ~ 125°C	-10	±2	10
LIFETIME DRIFT CHARACTERISTICS						
Sensitivity Error Lifetime Drift	E _{SENS_drift}	%	After reliability test, T _A =25°C	/	±0.5	/
Total Output Error Lifetime Drift	E _{TOT_drift}	%	After reliability test, T _A =25°C	/	±0.5	/

Note1: These parameters are obtained from laboratory testing with 3 σ data.

Note2: Offset error refers to ratiometric output mode of unipolar output or fixed output mode of differential output.

ACS724LMATR-30yB-T DEVICE PERFORMANCE CHARACTERISTICS

$T_A=25^{\circ}\text{C}$, $V_{CC}=5\text{V}/3.3\text{V}$, $C_{REF}=1\text{nF}$, $C_L=1\text{nF}$, $C_{VCC}=100\text{nF}$ (Unless otherwise noted)

Characteristic	Symbol	Unit	Test Conditions	Min.	Typ. ^{Note1}	Max.
NOMINAL PERFORMANCE						
Current Sensing Range	I _{PR}	A	/	-30	/	30
Sensitivity(V _{CC} =3.3V)	Sens	mV/A	I _{PRmin} < I _{PR} < I _{PRmax}	/	44	/
Sensitivity(V _{CC} =5V)	Sens	mV/A	I _{PRmin} < I _{PR} < I _{PRmax}	/	66.7	/
Zero Current Output Voltage	V _{IOUT(Q)}	V	Bipolar, I _{PR} =0A, V _{CC} =3.3V, Fixed output	1.64	1.65	1.66
			Bipolar, I _{PR} =0A, V _{CC} =5V, Fixed output	2.49	2.5	2.51
			Bipolar, I _{PR} =0A, Ratiometric output	/	V _{CC} *0.5	/
ACCURACY PERFORMANCE						
Total Output Error	E _{TOT}	%	I _P =I _{PRmax} , T _A =-40°C ~ 125°C	-1.6	±0.5	1.6
TOTAL OUTPUT ERROR COMPONENTS: E _{TOT} = (V _{IOUT} -V _{IOUT Ideal})/(Sens _{Ideal} ×I _P)×100%; E _{TOT} = ((V _{IOUT Meas} -V _{REF Meas})-(V _{IOUT Ideal} -V _{REF Ideal}))/(Sens _{Ideal} ×I _P)×100%						
Sensitivity Error	E _{SENS}	%	I _P =I _{PRmax} , T _A =25°C ~ 125°C	-1.5	±0.5	1.5
			I _P =I _{PRmax} , T _A =-40°C ~ 25°C	-1.0	±0.5	1.0
Offset Error ^{Note2}	V _{OE}	mV	I _P =0A, T _A =25°C ~ 125°C	-8	±2	8
			I _P =0A, T _A =25°C	-5	±2	5
			I _P =0A, T _A =-40°C ~ 125°C	-8	±2	8
LIFETIME DRIFT CHARACTERISTICS						
Sensitivity Error Lifetime Drift	E _{SENS_drift}	%	After reliability test, T _A =25°C	/	±0.5	/
Total Output Error Lifetime Drift	E _{TOT_drift}	%	After reliability test, T _A =25°C	/	±0.5	/

Note1: These parameters are obtained from laboratory testing with 3 σ data.

Note2: Offset error refers to ratiometric output mode of unipolar output or fixed output mode of differential output.

ACS724LMATR-30yU-T DEVICE PERFORMANCE CHARACTERISTICS

$T_A=25^{\circ}\text{C}$, $V_{CC}=5\text{V}/3.3\text{V}$, $C_{REF}=1\text{nF}$, $C_L=1\text{nF}$, $C_{VCC}=100\text{nF}$ (Unless otherwise noted)

