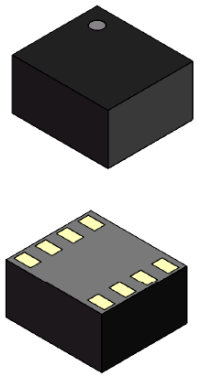
Photonic Power Isolated Gate Driver

YMH-HH2A42 Datasheet



Key Features:

- 8 pin DFN: 6 mm high, 2.54 mm pitch
- Open Voltage: 10V (min)
- Isolation Voltage: 3,000V (min)
- Built in Isolated DC/DC Power Source
- Under-Voltage Lockout Protection

Applications:

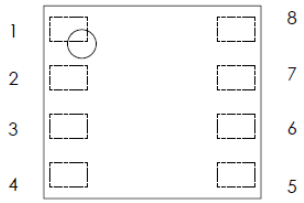
- MOSFET Gate Driver
- Switch Mode Power Supply
- Inverter / Converter
- Motor Driving Module

Product Description

MHGP's YMH-HH2A42 is a small footprint, high performance and optically isolated gate driver module, suitable for surface mount assembly. Unlike existing isolated gate drivers, the YMH-HH2A42 consists of a GaAs light emitting diode, optically coupled to a silicon-based MIH™ vertical multi-junction photovoltaic cell, providing voltage isolated power to drive power semiconductor devices such as MOSFETs.

The YMH-HH2A42 gate driver module provides the functionality of a traditional isolated power supply, a DC-DC converter, and a gate driver IC in a single component. This integrated, completely optically isolated and powered solution simplifies gate driver design, provides better noise immunity, reduces board size and cost, and provides higher voltage isolation.

Pin Configuration (top view)



Pin #	Name	Description
1	Anode1	Power LED Anode
2	Anode2	Signal LED Anode
3	Cathode2	Signal LED Cathode
4	Cathode1	Power LED Cathode
5	GND	GND
6	Vo	Voltage Output
7	Vo	Voltage Output
8	NC	--

Electrical Characteristics (Ta = 25°C)

Characteristic			Test Condition	Symbol	Min	Typ.	Max	Unit
DC Specifications								
Input	Power	Forward Voltage	–	V_{F1}	2.6	–	2.9	V
		Forward Current	–	I_{F1}	150	–	300	mA
	Signal	Forward Voltage	–	V_{F2}	1.7	–	2.5	V
		Forward Current	–	I_{F2}	5	–	20	mA
		Capacitance	–	C_2	–	10	–	pF
Output	Power	Output High Voltage	I_{F1} = 200mA	V_{OH}	8	–	12	V
		Output High Current Steady (Source)	I_{F1} = 200mA (see Fig. 1)	I_{OHS}	1.2	–	–	mA
		Output High Current Peak (Source)	I_{F1} = 200mA (see Fig. 2)	I_{OHP}	–	1.5	–	A
		Output Low Current Peak (Sink)	I_{F1} = 0mA (see Fig. 2)	I_{OL}	–	2.0	–	A
		UVLO Threshold +	–	V_{OUV+}	7.5	8.6	9.4	V
		UVLO Threshold -	–	V_{OUV-}	7.2	8.1	8.7	V
AC Specifications								
Propagation Delay Time to High Output Level			C_L = 200pF	T_{PDHL}	–	–	50	ns
Propagation Delay Time to Low Output Level			C_L = 200pF	T_{PDLH}	–	–	30	ns
Output Rise Time			C_L = 200pF	T_r	–	–	15	ns
Output Fall Time			C_L = 200pF	T_f	–	–	15	ns
Device Startup Time			–	T_{start}	–	–	15	ms
Common Mode Transient Immunity			VCM = 1,500V (see Fig. 3)	CMTI	–	30	–	kV/us

Recommended Operating Conditions

Characteristic	Symbol	Min	Typ.	Max	Unit
Power Forward Current	I_{F1}	150	–	200	mA
Signal Forward Current	I_{F2}	5	–	10	mA
Operating Temperature	T_{opr}	-20	–	65	℃

Note: Recommended operating conditions are given as a design guideline to obtain expected performance of the device. Additionally, each item is an independent guideline respectively.

