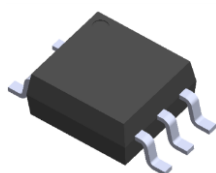


### 5 PIN SOP HIGH SPEED 1Mbit/s TRANSISTOR PHOTOCOUPLER ELM453H-G Series

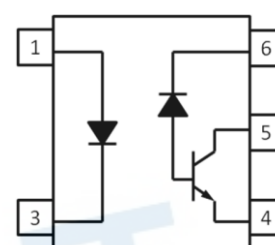
Preliminary



#### Features

- Compliance Halogen Free.  
(Br <900 ppm ,Cl <900 ppm , Br+Cl < 1500 ppm)
- Compliance with EU REACH
- Pb free and RoHS compliant.
- Guaranteed performance from -40 to 125°C
- High isolation voltage between input and output  
(Viso=3750 V rms )
- UL and cUL approved(No. E214129)
- VDE approved (No. 40028116)
- SEMKO approved
- NEMKO approved
- DEMKO approved
- FIMKO approved
- CQC approved

Schematic



Pin Configuration

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

#### Description

The ELM453H devices each consist of an infrared emitting diode, optically coupled to a high speed photo detector transistor. A separate connection for the photodiode bias and output-transistor collector increase the speed by several orders of magnitude over conventional phototransistor couplers by reducing the base-collector capacitance of the input transistor. The devices are packaged in industry standard 5pin SOP packages and are suitable for surface mounting.

#### Applications

- Line receivers
- Field bus communication and control.
- Power transistor isolation in motor drives
- Replacement for low speed phototransistor photo couplers
- High speed logic ground isolation
- Analog signal ground isolation

**Absolute Maximum Ratings (T<sub>A</sub>=25 °C)**

	Parameter	Symbol	Rating	Unit
Input	Forward current	I <sub>F</sub>	25	mA
	Reverse voltage	V <sub>R</sub>	5	V
	Power dissipation	P <sub>D</sub>	45	mW
Output	Power dissipation	P <sub>C</sub>	85	mW
	Output current	I <sub>O</sub>	8	mA
	Output voltage	V <sub>O</sub>	20	V
	Supply voltage	V <sub>CC</sub>	30	V
Output Power Dissipation		P <sub>O</sub>	85	mW
Isolation Voltage* <sup>1</sup>		V <sub>ISO</sub>	3750	V <sub>rms</sub>
Operating Temperature		T <sub>OPR</sub>	-40 ~ +125	°C
Storage Temperature		T <sub>STG</sub>	-55 ~ +125	°C
Soldering Temperature* <sup>2</sup>		T <sub>SOL</sub>	260	°C

Notes:

\*1 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.

\*2 For 10 seconds

## Electrical Characteristics

### Input

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Forward voltage	$V_F$	-	1.4	1.8	V	$I_F = 16\text{mA}$
Reverse Current	$I_R$	-	-	10	$\mu\text{A}$	$V_R = 5\text{V}$
Input capacitance	$C_{IN}$	-	70	-	pF	$V_F=0, f=1\text{MHz}$

### Output

Parameter	Symbol	Min	Typ.	Max.	Unit	Condition
High Level Output Current	$I_{OH}$	-	0.05	5	$\mu\text{A}$	$I_F=0\text{mA}, V_O=V_{CC}=15\text{V}, T_A=25^\circ\text{C}$
		-	-	50		$I_F=0\text{mA}, V_O=V_{CC}=15\text{V}, T_A=70^\circ\text{C}$
High level supply current	$I_{CCH}$	-	0.5	2	$\mu\text{A}$	$I_F=0\text{mA}, V_{CC}=15\text{V}$

### Transfer Characteristics

Parameter	Symbol	Min	Typ.	Max.	Unit	Condition
Low Level Output Current	$V_{OL}$	-	-	0.4	V	$I_F=16\text{mA}, I_O=3\text{mA}, V_{CC}=4.5\text{V}$
Current Transfer Ratio	CTR	20	-	-	%	$I_F=16\text{mA}, V_O=0.4\text{V}, V_{CC}=4.5\text{V}$

