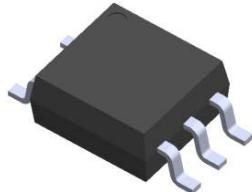


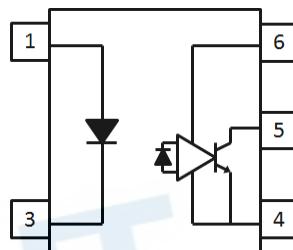
# 5 PIN SOP INTELLIGENT POWER MODULE PHOTOCOUPLER ELM456 series

**Preliminary**

## Features

- Compliance Halogen Free.  
(Br <900 ppm, Cl <900 ppm, Br+Cl < 1500 ppm).
- Pb free and RoHS compliant
- Compliance with EU REACH.
- High isolation voltage between input and output  
(Viso=3750 Vrms )
- UL and cUL approved (PENDING)
- VDE approved (PENDING)
- NEMKO approved (PENDING)
- FIMKO approved (PENDING)
- SEMKO approved (PENDING)
- DEMKO approved (PENDING)
- CQC approved (PENDING)

## Schematic



0.1 $\mu$ F bypass capacitor must be connected between pins 6 and 4 <sup>\*3</sup>

## Pin Configuration

- 1: Anode
- 3: Cathode
- 4: GND
- 5: V<sub>out</sub>
- 6: V<sub>cc</sub>

## Description

The ELM456 serie devices are consists of an infrared emitting diode optically coupled to a high gain photo detector. The devices are packaged in industry standard 5pin SOP packages and are suitable for surface mounting.

## Applications

- IPM Isolation
- Isolated IGBT/MOSFET Gate Drive
- AC and Brushless DC Motor Drives
- Industrial Inverters

## Absolute Maximum Ratings (Ta=25°C)

Parameter		Symbol	Rating	Unit
Input	Forward current	I <sub>F</sub>	20	mA
	Reverse voltage	V <sub>R</sub>	5	V
	Power dissipation	P <sub>D</sub>	40	mW
Output	Power dissipation	P <sub>C</sub>	85	mW
	Output current	I <sub>O</sub>	15	mA
	Output voltage	V <sub>O</sub>	30	V
	Supply voltage	V <sub>CC</sub>	30	V
	Output Power Dissipation	P <sub>O</sub>	100	mW
Isolation voltage <sup>*1</sup>		V <sub>ISO</sub>	3750	V rms
Operating temperature		T <sub>OPR</sub>	-40 ~ +85	°C
Storage temperature		T <sub>STG</sub>	-55 ~ +125	°C
Soldering temperature <sup>*2</sup>		T <sub>SOL</sub>	260	°C

## Notes:

<sup>\*1</sup> AC for 1 minute, R.H.= 40 ~ 60% R.H. In this test, pins 1 &3 are shorted together, and pins 4, 5 & 6 are shorted together.

<sup>\*2</sup> For 10 seconds.

## Electrical Characteristics

### Input

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Forward voltage	$V_F$	-	1.45	1.8	V	$I_F = 10\text{mA}$
Reverse Current	$I_R$	-	-	10	$\mu\text{A}$	$V_R = 5\text{V}$
Input capacitance	$C_{IN}$	-	60	-	pF	$V_F=0, f=1\text{MHz}$

### Output

Parameter	Symbol	Min	Typ.	Max.	Unit	Condition
High Level supply current	$I_{CCH}$	-	0.7	1.5	mA	$I_F=0\text{mA}, V_{CC}=5\text{V}$
Low Level supply current	$I_{CCL}$	-	0.7	-	mA	$I_F=10\text{mA}, V_{CC}=5\text{V}$

### Transfer Characteristics

Parameter	Symbol	Min	Typ.	Max.	Unit	Condition
Low Level Output Current	$V_{OL}$	-	0.15	0.6	V	$V_{CC} = 5\text{V}, I_F=5\text{mA}, I_O=2.4\text{mA}$
Input Threshold Current	$I_{TH}$	-	-	5	mA	$V_{CC} = 5.5\text{V}, V_O=0.6\text{V}, I_{OL}=13\text{mA}$
Low Level Output Current	$I_{OL}$		22		mA	$I_F=10\text{mA}, V_O=0.6\text{V}$ $V_{CC}=5\text{V}$
Current Transfer Ratio	CTR		220		%	$I_F=10\text{mA}, V_O=0.6\text{V}$ $V_{CC}=5\text{V}$

