

TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

# TLP624, TLP624-2, TLP624-4

Programmable Controllers  
AC/DC-Input Module  
Telecommunication

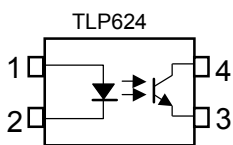
The TOSHIBA TLP624, -2 and -4 consist of a gallium arsenide infrared emitting diode optically coupled to a photo-transistor.  
The TLP624-2 offers two isolated channels in an eight lead plastic DIP, while the TLP624-4 provides four isolated channels in a sixteen plastic DIP.

- Collector-emitter voltage: 55V min.
- Current transfer ratio

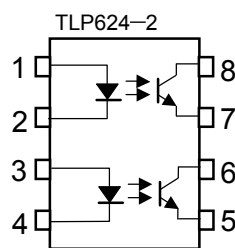
Classi- fication	Current Transfer Ratio(min)			Marking of classi- fication
	Ta = 25°C		Ta = -25~75°C	
	If=1mA VCE=0.5V	If=0.5mA VCE=1.5V	If=1mA VCE=0.5V	
Rank BV	200%	100%	100%	BV
Standard	100%	50%	50%	BV,blank

- Isolation voltage: 5000V<sub>rms</sub> min.
- UL recognized: UL1577, file No.E67349
- BSI approved: BS EN60065: 2002 Certificate No.7426  
BS EN60950-1: 2002 Certificate No.7427
- Note: Application type name for certification test, please use standard product type name, i.e.  
TLP624(BV): TLP624  
TLP624-2(BV): TLP624-2

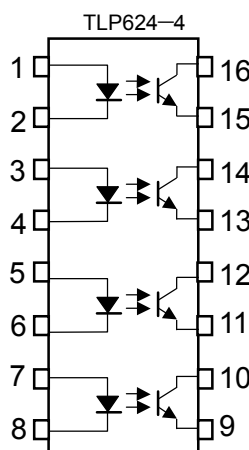
## Pin Configurations (top view)



- 1. Anode
- 2. Cathode
- 3. Emitter
- 4. Collector

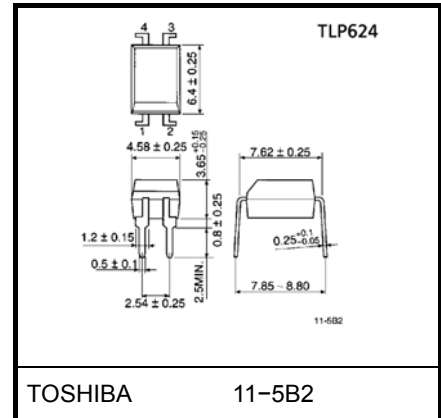


- 1,3 : Anode
- 2,4 : Cathode
- 5,7 : Emitter
- 6,8 : Collector

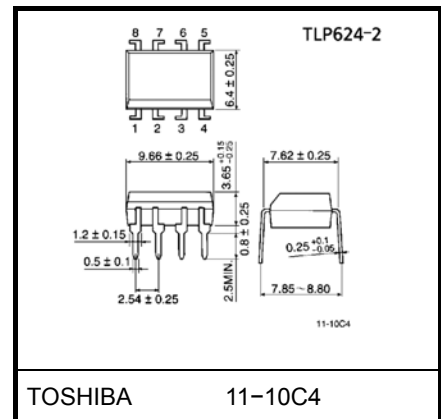


- 1,3,5,7: Anode
- 2,4,6,8: Cathode
- 9,11,13,15: Emitter
- 10,12,14,16: Collector

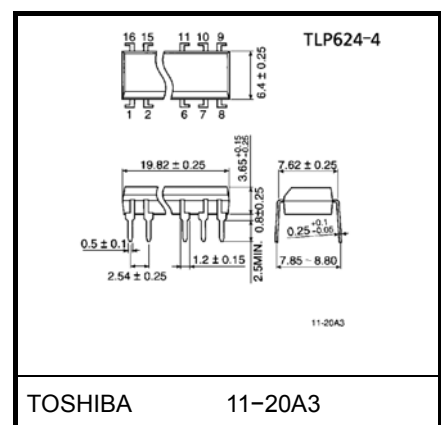
Unit in mm



TOSHIBA 11-5B2  
Weight: 0.26 g (typ.)



