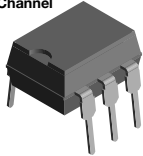
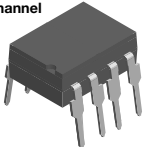


## Optocoupler, Photodarlington Output, (Single, Dual, Quad Channel)

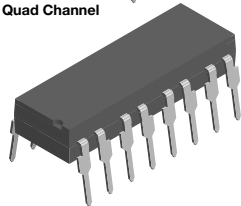
Single Channel



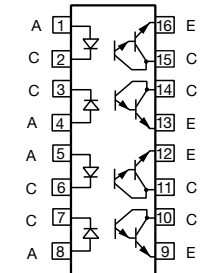
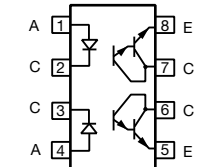
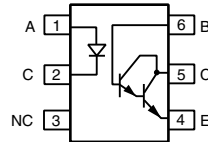
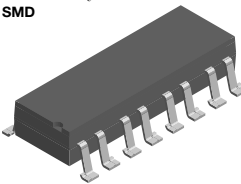
Dual Channel



Quad Channel



SMD



### FEATURES

- 125 mA load current rating
- Fast rise time, 10  $\mu$ s
- Fast fall time, 35  $\mu$ s
- Single, dual, and quad channel
- Solid state reliability
- Standard DIP packages
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

### AGENCY APPROVALS

- [UL1577](#)
- [cUL](#)
- [DIN EN 60747-5-5 \(VDE 0884-5\)](#)

### DESCRIPTION

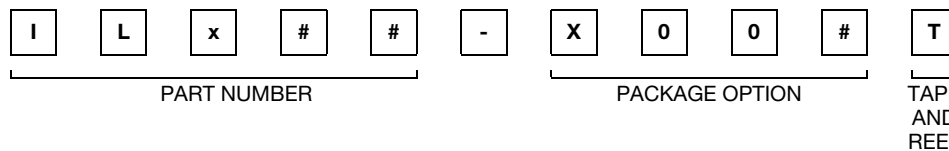
The IL30 single, ILD55 dual, and ILQ30, ILQ31, ILQ55 quad are optically coupled isolators with gallium arsenide infrared emitters and silicon photodarlington sensors. Switching can be achieved while maintaining a high degree of isolation between driving and load circuits, with no crosstalk between channels. These optocouplers can be used to replace reed and mercury relays with advantages of long life, high speed switching and elimination of magnetic fields.

The ILD55 is designed to reduce board space requirements in high density applications.

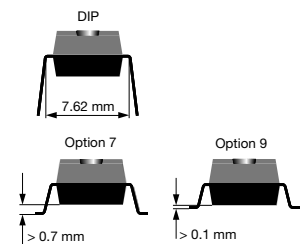
### LINKS TO ADDITIONAL RESOURCES



### ORDERING INFORMATION



x = D (Dual) or Q (Quad)



| AGENCY CERTIFIED / PACKAGE | SINGLE CHANNEL | DUAL CHANNEL | QUAD CHANNEL               |              |
|----------------------------|----------------|--------------|----------------------------|--------------|
|                            | CTR            |              |                            |              |
| <b>UL, cUL, FIMKO</b>      | <b>≥ 100</b>   | <b>≥ 100</b> | <b>≥ 100</b>               | <b>≥ 200</b> |
| DIP-6                      | IL30           | -            | -                          | -            |
| DIP-8                      | -              | ILD55        | -                          | -            |
| SMD-8, option 7            | -              | ILD55-X007   | -                          | -            |
| SMD-8, option 9            | -              | ILD55-X009   | -                          | -            |
| DIP-16                     | -              | -            | ILQ30, ILQ55               | ILQ31        |
| SMD-16, option 9           | -              | -            | ILQ55-X009T <sup>(1)</sup> | -            |

### Notes

- Additional options may be possible, please contact sales office
- <sup>(1)</sup> Also available in tubes, do not put "T" on the end



| <b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                |       |            |             |       |
|--|----------------|-------|------------|-------------|-------|
| PARAMETER  | TEST CONDITION | PART  | SYMBOL     | VALUE       | UNIT  |
| <b>INPUT</b>   |                |       |            |             |       |
| Peak reverse voltage   |                |       | $V_{RM}$   | 3           | V     |
| Forward continuous current   |                |       | $I_F$      | 60          | mA    |
| Power dissipation  |                |       | $P_{diss}$ | 100         | mW    |
| Derate linearly from 25 °C   |                |       |            | 1.33        | mW/°C |
| <b>OUTPUT</b>  |                |       |            |             |       |
| Collector emitter breakdown voltage  |                | IL30  | $BV_{CEO}$ | 30          | V     |
|  |                | ILQ30 | $BV_{CEO}$ | 30          | V     |
|  |                | ILD55 | $BV_{CEO}$ | 55          | V     |
|  |                | ILQ55 | $BV_{CEO}$ | 55          | V     |
| Collector (load) current   |                |       | $I_C$      | 125         | mA    |
| Power dissipation  |                |       | $P_{diss}$ | 150         | mW    |
| Derate linearly from 25 °C   |                |       |            | 2           | mW/°C |
| <b>COUPLER</b>   |                |       |            |             |       |
| Total package power dissipation  |                | IL30  | $P_{tot}$  | 250         | mW    |
|  |                | ILD55 | $P_{tot}$  | 400         | mW    |
|  |                | ILQ30 | $P_{tot}$  | 500         | mW    |
|  |                | ILQ31 | $P_{tot}$  | 500         | mW    |
|  |                | ILQ55 | $P_{tot}$  | 500         | mW    |
| Derate linearly from 25 °C   |                | IL30  |            | 3.3         | mW/°C |
|  |                | ILD55 |            | 3.3         | mW/°C |
|  |                | ILQ30 |            | 6.67        | mW/°C |
|  |                | ILQ31 |            | 6.67        | mW/°C |
|  |                | ILQ55 |            | 6.67        | mW/°C |
| Storage temperature  |                |       | $T_{stg}$  | -55 to +125 | °C    |
| Operating temperature  |                |       | $T_{amb}$  | -55 to +100 | °C    |
| Lead soldering time at 260 °C  |                |       |            | 10          | s     |