### Switching Characteristics (TA=0 to 70°C unless specified otherwise)

Parameter	Symbol	Min	Typ.	Max.	Unit	Condition
Propagation Delay Time to Logic Low	$T_{PHL}$	-	0.35	1.0	$\mu\text{s}$	$I_F=16\text{mA}, R_L=1.9\text{K}\Omega$
Propagation Delay Time to Logic High	$T_{PLH}$	-	0.45	1.0	$\mu\text{s}$	$I_F=16\text{mA}, R_L=1.9\text{K}\Omega$
Common Mode Transient Immunity at Logic High*3	$CM_H$	10			$\text{KV}/\mu\text{S}$	$I_F = 0\text{mA}, V_{CM}=1500\text{Vp-p}, R_L=1.9\text{K}\Omega, T_A = 25^\circ\text{C}$
Common Mode Transient Immunity at Logic Low*3	$CM_L$	10			$\text{KV}/\mu\text{S}$	$I_F=16\text{mA}, V_{CM}=1500\text{Vp-p}, R_L=1.9\text{K}\Omega, T_A=25^\circ\text{C}$

\*All typical at  $T_A = 25^\circ\text{C}$

Typical Electro-Optical Characteristics Curves

Figure 1. Forward Current vs Forward Voltage

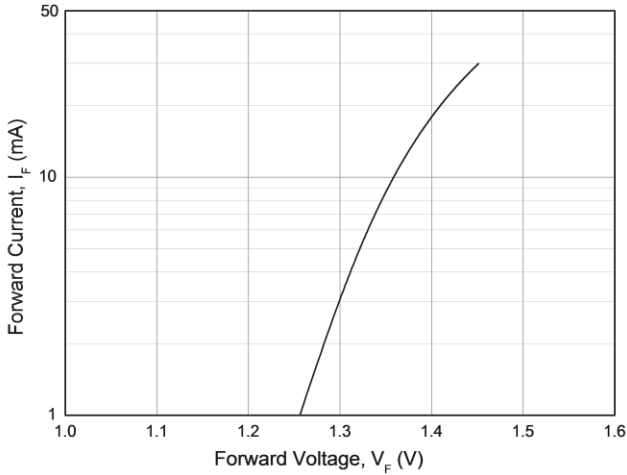


Figure 2. Current Transfer Ratio vs Forward Current

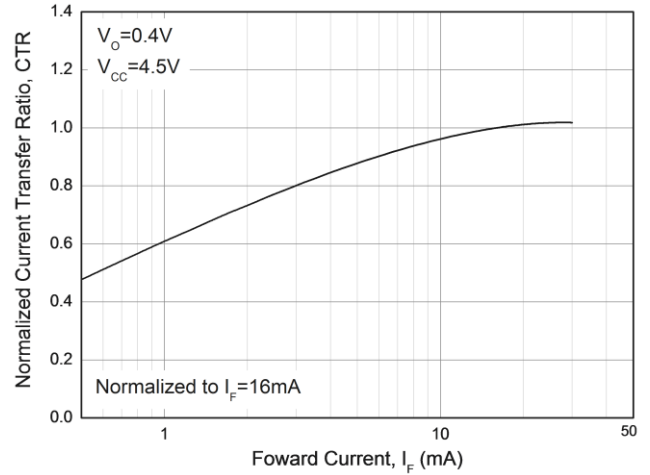


Figure 3. Current Transfer Ratio vs Ambient Temperature

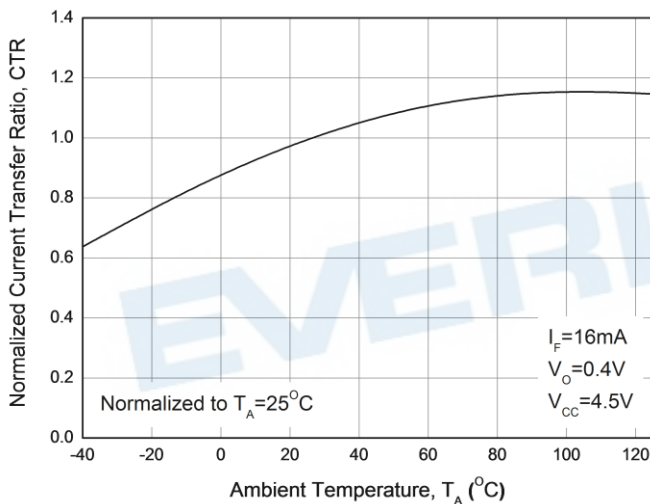


Figure 4. Output Current vs Output Voltage

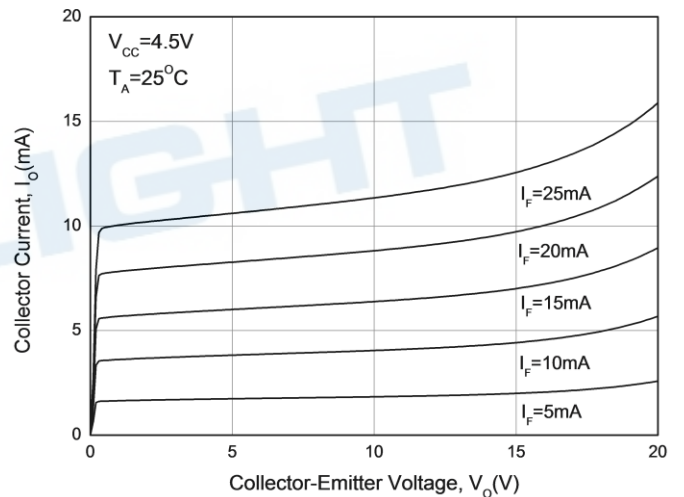


Figure 5. High Level Output Current vs Ambient Temperature

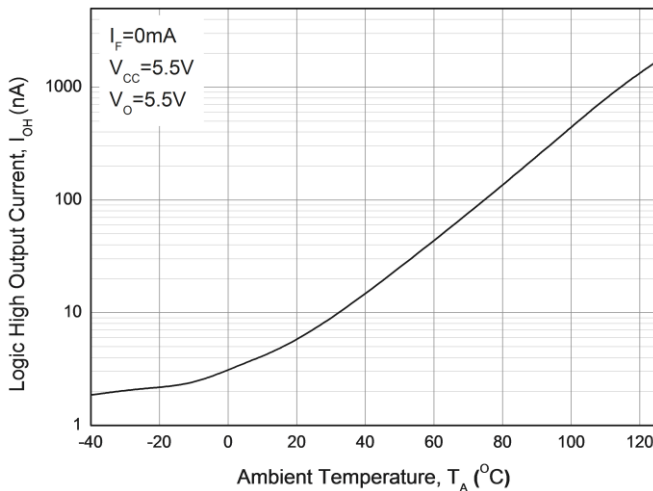


