

■ Features

- 4.0 A maximum peak output current
- Rail-to-rail output voltage
- 110ns maximum propagation delay
- Under Voltage Lock-Out protection (UVLO) with hysteresis
- Wide operating range: 10 to 30 Volts (VCC)
- Guaranteed performance over temperature -40°C ~ +110°C.
- MSL class 1
- Regulatory Approvals
 - UL - UL1577
 - VDE - EN60747-5-5
 - CQC – GB4943.1-2011

■ Description

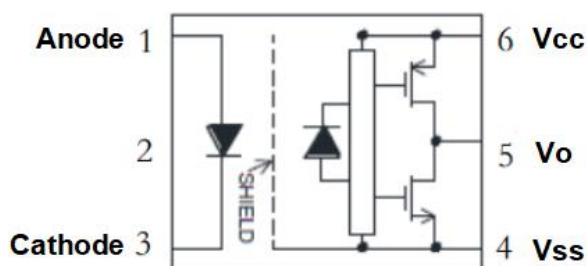
The MPH343 series Photocoupler is ideally suited for driving power IGBTs and MOSFETs used in motor control inverter applications and inverters in power supply system. It contains an AlGaAs LED optically coupled to an integrated circuit with a power output stage.

The 4.0A peak output current is capable of directly driving most IGBTs with ratings up to 1200 V/200 A. For IGBTs with higher ratings, the MPH-343 series can be used to drive a discrete power stage which drives the IGBT gate. The Photocoupler operational parameters are guaranteed over the temperature range from -40°C ~ +110°C.

■ Applications

- IGBT/MOSFET gate drive
- Uninterruptible power supply (UPS)
- Industrial Inverter
- AC/Brushless DC motor drives
- Switching power supplies

■ Schematic





MPH343 Series

4.0A, Gate Driver Photo Coupler

TURTH TABLE

LED	V _{CC} -V _{SS} (Turn-ON, +ve going)	V _{CC} -V _{SS} (Turn-OFF, -ve going)	V _O
Off	0V to 30V	0V to 30V	Low
On	0V to 11.0V	0V to 9.5V	Low
On	11.0V to 13.5V	9.5V to 12V	Transition
On	13.5V to 30V	12V to 30V	High

Note: A 0.1μF bypass capacitor must be connected between Pin 4 and 6.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	NOTE
Average Forward Current	I _F	-	20	mA	
Reverse Input Voltage	V _R	-	5	V	
Input Power Dissipation	P _I	-	45	mW	
Total Output Supply Voltage	(V _{CC} -V _{SS})	0	35	V	
“High” Peak Output Current	I _{OH(PEAK)}	-	4.0	A	1
“Low” Peak Output Current	I _{OL(PEAK)}	-	4.0	A	1
Output Current	V _{O(PEAK)}	-0.5	V _{CC}	V	
Output Power Dissipation	P _O	-	700	mW	
Operating Temperature	T _{opr}	-40	110	°C	
Output IC Junction Temperature	T _J	-	125	°C	
Storage Temperature	T _{stg}	-55	125	°C	
Soldering Temperature	T _{sol}	-	260	°C	

Ambient temperature = 25°C, unless otherwise specified. Stresses exceeding the absolute maximum ratings can cause permanent damage to the device. Exposure to absolute maximum ratings for long periods of time can adversely affect reliability.

Note 1: Exponential waveform. Pulse width ≤ 10 μs, f ≤ 15 kHz.

RECOMMENDED OPERATION CONDITIONS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Operating Temperature	T _A	-40	110	°C
Supply Voltage	V _{CC}	15	30	V
Input Current(ON)	I _{F(ON)}	7	16	mA
Input Voltage(OFF)	V _{F(OFF)}	-3.0	0.8	V



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4.0A, Gate Driver Photo Coupler

ELECTRICAL OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
INPUT CHARACTERISTICS							
Forward Voltage	V_F	1.6	1.9	2.4	V	$I_F=10\text{mA}$	
Input Forward Voltage Temperature Coefficient	$\Delta V_F / \Delta T$	-	-1.237	-	mV/°C	$I_F=10\text{mA}$	
Input Reverse Voltage	BV_R	5	-	-	V	$I_R=10\mu\text{A}$	
Input Threshold Current (Low to High)	I_{FLH}	-	0.9	2	mA	$V_O>5\text{V}, I_O=0\text{A}$	
Input Threshold Voltage (High to Low)	V_{FHL}	0.8	-	-	V	$V_{CC}=30\text{V}, V_O<5\text{V}$	
Input Capacitance	C_{IN}	-	60	-	pF	$V_F=0, f=1\text{MHz}$	
OUTPUT CHARACTERISTICS							
High Level Supply Current	I_{CCH}	-	1.70	3	mA	$I_F=10\text{mA}, V_{CC}=30\text{V}$ $V_O=\text{Open}, R_g=10\Omega$ $C_g=6\text{nF}$	
Low Level Supply Current	I_{CCL}	-	2.11	3	mA	$I_F=0\text{mA}, V_{CC}=30\text{V}$ $V_O=\text{Open}, R_g=10\Omega$ $C_g=6\text{nF}$	
High Level Output Voltage	V_{OH}	29.7	29.88	-	V	$I_F=10\text{mA}, I_O=-100\text{mA}$	2,3
Low Level Output Voltage	V_{OL}	-	0.1	0.3	V	$I_F=0\text{mA}, I_O=100\text{mA}$	
High Level Output Current	I_{OH}	4.0	-	-	A	$I_F=10\text{mA}, V_{CC}=30\text{V}$ $V_O=V_{CC}-15$	1
Low Level Output Current	I_{OL}	4.0	-	-	A	$I_F=10\text{mA}, V_{CC}=30\text{V}$ $V_O=V_{SS}+15$	1
Under Voltage Lockout Threshold	VUVLO+	11.0	12.6	13.5	V	$V_O>5\text{V}, I_F=10\text{mA}$	
	VUVLO-	9.5	11.2	12.0	V	$V_O<5\text{V}, I_F=10\text{mA}$	

All Typical values at $T_A = 25^\circ\text{C}$ and $V_{CC} - V_{SS} = 30\text{V}$, unless otherwise specified; all minimum and maximum specifications are at recommended operating condition.

Note 1: Maximum pulse width = 10 μs .