### Switching Characteristics ( $V_{CC}=5\text{V}, I_F=10\text{mA}$ unless specified otherwise)

Parameter	Symbol	Min	Typ.	Max.	Unit	Condition
Propagation delay time to output High level	$T_{PHL}$	-	150	-	ns	$C_L = 10\text{pF}, R_L=350\Omega,$
Propagation delay time to output Low level	$T_{PLH}$	-	450	-	ns	$C_L = 10\text{pF}, R_L=350\Omega,$
Pulse width distortion	$ T_{PHL} - T_{PLH} $	-	300	-	ns	$C_L = 15\text{pF}, R_L=350\Omega,$

## Switching Characteristics

Parameter	Symbol	Min	Typ.	Max.	Unit	Condition
Common Mode Transient Immunity at Logic High <sup>*4</sup>	CM <sub>H</sub>	10		-	KV/μS	$I_F = 0\text{mA}$ , $V_{OH}=2.0\text{V}$ , $R_L=350\Omega$ , $T_A=25^\circ\text{C}$ $V_{CM}=1000\text{Vp-p}$
Common Mode Transient Immunity at Logic Low <sup>*5</sup>	CM <sub>L</sub>	10	-	-	KV/μS	$I_F = 7.5\text{mA}$ , $V_{OL}=0.8\text{V}$ , $R_L=350\Omega$ , $T_A=25^\circ\text{C}$ $V_{CM}=1000\text{Vp-p}$