**Note**

- Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of this document. Exposure to absolute maximum ratings for extended periods of the time can adversely affect reliability

| <b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |  |             |         |      |      |               |
|--|--|-------------|---------|------|------|---------------|
| PARAMETER  | TEST CONDITION                           | SYMBOL      | MIN.    | TYP. | MAX. | UNIT          |
| <b>INPUT</b>   |  |             |         |      |      |               |
| Forward voltage  | $I_F = 20\text{ mA}$                     | $V_F$       | -       | 1.25 | 1.5  | V             |
| Reverse current  | $V_R = 3\text{ V}$                       | $I_R$       | -       | 0.1  | 10   | $\mu\text{A}$ |
| Capacitance  | $V_R = 0\text{ V}$                       | $C_O$       | -       | 25   |      | pF            |
| <b>OUTPUT</b>  |  |             |         |      |      |               |
| Collector emitter breakdown voltage  | $I_C = 100\text{ }\mu\text{A}$           | $BV_{CEO}$  | 30 / 55 | -    | -    | V             |
| Collector emitter leakage current  | $V_{CE} = 10\text{ V}, I_F = 0\text{ A}$ | $I_{CEO}$   | -       | 1    | 100  | nA            |
| Collector emitter capacitance  | $V_{CE} = 10\text{ V}, f = 1\text{ MHz}$ | $C_{CE}$    | -       | 3.4  | -    | pF            |
| <b>COUPLER</b>   |  |             |         |      |      |               |
| Collector emitter saturation voltage   | $I_C = 50\text{ mA}, I_F = 50\text{ mA}$ | $V_{CEsat}$ | -       | 0.9  | 1    | V             |
| Capacitance (input to output)  |  | $C_{IO}$    | -       | 0.5  | -    | pF            |

**Note**

- Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluation. Typical values are for information only and are not part of the testing requirements

| <b>CURRENT TRANSFER RATIO</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |  |       |        |      |      |      |      |
|--|--|-------|--------|------|------|------|------|
| PARAMETER  | TEST CONDITION                               | PART  | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| Current transfer ratio   | $I_F = 10\text{ mA}$ , $V_{CE} = 5\text{ V}$ | IL30  | CTR    | 100  | 400  | -    | %    |
|  |  | ILD55 | CTR    | 100  | 400  | -    | %    |
|  |  | ILQ30 | CTR    | 100  | 400  | -    | %    |
|  |  | ILQ55 | CTR    | 100  | 400  | -    | %    |
|  |  | ILQ31 | CTR    | 200  | 400  | -    | %    |

| <b>SWITCHING CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |   |        |      |      |      |               |  |
|---|---|--------|------|------|------|---------------|--|
| PARAMETER   | TEST CONDITION  | SYMBOL | MIN. | TYP. | MAX. | UNIT          |  |
| Rise time   | $V_{CC} = 13.5\text{ V}$ , $I_F = 50\text{ mA}$ , $R_L = 100\text{ }\Omega$ | $t_r$  | -    | 10   | -    | $\mu\text{s}$ |  |
| Fall time   | $V_{CC} = 13.5\text{ V}$ , $I_F = 50\text{ mA}$ , $R_L = 100\text{ }\Omega$ | $t_f$  | -    | 35   | -    | $\mu\text{s}$ |  |

| <b>SAFETY AND INSULATION RATINGS</b>         |   |            |                |                    |
|--|---|------------|----------------|--------------------|
| PARAMETER                                    | TEST CONDITION  | SYMBOL     | VALUE          | UNIT               |
| Climatic classification                      | According to IEC 68 part 1  |            | 55 / 100 / 21  |                    |
| Comparative tracking index                   |   | CTI        | 175            |                    |
| Maximum rated withstanding isolation voltage | $t = 1\text{ min}$  | $V_{ISO}$  | 4420           | $V_{RMS}$          |
| Maximum transient isolation voltage          |   | $V_{IOTM}$ | 10 000         | $V_{peak}$         |
| Maximum repetitive peak isolation voltage    |   | $V_{IORM}$ | 890            | $V_{peak}$         |
| Isolation resistance                         | $V_{IO} = 500\text{ V}$ , $T_{amb} = 25\text{ }^{\circ}\text{C}$  | $R_{IO}$   | $\geq 10^{12}$ | $\Omega$           |
|  | $V_{IO} = 500\text{ V}$ , $T_{amb} = 100\text{ }^{\circ}\text{C}$ | $R_{IO}$   | $\geq 10^{11}$ | $\Omega$           |
| Output safety power                          |   | $P_{SO}$   | 400            | mW                 |
| Input safety current                         |   | $I_{SI}$   | 275            | mA                 |
| Safety temperature                           |   | $T_S$      | 175            | $^{\circ}\text{C}$ |
| Creepage distance                            |   |            | $\geq 7$       | mm                 |
| Clearance distance                           |   |            | $\geq 7$       | mm                 |
| Insulation thickness                         |   | DTI        | $\geq 0.4$     | mm                 |

