HIGH-VOLTAGE OPTOCOUPLER

Optically coupled isolator consisting of an infrared emitting GaAs diode and a silicon n-p-n photo-transistor. The base is not accessible.

Features of this product:

- very high isolation voltage of 10 kV (d.c.).
- working voltage of 10 kV (d.c.).
- high common mode rejection 85 dB

QUICK REFERENCE DATA

Diode			
Continuous reverse voltage	V_R	max.	5 V
Forward current			
d.c.	I_F	max.	50 mA
(peak value); $t_p = 10\ \mu s$; $\delta = 0{,}01$	I_{FRM}	max.	3 A
Total power dissipation up to $T_{amb} = 25\ ^oC$	P_{tot}	max.	100 mW
Transistor			
Collector-emitter voltage (open base)	V_{CEO}	max.	30 V
Total power dissipation up to $T_{amb} = 25\ ^oC$	P_{tot}	max.	100 mW
Optocoupler			
Output/input d.c. current transfer ratio (C.T.R.) $I_F = 10$ mA; $V_{CE} = 0{,}4$ V; ($I_B = 0$)	I_C/I_F	>	0,2
Collector cut-off current (dark) $V_{CC} = 10$ V; working voltage (d.c.) = 10 kV diode: $I_F = 0$ (see also Fig. 4)	I_{CEW}	<	200 nA
Isolation voltage (d.c.)	V_{IORM}	min.	10 kV

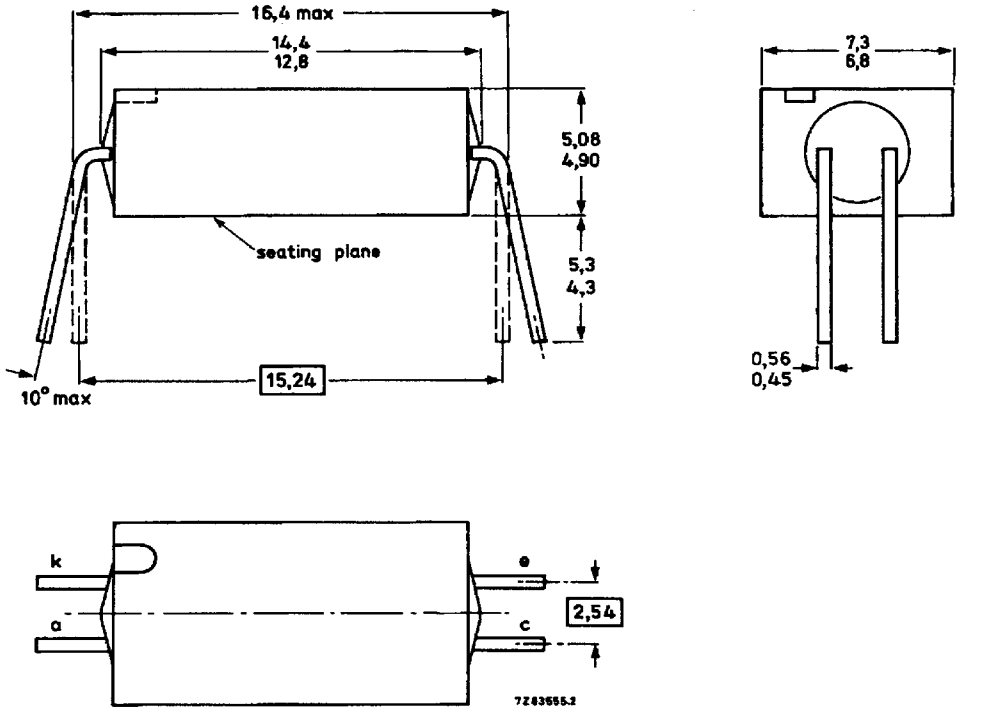
MECHANICAL DATA

SOT-211 (see Fig. 1)

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-211.



RATINGS

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

Diode			
Continuous reverse voltage	V_R	max.	5 V
Forward current			
d.c.	I_F	max.	50 mA
(peak value); t_p = 10 μs; δ = 0,01	I_{FRM}	max.	3 A
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	100 mW
Transistor			
Collector-emitter voltage (open base)	V_{CEO}	max.	30 V
Emitter-collector voltage (open base)	V_{ECO}	max.	7 V
Collector current			
d.c.	I_C	max.	25 mA
peak value	I_{CM}	max.	50 mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	100 mW