Characteristic	Symbol	Unit	Test Conditions	Min.	Typ. ^{Note1}	Max.
NOMINAL PERFORMANCE						
Current Sensing Range	I _{PR}	A	/	0	/	30
Sensitivity(V _{CC} =3.3V)	Sens	mV/A	I _{PRmin} < I _{PR} < I _{PRmax}	/	88	/
Sensitivity(V _{CC} =5V)	Sens	mV/A	I _{PRmin} < I _{PR} < I _{PRmax}	/	133.3	/
Zero Current Output Voltage	V _{IOUT(Q)}	V	Unipolar, I _{PR} =0A, V _{CC} =3.3V, Fixed output	0.32	0.33	0.34
			Unipolar, I _{PR} =0A, V _{CC} =5V, Fixed output	0.49	0.5	0.51
			Unipolar, I _{PR} =0A, Ratiometric output	/	V _{CC} *0.1	/
ACCURACY PERFORMANCE						
Total Output Error	E _{TOT}	%	I _P =I _{PRmax} , T _A =-40°C ~ 125°C	-1.6	±0.5	1.6
TOTAL OUTPUT ERROR COMPONENTS: E _{TOT} = (V _{IOUT} -V _{IOUT Ideal})/(Sens _{Ideal} ×I _P)×100%, E _{TOT} = ((V _{IOUT Meas} -V _{REF Meas})-(V _{IOUT Ideal} -V _{REF Ideal}))/(Sens _{Ideal} ×I _P)×100%						
Sensitivity Error	E _{SENS}	%	I _P =I _{PRmax} , T _A =25°C ~ 125°C	-1.5	±0.5	1.5
			I _P =I _{PRmax} , T _A =-40°C ~ 25°C	-1.0	±0.5	1.0
Offset Error ^{Note2}	V _{OE}	mV	I _P =0A, T _A =25°C ~ 125°C	-8	±2	8
			I _P =0A, T _A =25°C	-5	±2	5
			I _P =0A, T _A =-40°C ~ 125°C	-8	±2	8
LIFETIME DRIFT CHARACTERISTICS						
Sensitivity Error Lifetime Drift	E _{SENS_drift}	%	After reliability test, T _A =25°C	/	±0.5	/
Total Output Error Lifetime Drift	E _{TOT_drift}	%	After reliability test, T _A =25°C	/	±0.5	/

Note1: These parameters are obtained from laboratory testing with 3 σ data.

Note2: Offset error refers to ratiometric output mode of unipolar output or fixed output mode of differential output.

ACS724LMATR-40yB-T DEVICE PERFORMANCE CHARACTERISTICS

$T_A=25^{\circ}\text{C}$, $V_{CC}=5\text{V}/3.3\text{V}$, $C_{REF}=1\text{nF}$, $C_L=1\text{nF}$, $C_{VCC}=100\text{nF}$ (Unless otherwise noted)

Characteristic	Symbol	Unit	Test Conditions	Min.	Typ. ^{Note1}	Max.
NOMINAL PERFORMANCE						
Current Sensing Range	I _{PR}	A	/	-40	/	40
Sensitivity(V _{CC} =3.3V)	Sens	mV/A	I _{PRmin} < I _{PR} < I _{PRmax}	/	33	/
Sensitivity(V _{CC} =5V)	Sens	mV/A	I _{PRmin} < I _{PR} < I _{PRmax}	/	50	/
Zero Current Output Voltage	V _{IOUT(Q)}	V	Bipolar, I _{PR} =0A, V _{CC} =3.3V, Fixed output	1.64	1.65	1.66
			Bipolar, I _{PR} =0A, V _{CC} =5V, Fixed output	2.49	2.5	2.51
			Bipolar, I _{PR} =0A, Ratiometric output	/	V _{CC} *0.5	/
ACCURACY PERFORMANCE						
Total Output Error	E _{TOT}	%	I _P =I _{PRmax} , T _A =-40°C ~125°C	-1.6	±0.6	1.6
TOTAL OUTPUT ERROR COMPONENTS: E _{TOT} = (V _{IOUT} -V _{IOUT Ideal})/(Sens _{Ideal} ×I _P)×100%, E _{TOT} = ((V _{IOUT Meas} -V _{REF Meas})-(V _{IOUT Ideal} -V _{REF Ideal}))/(Sens _{Ideal} ×I _P)×100%						
Sensitivity Error	E _{SENS}	%	I _P =I _{PRmax} , T _A =25°C ~ 125°C	-1.5	±0.6	1.5
			I _P =I _{PRmax} , T _A =-40°C ~ 25°C	-1.5	±0.6	1.5
Offset Error ^{Note2}	V _{OE}	mV	I _P =0A, T _A =25°C ~ 125°C	-7	±2	7
			I _P =0A, T _A =25°C	-5	±2	5
			I _P =0 A, T _A =-40°C ~ 125°C	-7	±2	7
LIFETIME DRIFT CHARACTERISTICS						
Sensitivity Error Lifetime Drift	E _{SENS_drift}	%	After reliability test, T _A =25°C	/	±0.5	/
Total Output Error Lifetime Drift	E _{TOT_drift}	%	After reliability test, T _A =25°C	/	±0.5	/

Note1: These parameters are obtained from laboratory testing with 3 σ data.