**Note**

- As per IEC 60747-5-5, § 7.4.3.8.2, this optocoupler is suitable for “safe electrical insulation” only within the safety ratings. Compliance with the safety ratings shall be ensured by means of protective circuits

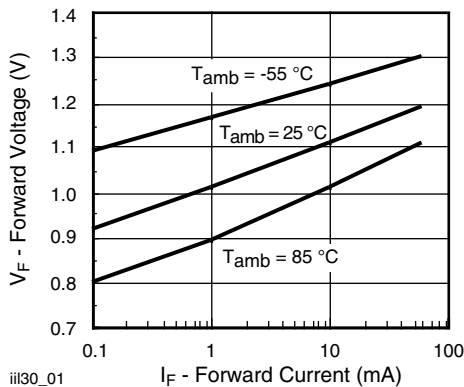
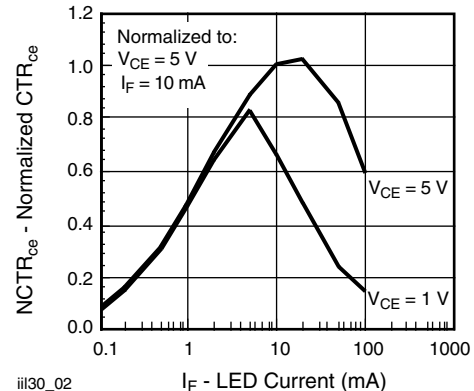
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 1 - Forward Voltage vs. Forward Current


 Fig. 2 - Normalized Non-Saturated and Saturated  $CTR_{ce}$  vs. LED Current

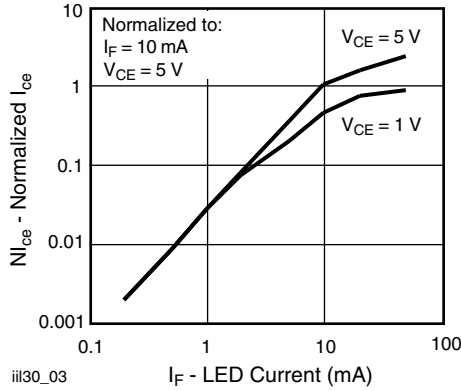


Fig. 3 - Normalized Non-Saturated and Saturated Collector Emitter Current vs. LED Current

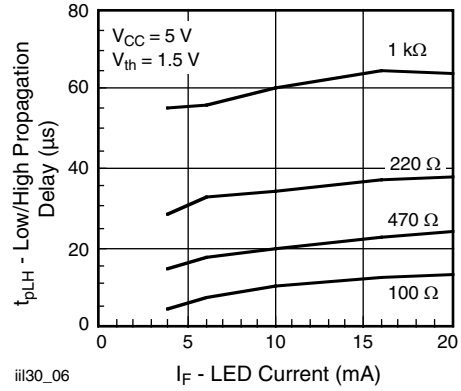


Fig. 6 - Low to High Propagation Delay vs. Collector Load Resistance and LED Current

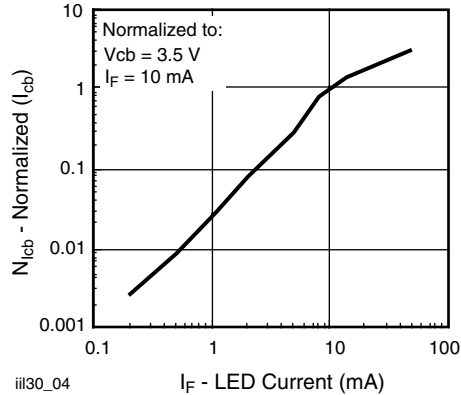


Fig. 4 - Normalized Collector Base Photocurrent vs. LED Current

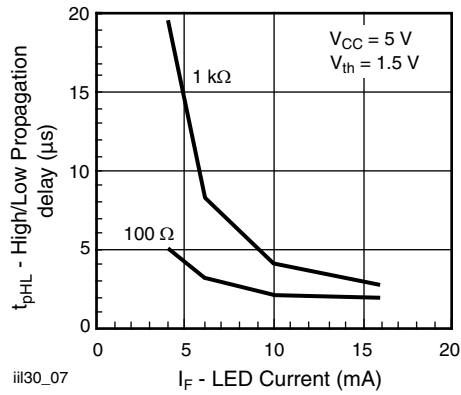


Fig. 7 - High to Low Propagation Delay vs. Collector Load Resistance and LED Current