TOSHIBA 11-10C4  
Weight: 0.54 g (typ.)



TOSHIBA 11-20A3  
Weight: 1.1 g (typ.)

## Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating		Unit
			TLP624	TLP624-2 TLP624-4	
LED	Forward current	$I_F$	60	50	mA
	Forward current detating	$\Delta I_F / ^\circ\text{C}$	-0.7(Ta $\geq$ 39°C)	-0.5(Ta $\geq$ 25°C)	mA / °C
	Pulse forward current	$I_{FP}$	1(100 $\mu$ s, pulse, 100pps)		A
	Power dissipation(1 Circuit)	$P_D$	100	70	mW
	Power dissipation derating (Ta $\geq$ 25°C, 1 Circuit)	$\Delta P_D / ^\circ\text{C}$	-1.0	-0.7	mW / °C
	Reverse voltage	$V_R$	5		V
	Junction temperature	$T_j$	125		°C
Detector	Collector-emitter voltage	$V_{CEO}$	55		V
	Emitter-collector voltage	$V_{ECO}$	7		V
	Collector current	$I_C$	50		mA
	Collector power dissipation(1 circuit)	$P_C$	150	100	mW
	Collector power dissipation derating (Ta $\geq$ 25°C, 1 Circuit)	$\Delta P_C / ^\circ\text{C}$	-1.5	-1.0	mW / °C
	Junction temperature	$T_j$	125		°C
	Storage temperature range	$T_{stg}$	-55~125		°C
Operating temperature range	$P_{opr}$	-55~100		°C	
Lead soldering temperature	$T_{sol}$	260(10s)		°C	
Total package power dissipation(1 Circuit)	$P_T$	250	150	mW	
Total package power dissipation derating (Ta $\geq$ 25°C, 1 Circuit)	$\Delta P_T / ^\circ\text{C}$	-2.5	-1.5	mW / °C	
Isolation voltage	(Note 1) $BV_S$	5000(AC, 1min., RH $\leq$ 60%)		Vrms	

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

(Note 1) Device considered a two terminal device: LED side pins shorted together, and detector side pins shorted together.

## Recommended Operating Conditions

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	$V_{CC}$	—	5	24	V
Forward current	$I_F$	—	1.6	20	mA
Collector current	$I_C$	—	1	10	mA
Operating temperature	$T_{opr}$	-25	—	75	°C

Note: Recommended operating conditions are given as a design guideline to obtain expected performance of the device. Additionally, each item is an independent guideline respectively. In developing designs using this product, please confirm specified characteristics shown in this document.

## Individual Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min.	Typ.	Max.	Unit
LED	Forward voltage	$V_F$	$I_F = 10\text{mA}$	1.0	1.15	1.3	V
	Reverse current	$I_R$	$V_R = 5\text{V}$	—	—	10	$\mu\text{A}$
	Capacitance	$C_T$	$V = 0, f = 1\text{MHz}$	—	30	—	pF
Detector	Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C = 0.5\text{mA}$	55	—	—	V
	Emitter-collector breakdown voltage	$V_{(BR)ECO}$	$I_E = 0.1\text{mA}$	7	—	—	V
	Collector dark current	$I_{CEO}$	$V_{CE} = 24\text{V}$	—	10	100	nA
			$V_{CE} = 24\text{V}, T_a = 85^\circ\text{C}$	—	2	50	$\mu\text{A}$
Capacitance collector to emitter	$C_{CE}$	$V=0, f=1\text{MHz}$	—	12	—	pF	

