High Speed 1M bit/s Photocoupler

Product Description

The EMD2A50L consists of a high efficient AlGaP Light Emitting Diode and a high speed optical detector. This design provides excellent AC and DC isolation between the input and output sides of the Optocoupler. The output of the optical detector features an open collector Schottky clamped transistor. The internal shield ensures high common mode transient immunity. A guaranteed common mode transient immunity is up to 15KV/μs (min.). The Optocoupler operational parameters are guaranteed over the temperature range from -40°C ~ +110°C.

Applications

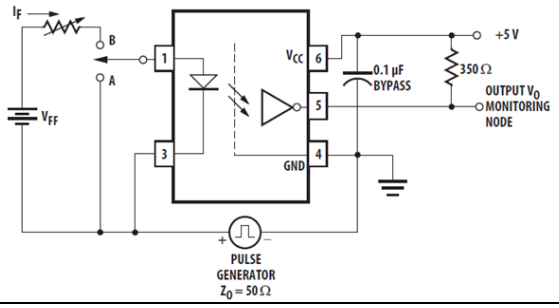
- Digital signal isolation
- Communications interface
- Micro-controller interface
- Feedback elements in switching power supplies
- Digital isolation for A/D, D/A conversion Digital field

Features

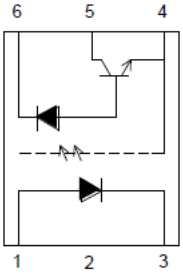
- Stretched LSOP-6
- High speed: 1M bit/s typical
- Package creepage 7mm & 8mm
- Compatible with infrared vapor phase reflow and wave soldering process Inverter logic type
- Very high common mode transient immunity: 15K V/μs at VCM = 1500 V guaranty
- Guarantee performance from temperature range: -40°C to 110°C
- TTL compatible
- Open collector output

Safety approved

- UL1577 recognized with 3750 Vrms for 1 minute for EMD2A50L-SK and 5000 Vrms for 1 minute for EMD2A50L-SL Certificate No. E529603
- IEC/EN/DIN EN 60747-5-5 Approved
  V_{IORM} = 891 Vpeak for EMD2A50L-SK
  V_{IORM} = 1140 Vpeak for EMD2A50L-SL
  Certificate No. 40055846
- CQC approved: GB4943.1-2011 Certificate No. CQC22001358589

SCHEMATIC	PIN DEFINITION	PACKAGE
	1.Anode 2.NC 3.Cathode 4.GND 5.VO 6.V_{CC}	

Connection Diagram



Order Information

EMD2A50L-00S###%FR1

00	Internal control Code
S###	SK06: LSOP-6 Package 7mm clearance
	SL06: LSOP-6 Package 8mm clearance
%	E: RoHS & Halogen free package with VDE
	N: RoHS & Halogen free package
F	-40 to 110°C temperature rating
R1	Packing in Tape & Reel

Order, Mark & Packing Information

Package	Product ID	Mark		Packing
LSOP-6	EMD2A50L-00SK06EFR1 EMD2A50L-00SL06EFR1	EYYWW 50L HV	E : ESMT YY : Date code (Year) WW : Date code (Week) 50L：Part Number H : Internal Tracking Code V：VDE Option	Tape & Reel 3Kpcs
	EMD2A50L-00SK06NFR1 EMD2A50L-00SL06NFR1	EYYWW 50L H		

Absolute Maximum Ratings (Ta = 25°C unless otherwise specified)

Parameter	Symbol	Min	Max	Unit
Storage Temperature	Tstg	-55	125	°C
Operating Temperature	Topr	-40	110	°C
Supply Voltage	VCC	-0.5	30	V
Average Forward Input Current	IF	-	25	mA
Reverse Input Voltage	VR	-	5	V
Input Power Dissipation	PI	-	45	mW
Output Collector Current	IO		8	mA
Output Collector Voltage	VO	-0.5	20	V
Output Collector Power Dissipation	PI	-	100	mW
Lead Solder Temperature	Tsol	-	260	°C

