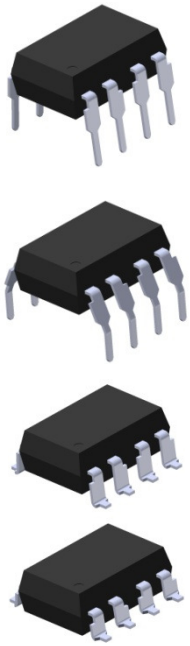
EVERLIGHT

# 8 PIN DIP HIGH SPEED 1Mbit/s TRANSISTOR PHOTOCOUPLER

# 6N135 6N136 EL450X series

## Features



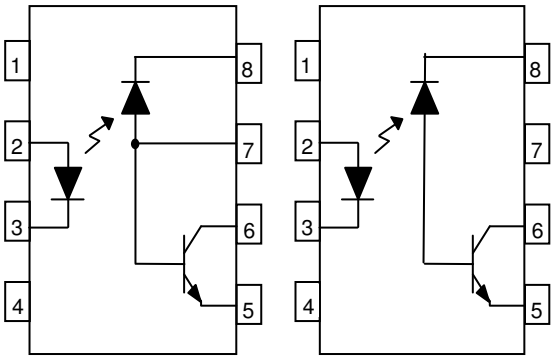
- High speed 1Mbit/s
- High isolation voltage between input and output (Viso=5000 Vrms )
- Guaranteed performance from 0℃ to 70℃
- Wide operating temperature range of -55℃ to 100℃
- Pb free and RoHS compliant
- UL approved (No. 214129)
- VDE approved (No. 132249)
- SEMKO approved
- NEMKO approved
- DEMKO approved
- FIMKO approved
- CSA approved (No. 2037145)

## Description

The 6N135, 6N136, EL4502 and EL4503 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 an 8-pin DIP package and available in wide-lead spacing and SMD option.

Schematic




6N135 / 6N136

Pin Configuration

1. No Connection
2. Anode
3. Cathode
4. No Connection
5. Gnd
6. Vout
7. $V_B$
8. $V_{CC}$

EL4502 / EL4503

Pin Configuration

1. No Connection
2. Anode
3. Cathode
4. No Connection
5. Gnd
6. Vout
7. No Connection
8. $V_{CC}$

## Applications

- Line receivers
- Telecommunication equipments
- Power transistor isolation in motor drives
- Replacement for low speed phototransistor photo couplers
- Feedback loop in switch-mode power supplies
- Home appliances
- High speed logic ground isolation

## Absolute Maximum Ratings ($T_a$=25℃)

| Parameter | | | Symbol | Rating | Unit |
|---|---|---|---|---|---|
| Input | Forward current | | $I_F$ | 25 | mA |
| | Peak forward current (50% duty, 1ms P.W) | | $I_{FP}$ | 50 | mA |
| | Peak transient current (≤1μs P.W,300pps) | | $I_{Ftrans}$ | 1 | A |
| | Reverse voltage | | $V_R$ | 5 | V |
| | Power dissipation | | $P_{IN}$ | 45 | mW |
| Output | Power dissipation | | $P_O$ | 100 | mW |
| | Emitter-Base reverse voltage | 6N135 6N136 | $V_{EBR}$ | 5 | V |
| | Base current | 6N135 6N136 | $I_B$ | 5 | mA |
| | Average Output current | | $I_{O(AVG)}$ | 8 | mA |
| | Peak Output current | | $I_{O(PK)}$ | 16 | mA |
| | Output voltage | | $V_O$ | -0.5 to 20 | V |
| | Supply voltage | | $V_{CC}$ | -0.5 to 30 | V |
| Isolation voltage *1 | | | $V_{ISO}$ | 5000 | V rms |
| Operating temperature | | | $T_{OPR}$ | -55 ~ +100 | ℃ |
| Storage temperature | | | $T_{STG}$ | -55 ~ +125 | ℃ |
| Soldering temperature *2 | | | $T_{SOL}$ | 260 | ℃ |

Notes

*1 AC for 1 minute, R.H.= 40 ~ 60% R.H. In this test, pins 1, 2, 3, 4 are shorted together, and pins 5, 6, 7, 8 are shorted together.

*2 For 10 seconds.