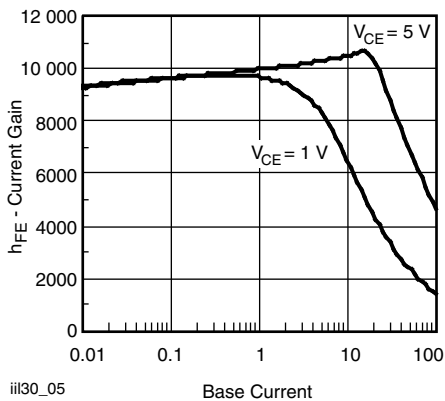


Fig. 5 -  $h_{FE}$  Current Gain vs. Base Current

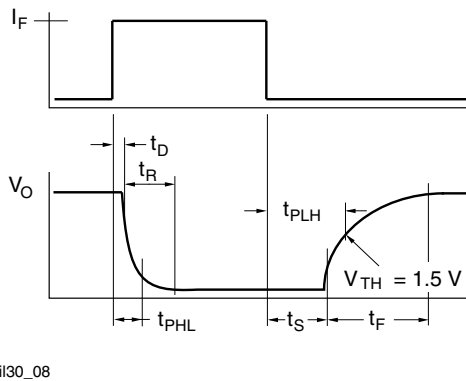
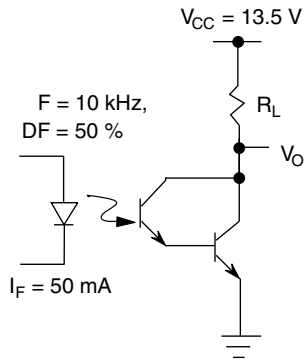