Note2: Offset error refers to ratiometric output mode of unipolar output or fixed output mode of differential output.

ACS724LMATR-50yB-T DEVICE PERFORMANCE CHARACTERISTICS

$T_A=25^{\circ}\text{C}$, $V_{CC}=5\text{V}/3.3\text{V}$, $C_{REF}=1\text{nF}$, $C_L=1\text{nF}$, $C_{VCC}=100\text{nF}$ (Unless otherwise noted)

Characteristic	Symbol	Unit	Test Conditions	Min.	Typ. ^{Note1}	Max.
NOMINAL PERFORMANCE						
Current Sensing Range	I _{PR}	A	/	-50	/	50
Sensitivity(V _{CC} =3.3V)	Sens	mV/A	I _{PRmin} < I _{PR} < I _{PRmax}	/	26.4	/
Sensitivity(V _{CC} =5V)	Sens	mV/A	I _{PRmin} < I _{PR} < I _{PRmax}	/	40	/
Zero Current Output Voltage	V _{IOUT(Q)}	V	Bipolar, I _{PR} =0A, V _{CC} =3.3V, Fixed output	1.64	1.65	1.66
			Bipolar, I _{PR} =0A, V _{CC} =5V, Fixed output	2.49	2.5	2.51
			Bipolar, I _{PR} =0A, Ratiometric output	/	V _{CC} *0.5	/
ACCURACY PERFORMANCE						
Total Output Error	E _{TOT}	%	I _P =I _{PRmax} , T _A =-40°C ~ 125°C	-1.6	±0.6	1.6
TOTAL OUTPUT ERROR COMPONENTS: E _{TOT} = (V _{IOUT} -V _{IOUT Ideal})/(Sens _{Ideal} ×I _P)×100%, E _{TOT} = ((V _{IOUT Meas} -V _{REF Meas})-(V _{IOUT Ideal} -V _{REF Ideal}))/(Sens _{Ideal} ×I _P)×100%						
Sensitivity Error	E _{SENS}	%	I _P =I _{PRmax} , T _A =25°C ~ 125°C	-1.5	±0.6	1.5
			I _P =I _{PRmax} , T _A =-40°C ~ 25°C	-1.0	±0.6	1.0
Offset Error ^{Note2}	V _{OE}	mV	I _P =0 A, T _A =25°C ~ 125°C	-6	±2	6
			I _P =0 A, T _A =25°C	-5	±2	5
			I _P =0 A, T _A =-40°C ~ 25°C	-6	±2	6
LIFETIME DRIFT CHARACTERISTICS						
Sensitivity Error Lifetime Drift	E _{SENS_drift}	%	After reliability test, T _A =25°C	/	±0.5	/
Total Output Error Lifetime Drift	E _{TOT_drift}	%	After reliability test, T _A =25°C	/	±0.5	/

Note1: These parameters are obtained from laboratory testing with 3σ data.

Note2: Offset error refers to ratiometric output mode of unipolar output or fixed output mode of differential output.

ACS724LMATR-65yB-T DEVICE PERFORMANCE CHARACTERISTICS

$T_A=25^{\circ}\text{C}$, $V_{CC}=5\text{V}/3.3\text{V}$, $C_{REF}=1\text{nF}$, $C_L=1\text{nF}$, $C_{VCC}=100\text{nF}$ (Unless otherwise noted)