Test Circuits

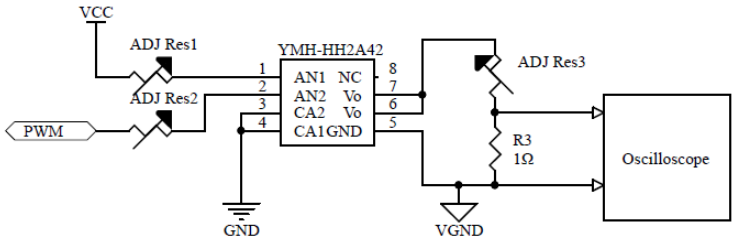


Fig. 1 – Output High Steady Current Test Circuit

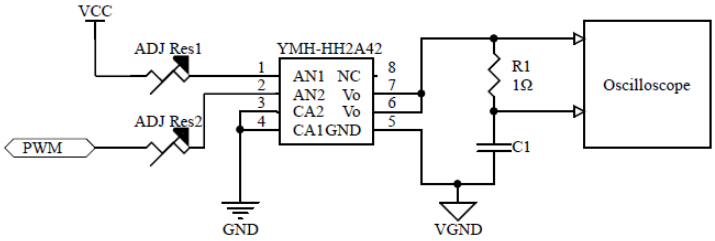


Fig. 2 – Output High / Low Peak Current Test Circuit

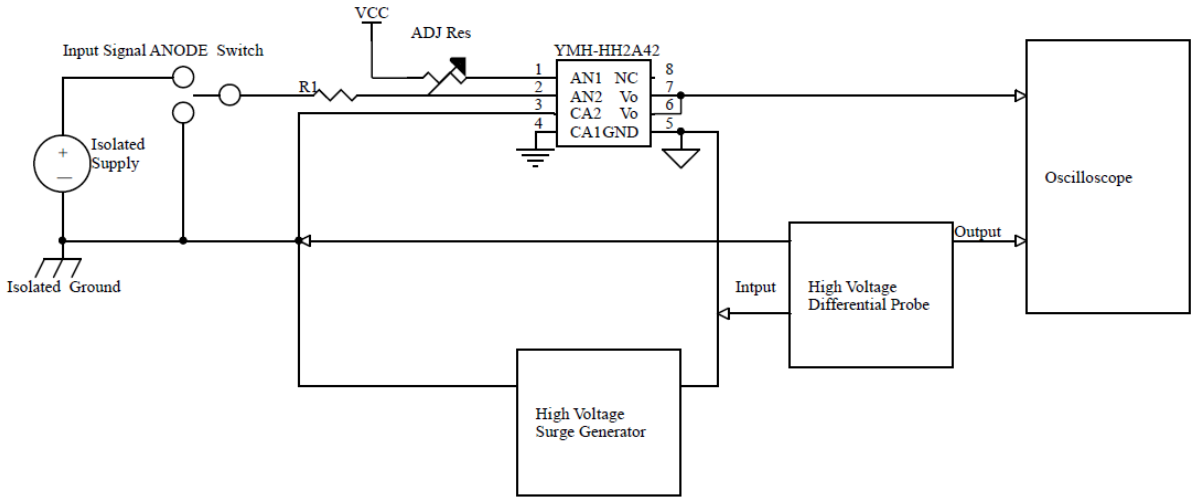


Fig. 3 – Common Mode Transient Immunity Test Circuit

Absolute Maximum Ratings (Ta = 25℃)

Characteristic			Symbol	Rating	Unit
Input	Power	Forward Current	I_{F1}	300	mA
		Reverse Voltage	V_{R1}	18	V
		Junction Temperature	T_{J1}	125	°C
	Signal	Forward Current	I_{F2}	20	mA
		Reverse Voltage	V_{R2}	0.5	V
		Junction Temperature	T_{J2}	125	°C
Output	PV	Reverse Voltage	V_{RD}	> 1,000	V
		Junction Temperature	T_J	150	°C
Power Dissipation			P_D	1,000	mW
Storage Temperature Range			T_{stg}	-40 to 85	°C
Operating Temperature Range			T_{opr}	-20 to 85	°C
Lead Soldering Temperature (10 sec)			T_{sol}	260	°C
Isolated Voltage (Ta = 25℃, R.H. < 50%, t = 60 sec)			V_{iso}	3,000	V