IEC/EN/DIN EN 60747-5-5 Insulation Characteristics

Description	Symbol	EMD2A50L-SK	EMD2A50L-SL	Unit
Climatic Classification	--	55/100/21	55/100/21	--
Pollution Degree (DIN VDE 0110/1.89)	--	2	2	--
Maximum Working Insulation Voltage	V_{IORM}	891	1140	V_{peak}
Input to Output Test Voltage, Method b (Note 1) V_{IORM} x 1.875=V_{PR}, 100% Production Test With t_m=1sec, Partial discharge < 5pC	V_{PR}	1671	2137	V_{peak}
Input to Output Test Voltage, Method a (Note 1) V_{IORM} x 1.6=V_{PR}, 100% Production Test With t_m=10sec, Partial discharge < 5pC	V_{PR}	1426	1824	V_{peak}
Highest Allowable Overvoltage (Transient Overvoltage t_{ini} = 60sec)	V_{IOTM}	6000	8000	V_{peak}
Safety-limiting values – maximum values allowed in the event of a failure				
Case Temperature	Ts	175	175	℃
Input Current	Is, INPUT	150	150	mA
Output Power	Ps, OUTPUT	600	600	mW
Insulation Resistance at TS, V_{IO} = 500 V	Rs	$>10^9$	$>10^9$	Ω

Note 1 : Refer to the optocoupler section of th Isolation and Control Components Designer's Catalog, under Product Safety Regulations section, (IEC/EN/DIN EN 60747-5-5) for a detailed description of Method a and Method b partial discharge test profiles.
These optocouplers are suitable for "safe electrical isolation" only within the safety limit data. Maintenance of the safety data shall be ensured by means of protective circuits. Surface mount classification is Class A accordance with CECC 00802.

Insulation and Safety-Related Specifications

Parameter	Symbol	EMD2A		Unit	Conditions
		50L-SK	50L-SL		
Minimum External Air Gap (External Clearance)	L(101)	7.0	8.0	mm	Measured from input terminals to output terminals, shortest distance through air.
Minimum External Tracking (External Creepage)	L(102)	8.0	8.0	mm	Measured from input terminals to output terminals, shortest distance path along body.
Tracking Resistance (Comparative Tracking Index)	CTI	>175	>175	V	DIN IEC 112/VDE 0303 Part 1.

Electrical Characteristics (DC)

All Typical values at T_A = 25°C, unless otherwise specified; all minimum and maximum specifications are at recommended operating condition.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Input Forward Voltage	VF	1.6	2.0	2.4	V	IF = 16 mA
Input Reverse Breakdown Voltage	BVR	5	-	-	V	IR = 10 μA
Current transfer ratio	CTR	20	100	-	%	IF = 16mA; VCC = 4.5V; TA = 25 °C; VO = 0.4V
		15	110	-		IF = 16mA; VCC = 4.5V; TA = 25°C; VO = 0.5V
Logic low output voltage	VOL	-	0.1	0.4	V	IF = 16mA;VCC = 4.5V; Io = 3.0mA; TA = 25°C
		-	-	0.5		IF = 16mA;VCC = 4.5V; Io = 2.4mA; TA = 25°C
Logic high output current	IOH	-	0.002	0.5	uA	IF = 0mA, VO = VCC = 5.5V, TA = 25°C
		-	0.013	1		IF = 0mA, VO = VCC = 15V TA = 25°C
		-	-	50		TA = 0 ~ 70°C
Logic low supply current	ICCL	-	230	-		IF = 16mA, Vo = open (VCC=30V)
Logic high supply current	ICCH	-	0.002	1		IF = 0mA, Vo = open ; TA = 25°C (VCC = 30V)

Note 2: Current Transfer Ratio in percent is defined as the ratio of output collector current, IO, to the forward LED input current, IF, times 100%.

Switching Specification (AC)

All Typical values at TA = 25°C, unless otherwise specified; all minimum and maximum specifications are at recommended operating condition.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition	
Propagation Delay Time to Low Output Level (Note 3)	tPHL	-	250	800	ns	TA = 25°C	RL=1.9KΩ
		-	-	800		0 ~ 100°C	
Propagation Delay Time to High Output Level (Note 4)	tPLH	-	650	800		TA = 25°C	
		-	-	800		0 ~ 100°C	
Common mode transient immunity at high level output (Note 5)	|CMH|	15	25	-	kV/μs	IF = 0mA; VCM = 1500Vp-p; CL = 15 pF; TA=25°C , RL=1.9KΩ	
Common mode transient immunity at low level output (Note 6)	|CML|	15	25	-	kV/μs	IF = 16mA; VCM = 1500Vp-p; CL = 15 pF; TA = 25°C , RL = 1.9KΩ	

Note 3: tPLH (propagation delay) is measured from the 3.75 mA point on the falling edge of the input pulse to the 1.5 V point on the rising edge of the output pulse.