Note 2: In this test V_{OH} is measured with a dc load current. When driving capacitive loads, V_{OH} will approach V_{CC} as I_{OH} approaches zero amps.

Note 3: Maximum pulse width = 1 ms.



MPH343 Series

4.0A, Gate Driver Photo Coupler

SWITCHING SPECIFICATION							
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
SWITCHING CHARACTERISTICS							
Propagation Delay Time to Output Low Level	t_{PHL}	-	74.5	110	ns	$R_g=10\Omega,$ $C_g=25nF,$ $f=10kHz,$ Duty Cycle=50%, $I_F=10mA,$ $V_{CC}=30V$	
Propagation Delay Time to Output High Level	t_{PLH}	-	61.3	110	ns		
Pulse Width Distortion	PWD	-	22	70	ns		
Propagation Delay Difference Between Any Two Parts	PDD ($t_{PHL}-t_{PLH}$)	-100	-	+100	ns		
Rise Time	t_r	-	20	-	ns		
Fall Time	t_f	-	15	-	ns		
Common Mode Transient Immunity at Logic High	CM_H	20	40	-	kV/ μs	$I_F=7$ to $16mA,$ $V_{CC}=30V, T_A=25^\circ C,$ $V_{CM}=1kV$	1,2
Common Mode Transient Immunity at Logic Low	CM_L	20	40	-	kV/ μs	$I_F=0mA, V_{CC}=30V,$ $T_A=25^\circ C,$ $V_{CM}=1kV$	1,3

All Typical values at $T_A = 25^\circ C$ and $V_{CC} - V_{SS} = 30 V$, unless otherwise specified; all minimum and maximum specifications are at recommended operating condition.

Note 1: Pin 2 needs to be connected to LED common.

Note 2: Common mode transient immunity in the high state is the maximum tolerable dV_{CM}/dt of the common mode pulse, V_{CM} , to assure that the output will remain in the high state (meaning $V_O > 15.0V$).

Note 3: Common mode transient immunity in a low state is the maximum tolerable dV_{CM}/dt of the common mode pulse, V_{CM} , to assure that the output will remain in a low state (meaning $V_O < 1.0V$).

ISOLATION CHARACTERISTIC							
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION	NOTE
Withstand Insulation Test Voltage	V_{ISO}	5000	-	-	V	$RH \leq 40\sim 60\%,$ $t=1min, T_A=25^\circ C$	1,2
Input-Output Resistance	R_{I-O}	-	10^{12}	-	Ω	$V_{I-O}=500V$ DC	1

All Typical values at $T_A = 25^\circ C$ and $V_{CC} - V_{SS} = 30 V$, unless otherwise specified; all minimum and maximum specifications are at recommended operating condition.

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

Note 2: According to UL1577, each photocoupler is tested by applying an insulation test voltage 6000VRMS for one second. This test is performed before the 100% production test for partial discharge.