Fig. 8 - Switching Waveform

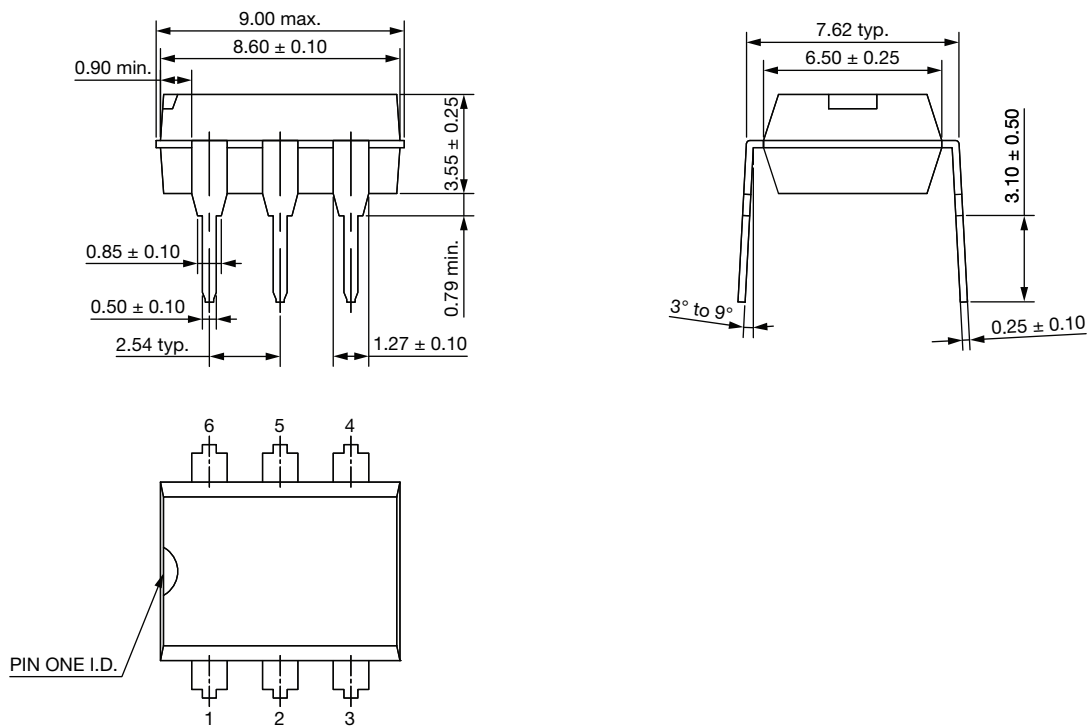


iii30\_09

Fig. 9 - Switching Schematic

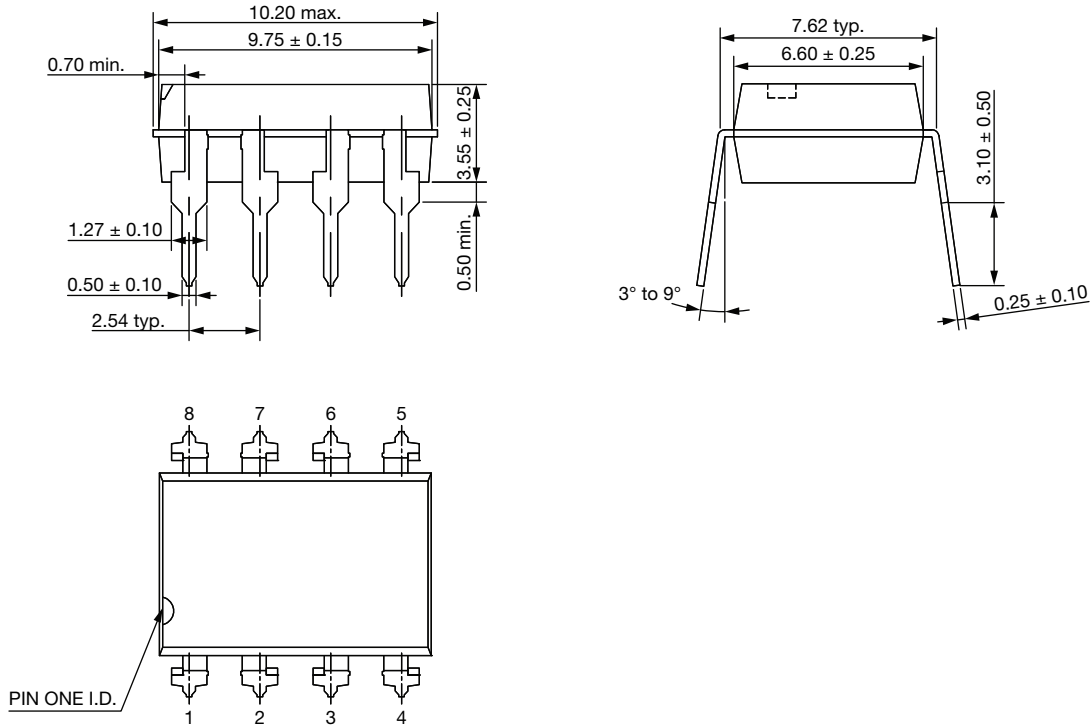
**PACKAGE DIMENSIONS** in millimeters

**DIP-6**

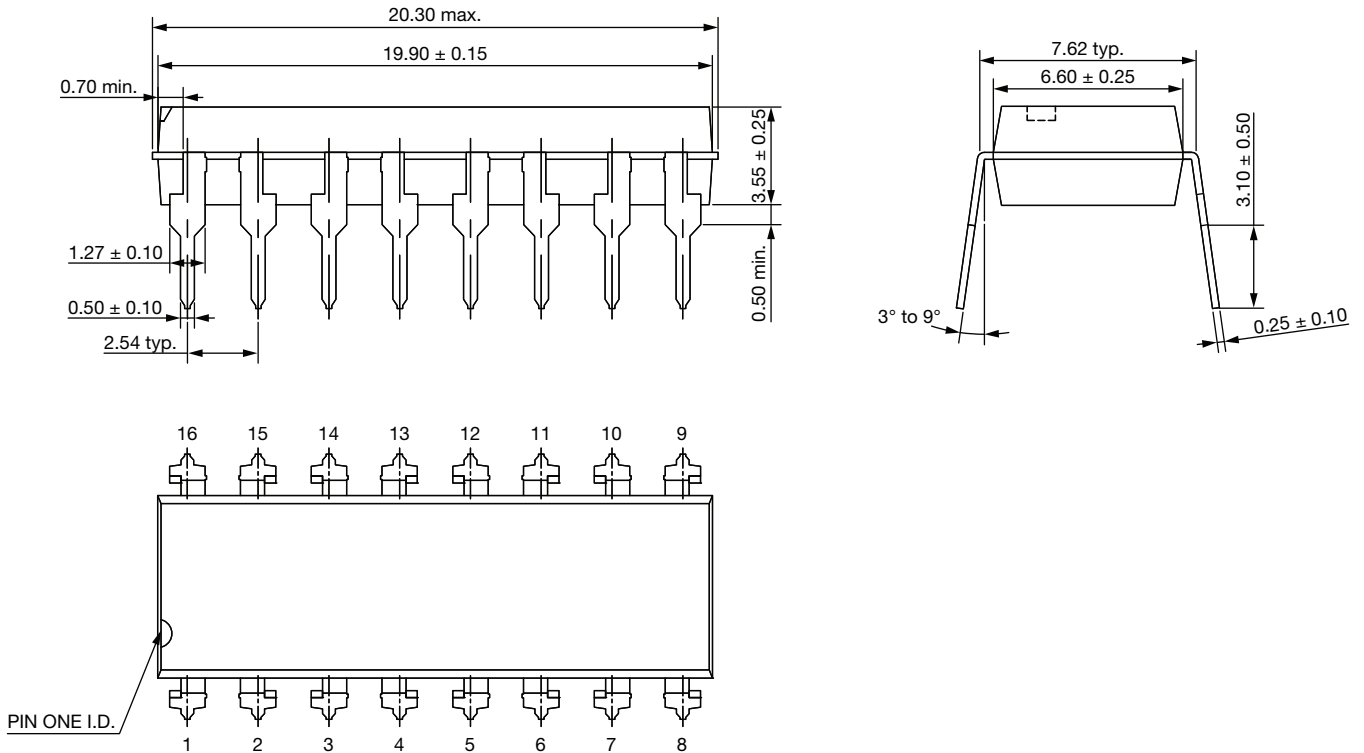