Characteristic	Symbol	Unit	Test Conditions	Min.	Typ. ^{Note1}	Max.
NOMINAL PERFORMANCE						
Current Sensing Range	I _{PR}	A	/	-65	/	65
Sensitivity(V _{CC} =3.3V)	Sens	mV/A	I _{PRmin} < I _{PR} < I _{PRmax}	/	20.3	/
Sensitivity(V _{CC} =5V)	Sens	mV/A	I _{PRmin} < I _{PR} < I _{PRmax}	/	30.8	/
Zero Current Output Voltage	V _{IOUT(Q)}	V	Bipolar, I _{PR} =0A, V _{CC} =3.3V, Fixed output	1.64	1.65	1.66
			Bipolar, I _{PR} =0A, V _{CC} =5V, Fixed output	2.49	2.5	2.51
			Bipolar, I _{PR} =0A, Ratiometric output	/	V _{CC} *0.5	/
ACCURACY PERFORMANCE						
Total Output Error	E _{TOT}	%	I _P =I _{PRmax} , T _A =-40°C ~ 125°C	-1.8	±0.6	1.8
TOTAL OUTPUT ERROR COMPONENTS: E _{TOT} = (V _{IOUT} -V _{IOUT Ideal})/(Sens _{Ideal} ×I _P)×100%, E _{TOT} = ((V _{IOUT Meas} -V _{REF Meas})-(V _{IOUT Ideal} -V _{REF Ideal}))/(Sens _{Ideal} ×I _P)×100%						
Sensitivity Error	E _{SENS}	%	I _P =I _{PRmax} , T _A =25°C ~ 125°C	-1.6	±0.6	1.6
			I _P =I _{PRmax} , T _A =-40°C ~ 25°C	-1.2	±0.6	1.2
Offset Error ^{Note2}	V _{OE}	mV	I _P =0 A, T _A =25°C ~ 125°C	-6	±2	6
			I _P =0 A, T _A =25°C	-5	±2	5
			I _P =0 A, T _A =-40°C ~ 25°C	-6	±2	6
LIFETIME DRIFT CHARACTERISTICS						
Sensitivity Error Lifetime Drift	E _{SENS_drift}	%	After reliability test, T _A =25°C	/	±0.5	/
Total Output Error Lifetime Drift	E _{TOT_drift}	%	After reliability test, T _A =25°C	/	±0.5	/

Note1: These parameters are obtained from laboratory testing with 3 σ data.

Note2: Offset error refers to ratiometric output mode of unipolar output or fixed output mode of differential output.

6 PARAMETERS DESCRIPTION

Sensitivity Sens

The change in sensor IC output in response to a 1A change through the primary conductor. The sensitivity is the product of the magnetic circuit sensitivity (G/A) (1G = 0.1 mT) and the linear IC amplifier gain (mV/G). The linear IC amplifier gain is programmed at the factory to optimize the sensitivity (mV/A) for the full-scale current of the device.

Sensitivity error E_{SENS}

Sensitivity error E_{SENS} refers to the percentage deviation between the actual measured sensitivity and the ideal sensitivity.

For example, when $V_{CC} = 5V$,

$$E_{SENS} = (Sens_{Meas(5V)} - Sens_{Ideal(5V)}) / Sens_{Ideal(5V)} \times 100\%$$

The sensitivity temperature drift of dS_{ERR}

Over the entire operating temperature range is defined as:

$$dS_{ERR} = (Sens_{(TA)} - Sens_{(25^\circ C)}) / Sens_{(25^\circ C)} \times 100\%$$

Saturation output voltage $V_{OUT-SAT(H/L)}$

$V_{OUT-SAT(H)}$ is the maximum output of the chip under the positive current.

$V_{OUT-SAT(L)}$ is the maximum output of the chip under negative current.

Zero current output voltage $V_{IOUT(Q)}$

$I_p=0$, Output voltage of the sensor $V_{IOUT(Q)}$.

For bipolar devices, the output voltage $V_{IOUT(Q)} = V_{CC} \times 0.5$

, For unipolar devices, the output voltage $V_{IOUT(Q)} = V_{CC} \times 0.1$

Variation in $V_{IOUT(Q)}$ can be attributed to the resolution of the linear IC quiescent voltage trim and thermal drift.

Offset voltage V_{OE}

Used to measure the influence of external non-magnetic factors. Under zero-current conditions, in ratiometric output mode, it is the difference between the actual output voltage and the theoretical output voltage. In fixed output mode, it is the difference between the actual output voltage and the actual V_{REF} voltage.

Offset temperature drift $V_{IOUT(Q)TC}$

Due to internal circuit tolerance and heat dissipation, static output voltage due to internal circuit tolerance and heat dissipation $V_{OUT(Q)}$ differential static output voltage V_{OE} . May shift with operating temperature $V_{OUT(Q)TC}$.