TYPICAL PERFORMANCE CURVES & TEST CIRCUITS

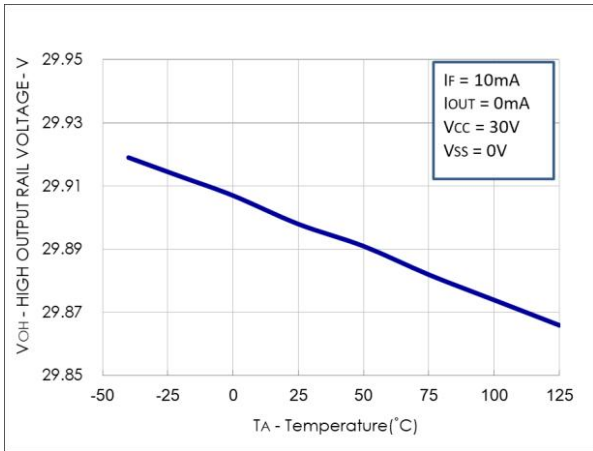


Fig.1 High output rail voltage vs. Temperature

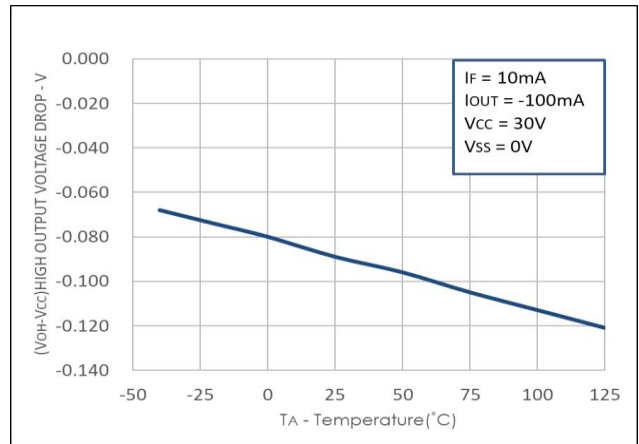


Fig.2 V_{OH} vs. Temperature

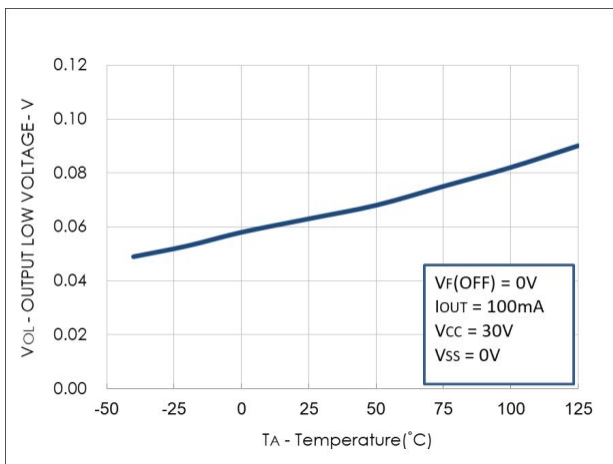


Fig.3 V_{OL} vs. Temperature

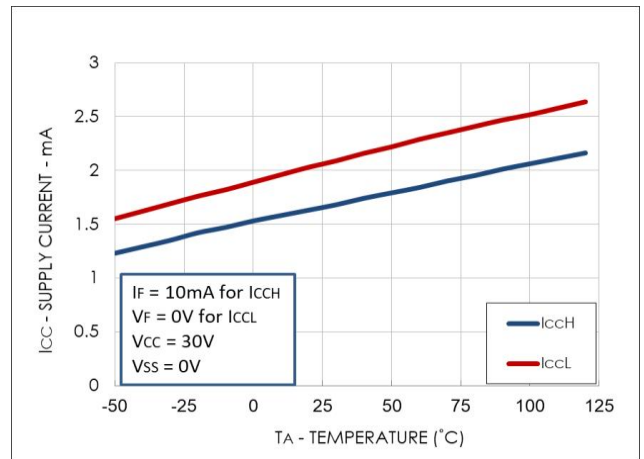


Fig.4 I_{cc} vs. Temperature

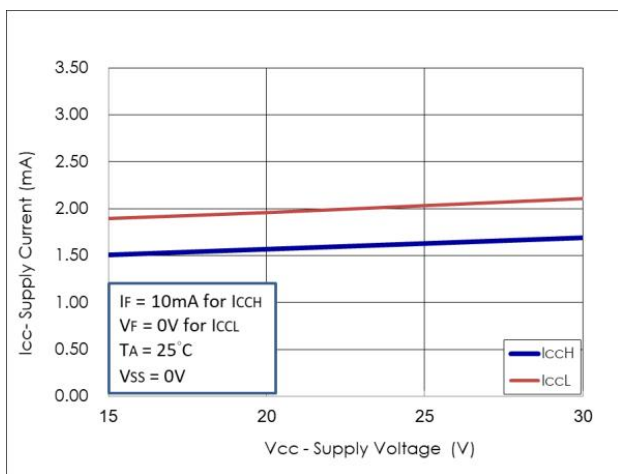


Fig.5 I_{cc} vs. V_{CC}

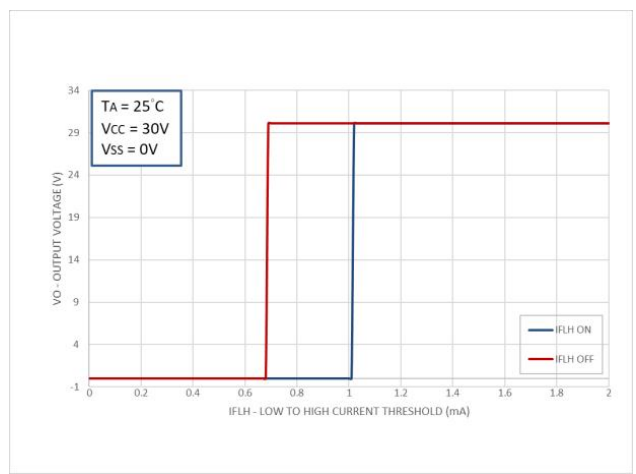