## Typical Electro-Optical Characteristics Curves

Figure 1. Output Current vs Forward current

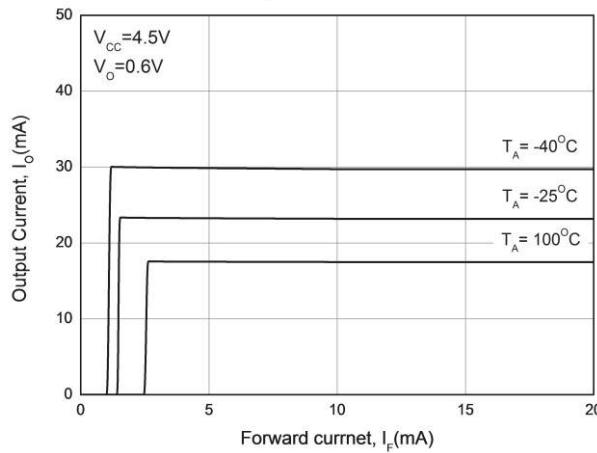


Figure 2. Normalized Output Current vs Temperature

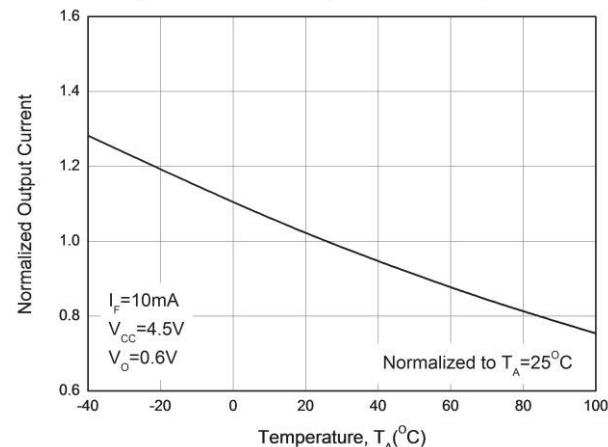


Figure 3. Propagation Delay vs Temperature

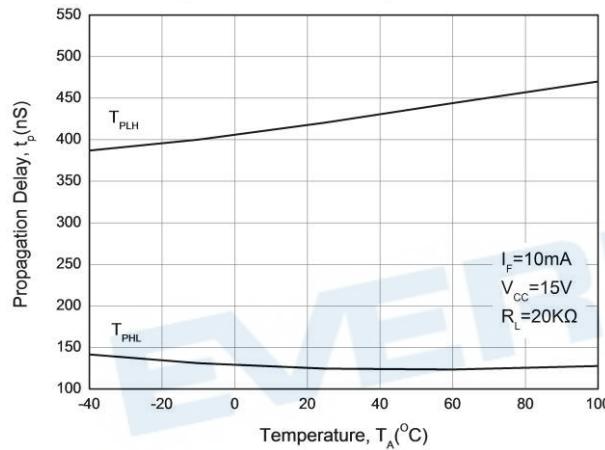


Figure 4. Propagation Delay vs Load Resistance

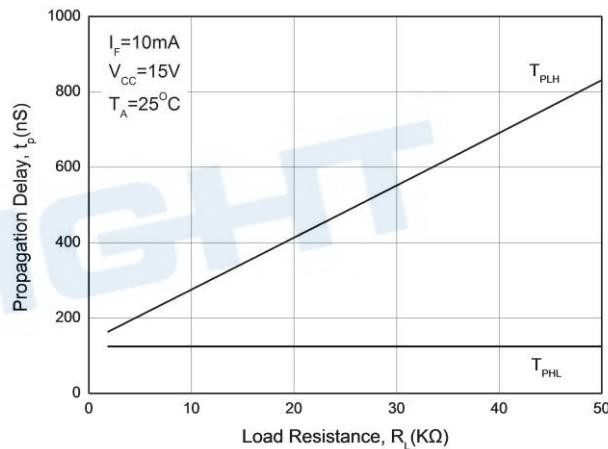


Figure 5. Propagation Delay vs Supply Voltage

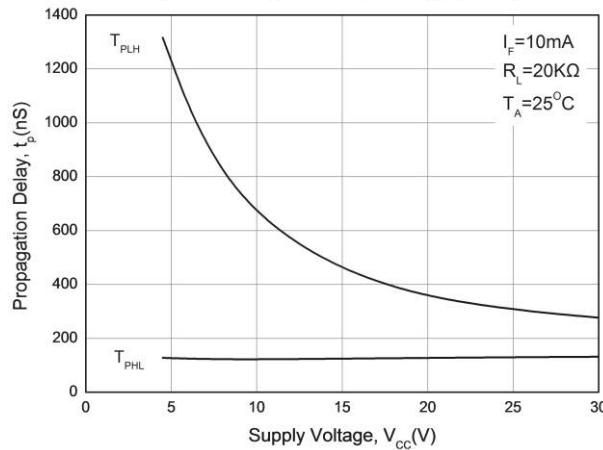
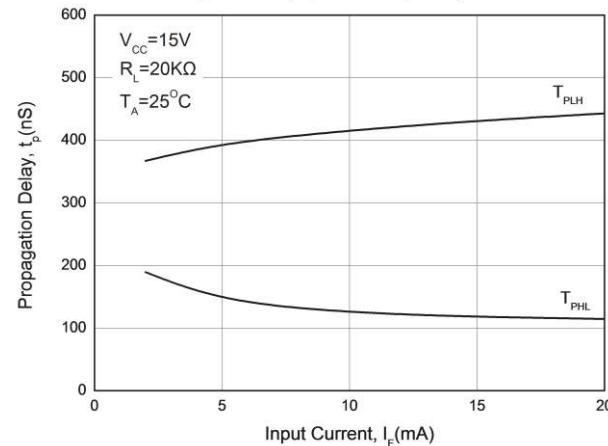