## Electrical Characteristics ($T_A$=0 to 70℃ unless specified otherwise)

### Input

| Parameter | Symbol | Min. | Typ.* | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Forward voltage | $V_F$ | - | 1.45 | 1.8 | V | $I_F$ = 16mA |
| Reverse Voltage | $V_R$ | 5.0 | - | - | V | $I_R$ = 10μA |
| Temperature coefficient of forward voltage | $\Delta V_F/\Delta T_A$ | - | -1.9 | - | mV/℃ | $I_F$ =16mA |

### Output

| Parameter | Symbol | Min. | Typ.* | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Logic High Output Current | $I_{OH}$ | - | 0.001 | 0.5 | μA | $I_F$=0mA, $V_O$=$V_{CC}$=5.5V, $T_A$=25℃ |
| | | - | 0.01 | 1 | | $I_F$=0mA, $V_O$=$V_{CC}$=15V, $T_A$=25℃ |
| | | - | - | 50 | | $I_F$=0mA, $V_O$=$V_{CC}$=15V |
| Logic Low Supply Current | $I_{CCL}$ | - | 140 | 200 | μA | $I_F$=16mA, $V_O$=Open, $V_{CC}$=15V |
| Logic High Supply Current | $I_{CCH}$ | - | 0.01 | 1 | μA | $I_F$=0mA, $V_O$=Open, $V_{CC}$=15V, $T_A$=25℃ |
| | | - | - | 2 | | $I_F$=0mA, $V_O$=Open, $V_{CC}$=15V |

* Typical values at $T_A$ = 25℃

**Transfer Characteristics ($T_A$=0 to 70℃ unless specified otherwise)**

| Parameter | | Symbol | Min. | Typ.* | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|---|
| Current Transfer Ratio | 6N135 | CTR | 7 | - | 50 | % | $I_F$ = 16mA ,$V_O$ = 0.4V, $V_{CC}$=4.5V, $T_A$=25℃ |
| | 6N136 EL4502 EL4503 | | 19 | - | 50 | | |
| | 6N135 | | 5 | - | - | | $I_F$ = 16mA ,$V_O$ = 0.4V, $V_{CC}$=4.5V |
| | 6N136 EL4502 EL4503 | | 15 | - | - | | |
| Logic Low Output Voltage | 6N135 | $V_{OL}$ | - | 0.18 | 0.4 | V | $I_F$ = 16mA ,$I_O$ = 1.1mA, $V_{CC}$=4.5V, $T_A$=25℃ |
| | 6N136 EL4502 EL4503 | | - | 0.25 | 0.4 | | $I_F$ = 16mA ,$I_O$ = 3mA, $V_{CC}$=4.5V, $T_A$=25℃ |
| | 6N135 | | - | - | 0.5 | | $I_F$ = 16mA ,$I_O$ = 0.8mA, $V_{CC}$=4.5V |
| | 6N136 EL4502 EL4503 | | - | - | 0.5 | | $I_F$=16mA ,$I_O$=2.4mA, $V_{CC}$=4.5V |

**Switching Characteristics ($T_A$=0 to 70℃ unless specified otherwise, $I_F$=16mA, Vcc=5V)**

| Parameter | | Symbol | Min. | Typ.* | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|---|
| Propagation Delay Time to Logic Low (Fig.8) | 6N135 | TPHL | - | 0.35 | 1.5 | μs | $R_L$=4.1KΩ, $T_A$=25℃ |
| | | | - | - | 2.0 | | $R_L$=4.1KΩ |
| | 6N136 EL4502 EL4503 | | - | 0.35 | 0.8 | | $R_L$=1.9KΩ, $T_A$=25℃ |
| | | | - | - | 1.0 | | $R_L$=1.9KΩ |
| Propagation Delay Time to Logic High (Fig.8) | 6N135 | TPLH | - | 0.5 | 1.5 | μs | $R_L$=4.1KΩ, $T_A$=25℃ |
| | | | - | - | 2.0 | | $R_L$=4.1KΩ |
| | 6N136 EL4502 EL4503 | | - | 0.3 | 0.8 | | $R_L$=1.9KΩ, $T_A$=25℃ |
| | | | - | - | 1.0 | | $R_L$=1.9KΩ |
| Common Mode Transient Immunity at Logic High (Fig.9)*3 | 6N135 | $CM_H$ | 1,000 | - | - | V/μs | $I_F$ = 0mA , $V_{CM}$=10Vp-p, $R_L$=4.1KΩ, $T_A$ =25℃ |
| | 6N136 EL4502 | | 1,000 | - | - | | $I_F$ = 0mA , $V_{CM}$=10Vp-p, $R_L$=1.9KΩ, $T_A$ =25℃ |
| | EL4503 | | 15000 | 20000 | - | | $I_F$ = 0mA , $V_{CM}$=1500Vp-p, $R_L$=1.9KΩ, $T_A$ =25℃ |
| Common Mode Transient Immunity at Logic Low (Fig.9)*3 | 6N135 | $CM_L$ | 1,000 | - | - | V/μs | $I_F$ = 16mA , $V_{CM}$=10Vp-p, $R_L$=4.1KΩ, $T_A$ =25℃ |
| | 6N136 EL4502 | | 1,000 | - | - | | $I_F$ = 16mA , $V_{CM}$=10Vp-p, $R_L$=1.9KΩ, $T_A$=25℃ |
| | EL4503 | | 15000 | 20000 | - | | $I_F$ = 0mA , $V_{CM}$=1500Vp-p, $R_L$=1.9KΩ, $T_A$ =25℃ |