Figure 6. Propagation Delay vs. Load Resistance

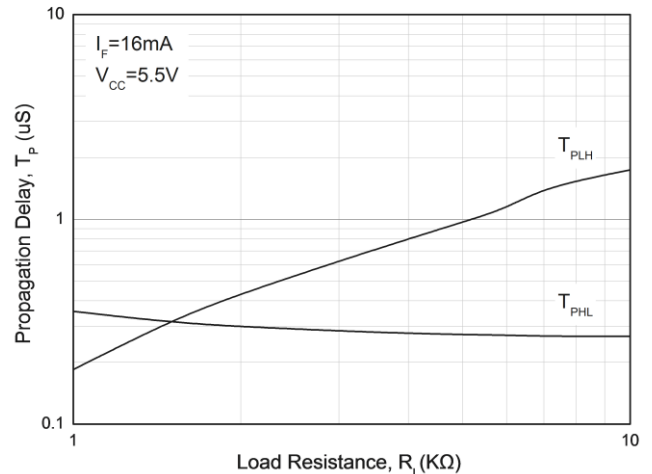


Figure 7. Propagation Delay vs. Temperature

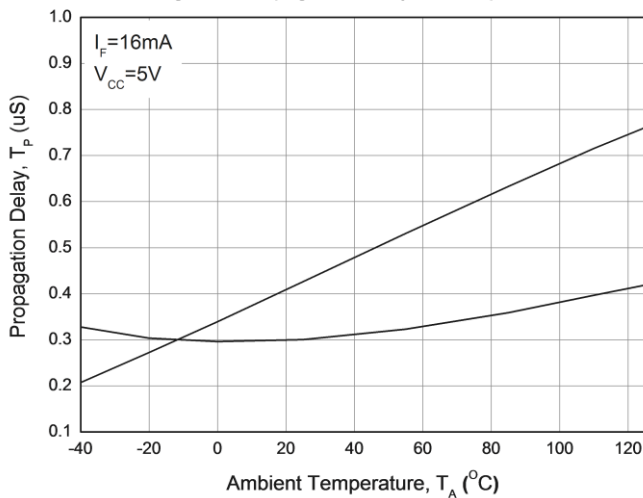


Fig. 8 Switching Time Test circuit

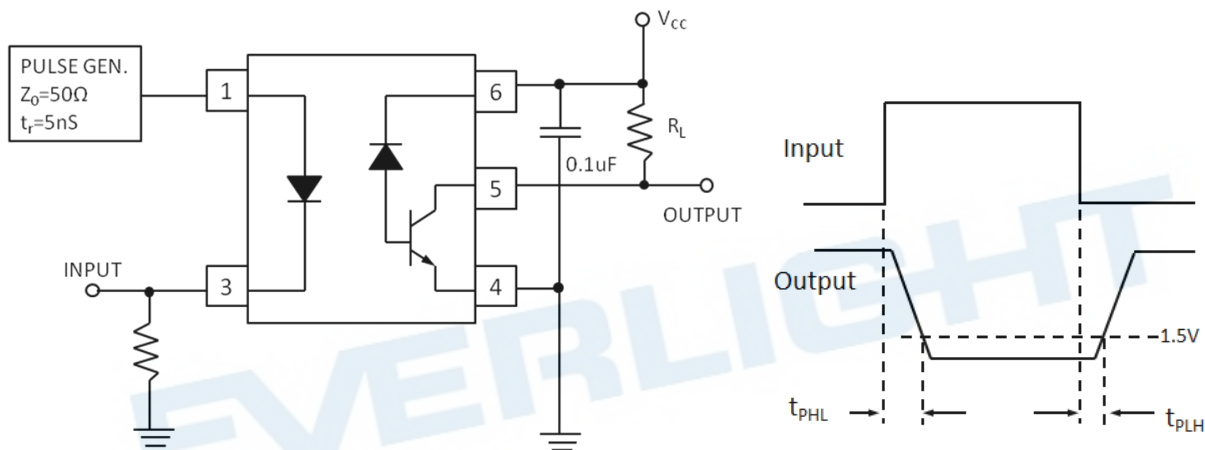
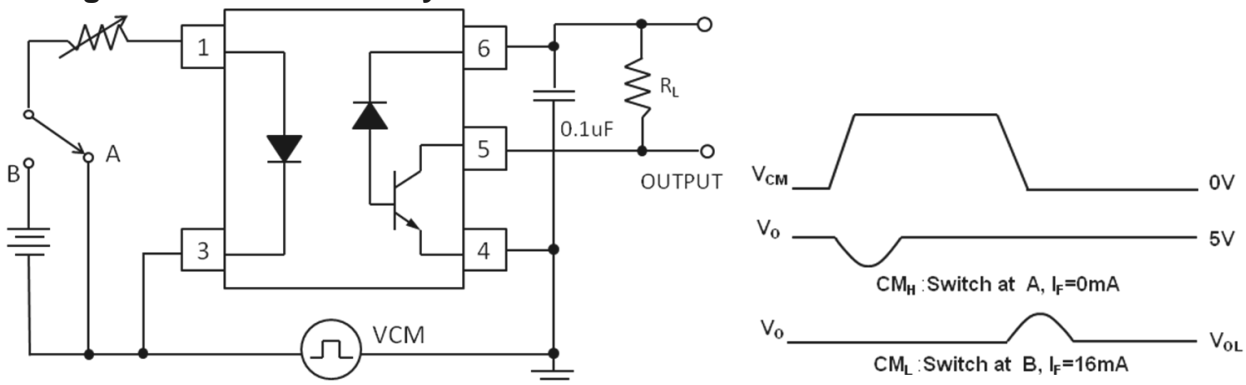


Fig. 9 Transient Immunity Test circuit



Note:

\*3 Common mode transient immunity in logic high level is the maximum tolerable (positive)  $dV_{cm}/dt$  on the leading edge of the common mode pulse signal  $V_{CM}$ , to assure that the output will remain in a logic high state (i.e.,  $V_O > 2.0V$ ).