Figure 6. Propagation Delay vs Input Current



## Order Information

### Part Number

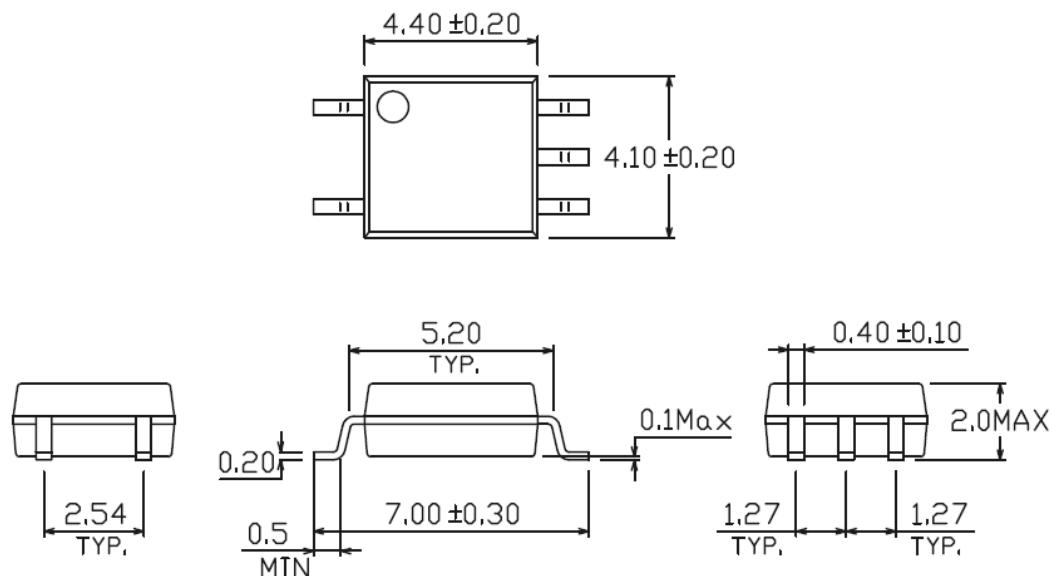
**ELM456(Y)-VG**

#### Note

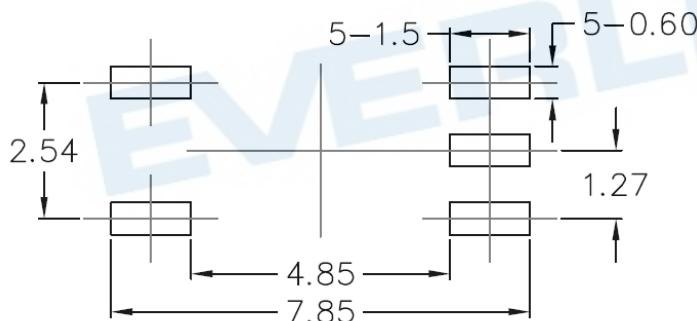
EL = denotes EVERLIGHT  
M456 = part no.  
Y = Tape and reel option (TA, TB)  
V = VDE (optional)  
G = Halogens free

Option	Description	Packing quantity
(TA)	Surface mount lead form + TA tape & reel option	1000 units per reel
(TB)	Surface mount lead form + TB tape & reel option	1000 units per reel

## Package Dimension (Dimensions in mm)



## Recommended pad layout for surface mount leadform



## Device Marking



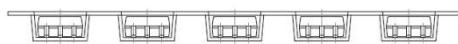
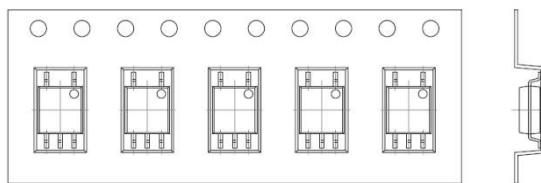
### Notes

EL	denotes EVERLIGHT
M456	denotes Device Number
Y	denotes 1 digit Year code
WW	denotes 2 digit Week code
V	denotes VDE (optional)

EVERLIGHT

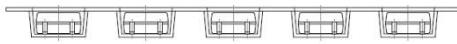
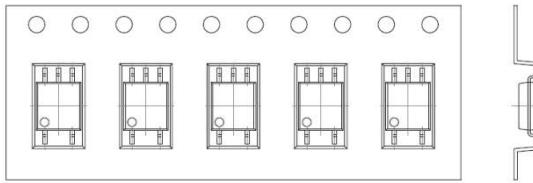
## Tape & Reel Packing Specifications

