# Agilent 4N35
# Phototransistor Optocoupler General Purpose Type
## Data Sheet

### Description
The 4N35 is an optocoupler for general purpose applications. It contains a light emitting diode optically coupled to a photo-transistor. It is packaged in a 6-pin DIP package and available in wide-lead spacing option and lead bend SMD option. Response time, $t_r$, is typically 3 µs and minimum CTR is 100% at input current of 10 mA.

### Ordering Information
Specify part number followed by Option Number (if desired).

4N35-XXXE
- XXX — Option Number
- E — Lead Free

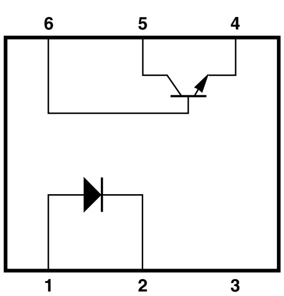
000 = No Options
060 = IEC/EN/DIN EN 60747-5-2 Option
W00 = 0.4" Lead Spacing Option
300 = Lead Bend SMD Option
500 = Tape and Reel Packaging Option

### Features
- High Current Transfer Ratio (CTR: min. 100% at $I_F$ = 10 mA, $V_{CE}$ = 10 V)
- Response time ($t_r$: typ., 3 µs at $V_{CE}$ = 10 V, $I_C$ = 2 mA, $R_L$ = 100 Ω)
- Input-output isolation voltage ($V_{iso}$ = 3550 Vrms)
- Dual-in-line package
- UL approved
- CSA approved
- IEC/EN/DIN EN 60747-5-2 approved
- Options available:
  - Leads with 0.4" (10.16 mm) spacing (W00)
  - Leads bends for surface mounting (300)
  - Tape and reel for SMD (500)
  - IEC/EN/DIN EN 60747-5-2 approvals (060)

### Applications
- I/O interfaces for computers
- System appliances, measuring instruments
- Signal transmission between circuits of different potentials and impedances

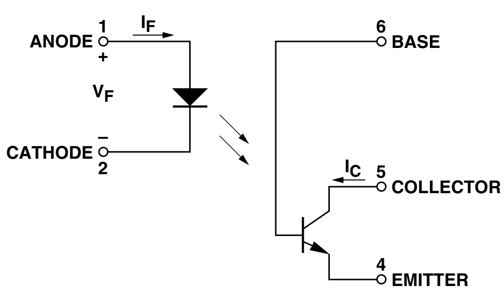
### Functional Diagram

PIN NO. AND INTERNAL CONNECTION DIAGRAM




1. ANODE
2. CATHODE
3. NC
4. EMITTER
5. COLLECTOR
6. BASE

### Schematic




***CAUTION:*** *It is advised that normal static precautions be taken in handling and assembly of this component to prevent damage and/or degradation which may be induced by ESD.*

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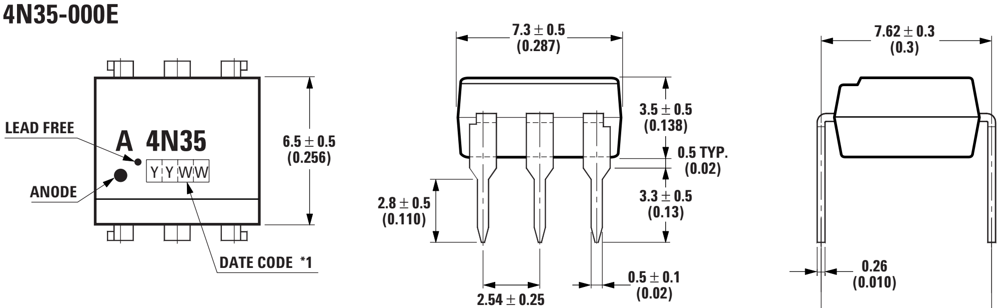
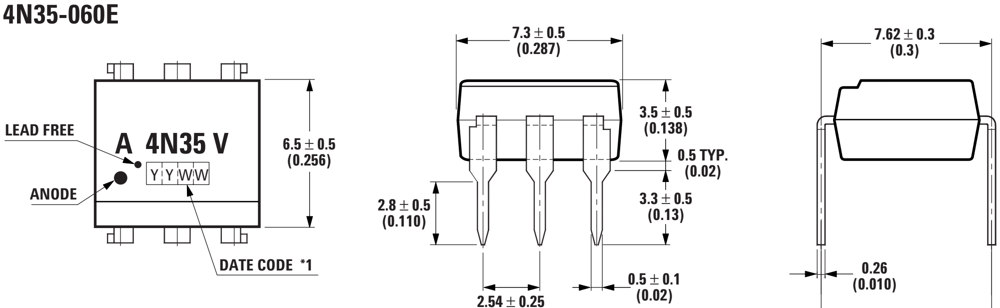
## Package Outline Drawings