Note 4: tPHL (propagation delay) is measured from the 3.75 mA point on the rising edge of the input pulse to the 1.5 V point on the falling edge of the output pulse.

Note 5: CMH is the maximum tolerable rate of rise of the common mode voltage to assure that the output will remain in a high logic state.

Note 6: CML is the maximum tolerable rate of fall of the common mode voltage to assure that the output will remain in a low logic state.

Isolation characteristic

All Typical values at T_A = 25°C and V_{CC} = 5 V, unless otherwise specified; all minimum and maximum specifications are at recommended operating condition.

Parameter	Symbo	Device	Min.	Typ.	Max.	Unit	Test Condition
Withstand Insulation Test Voltage (Note 7, 8)	V_{ISO}	EMD2A50L-SK	5000	-	-	V	RH ≤ 40%-60%, t = 1min, T_A = 25 °C
		EMD2A50L-SL					
Input-Output Resistance (Note 7)	R_{I-O}	-	-	10^{12}	-	Ω	V_{I-O} = 500V DC

Note 7: Device is considered a two terminal device: pins 1, 2, 3 are shorted together and pins 4, 5, 6 are shorted together.

Note 8: According to UL1577, each photo coupler is tested by applying an insulation test voltage 6000VRMS for one second (leakage current less than 10uA). This test is performed before the 100% production test for partial discharge.