DIP-8

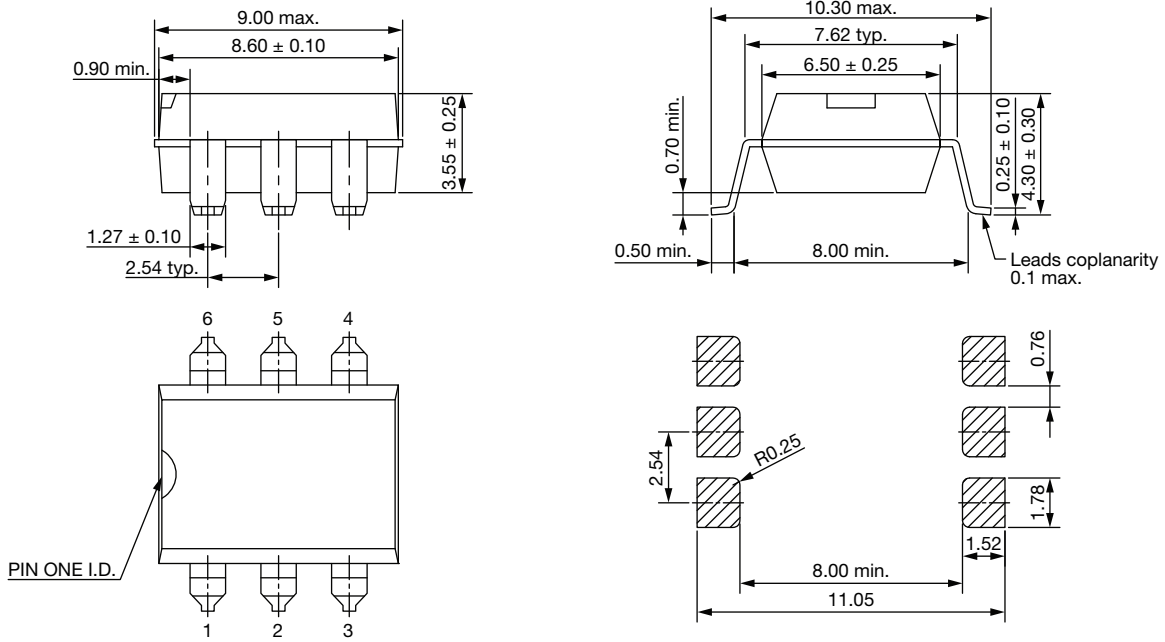


DIP-16

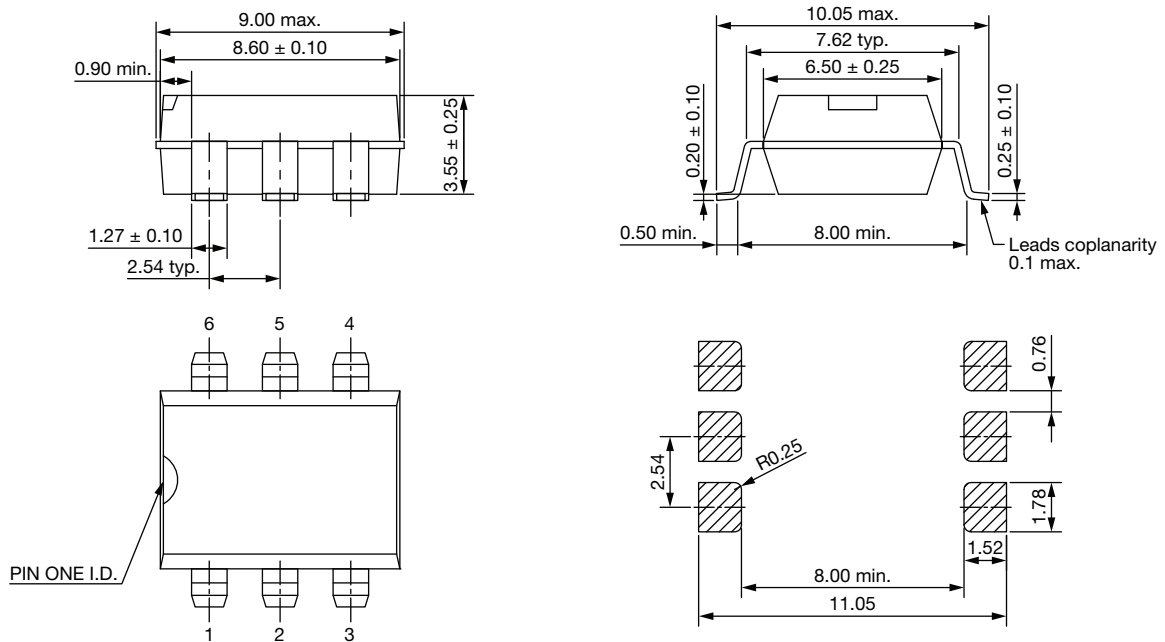




SMD-6, Option 7

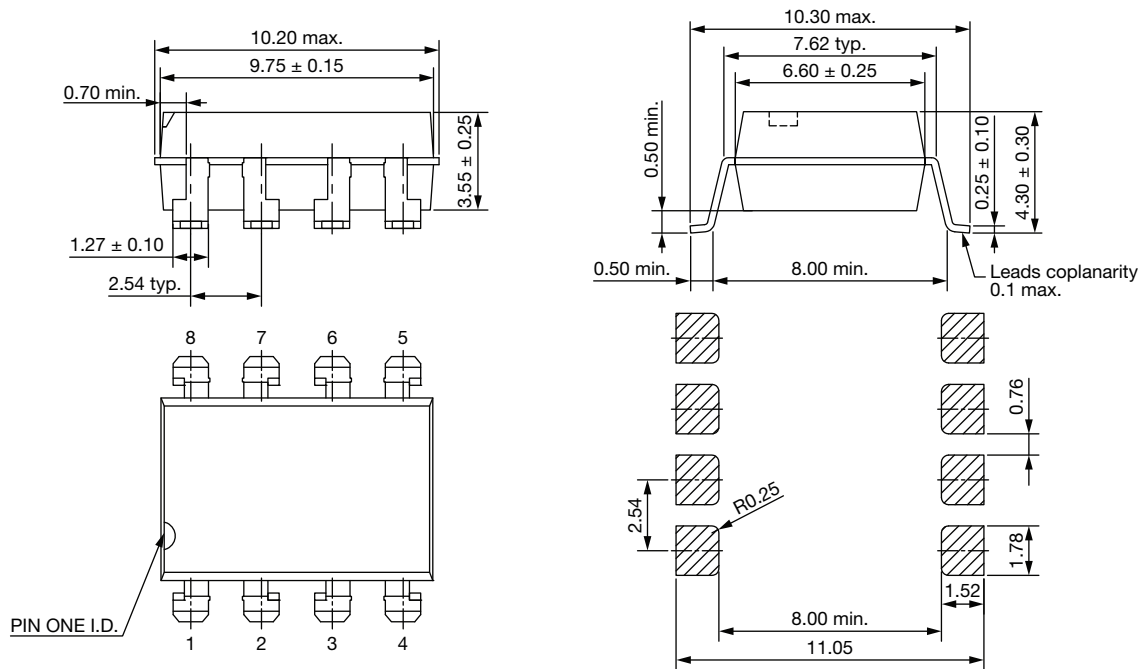


SMD-6, Option 9

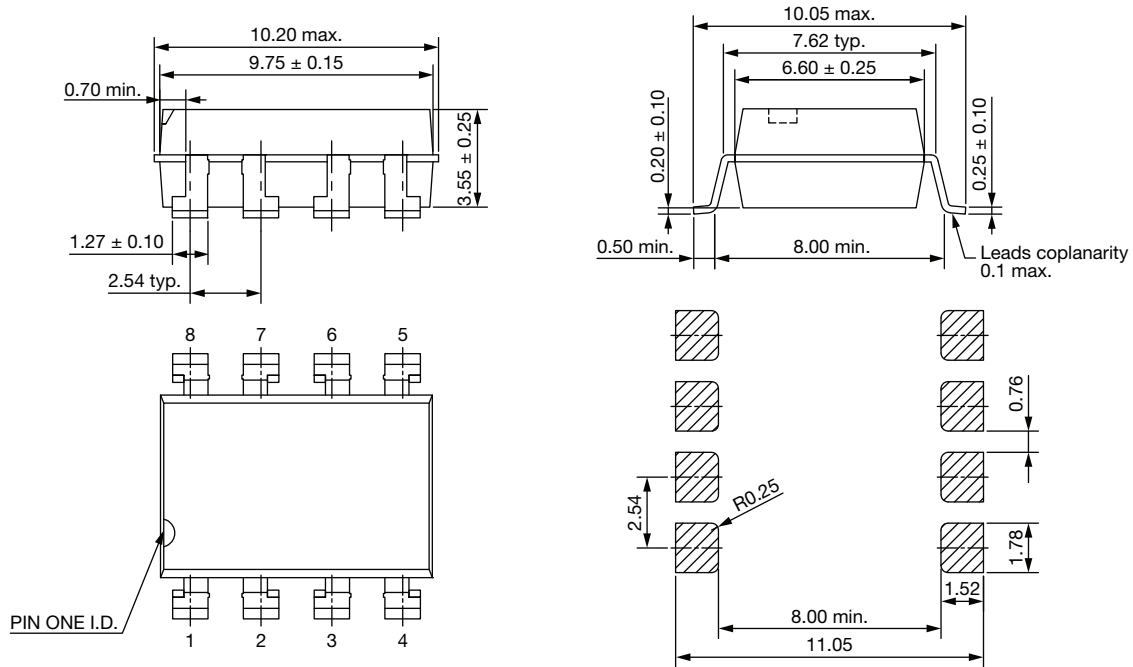