### 4N35-000E



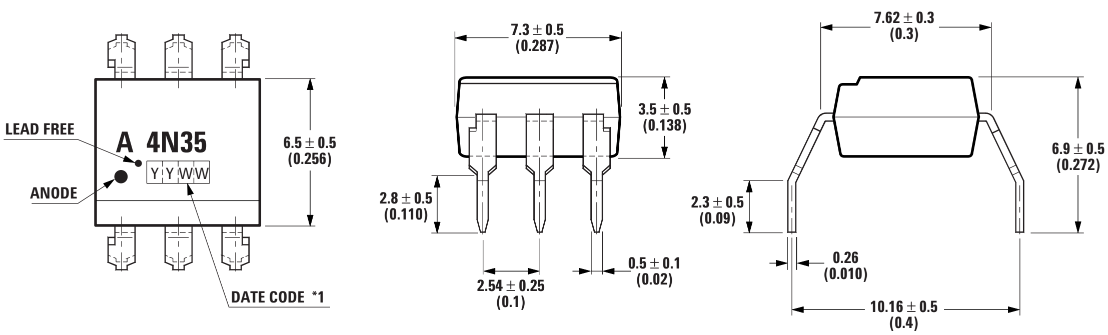

DIMENSIONS IN MILLIMETERS AND (INCHES)

### 4N35-060E



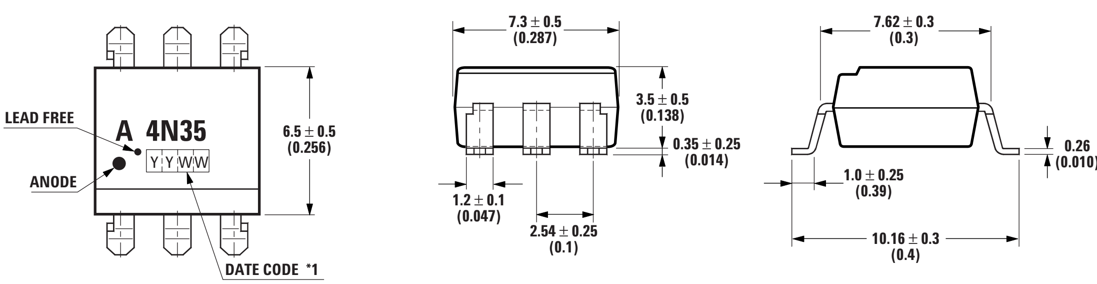

DIMENSIONS IN MILLIMETERS AND (INCHES)

### 4N35-W00E




DIMENSIONS IN MILLIMETERS AND (INCHES)

### 4N35-300E

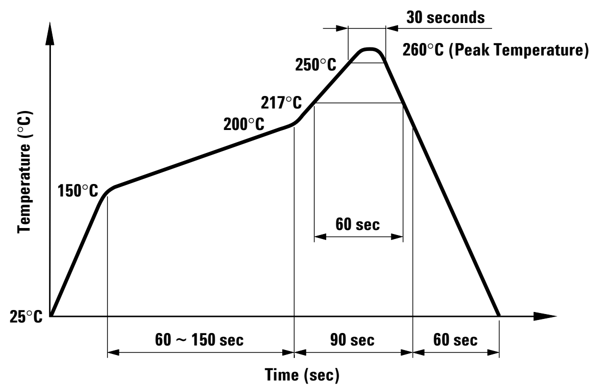



DIMENSIONS IN MILLIMETERS AND (INCHES)

## Solder Reflow Temperature Profile

1) One-time soldering reflow is recommended within the condition of temperature and time profile shown at right.

