

OPTOCOUPERS



This product range is one of the industrial standards applied in the market. The current transfer ratio, isolation voltage and low saturation voltage comply with the specifications of the main part of the optocoupler market.

This range can be used with TTL circuits and is comprised of an infrared emitting GaAs diode and an npn silicon phototransistor.

**Features**

- Fast switching speeds
- Low saturation voltage
- High output/input DC current transfer ratio
- Isolation voltage of 2 kV (RMS) and 2,82 kV (DC)

UL – Covered under UL component recognition FILE E90700

VDE – Approved according to VDE 0883/6.80

Reference voltage (VDE 0110b Tab. 4): AC 250 V/DC 300 V isolation group C

CECC – Capability of approval GaAs optocouplers

**QUICK REFERENCE DATA**

Collector-emitter voltage of phototransistor (see note)		$V_{CEO}$	max.	30 V
DC forward current of infrared emitting diode (see note)		$I_F$	max.	80 mA
DC current transfer ratio $I_F = 10 \text{ mA}; V_{CE} = 10 \text{ V}$ (see note)	4N25 to 4N26	$I_C/I_F$	min.	0.2
	4N27 4N28	$I_C/I_F$	min.	0.1
Total power dissipation up to $T_{amb} = 25 \text{ }^\circ\text{C}$		$P_{tot}$	max.	250 mW
Isolation voltage DC AC (RMS value)		$V_{IO}$	min.	2.82 kV
				2.0 kV

**MECHANICAL DATA**

SOT90B (see Fig.1).

**Note**

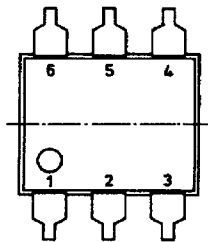
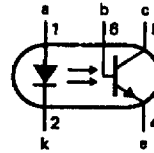
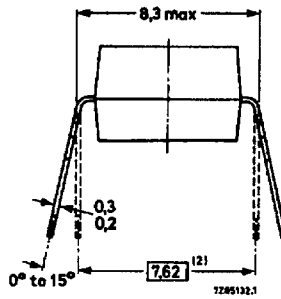
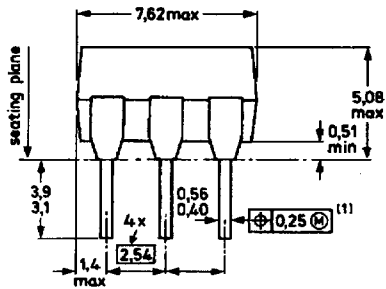
JEDEC registered data.

4N25 4N25A  
4N26 4N27  
4N28

**MECHANICAL DATA**

Fig.1 SOT90B.

Dimensions in mm



⊕ Positional accuracy.

Ⓜ Maximum Material Condition.

- (1) Centre-lines of all leads are within  $\pm 0,125$  mm of the nominal position shown; in the worst case, the spacing between any two leads may deviate from nominal by 0,25 mm.
- (2) When the leads are parallel, the tips remain in position for automatic insertion.

**RATINGS**

Limiting factors in accordance with the Absolute Maximum System (IEC 134)

**Diode**

Continuous reverse voltage (note 2)	$V_R$	max.	5 V
DC forward current (note 1)	$I_F$	max.	80 mA
peak value; $t_{on} = 300 \mu s$ ; $\delta = 0.02$	$I_{FRM}$	max.	3 A
Total power dissipation up to $T_{amb} = 25^\circ C$ (note 1)	$P_{tot}$	max.	150 mW

**Transistor**

Collector-emitter voltage (open base) (note 1)	$V_{CEO}$	max.	30 V
Collector-base voltage (open emitter) (note 1)	$V_{CBO}$	max.	70 V
Emitter-collector voltage (open base) (note 1)	$V_{ECO}$	max.	7 V
DC collector current	$I_C$	max.	100 mA
Total power dissipation up to $T_{amb} = 25^\circ C$ (note 1)	$P_{tot}$	max.	150 mW

**Notes**

- 1. JEDEC registered data.
- 2. JEDEC registered data is 3 V.

**Optocoupler**

Storage temperature range (note 1)	$T_{stg}$		-55 to +150 °C
Operating ambient temperature range (note 1)	$T_{amb}$		-40 to +100 °C
Soldering temperature up to the seating plane; $t_{sld} < 10$ s	$T_{sld}$	max.	260 °C
Total power dissipation up to $T_{amb} = 25$ °C	$P_{tot}$	max.	250 mW

**THERMAL RESISTANCE**

From junction to ambient in free air diode	$R_{th\ j-a}$	=	500 K/W
transistor	$R_{th\ j-a}$	=	500 K/W

**LINEAR DERATING FACTORS**

Above 25 °C			
diode (note 1)			2 mW/K
transistor (note 1)			2 mW/K
optocoupler (note 1)			3.3 mW/K

**ISOLATION RELATED VALUES**

External air gap (clearance) input terminals to output terminals	L(IO1)	min.	7.2 mm
External tracking path (creepage distance) input terminals to output terminals	L(IO2)	min.	7.0 mm
Tracking resistance (KB-value)			KB-100/A
Internal plastic gap (clearance) isolation thickness between emitter and receiver		min.	1 mm