Common mode transient immunity in logic low level is the maximum tolerable (negative)  $dV_{cm}/dt$  on the trailing edge of the common mode pulse signal,  $V_{CM}$ , to assure that the output will remain in a logic low state (i.e.,  $V_O < 0.8V$ )

## Order Information

### Part Number

# ELM453H(Z)-VG

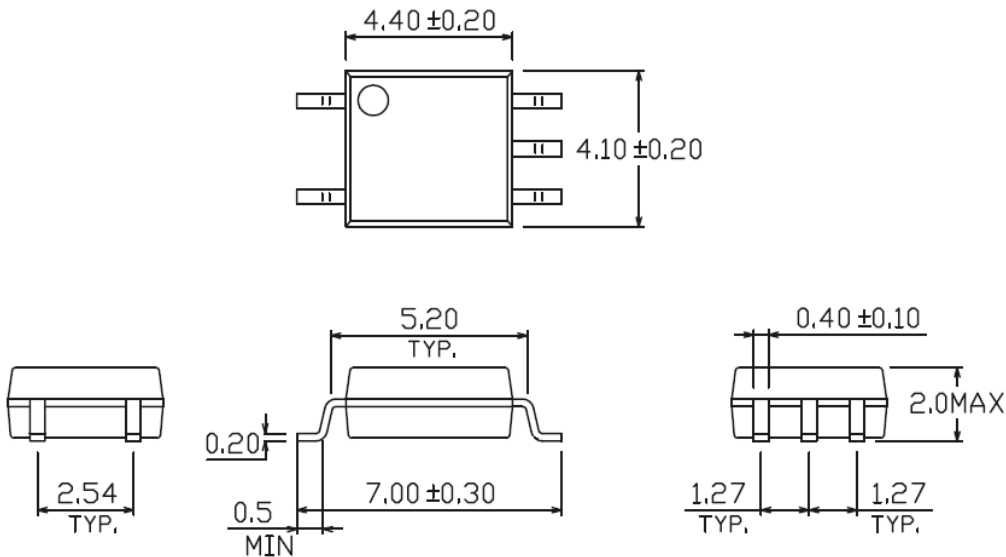
#### Note

- Z = Tape and reel option (TA, TB or none)
- V = VDE (optional)
- G = Halogens free

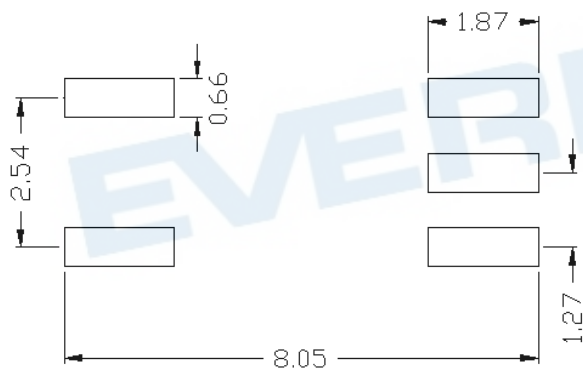
Option	Description	Packing quantity
None	Standard SMD option	100 units per tube
(TA)	Surface mount lead form + TA tape & reel option	3000 units per reel
(TB)	Surface mount lead form + TB tape & reel option	3000 units per reel

EVERLIGHT

**Package Dimension**  
(Dimensions in mm)



**Recommended pad layout for surface mount leadform**



**Notes**

Suggested pad dimension is just for reference only.  
Please modify the pad dimension based on individual need.

## Device Marking



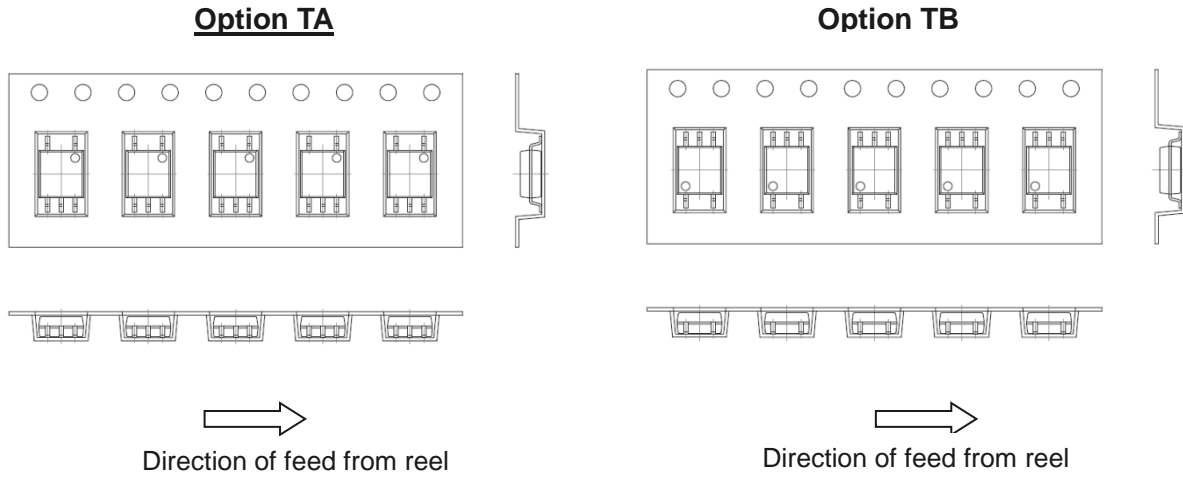
### Notes

EL	denotes EVERLIGHT
M453H	denotes Device Number
Y	denotes 1 digit Year code
WW	denotes 2 digit Week code
V	denotes VDE (optional)