Defined in ratiometric output mode:

$$V_{IOUT(Q)TC} = V_{OUT(Q)(TA)} - V_{OUT(25^\circ C)}$$

Defined in fixed output mode:

$$V_{IOUT(Q)TC} = (V_{OUT(Q)(TA)} - V_{REF(TA)}) - (V_{OUT(Q)(25^\circ C)} - V_{REF(25^\circ C)})$$

Noise V_N

Noise is the macroscopic sum of thermal noise and shot noise inside the current sensor.

Dividing the noise (mV) by the sensitivity (mV/A) gives the smallest current that the device can resolve.

Symmetry E_{SYM}

Definition: The relationship between the actual output voltage $V_{IOUT(Q)}$ and the forward half-range $V_{IOUT-POSHALF}$ and reverse half-range $V_{IOUT-NEGHALF}$ outputs.

The formula is defined as follows:

$$E_{SYM} = (1 - (V_{IOUT-POSHALF} - V_{IOUT(Q)}) / (V_{IOUT(Q)} - V_{IOUT-NEGHALF})) \times 100\%$$

Nonlinearity E_{LIN}

The design output of the device varies linearly with the measured current.

Ideally, under the same supply voltage and ambient temperature conditions, the output sensitivity of the device is the same for two different current sizes I_1 (half scale current) and I_2 (full scale current).

In practical application, there is a difference in sensitivity for the measurement of two different current sizes I_1 and I_2 , and nonlinear sensitivity error E_{LIN} describes the difference digitally.

In the chip, positive current nonlinearity E_{LINPOS} and negative current nonlinearity E_{LINNEG} are defined as follows:

I_{POSx} , I_{NEGx} is positive current and negative current

$$I_{POS2} = 2 \times I_{POS1}$$

$$I_{NEG2} = 2 \times I_{NEG1}$$

$$Sens_{Ix} = (V_{IOUT(Ix)} - V_{IOUT(Q)}) / I_x$$

$$E_{LINPOS} = (1 - (Sens_{IPOS2} / Sens_{IPOS1})) \times 100\%$$

$$E_{LINNEG} = (1 - (Sens_{INEG2} / Sens_{INEG1})) \times 100\%$$

6 PARAMETERS DESCRIPTION (CONTINUED)

Proportional output sensitivity error S_{ERR}

The proportional output sensitivity error S_{ERR} is defined based on the supply voltage V_{CC} :

$$S_{ERR} = (1 - (Sens_{V_{CC}}/Sens_{5V}) / (V_{CC}/5V)) \times 100\%$$

$$S_{ERR} = (1 - (Sens_{V_{CC}}/Sens_{3.3V}) / (V_{CC}/3.3V)) \times 100\%$$

Proportional output error of static voltage V_{Ozero}

Error between the ratio of V_{out1} and V_{out0} value at $V_{CC}=5V$ and the theoretical ratio when V_{CC} varies from 4.5V to 5.5V, or at $V_{CC}=3.3V$ and the theoretical ratio when V_{CC} varies from 3.0V to 3.6V.

$$V_{Ozero} = (1 - (V_{out1}/V_{out0}) / (V_{CC}/5V)) \times 100\%$$

$$V_{Ozero} = (1 - (V_{out1}/V_{out0}) / (V_{CC}/3.3V)) \times 100\%$$

Total output error E_{TOT}

The difference between the current measurement from the sensor IC and the actual current (I_P), relative to the actual current. This is equivalent to the difference between the ideal output voltage and the actual output voltage, divided by the ideal sensitivity, relative to the current flowing through the primary conduction path:

$$E_{TOT} = (V_{IOUT} - V_{IOUTIdeal}) / (Sens_{Ideal} \times I_P) \times 100\%$$

Defined in fixed output mode:

$$E_{TOT} = ((V_{IOUT Meas} - V_{REF Meas}) - (V_{IOUT Ideal} - V_{REF Ideal})) / (Sens_{Ideal} \times I_P) \times 100\%$$

Where: Total output error E_{TOT} contains all error sources and is a function of I_P .

$$V_{IOUTIdeal} = V_{IOUT(Q)} + (Sens_{Ideal} \times I_P)$$

At relatively large current, E_{TOT} is mainly sensitivity error, while at relatively small current, E_{TOT} is mainly zero current sensitivity error voltage V_{OE} . As I_P approaches zero, E_{TOT} approaches infinity due to the bias voltage.