2) When using another soldering method such as infrared ray lamp, the temperature may rise partially in the mold of the device. Keep the temperature on the package of the device within the condition of (1) above.




## Absolute Maximum Ratings

| | |
|---|---|
| Storage Temperature, $T_S$ | –55˚C to +150˚C |
| Operating Temperature, $T_A$ | –55˚C to +100˚C |
| Lead Solder Temperature, max. (1.6 mm below seating plane) | 260˚C for 10 s |
| Average Forward Current, $I_F$ | 60 mA |
| Reverse Input Voltage, $V_R$ | 6 V |
| Input Power Dissipation, $P_I$ | 100 mW |
| Collector Current, $I_C$ | 100 mA |
| Collector-Emitter Voltage, $V_{CEO}$ | 30 V |
| Emitter-Collector Voltage, $V_{ECO}$ | 7 V |
| Collector-Base Voltage, $V_{CBO}$ | 70 V |
| Collector Power Dissipation | 300 mW |
| Total Power Dissipation | 350 mW |
| Isolation Voltage, $V_{iso}$ (AC for 1 minute, R.H. = 40 ~ 60%) | 3550 Vrms |

### Electrical Specifications ($T_A$ = 25°C)

| Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| Forward Voltage | $V_F$ | – | 1.2 | 1.5 | V | $I_F$ = 10 mA |
| Reverse Current | $I_R$ | – | – | 10 | µA | $V_R$ = 4 V |
| Terminal Capacitance | $C_t$ | – | 50 | – | pF | V = 0, f = 1 KHz |
| Collector Dark Current | $I_{CEO}$ | – | – | 50 | nA | $V_{CE}$ = 10 V, $I_F$ = 0, $T_A$ = 25° C |
| | | – | – | 500 | µA | $V_{CE}$ = 30 V, $I_F$ = 0, $T_A$ = 100° C |
| Collector-Emitter Breakdown Voltage | $BV_{CEO}$ | 30 | – | | V | $I_C$ = 0.1 mA, $I_F$ = 0 |
| Emitter-Collector Breakdown Voltage | $BV_{ECO}$ | 7 | – | – | V | $I_E$ = 10 µA, $I_F$ = 0 |
| Collector-Base Breakdown Voltage | $BV_{CBO}$ | 70 | – | – | V | $I_C$ = 0.1 mA, $I_F$ = 0 |
| Collector Current | $I_C$ | 10 | – | – | mA | $I_F$ = 10 mA |
| *Current Transfer Ratio | CTR | 100 | – | – | % | $V_{CE}$ = 10 V |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | – | – | 0.3 | V | $I_F$ = 50 mA, $I_C$ = 2 mA |
| Response Time (Rise) | $t_r$ | – | 3 | 10 | µs | $V_{CC}$ = 10 V, $I_C$ = 2 mA |
| Response Time (Fall) | $t_f$ | – | 3 | 10 | µs | $R_L$ = 100 Ω |
| Isolation Resistance | $R_{iso}$ | $5 \times 10^{10}$ | $1 \times 10^{11}$ | – | Ω | DC 500 V<br>40 ~ 60% R.H. |
| Floating Capacitance | $C_f$ | – | 1 | 2.5 | pF | V = 0, f = 1 MHz |

$$* \ CTR = \frac{I_C}{I_F} \times 100\%$$

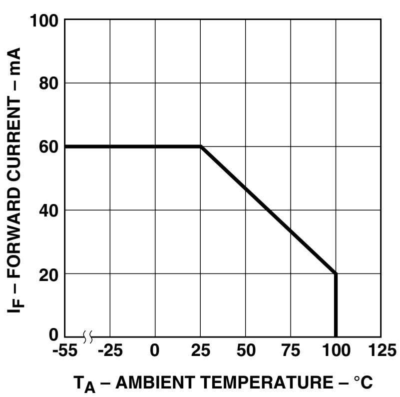



Figure 1. Forward current vs. temperature.