**CHARACTERISTICS**

$T_j = 25$  °C unless otherwise specified

**Diode**

Forward voltage (note 1) $I_F = 10$ mA	$V_F$	typ. max.	1.15 V 1.5 V
Reverse current (note 2) $V_R = 5$ V	$I_R$	max.	100 $\mu$ A
Capacitance at $f = 1$ MHz $V = 0$	$C_d$	typ.	50 pF

**Transistor**

Collector-emitter breakdown voltage (note 1) $I_C = 1$ mA	$V_{(BR)CEO}$	min.	30 V
Collector-base breakdown voltage (note 1) $I_C = 0,1$ mA	$V_{(BR)CBO}$	min.	70 V
Emitter-collector breakdown voltage (note 1) $I_E = 0,1$ mA	$V_{(BR)ECO}$	min.	7 V

**Notes**

1. JEDEC registered data.
2. JEDEC registered data is at  $V_R = 3$  V.

4N25 4N25A  
4N26 4N27  
4N28

Dark current (note 1) VCE = 10 V	4N25 to 4N27	ICEO	typ. max.	2 nA 50 nA
VCB = 10 V	4N28	ICEO ICBO	max. max.	100 nA 20 nA

**Optocoupler**

Output/input DC current transfer ratio (note 1)

IF = 10 mA; VCE = 10 V	4N25 to 4N26	IC/IF	min.	0.2
	4N27 4N28	IC/IF	min.	0.1

Collector-emitter saturation voltage (note 1)

IF = 50 mA; IC = 2 mA		VCEsat	max. typ.	0.5 V 0.1 V
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Isolation voltage; t = 1 min DC  
(see notes 2 and 3) AC (RMS value)

	VIO	min.	2.82 kV 2.0 kV
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Capacitance between input and output

VIO = 0; f = 1 MHz	Cio	typ. max.	0.6 pF 1.7 pF
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Insulation resistance between input and output

VIO = 500 V	RIO	typ. min.	10 TΩ 1 TΩ
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Bandwidth

-IC = 2 mA; VCE = 10 V RL = 100 Ω	BW	typ.	300 kHz
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Switching times (unsaturated) see Fig. 2

Rise time

IC = 2 mA; VCC = 10 V; RL = 100 Ω	tr	typ.	3 μs
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Fall time

IC = 2 mA; VCC = 10 V; RL = 100 Ω	tf	typ.	3 μs
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Switching times (saturated) see Fig. 3

Turn-on time (TTL defined)

IF = 15 mA; VCC = 5 V; RL = 2 kΩ RBE = ∞	t <sub>on</sub>	typ.	5 μs
IF = 20 mA; VCC = 5 V; RL = 2 kΩ RBE = 100 kΩ	t <sub>on</sub>	typ.	5 μs

Turn-off time (TTL defined)

IF = 15 mA; VCC = 5 V; RL = 2 kΩ RBE = ∞	t <sub>off</sub>	typ.	30 μs
IF = 20 mA; VCC = 5 V; RL = 2 kΩ RBE = 100 kΩ	t <sub>off</sub>	typ.	10 μs

Notes

1. JEDEC registered data.
2. Satisfies JEDEC registered isolation voltage ratings (min.  $V_{IO}$ ):
 

4N25	2.5 kV (peak)
4N25-A	1.775 kV (RMS)
4N26	1.5 kV (peak)
4N27	1.5 kV (peak)
4N28	0.5 kV (peak)
3. Every single product is tested by applying an isolation test voltage of 2500 V (RMS) for 2 seconds between the shorted input (diode) leads and the shorted output (phototransistor) leads, with a detection current of about  $1 \mu\text{A}$ .

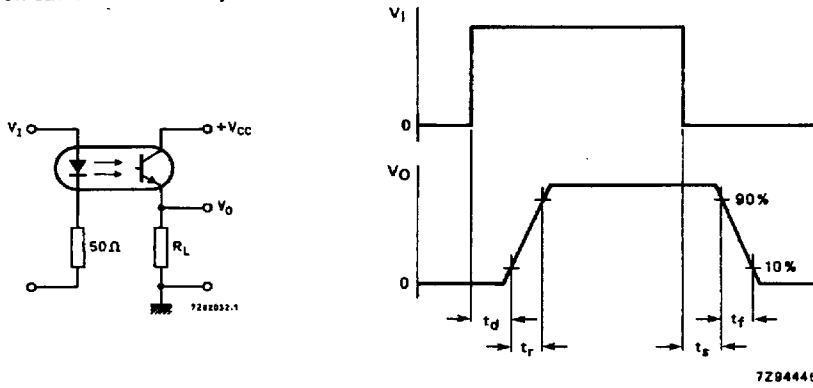


Fig. 2 Measuring circuit and waveforms.