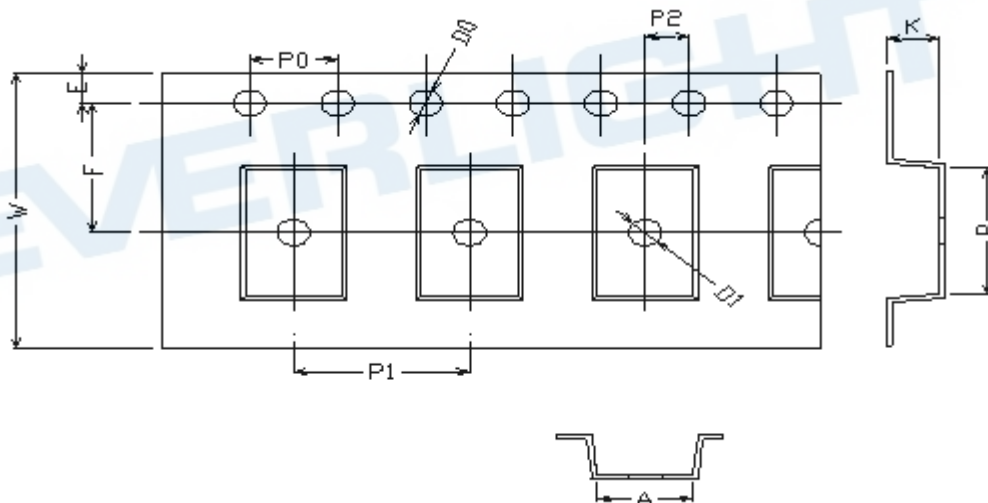
EVERLIGHT



### Tape & Reel Packing Specifications



### Tape dimensions

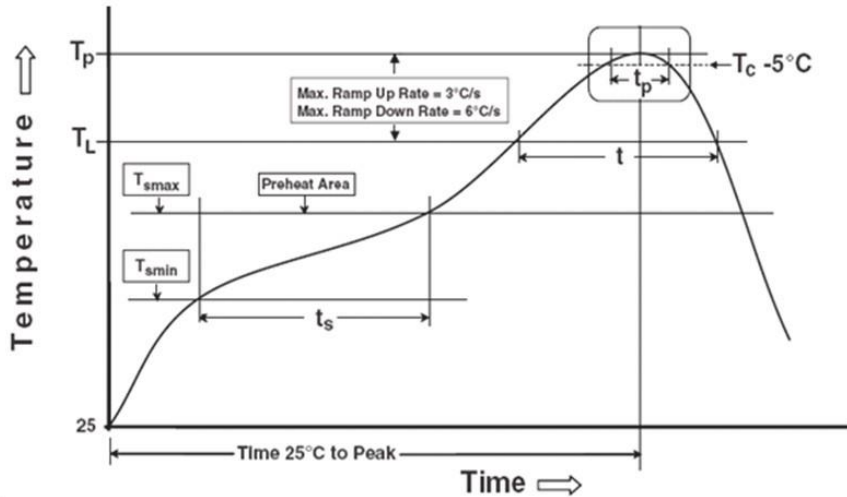


Dimension No.	<b>A</b>	<b>B</b>	<b>Do</b>	<b>D1</b>	<b>E</b>	<b>F</b>
Dimension (mm)	4.4 ± 0.1	7.4 ± 0.1	1.5 ± 0.1	1.5 ± 0.1	1.75 ± 0.1	7.5 ± 0.1
Dimension No.	<b>Po</b>	<b>P1</b>	<b>P2</b>	<b>t</b>	<b>W</b>	<b>K</b>
Dimension (mm)	4.0 ± 0.15	8.0 ± 0.1	2.0 ± 0.1	0.25 ± 0.1	16.0 ± 0.2	2.4 ± 0.1

## 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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