Fig.6 I_{FLH} vs. Hysteresis

CHARACTERISTIC CURVES

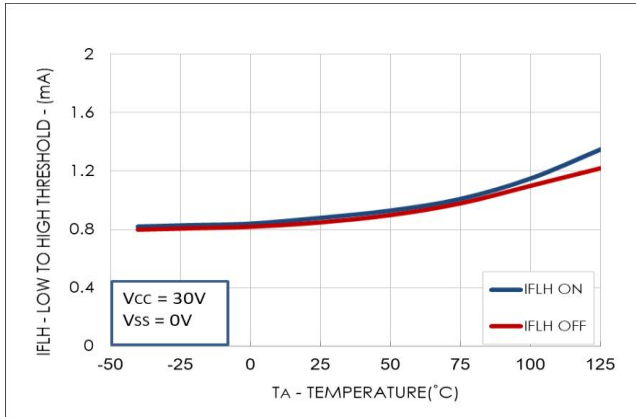


Fig.7 I_{FH} vs. Temperature

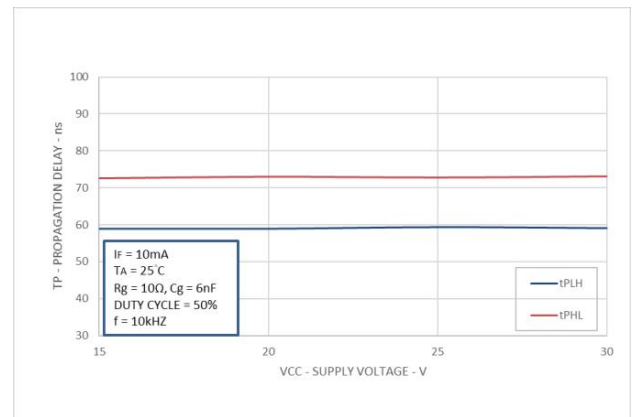


Fig.8 Propagation Delays vs. V_{CC}

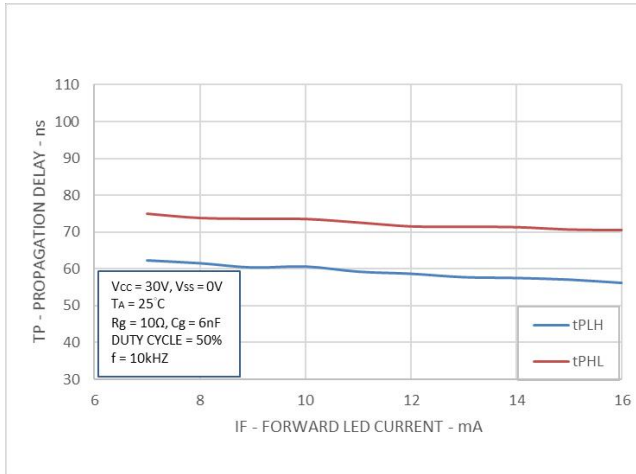


Fig.9 Propagation Delays vs. I_f

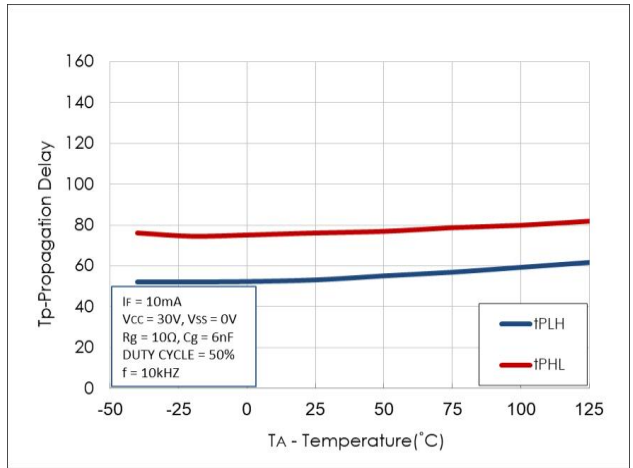


Fig.10 Propagation Delays vs. Temperature

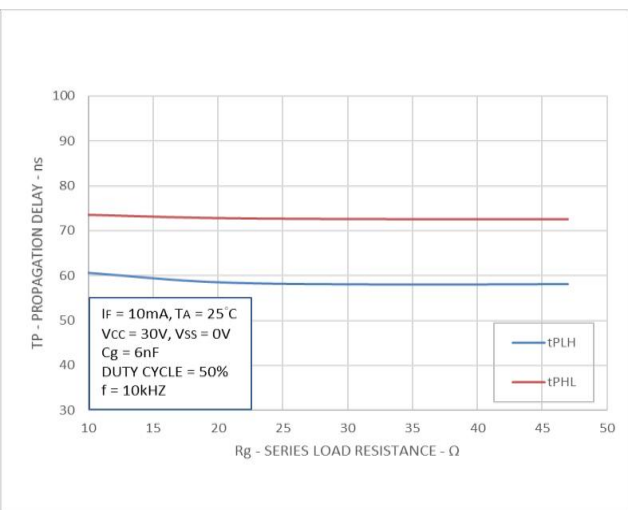


Fig.11 Propagation Delays vs. R_g

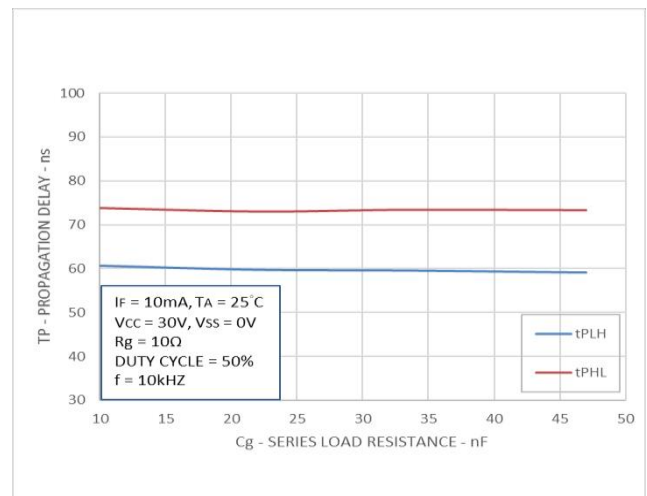