## Coupled Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Current transfer ratio	$I_C / I_F$	$I_F = 1\text{mA}, V_{CE} = 0.5\text{V}$ Rank BV	100	—	1200	%
			200	—	1200	
Low input CTR	$I_C / I_F$ (low)	$I_F = 0.5\text{mA}, V_{CE} = 1.5\text{V}$ Rank BV	50	—	—	%
			100	—	—	
Collector-emitter saturation voltage	$V_{CE}$ (sat)	$I_C = 0.5\text{mA}, I_F = 1\text{mA}$ $I_C = 1\text{mA}, I_F = 1\text{mA}$ Rank BV	—	—	0.4	V
			—	0.2	—	
			—	—	0.4	

## Coupled Electrical Characteristics (Ta = -25°C~75°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Current transfer ratio	$I_C / I_F$	$I_F = 1\text{mA}, V_{CE} = 0.5\text{V}$ Rank BV	50	—	—	%
			100	—	—	
Low input CTR	$I_C / I_F$ (low)	$I_F = 0.5\text{mA}, V_{CE} = 1.5\text{V}$ Rank BV	—	50	—	%
			—	100	—	

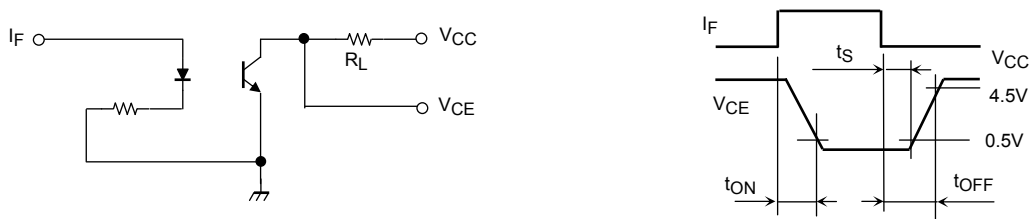
## Isolation Characteristics (Ta = 25°C)