Dynamic response characteristic

Power-On time T_{PO}

When the supply is ramped to its operating voltage, the device requires a finite amount of time to power its internal components before responding to an input magnetic field. Power-On Time (T_{PO}) is defined as the time interval between the power supply has reached its minimum specified operating voltage (V_{UVLOD}) and the sensor output has settled within $\pm 10\%$ of its steady-state value under an applied magnetic field.

Rise time T_r

The time interval between the sensor output voltage reaches 10% of its full-scale value and it reaches 90% of its full-scale value.

Propagation delay T_{PROP}

The time interval between the sensed primary current reaches 20% of its final value and the sensor output voltage reaches 20% of its full-scale value.

Response Time $T_{RESPONSE}$

The time interval between the sensed primary current reaches 90% of its final value and the sensor output voltage reaches 90% of its full-scale value.

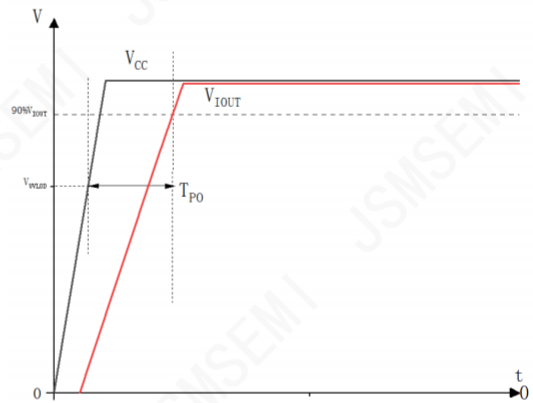


Figure 2. Power-On Time T_{PO}

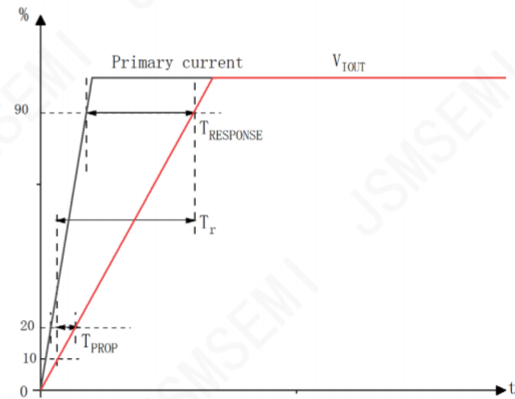


Figure 3. Dynamic Response Time Parameters

7 THERMAL EVALUATION

The product will naturally heat up during using, and the thermal curve performance of this device was measured in a windless environment at $25\pm 3^{\circ}\text{C}$ in application laboratory using a MSEVB0005ACS724REVA0 EVM.

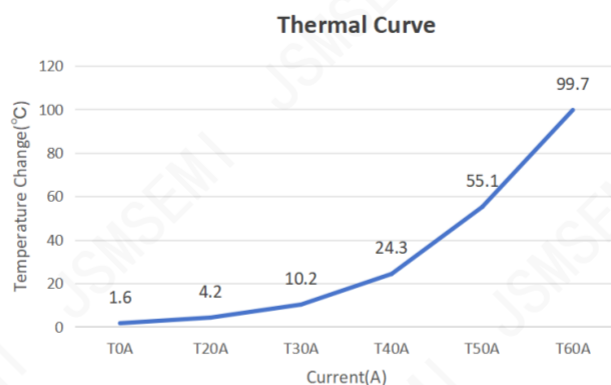


Figure 4. Thermal curve

8 LAYOUT GUIDELINES

Test information of the demo board

The IP heat dissipation copper thickness of the demo board is 4oz, the heat dissipation area is $2\times 600\text{ (mm}^2\text{)}$, the test wiring uses Kelvin sense to avoid the voltage drop caused by GND impedance, and capacitors should set to the chip pins as close as possible. $C_L=1\text{nF}$, $C_{REF}=1\text{nF}$, $C_{VCC}=100\text{nF}$