Fig.12 Propagation Delays vs. C_g

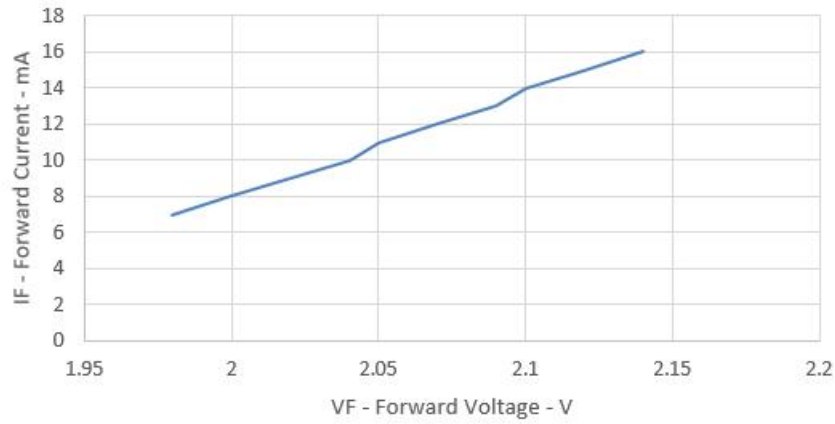


Fig.13 Input Current vs. Forward Voltage

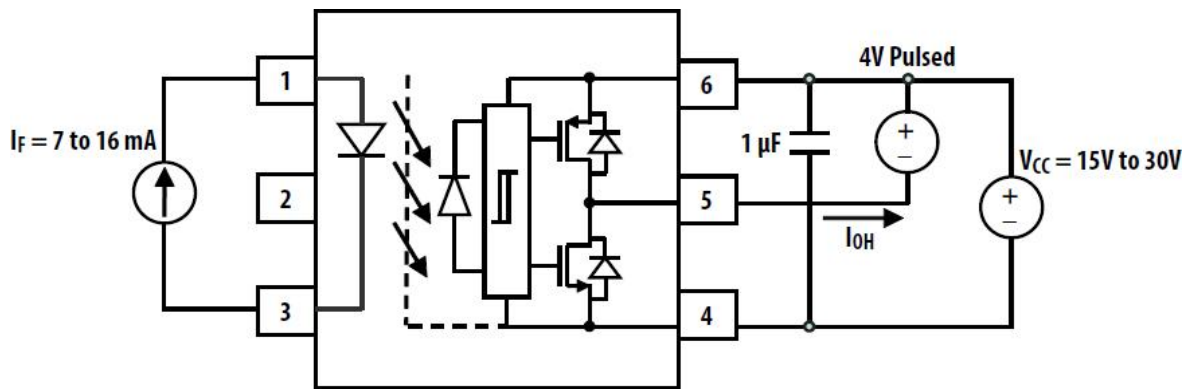


Fig.14 IOH Test Circuit

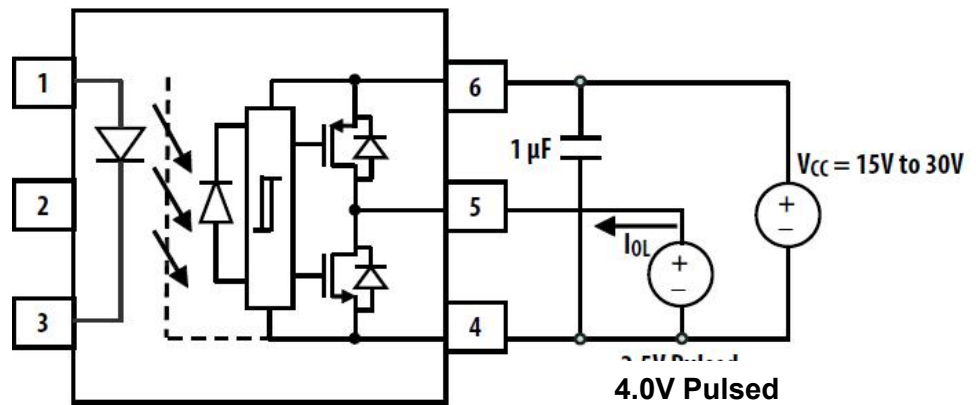


Fig.15 IOL Test Circuit

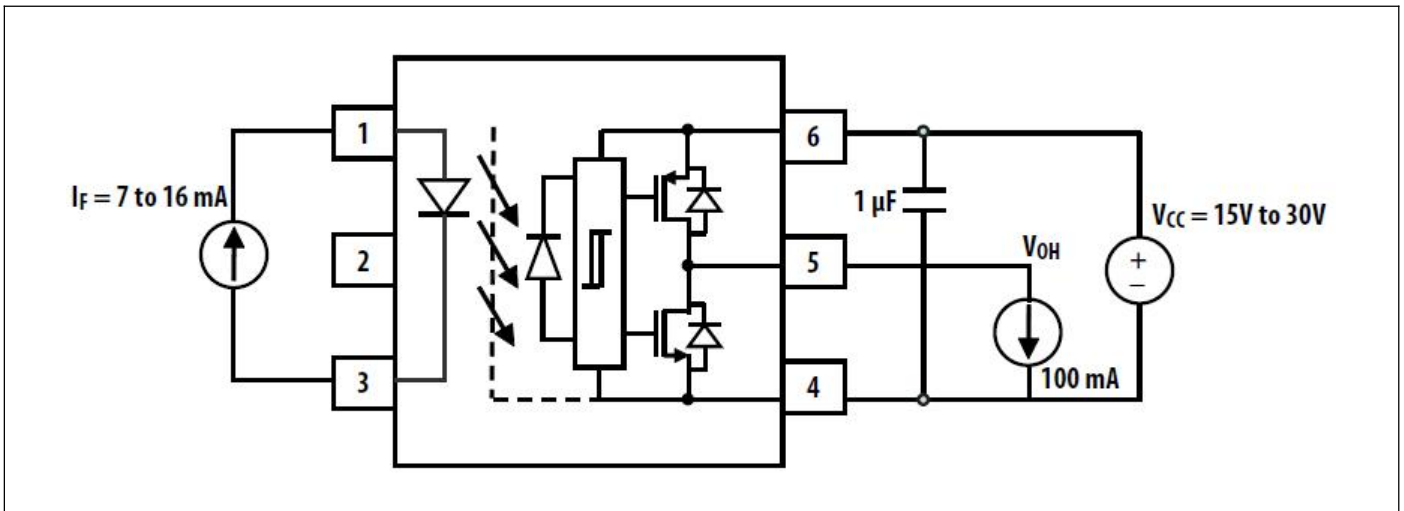


Fig.16 VOH Test Circuit

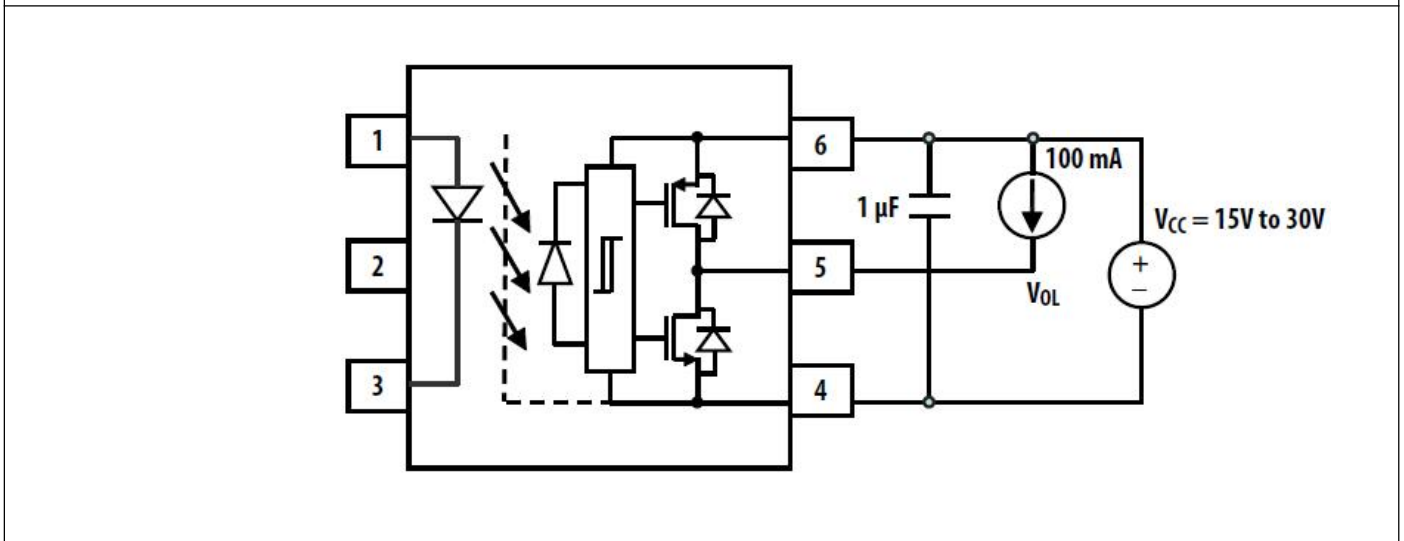


Fig.17 VOL Test Circuit

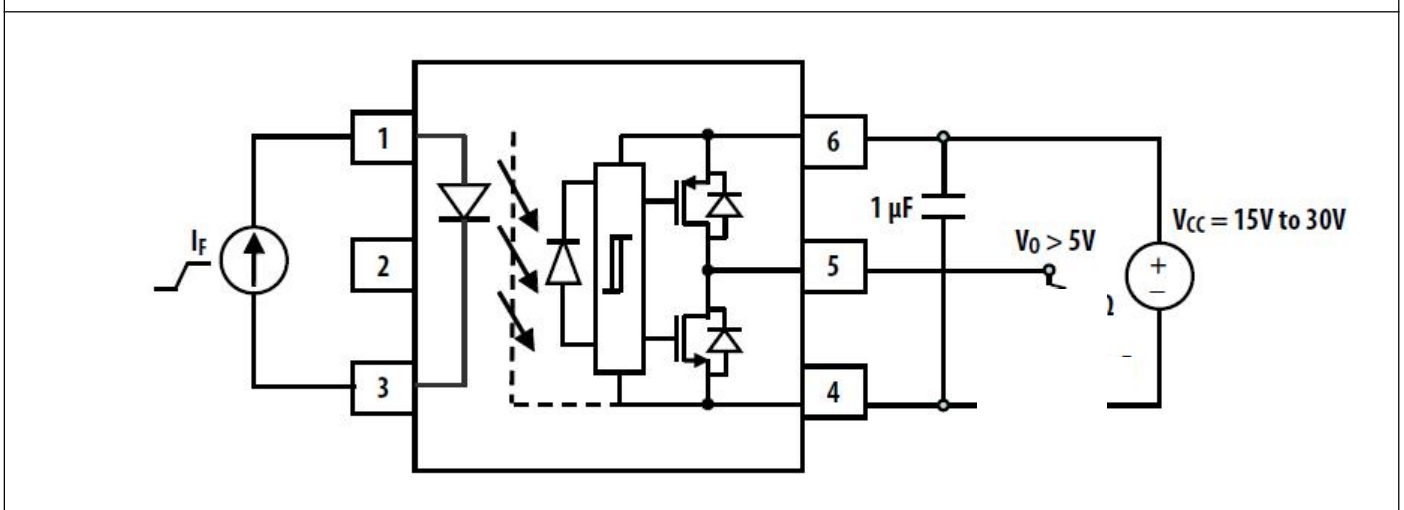


Fig.18 IFLH Test Circuit