* Typical values at $T_A$ = 25℃

## Typical Performance Curves

Fig.3 Normalized Current Transfer Ratio vs. Ambient Temperature

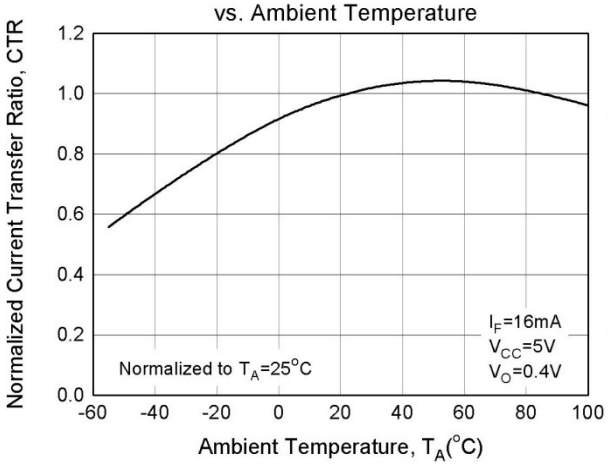



Fig.1 Forward Current vs. Forward Voltage

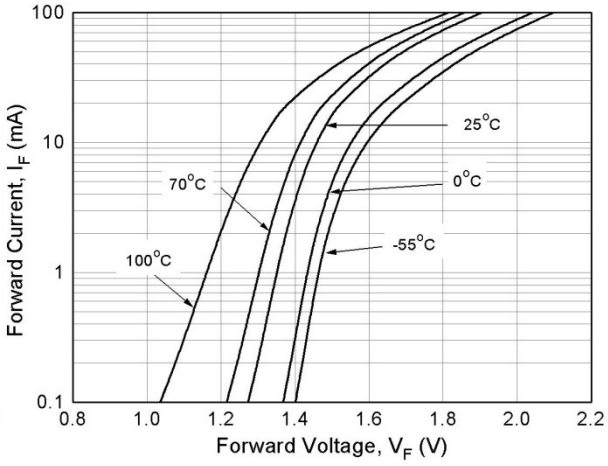



Fig.2 Normalized Current Transfer Ratio vs. Forward Current

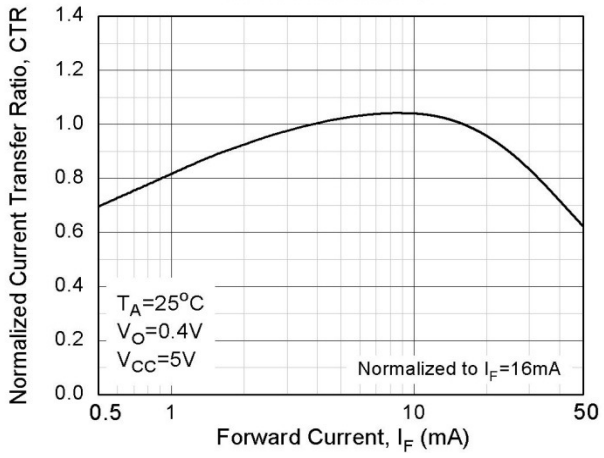



Fig.4 Output Current vs Output Voltage