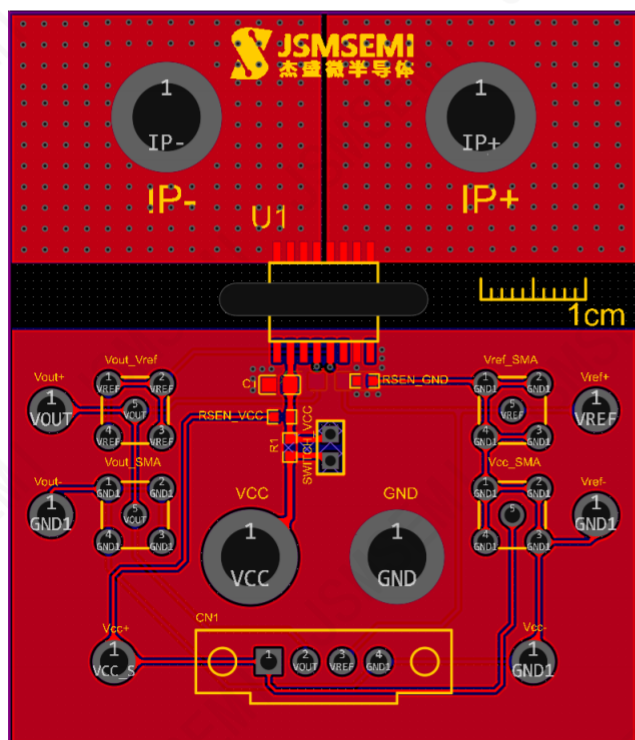


Figure 5. The front of the demo board

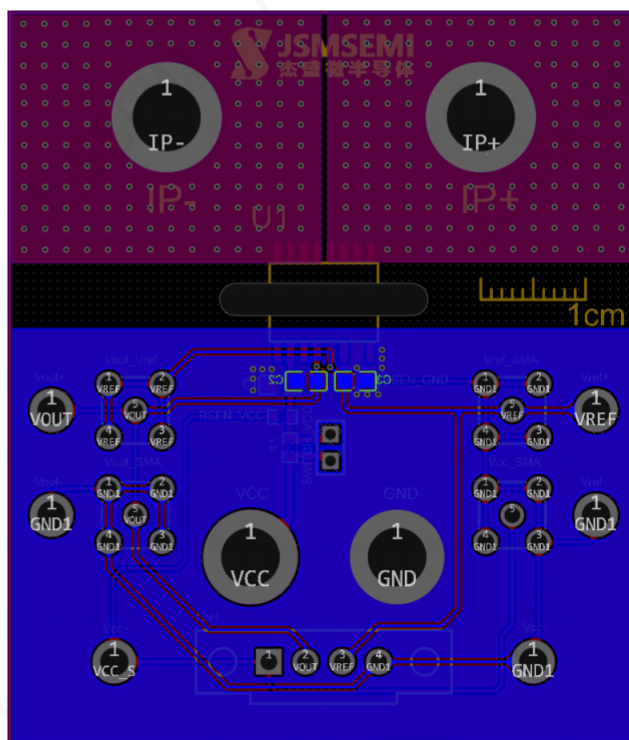
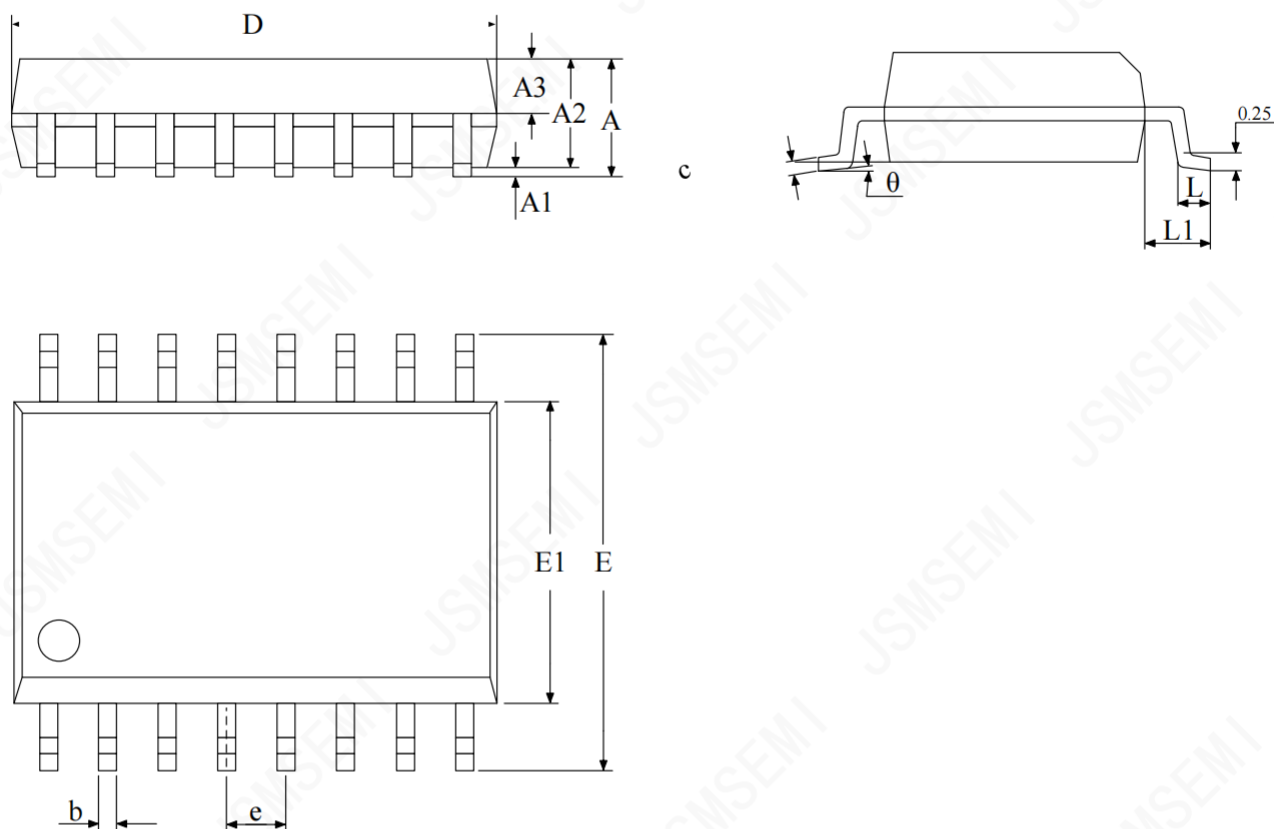