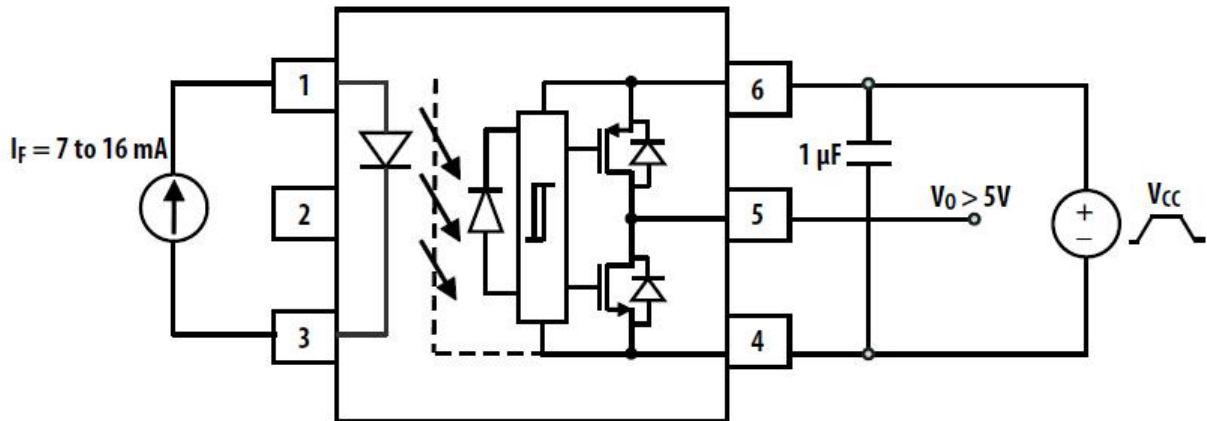


Fig.19 UVLO Test Circuit

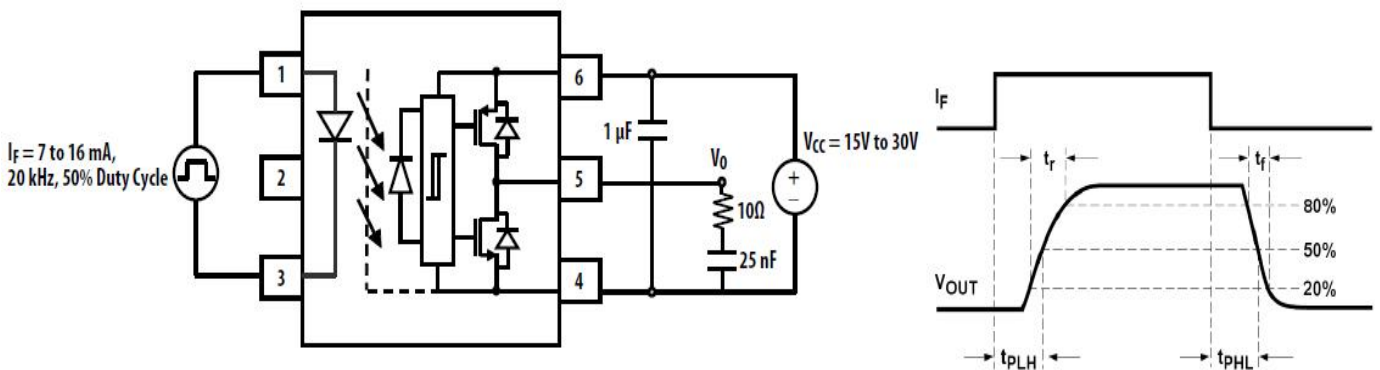


Fig.20 tPHL, tPLH, tr and tf Test Circuit and Waveforms

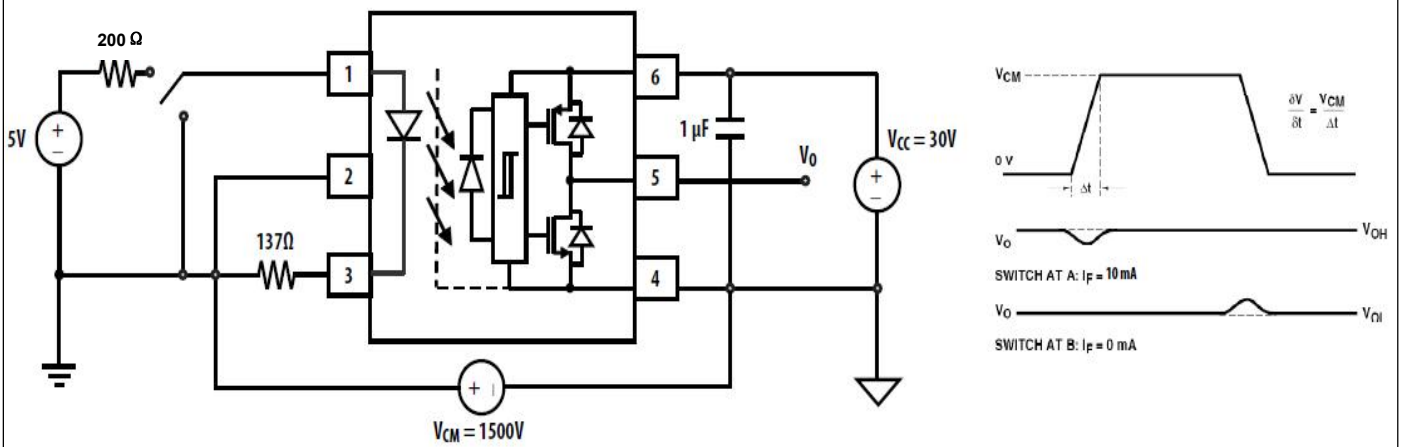
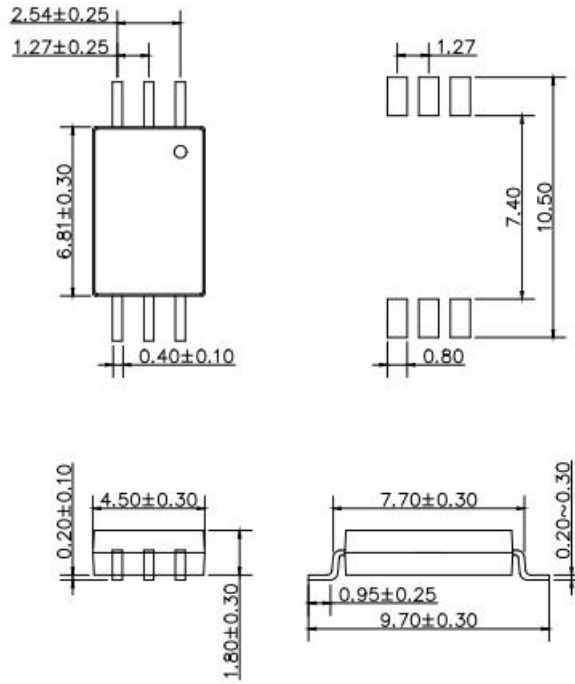


Fig.21 CMR Test Circuit with Split Resistors Network and Waveforms

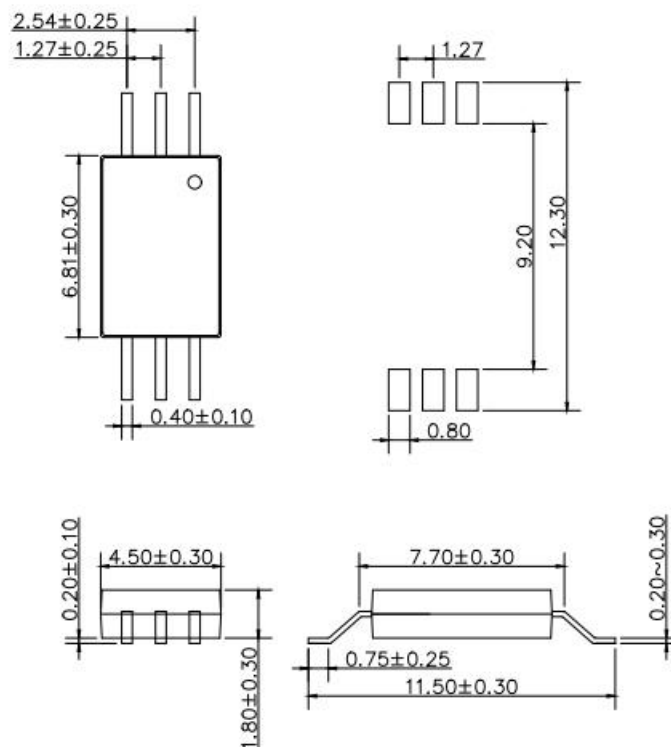
PACKAGE DIMENSIONS (Dimensions in mm unless otherwise stated)

Surface Mount Lead Forming

P type Dimension