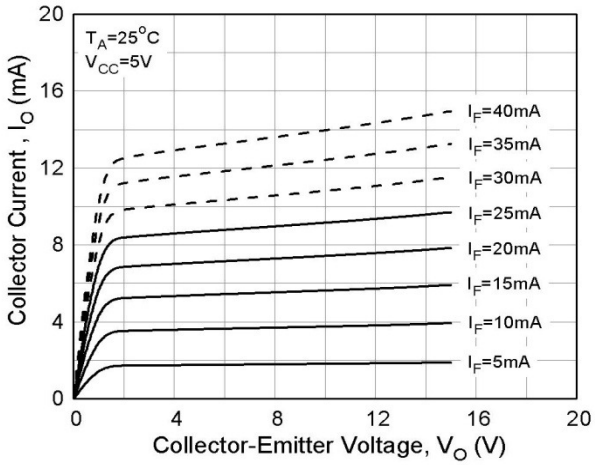



Fig.5 Logic High Output Current vs. Temperature

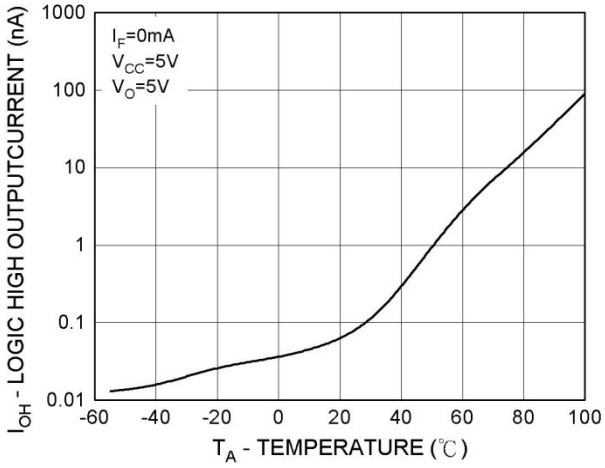



Fig.6 Propagation Delay vs. Load Resistance

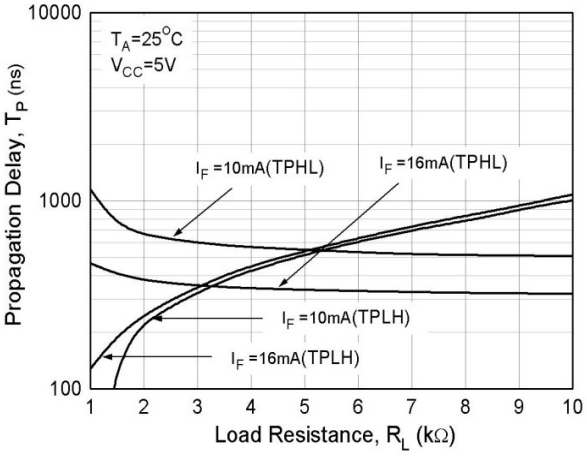


Fig.7 Propagation Delay vs. Temperature

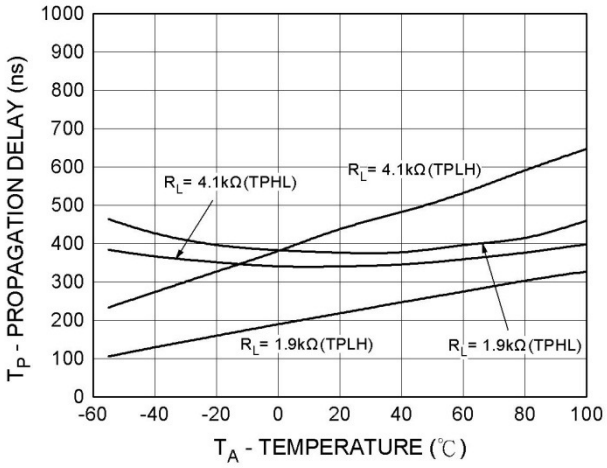



**Figure 8 Switching Time Test Circuit & Waveform**

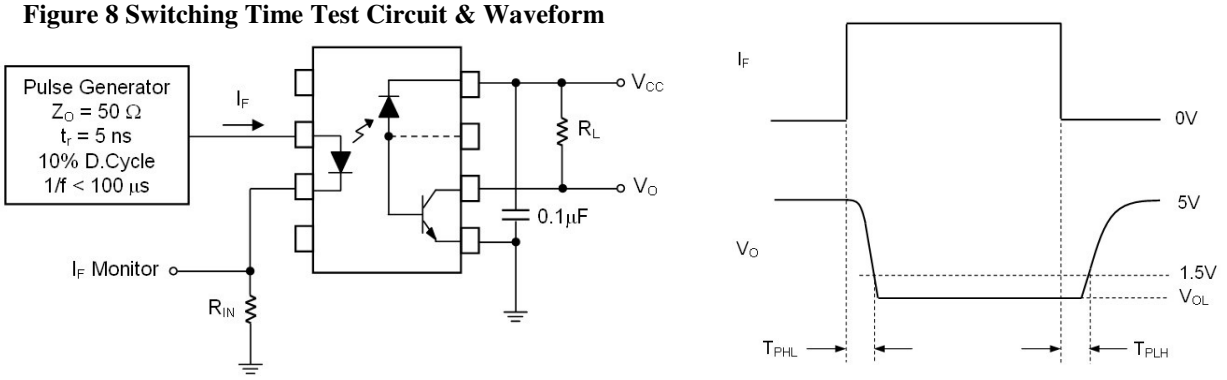
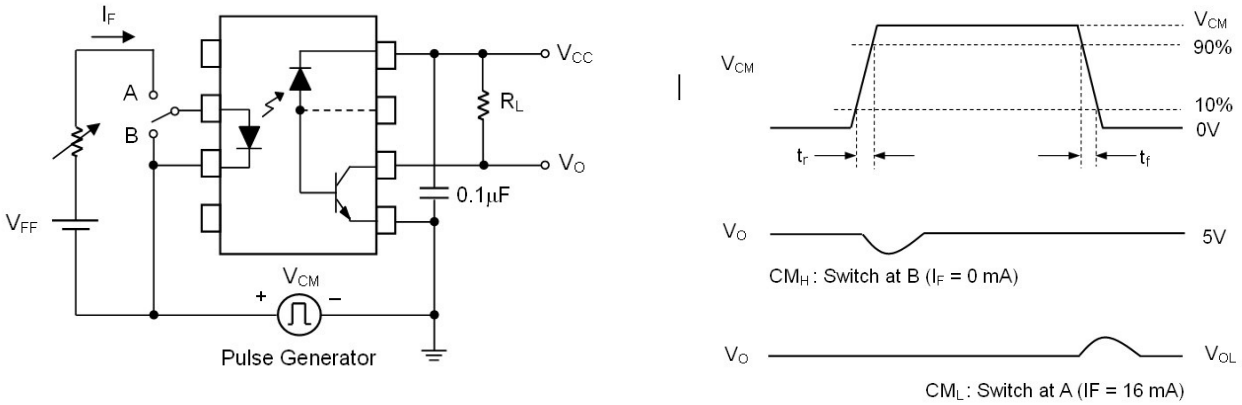