## SMD-8, Option 7



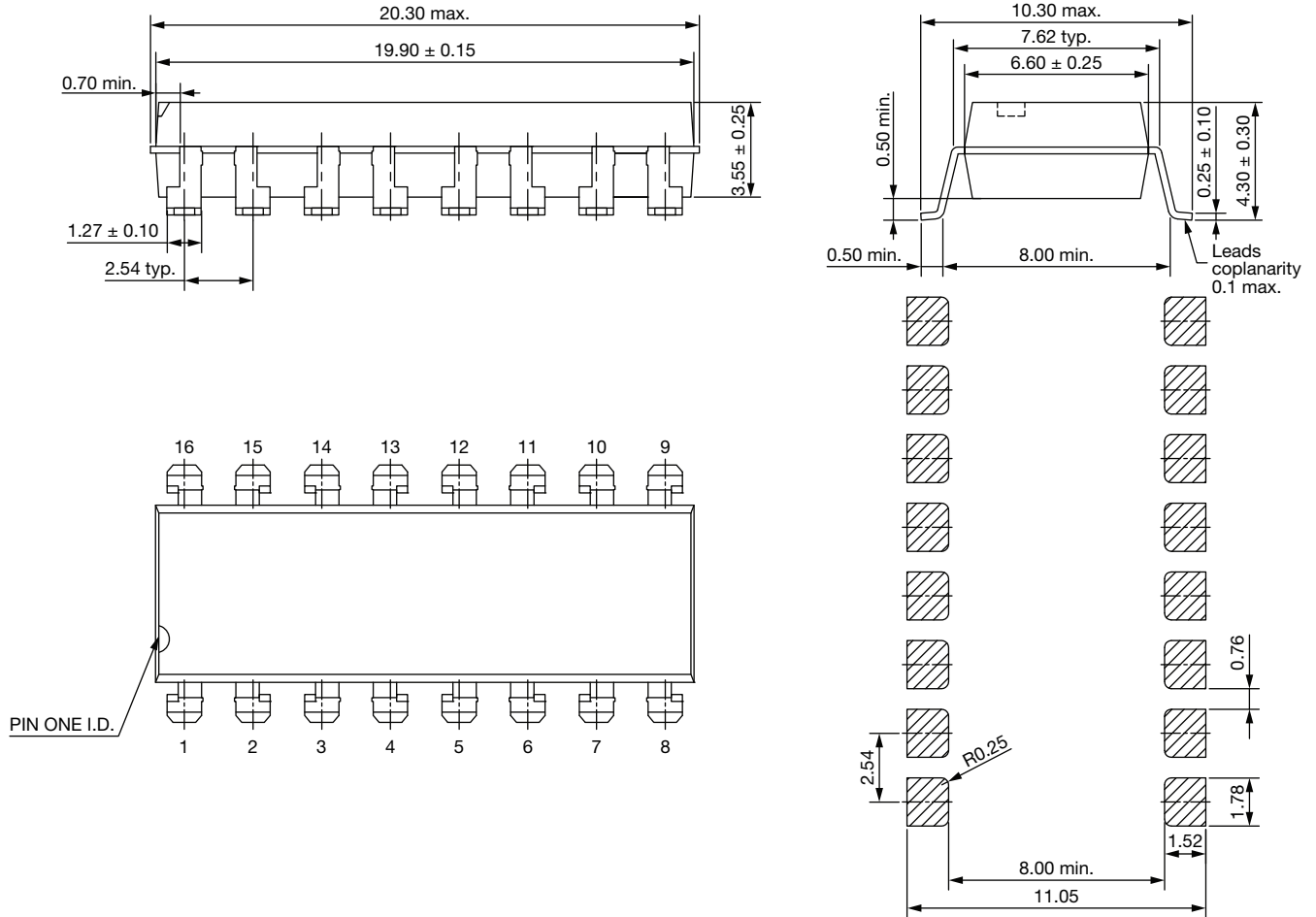
## SMD-8, Option 9





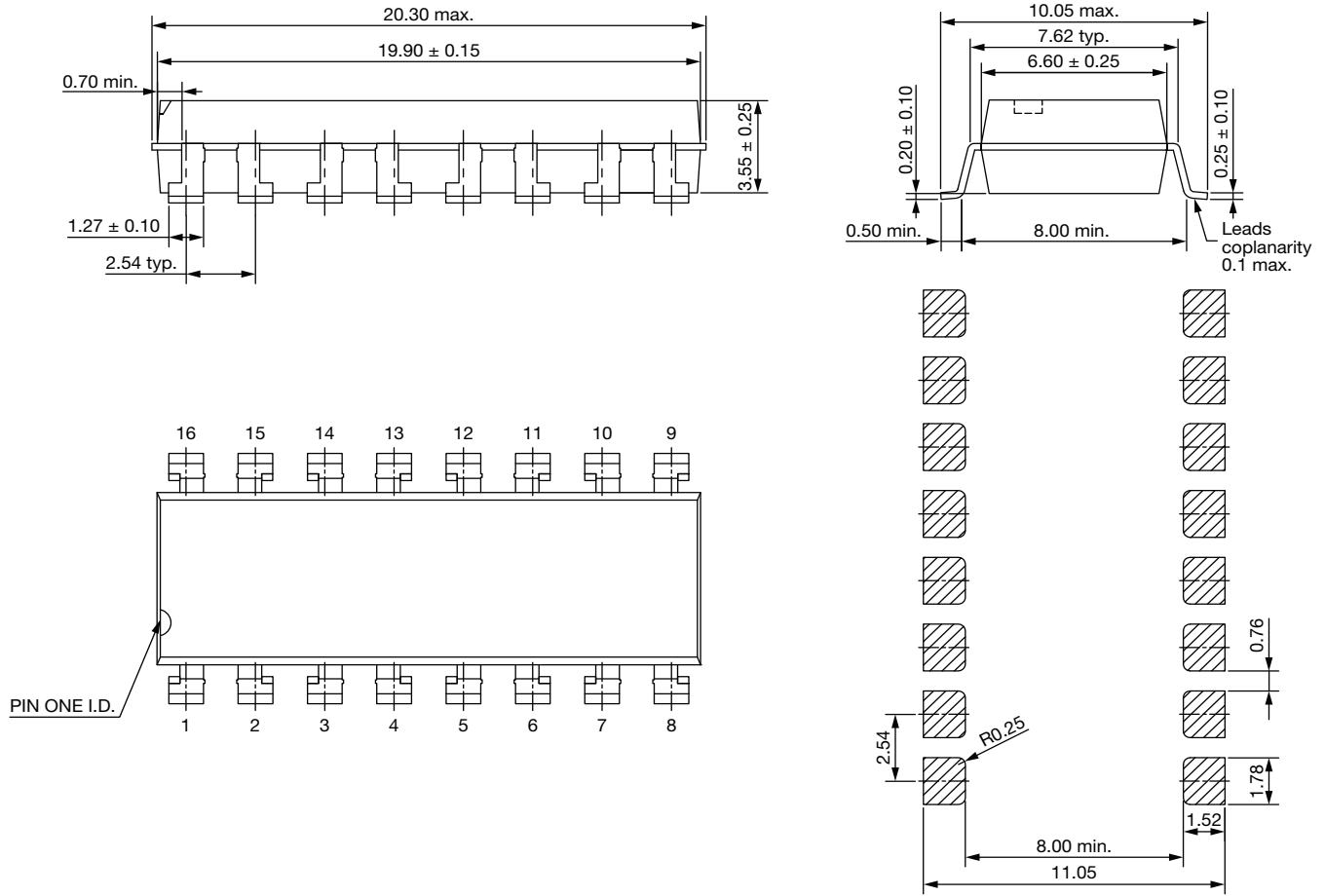


SMD-16, Option 7

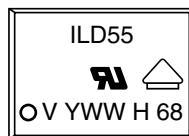




### SMD-16, Option 9



### PACKAGE MARKING (example)



### Notes

- Only option 1 and 7 reflected in the package marking
- The VDE logo is only marked on option 1 parts
- Tape and reel suffix (T) is not part of the package marking



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