Optocoupler			
Storage temperature	T_{stg}	−55 to + 100	°C
Junction temperature	T_j	max. 100	°C
Lead soldering temperature up to the seating plane; $t_{sld} < 10$ s	T_{sld}	max. 260	°C
THERMAL RESISTANCE			
From junction to ambient in free air			
diode	$R_{th\ j\text{-}a}$	max. 750	K/W
transistor	$R_{th\ j\text{-}a}$	max. 750	K/W
From junction to ambient, device mounted on a printed circuit board			
diode	$R_{th\ j\text{-}a}$	max. 400	K/W
transistor	$R_{th\ j\text{-}a}$	max. 400	K/W
CHARACTERISTICS			
T_j = 25 °C unless otherwise specified			
Diode			
Forward voltage		typ. 1,15	V
I_F = 10 mA	V_F	< 1,3	V
Reverse current			
V_R = 5 V	I_R	< 100	μA
Diode capacitance at f = 1 MHz			
V_R = 0	C_d	typ. 40	pF
Transistor			
Collector cut-off current (dark)		typ. 2	nA
V_{CE} = 10 V	I_{CEO}	< 50	nA
Collector-emitter breakdown voltage			
open base; I_C = 1 mA	$V_{(BR)CEO}$	min. 30	V
Emitter-collector breakdown voltage			
open base; I_E = 0,1 mA	$V_{(BR)ECO}$	min. 7	V
Optocoupler (I_B = 0)*			
Output/input d.c. current transfer ratio (C.T.R.)		min. 0,2	
I_F = 10 mA; V_{CE} = 0,4 V	I_C/I_F	typ. 0,5	
Collector-emitter saturation voltage			
I_F = 10 mA; I_C = 2 mA	V_{CEsat}	typ. 0,15	V
Isolation voltage, d.c. value (see note 1)	V_{IORM}	min. 10	kV

Note see next page.

* Where the phototransistor receives light from the diode the O (for open base) has been omitted from the symbols.

Capacitance between input and output $I_F = 0$; $V = 0$; $f = 1$ MHz	C_{io}	typ.	0,15 pF
Insulation resistance between input and output $\pm V_{IO} = 1$ kV	r_{IO}	>	10^{11} Ω 12^{12} Ω
Common mode rejection (see Fig. 3) $I_C = 2$ mA; $f = 10$ kHz	CMRR	typ.	85 dB
Switching times (see Fig. 13) $I_{Con} = 2$ mA; $V_{CC} = 5$ V; $R_L = 100$ Ω			
Turn-on time	t_{on}	typ.	3 μs
Turn-off time	t_{off}	typ.	3 μs
$I_{Con} = 2$ mA; $V_{CC} = 5$ V; $R_L = 1$ kΩ			
Turn-on time	t_{on}	typ.	12 μs
Turn-off time	t_{off}	typ.	12,5 μs
Collector cut-off current (dark) see Fig. 2 $V_{CC} = 10$ V; working voltage (d.c.) = 10 kV	I_{CEW}	<	200 nA*

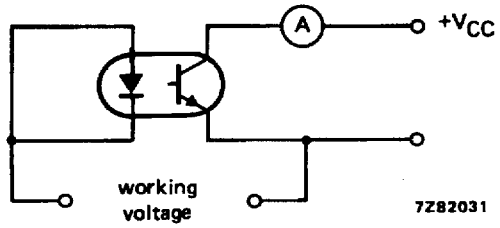


Fig. 2.

Notes

1. This parameter is tested with both input (diode) leads shorted together and both output (photo-transistor) leads shorted together at 10 kV (d.c.) for 1 min. Tested on sample basis.
2. $CMRR = \frac{V_o}{V_{CM}}$.

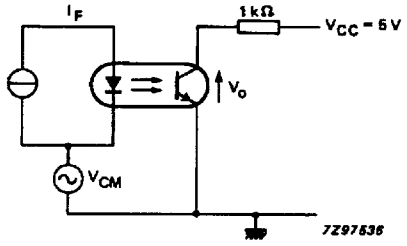


Fig. 3.

* As quality assurance (on a sample basis), these parameters are covered by a 1000 h reliability test.

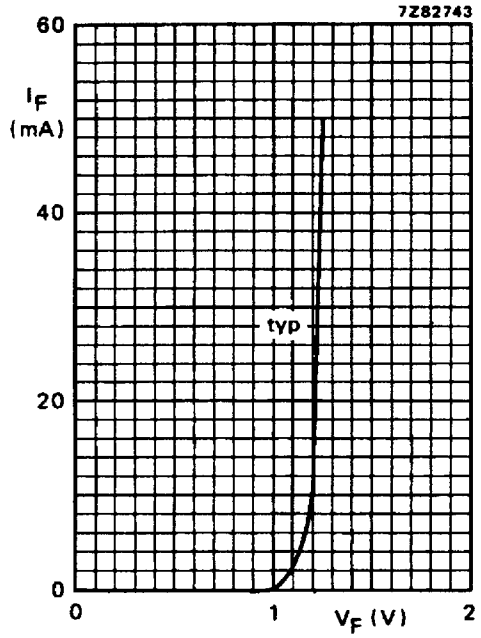


Fig. 4 T_j = 25 °C.