**Figure 9 Transient Immunity Test Circuit &**




**Note:**

*3 Common mode transient immunity in logic high level is the maximum tolerable (positive) dVcm/dt on the leading edge of the common mode pulse signal VCM, to assure that the output will remain in a logic high state (i.e., VO > 2.0V).

Common mode transient immunity in logic low level is the maximum tolerable (negative) dVcm/dt on the trailing edge of the common mode pulse signal, VCM, to assure that the output will remain in a logic low state (i.e., VO < 0.8V).

## Order Information

### Part Number

**6N13XY(Z)-V**

**or**

**EL450XY(Z)-V**

### Note

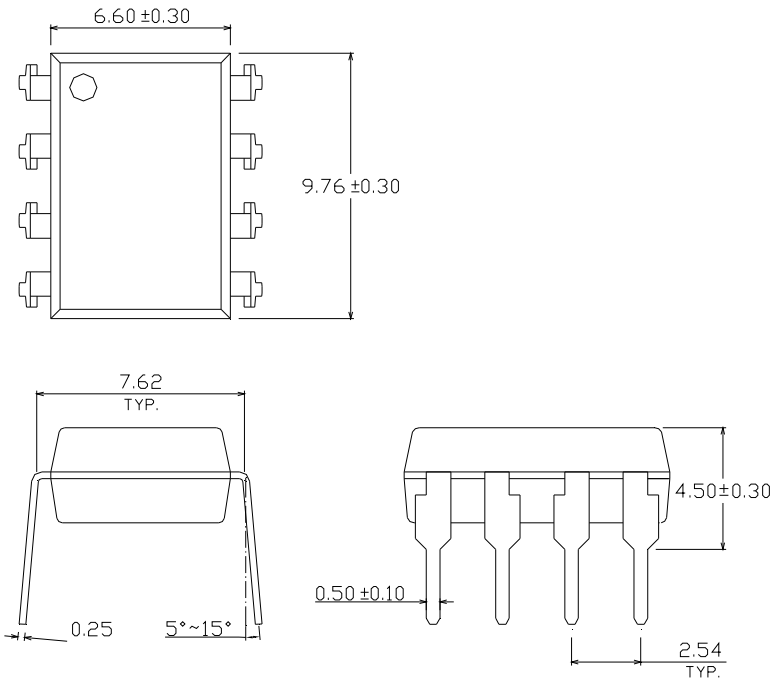
X = Part No. (X = 5 or 6) for 6N series; (X=2 or 3) for EL45 series
Y = Lead form option (S, S1, M or none)
Z = Tape and reel option (TA, TB or none)
V = VDE (optional)

| Option | Description | Packing quantity |
|---|---|---|
| None | Standard DIP-8 | 45 units per tube |
| M | Wide lead bend (0.4 inch spacing) | 45 units per tube |
| S (TA) | Surface mount lead form + TA tape & reel option | 1000 units per reel |
| S (TB) | Surface mount lead form + TB tape & reel option | 1000 units per reel |
| S1 (TA) | Surface mount lead form (low profile) + TA tape & reel option | 1000 units per reel |
| S1 (TB) | Surface mount lead form (low profile) + TB tape & reel option | 1000 units per reel |