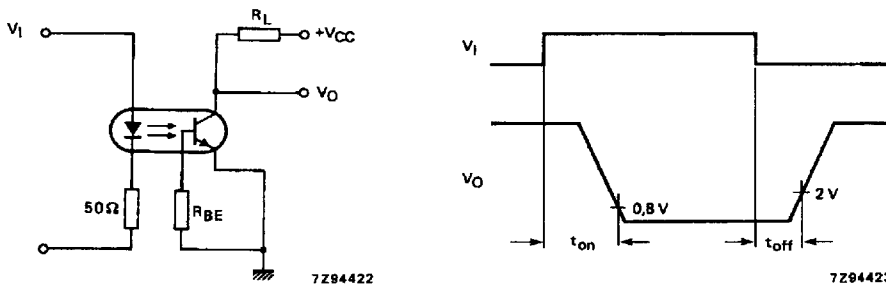


Fig. 3 Measuring circuit and waveforms.

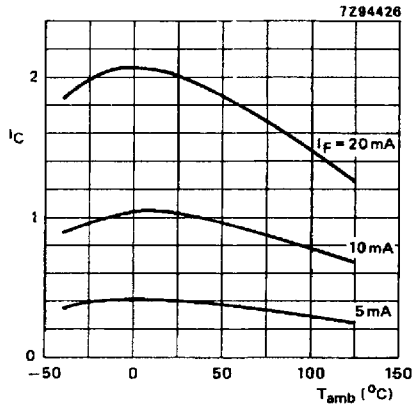


Fig. 4 Normalized at  $I_F = 10\text{ mA}$ ;  $V_{CE} = 10\text{ V}$ ;  $T_{amb} = 25\text{ °C}$ ; typical values.

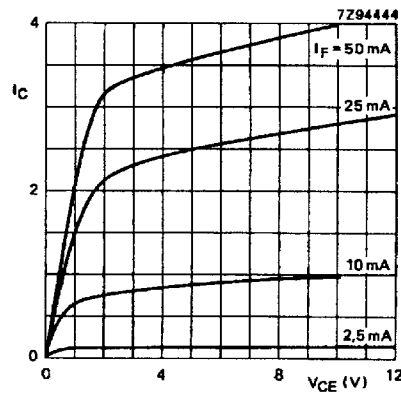


Fig. 5 Normalized at  $I_C = 1\text{ mA}$ ;  $I_F = 10\text{ mA}$ ;  $V_{CE} = 10\text{ V}$ ; typical values.

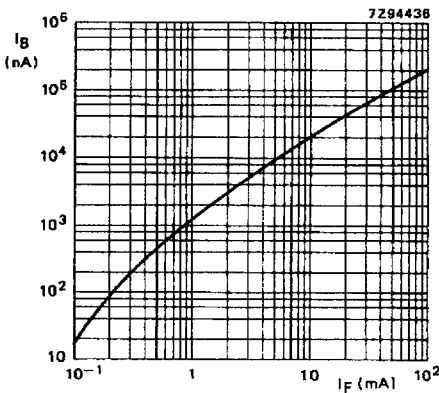


Fig. 6  $V_{CB} = 10\text{ V}$ ;  $T_{amb} = 25\text{ °C}$ ; typical values.

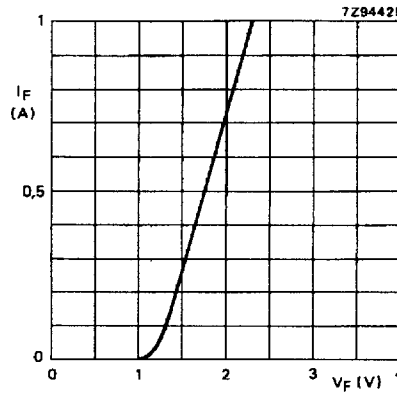


Fig. 7  $T_{amb} = 25\text{ °C}$ ;  $t_{on} = 20\text{ }\mu\text{s}$ ;  $\delta = 0,01$ ; typical values.

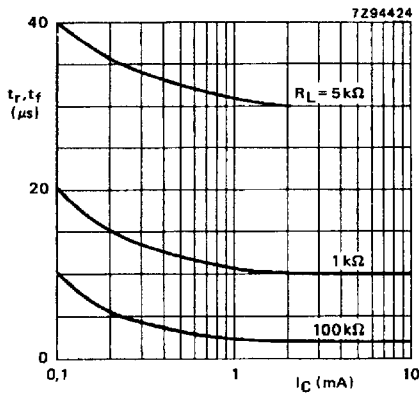


Fig. 8 Normalized at  $I_F = 10\text{ mA}$ ;  $V_{CE} = 10\text{ V}$ ;  $T_{amb} = 25\text{ °C}$ ; typical values.

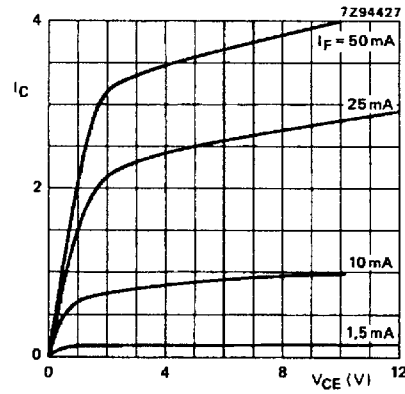


Fig. 9  $T_{amb} = 25\text{ °C}$ ; typical values.