Figure 6. The back of the demo board

9 PACKAGE OUTLINE

SOIC-16 (W) Package Outlines



SOIC-16 (W) Package Dimensions

Size Symbol	MIN(mm)	TYP(mm)	MAX(mm)	Size Symbol	MIN(mm)	TYP(mm)	MAX(mm)
A	2.35	-	2.65	D	10.2	-	10.4
A1	0.10	-	0.30	E	10.5	-	10.1
A2	2.25	-	2.35	E1	7.4	7.5	7.6
A3	0.97	-	1.10	e	1.27BSC		
b	0.35	-	0.43	L	0.55	-	0.85
θ	0	-	8°	L1	1.4BSC		

Revision History

Rev.	Change	Date
V1.0	Initial version	3/17/2021

Important Notice

JSMSEMI Semiconductor (JSMSEMI) PRODUCTS ARE NEITHER DESIGNED NOR INTENDED FOR USE IN MILITARY AND/OR AEROSPACE, AUTOMOTIVE OR MEDICAL DEVICES OR SYSTEMS UNLESS THE SPECIFIC JSMSEMI PRODUCTS ARE SPECIFICALLY DESIGNATED BY JSMSEMI FOR SUCH USE. BUYERS ACKNOWLEDGE AND AGREE THAT ANY SUCH USE OF JSMSEMI PRODUCTS WHICH JSMSEMI HAS NOT DESIGNATED FOR USE IN MILITARY AND/OR AEROSPACE, AUTOMOTIVE OR MEDICAL DEVICES OR SYSTEMS IS SOLELY AT THE BUYER' S RISK.

JSMSEMI assumes no liability for application assistance or customer product design. Customers are responsible for their products and applications using JSMSEMI products.

Resale of JSMSEMI products or services with statements diferent from or beyond the parameters stated by JSMSEMI for that product or service voids all express and any implied warranties for the associated JSMSEMI product or s ervice. JSMSEMI is not responsible or liable for any such statements.

JSMSEMI All Rights Reserved. Information and data in this document are owned by JSMSEMI wholly and may not be edited, reproduced, or redistributed in any way without the express written consent from JSMSEMI.

Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the JSMSEMI product that you intend to use.

For additional information please visit www.jssemi.com