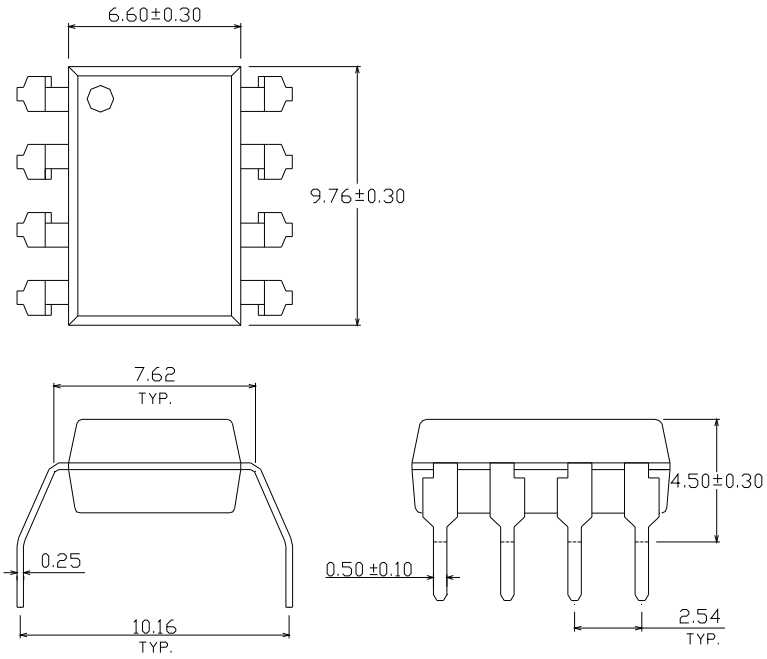
## Package Drawing

**(Dimensions in mm)**

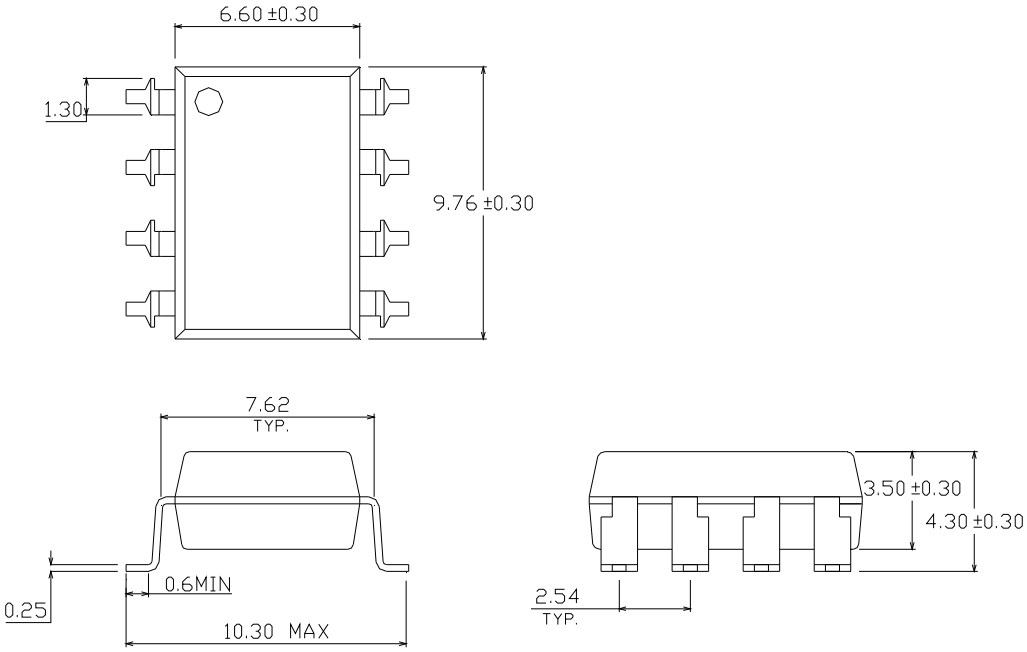
### Standard DIP Type



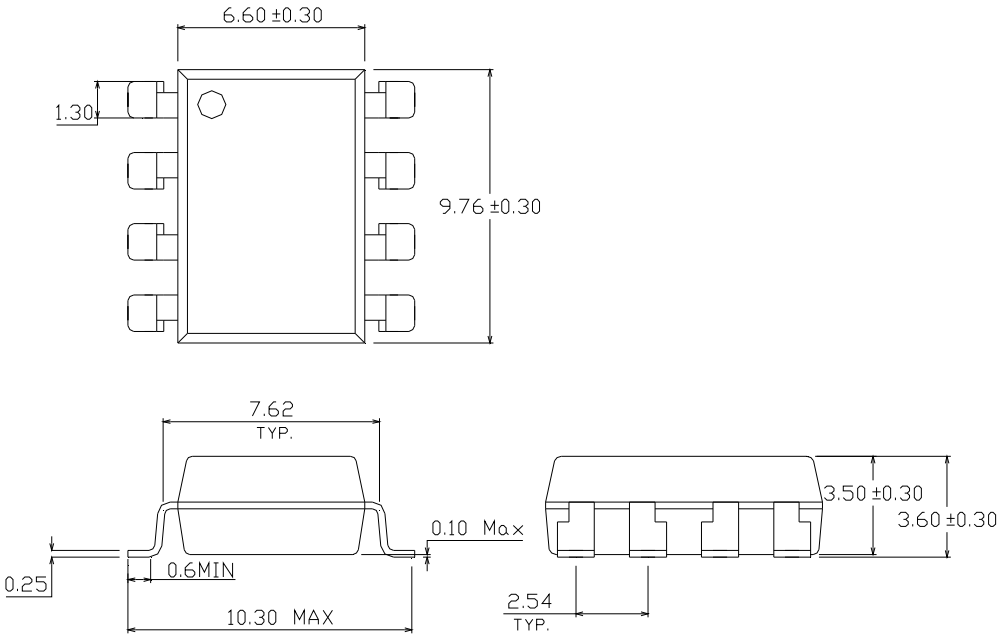

### Option M Type



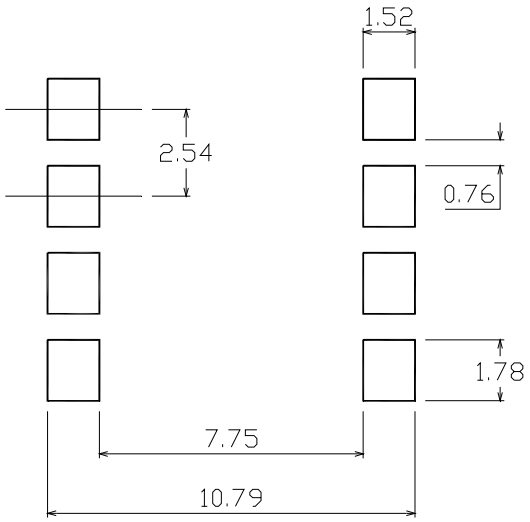
**Option S Type**



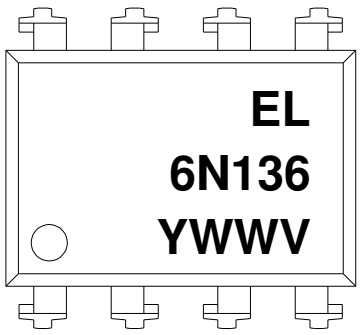

**Option S1 Type**

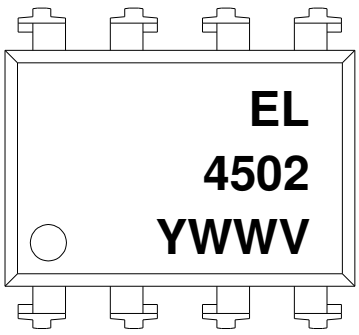


**Recommended pad layout for surface mount leadform**




**Device Marking**



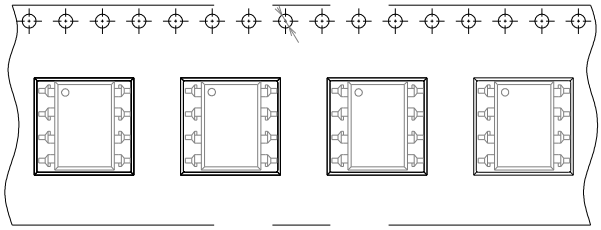

**Notes**

4502

| | |
|---|---|
| 6N136 | denotes Device Number |
| Y | denotes 1 digit Year code |
| WW | denotes 2 digit Week code |
| V | denotes VDE (optional) |