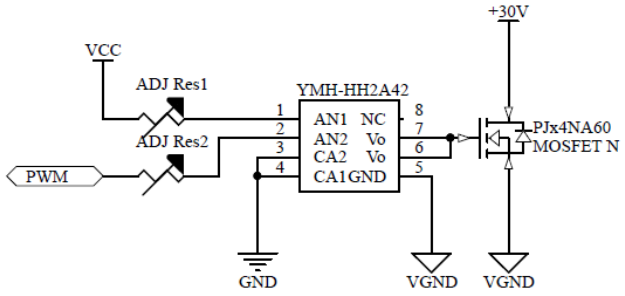
Under Voltage Lockout (UVLO)

The UVLO circuit unconditionally drives V_O low when V_O is below the lockout threshold. During power up, the YMH-HH2A42 maintains in UVLO until V_{OH} rises above V_{OUV+}. During power down, the YMH-HH2A42 enters UVLO when V_{OH} falls below V_{OUV-}.

Typical Application Schematic

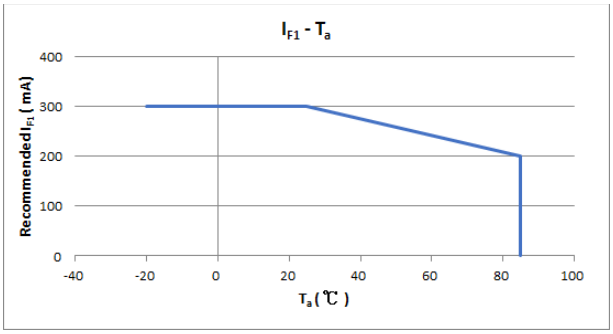
Example: PJx4NA60 MOSFET-N with MHGP YMH-HH2A42

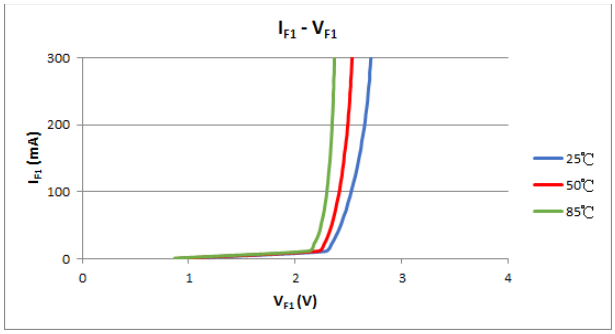
PJx4NA60 – Gate Charge: 11.1nC & Input capacitance: 450pF

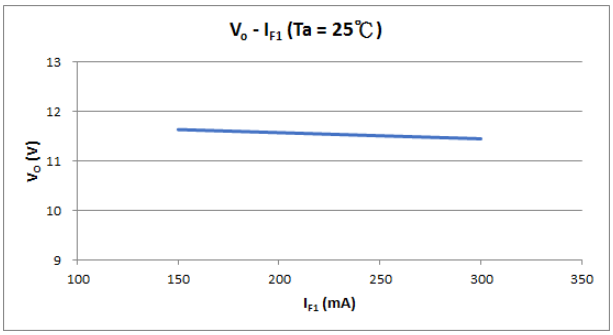


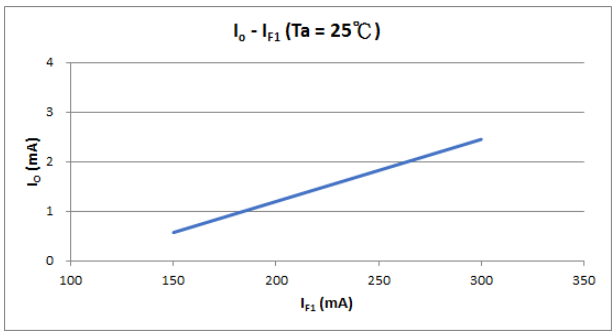
I_f (mA)	MOSFET-N V_{gs} (V)	
	@ 30kHz	@ 65kHz
130	8.8	-
160	10.0	8.6
180	10.4	9.2
200	10.8	9.8
Ta = 25°C, all T_r & T_f < 15 ns		