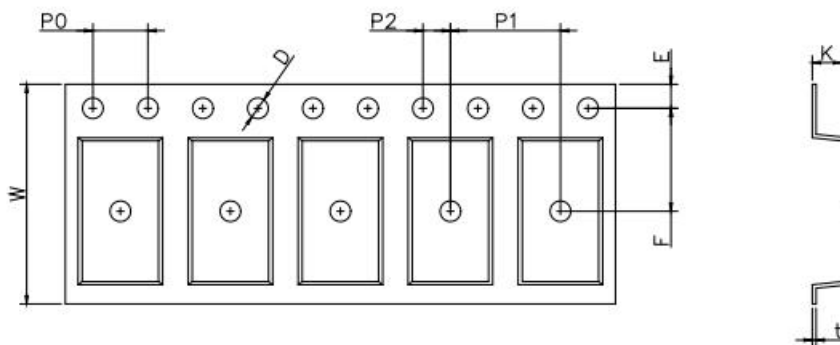


W type Dimension



TAPING DIMENSIONS (Dimensions in mm unless otherwise stated)

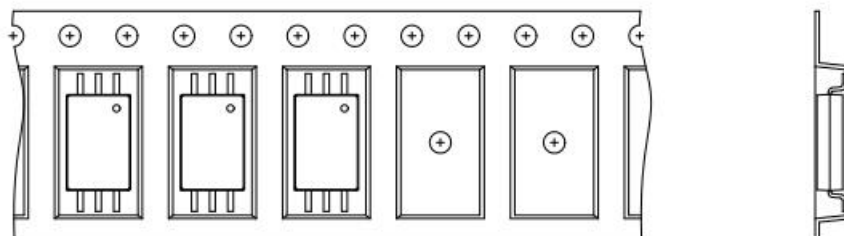
Taping Dimensions



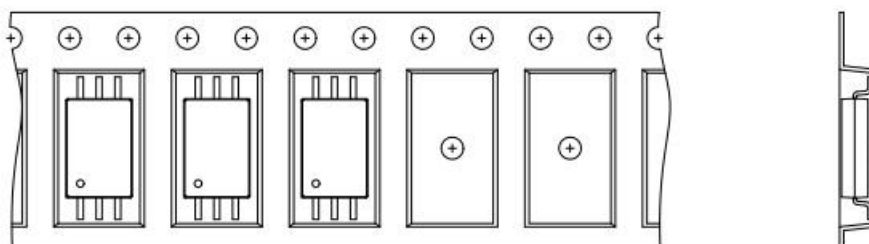
Dimension Symbol	D	E	F	P0	P1	P2	t	W	K
P type Dimension (mm)	1.5±0.1	1.75±0.1	7.5±0.1	4.0±0.1	8.0±0.1	2.0±0.1	0.3±0.1	16.0±0.3	2.15±0.1
W type Dimension (mm)	1.5±0.1	1.75±0.1	11.5±0.1	4.0±0.1	8.0±0.1	2.0±0.1	0.3±0.1	24.0±0.3	2.52±0.1