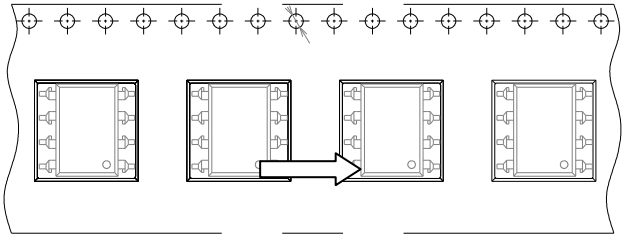
## Tape & Reel Packing Specifications

**Option TA**



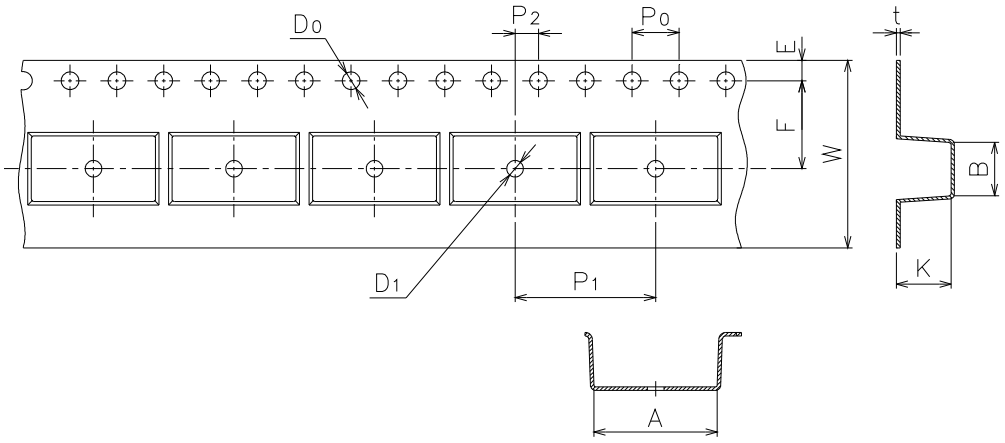
Direction of feed from reel

**Option TB**



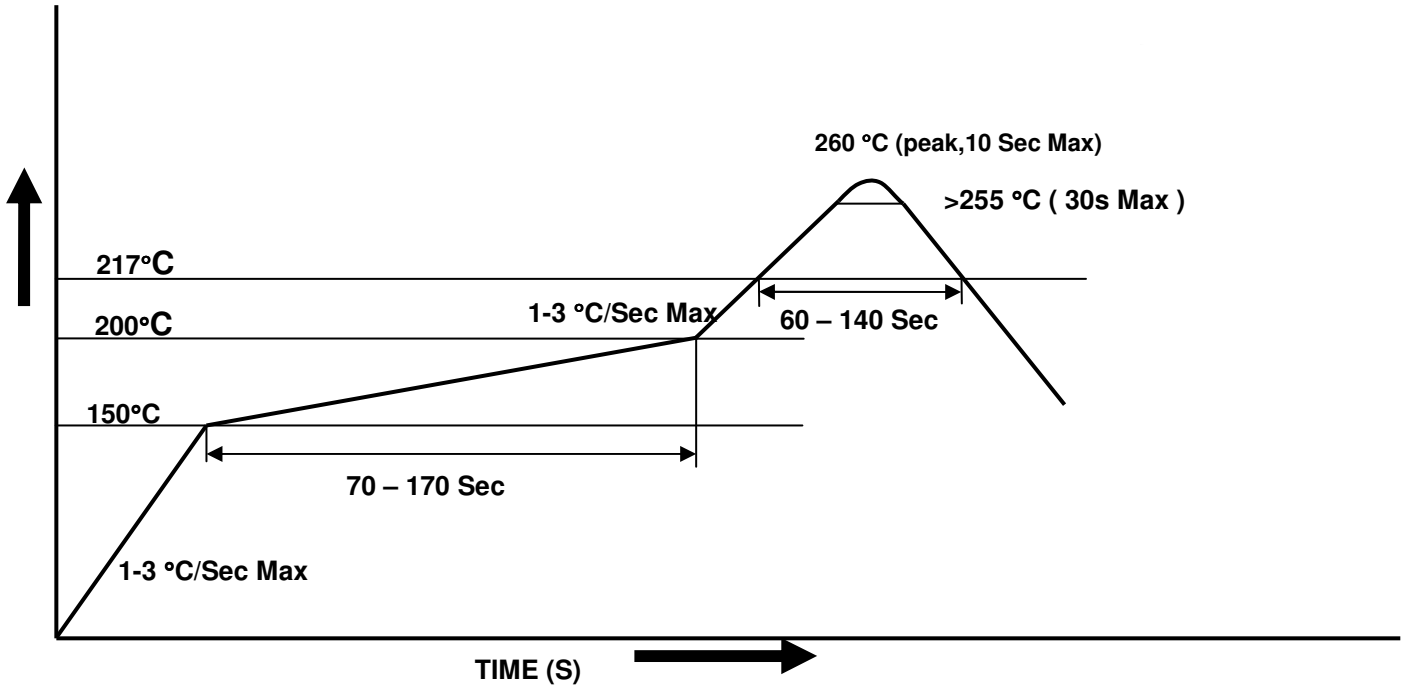
Direction of feed from reel

## Tape dimensions




| Dimension No. | A | B | Do | D1 | E | F |
|---|---|---|---|---|---|---|
| Dimension(mm) | 10.4±0.1 | 10.0±0.1 | 1.5±0.1 | 1.5±0.1 | 1.75±0.1 | 7.5±0.1 |
| Dimension No. | Po | P1 | P2 | t | W | K |
| Dimension(mm) | 4.0±0.1 | 12.0±0.1 | 2.0±0.1 | 0.4±0.1 | 16.0+0.3/ -0.1 | 4.5±0.1 |

**Solder Reflow Temperature Profile**



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- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

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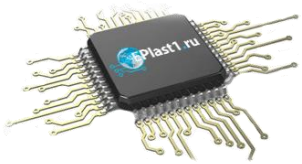
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.




**Как с нами связаться**

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