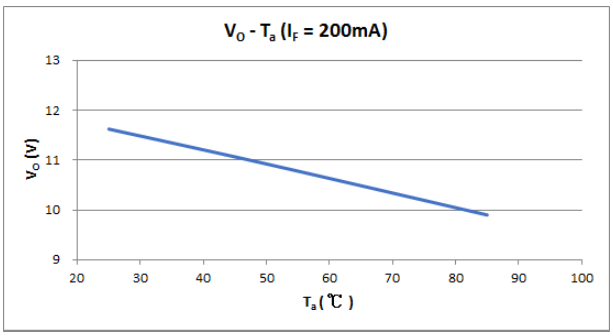
Typical Characteristics

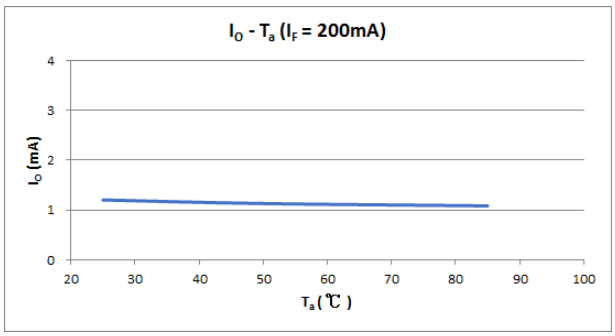


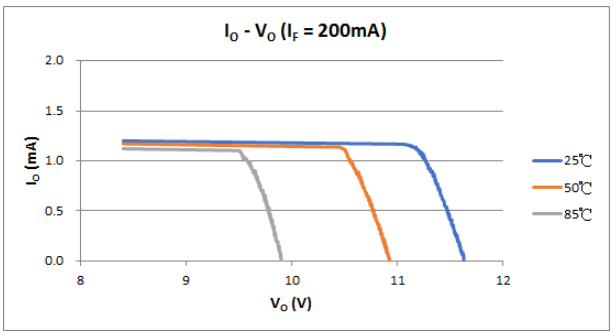


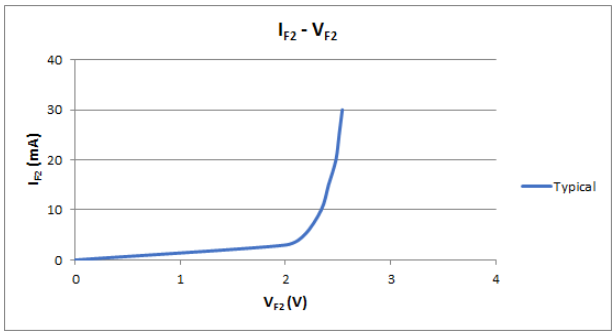




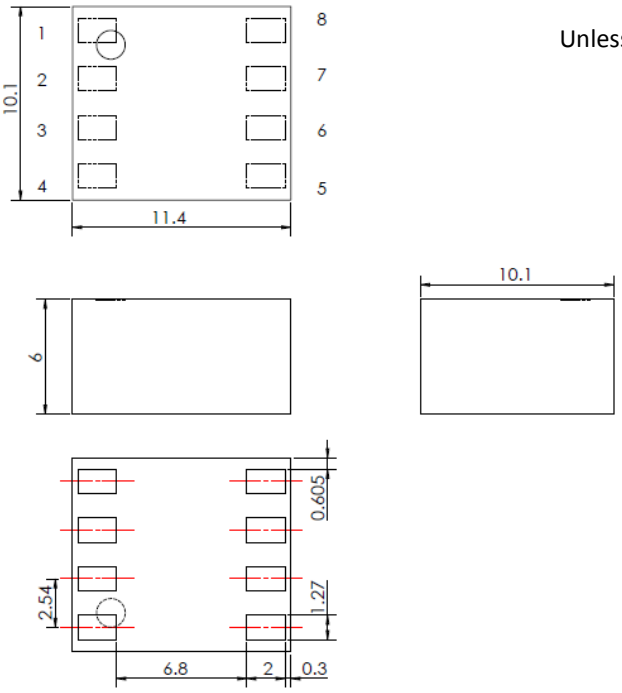






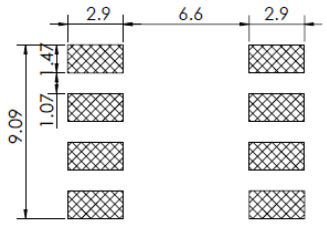


Mechanical Dimensions



Unit: mm
Unless otherwise specified: ±0.1
Net weight: 1.4g

Recommended Land Pattern



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