Typical Performance Curves & Test Circuits

Fig.1 DC and Pulsed Transfer Characteristics

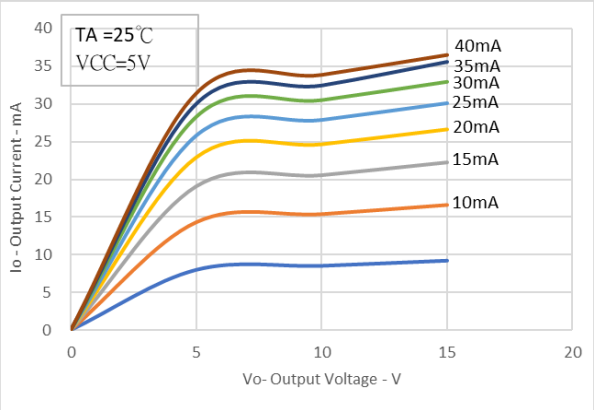


Fig.2 Input Current vs. Forward Voltage

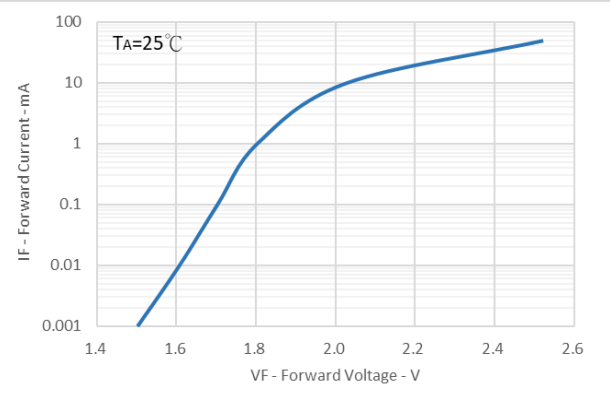


Fig.3 Propagation Delay vs. Load Resistance

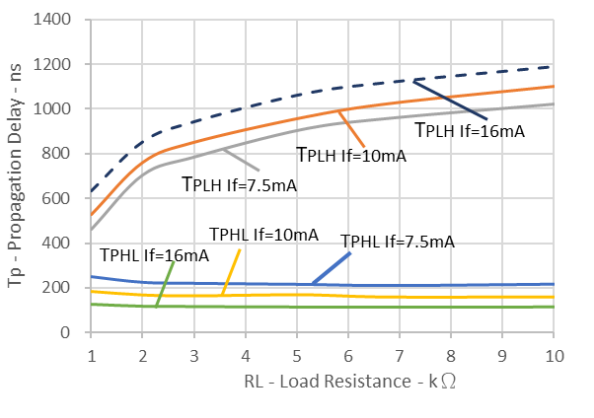


Fig.4 Current Transfer Ratio vs. Input Current

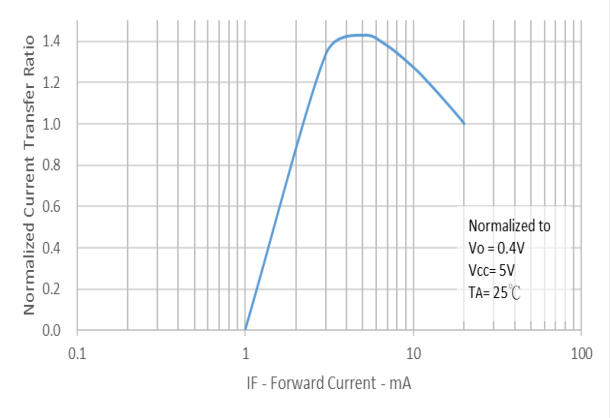


Fig.5 Current Transfer Ration vs. Temperature

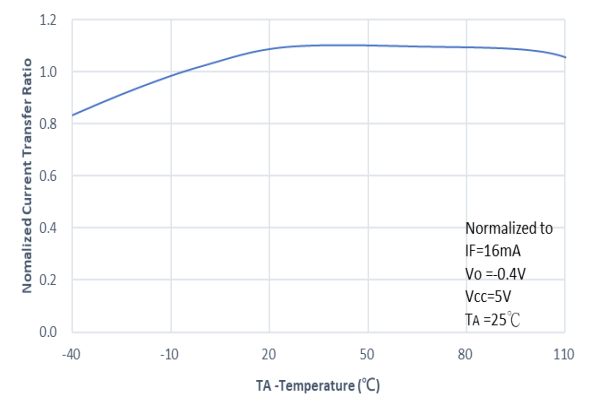


Fig.6 Propagation Delay Time vs. Temperature

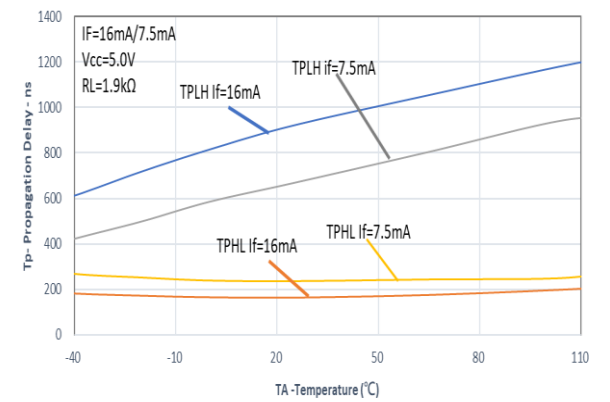
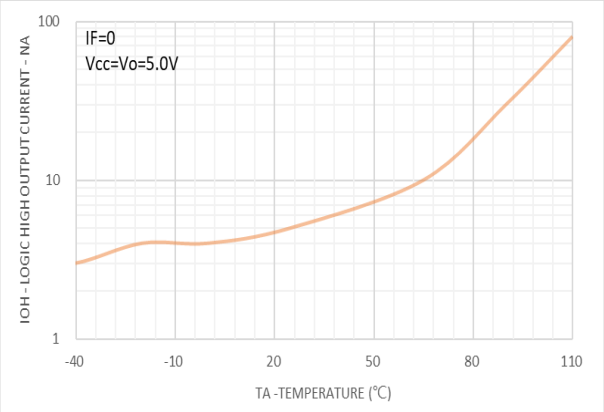
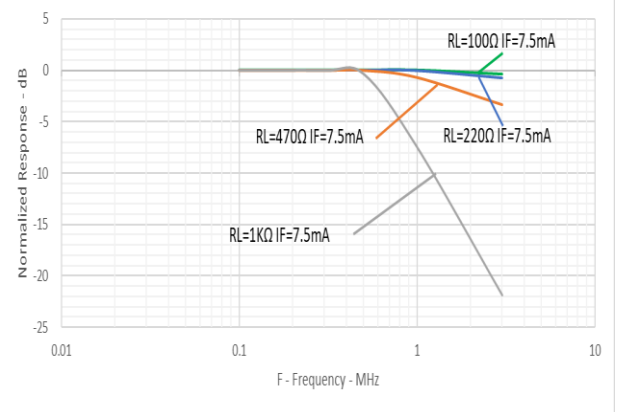
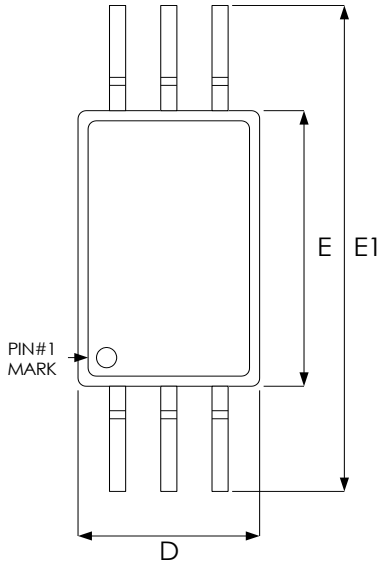
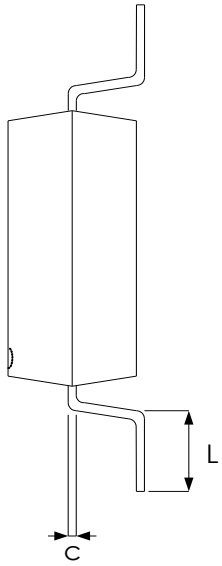