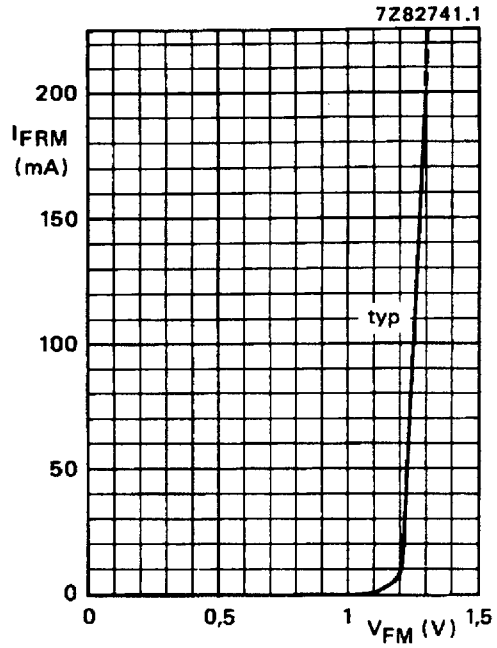


Fig. 5 T_{amb} = 25 °C; t_p = 10 μs; T = 1 ms.

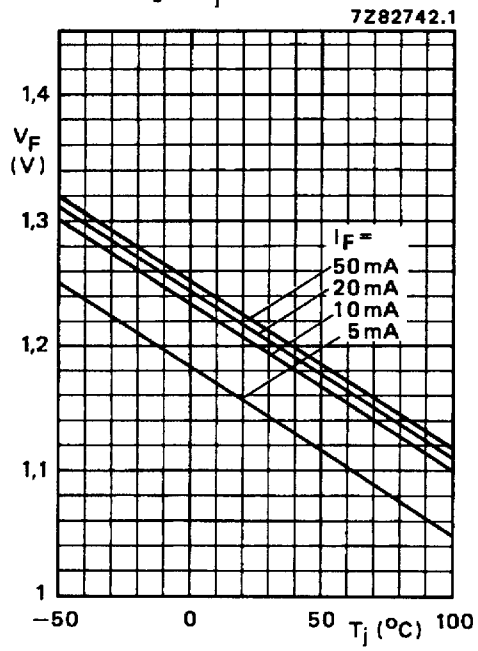


Fig. 6 Typical values.

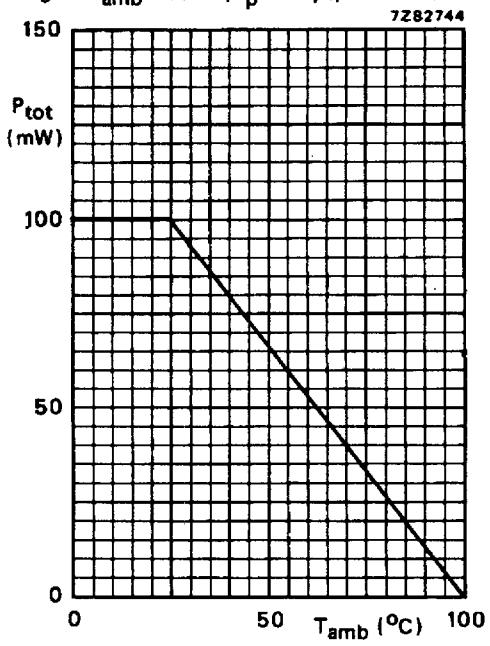


Fig. 7 Power derating curve for diode and transistor versus ambient temperature.

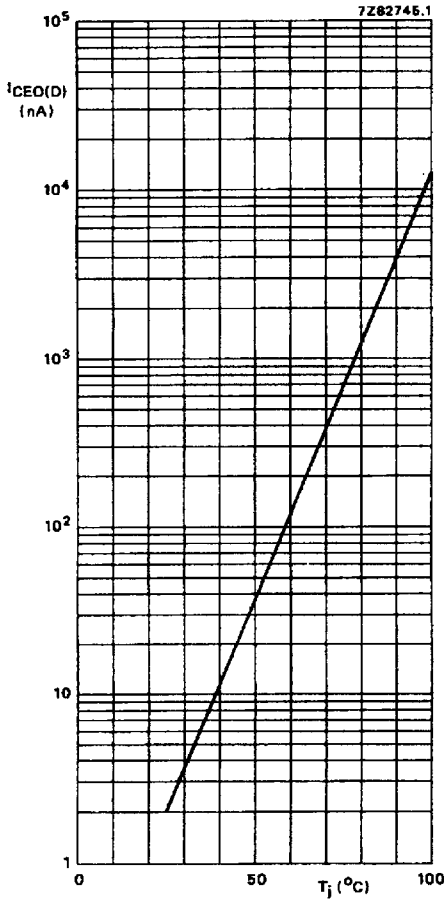


Fig. 8 Typical values.