Tape & Reel Packing Specifications

Option T1

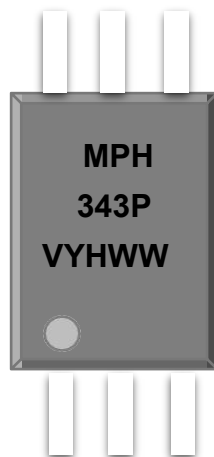


Option T2



ORDERING AND MARKING INFORMATION

MARKING INFORMATION



MP	: Company Abbr.
H	: High performance Photocoupler
343	: Part Number
P/W	: Lead Form Option
V	: VDE Identification(Option)
Y	: Year date code
H	: Factory identification mark
WW	: 2-digit work week

ORDERING INFORMATION

MPH343(P/W)-VZ

MP– Company Abbr.
H – High performance Photocoupler
343 – Part Number
P/W – Lead Form Option(P-9mm Clearance or W-11mm Clearance)
V – VDE Option (V or None)
Z – Tape and Reel Option (T1/T2)

Packing Quantity

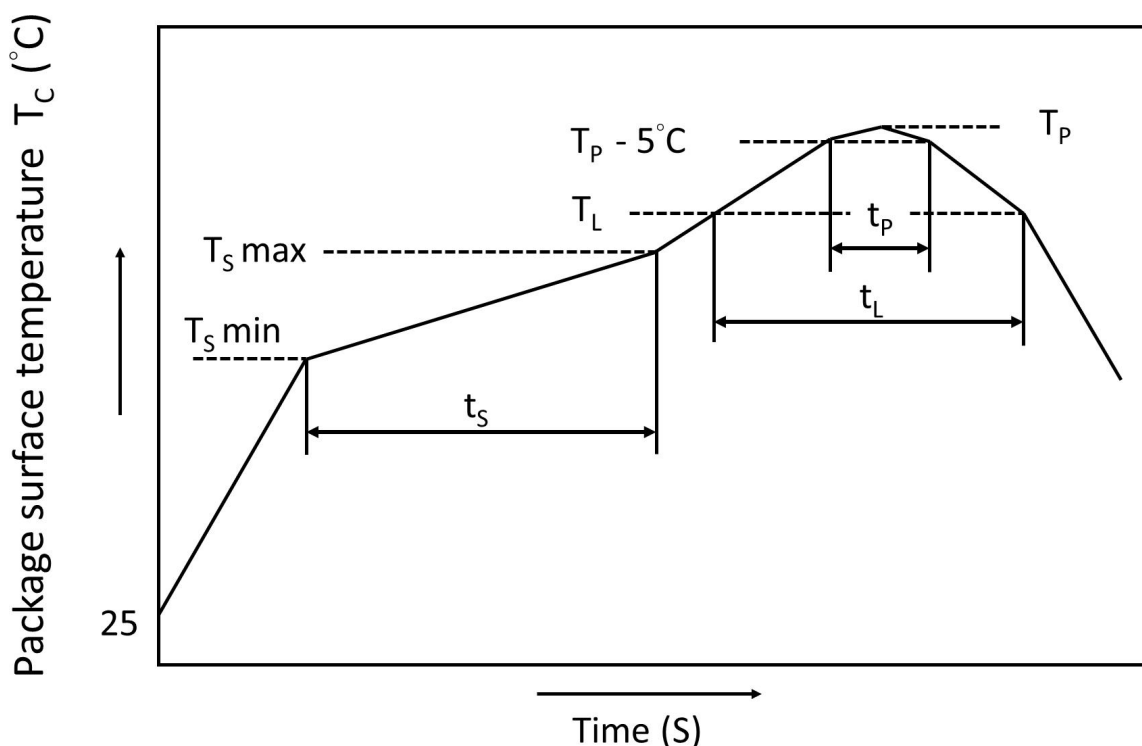
Option	Description	Quantity
P(T1)	Surface Mount Lead Forming – With Option 1 Taping	3000 Units/Reel
P(T2)	Surface Mount Lead Forming – With Option 2 Taping	3000 Units/Reel
W(T1)	Surface Mount Lead Forming – With Option 1 Taping	3000 Units/Reel
W(T2)	Surface Mount Lead Forming – With Option 2 Taping	3000 Units/Reel

REFLOW INFORMATION

REFLOW PROFILE

IR Reflow soldering

One time soldering reflow is recommended within the condition of temperature and time profile shown below. Do not solder more than three times.



	Symbol	Min.	Max.	Unit
Preheat temperature	T_S	150	200	°C
Preheat time	t_s	60	120	s
Ramp-up rate (T_L to T_P)			3	°C/s
Liquidus temperature	T_L	217		°C
Time above T_L	t_L	60	100	s
Peak Temperature	T_P		260	°C
Time during which T_C is between ($T_P - 5$) and T_P	t_p		20	s
Ramp-down rate			6	°C/s



MPH343 Series

4.0A, Gate Driver Photo Coupler

DISCLAIMER

- Our company is continually improving the quality, reliability, function and design. Our company reserves the right to make changes without further notices.
- The characteristic curves shown in this datasheet are representing typical performance which are not guaranteed.
- This product is not intended to be used for military, aircraft, automotive, medical, life sustaining or lifesaving applications or any other application which can result in human injury or death.
- Immerge unit's body in solder paste is not recommended.
- Discoloration might be occurred on the package surface after soldering, reflow or long-time use. It neither impacts the performance nor reliability..

■ Revision History

Version	Date	Subjects (major changes since last revision)
1.0	2022-07-21	Datasheet Complete