Fig.6 Propagation Delay Time vs. Temperature	Fig.8 Frequency Response
	

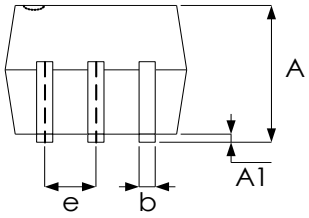
Package Outline Drawing
L-SOP 6L (277mil, 7mm clearance)



TOP VIEW



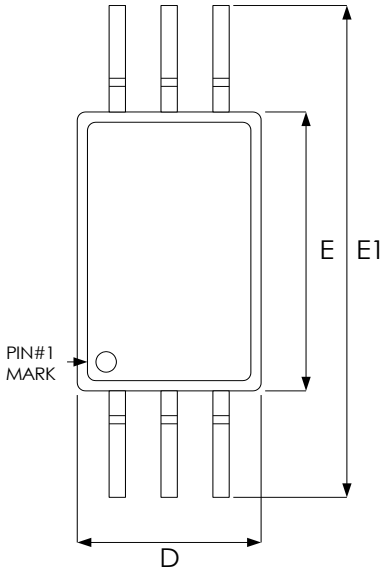
SIDE VIEW



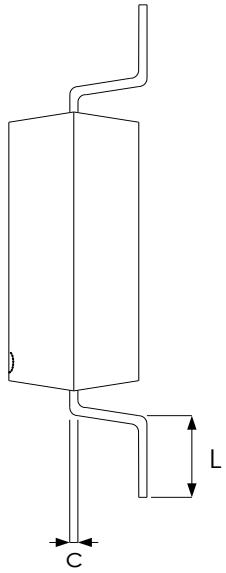
BOTTOM VIEW

Symbol	Dimension in mm	
	Min.	Max.
A	1.70	2.30
A1	0.10	0.30
b	0.30	0.50
c	0.20	0.30
D	4.20	4.80
E	6.50	7.10
E1	9.40	10.00
e	1.27 BSC	
L	0.70	1.20

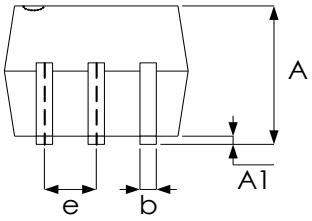
Package Outline Drawing
L-SOP 6L (277mil, 8mm clearance)



TOP VIEW



SIDE VIEW



BOTTOM VIEW

Symbol	Dimension in mm	
	Min.	Max.
A	1.70	2.30
A1	0.10	0.30
b	0.30	0.50
c	0.20	0.30
D	4.20	4.80
E	6.51	7.11
E1	11.20	11.80
e	1.27 BSC	
L	0.50	1.00

Revision History

Revision	Date	Description
0.1	2023.06.01	Initial version

Important Notice

The contents contained in this document are believed to be accurate at the time of publication. ESMT assumes no responsibility for any error in this document, and reserves the right to change the products or specification in this document without notice.

The information contained herein is presented only as a guide or examples for the application of our products. No responsibility is assumed by ESMT for any infringement of patents, copyrights, or other intellectual property rights of third parties which may result from its use. No license, either express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of ESMT or others.

Any semiconductor devices may have inherently a certain rate of failure. To minimize risks associated with customer's application, adequate design and operating safeguards against injury, damage, or loss from such failure, should be provided by the customer when making application designs.

ESMT's products are not authorized for use in critical applications such as, but not limited to, life support devices or system, where failure or abnormal operation may directly affect human lives or cause physical injury or property damage. If products described here are to be used for such kinds of application, purchaser must do its own quality assurance testing appropriate to such applications.