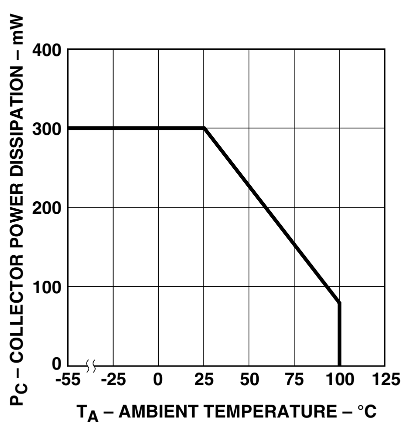



Figure 2. Collector power dissipation vs. temperature.

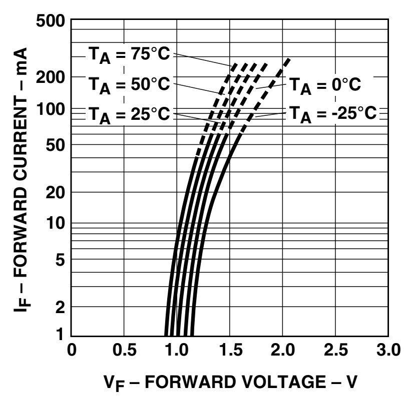



Figure 3. Forward current vs. forward voltage.

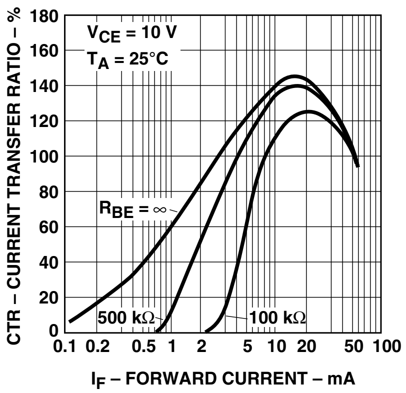



Figure 4. Current transfer ratio vs. forward current.

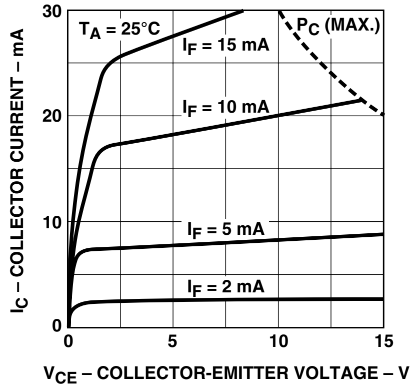



Figure 5. Collector current vs. collector-emitter voltage.

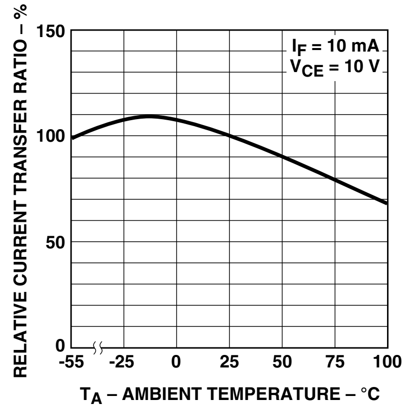



Figure 6. Relative current transfer ratio vs. temperature.

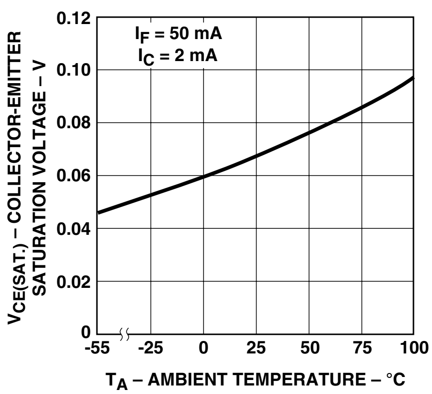



Figure 7. Collector-emitter saturation voltage vs. temperature.