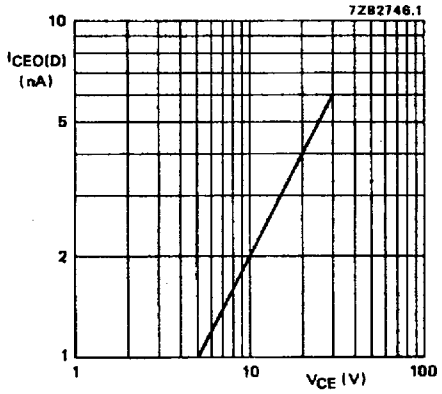


Fig. 9 Typical values.

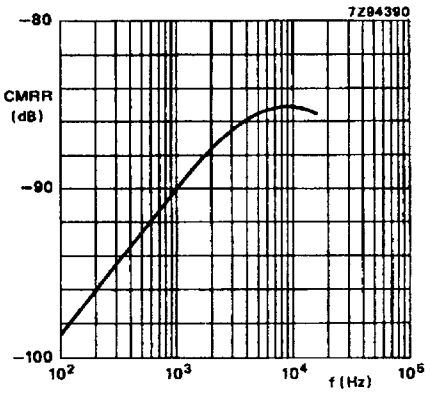


Fig. 10 Typical values.

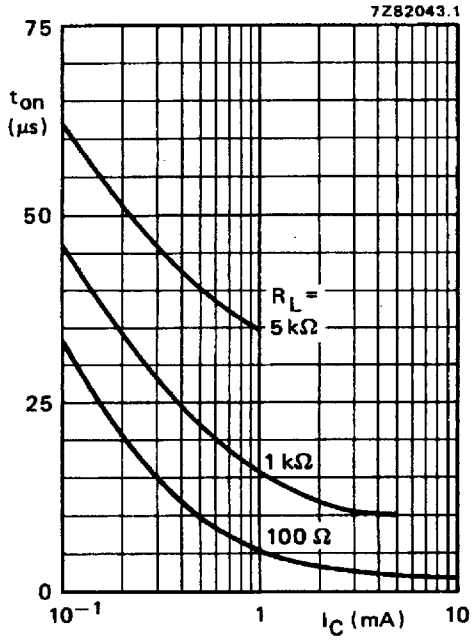


Fig. 11 $I_B = 0$; $V_{CC} = 5$ V; $T_{amb} = 25$ °C; typical values. See also Fig. 13.

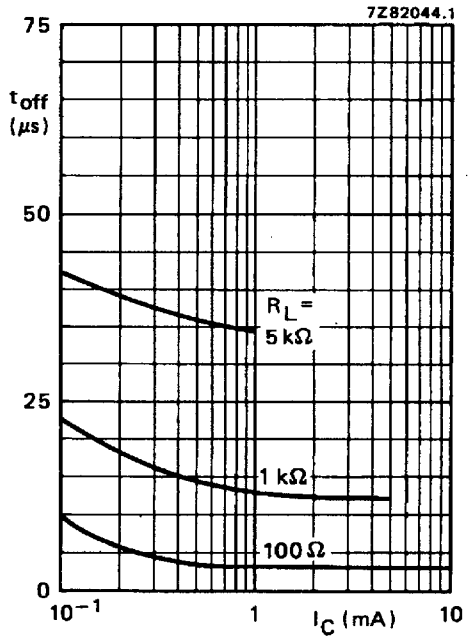


Fig. 12 $I_B = 0$; $V_{CC} = 5$ V; $T_{amb} = 25$ °C; typical values. See also Fig. 13.

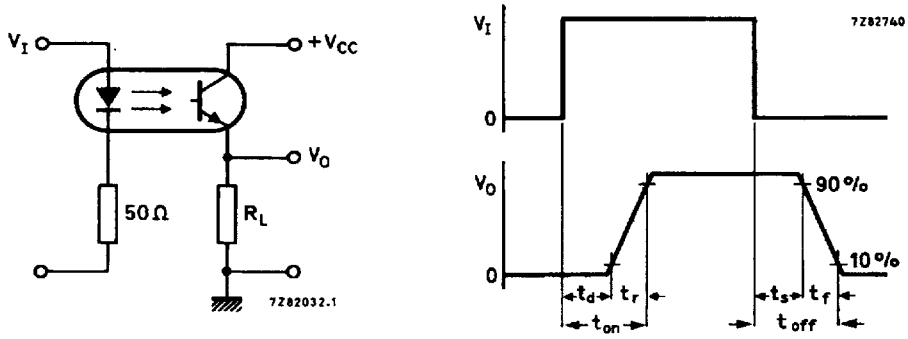


Fig. 13 Switching circuit and waveforms.