**Option TA**



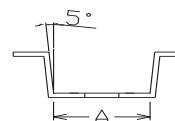
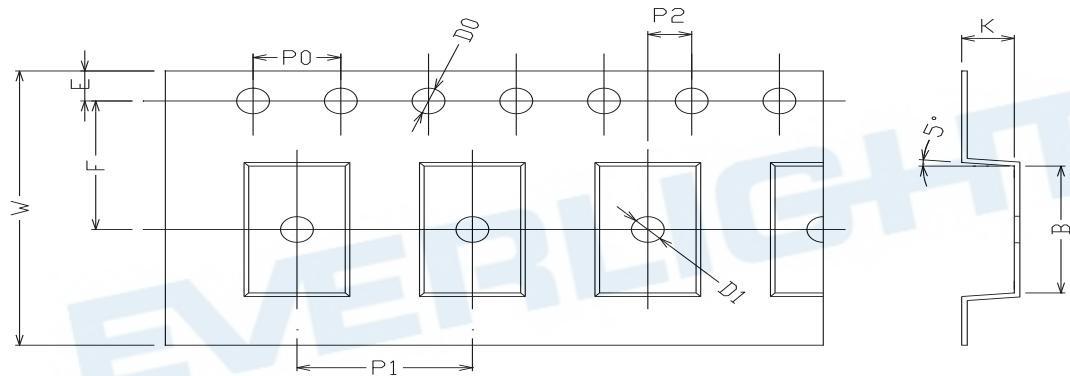
Direction of feed from reel

**Option TB**



Direction of feed from reel

### Tape dimensions

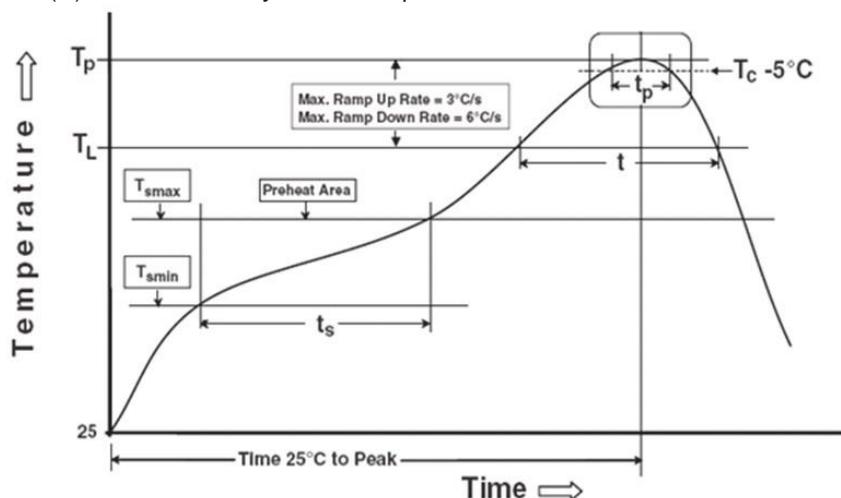


Dimension No.	A	B	Do	D1	E	F
Dimension (mm)	$4.4 \pm 0.1$	$7.4 \pm 0.1$	$1.5 + 0.1/-0$	$1.5 \pm 0.1$	$1.75 \pm 0.1$	$7.5 \pm 0.05$
Dimension No.	P0	P1	P2	t	W	K
Dimension (mm)	$4.0 \pm 0.15$	$8.0 \pm 0.1$	$2.0 \pm 0.1$	$0.25 \pm 0.03$	$16.0 \pm 0.2$	$2.4 \pm 0.1$

## Precautions for Use

### 1. Soldering Condition

#### 1.1 (A) Maximum Body Case Temperature Profile for evaluation of Reflow Profile



Note:

Reference: IPC/JEDEC J-STD-020D

#### Preheat

Temperature min ( $T_{smin}$ )	150 °C
Temperature max ( $T_{smax}$ )	200°C
Time ( $T_{smin}$ to $T_{smax}$ ) ( $t_s$ )	60-120 seconds
Average ramp-up rate ( $T_{smax}$ to $T_p$ )	3 °C/second max

#### Other

Liquidus Temperature ( $T_L$ )	217 °C
Time above Liquidus Temperature ( $t_L$ )	60-100 sec
Peak Temperature ( $T_p$ )	260°C
Time within 5 °C of Actual Peak Temperature: $T_p - 5^\circ\text{C}$	30 s
Ramp- Down Rate from Peak Temperature	6°C /second max.
Time 25°C to peak temperature	8 minutes max.
Reflow times	3 times

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