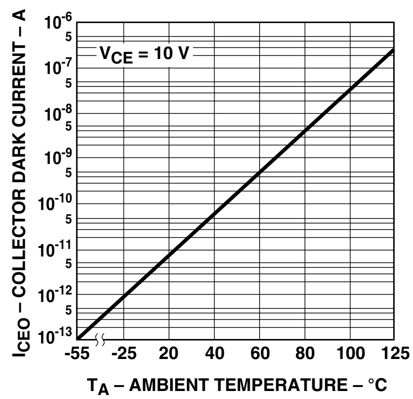



Figure 8. Collector dark current vs. temperature.

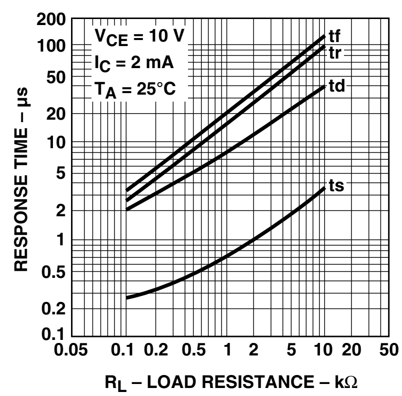



Figure 9. Response time vs. load resistance.

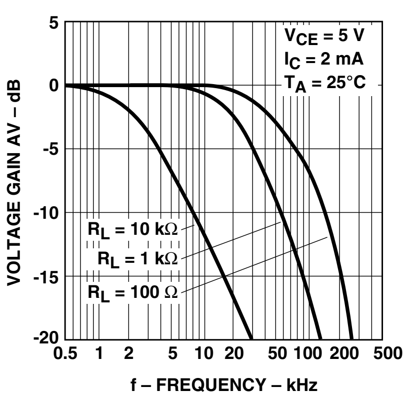



Figure 10. Frequency response.

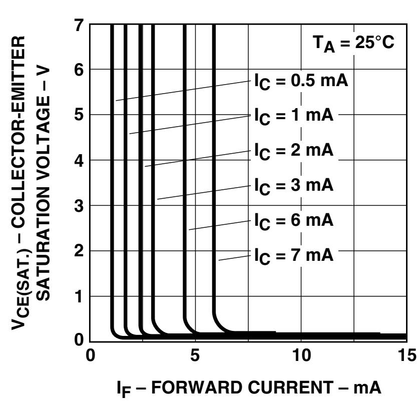
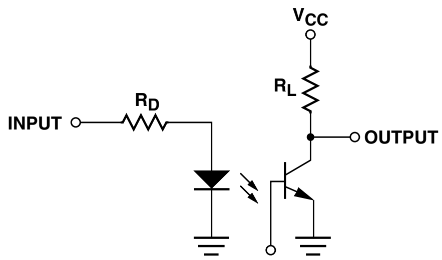
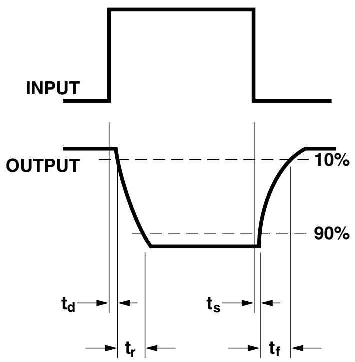


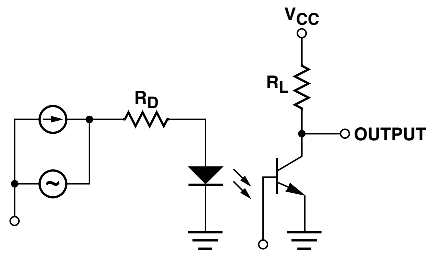

Figure 11. Collector-emitter saturation voltage vs. forward current.

### Test Circuit for Response Time




### Test Circuit for Frequency Response

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Data subject to change.

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