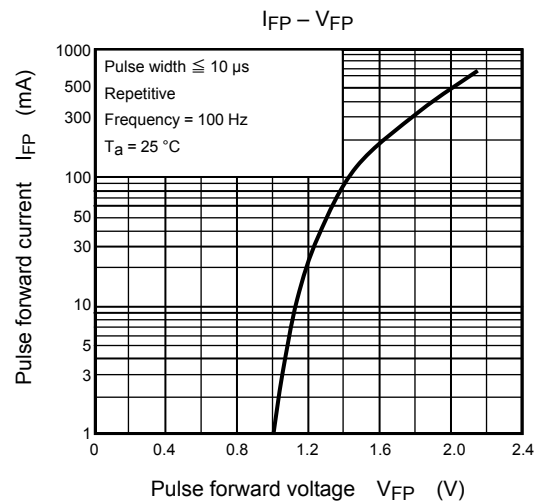
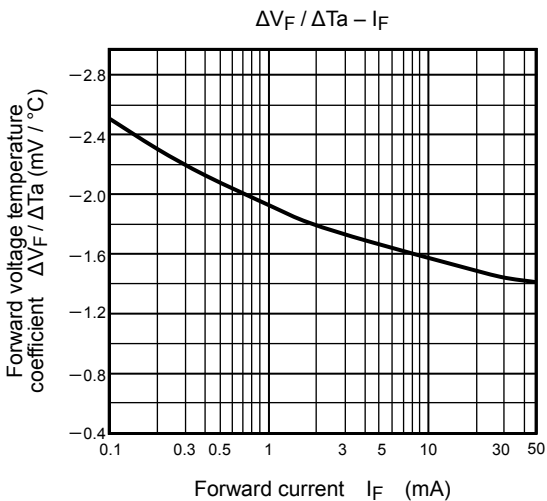
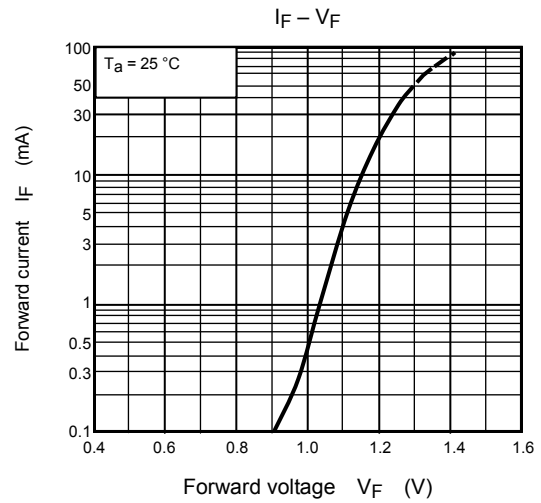
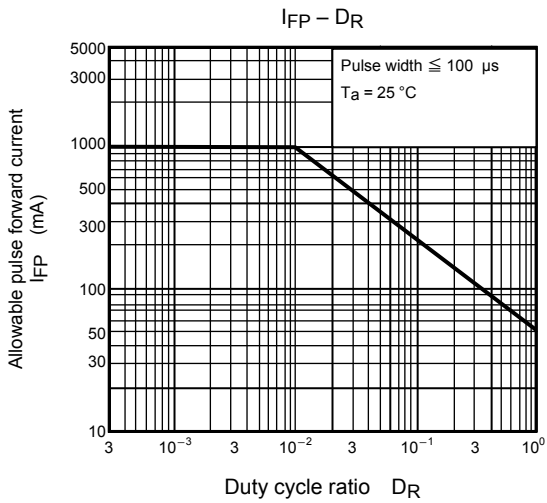
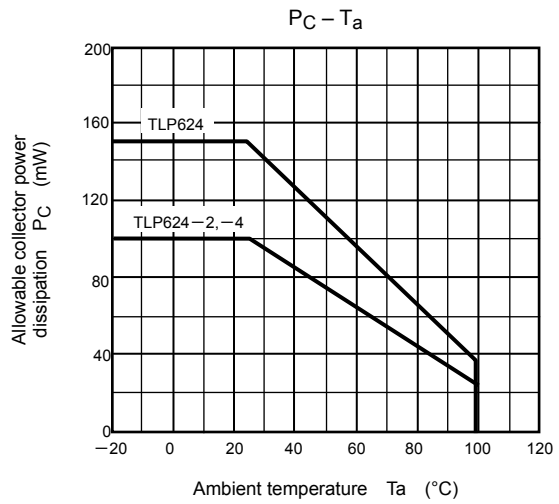
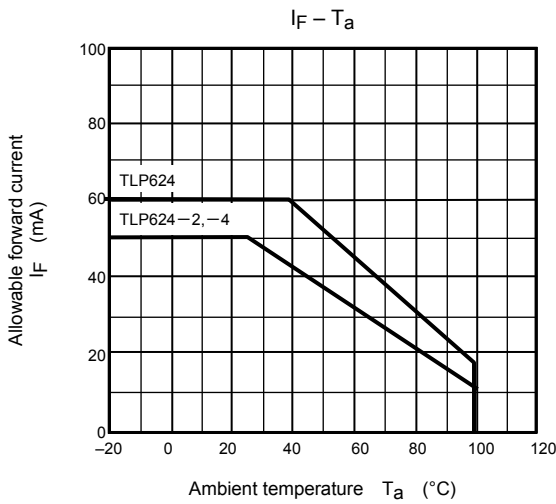
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Capacitance input to output	C <sub>S</sub>	V <sub>S</sub> = 0, f = 1MHz	—	0.8	—	pF
Isolation resistance	R <sub>S</sub>	V <sub>S</sub> = 500V	5×10 <sup>10</sup>	10 <sup>14</sup>	—	Ω
Isolation voltage	BV <sub>S</sub>	AC, 1minute	5000	—	—	V <sub>rms</sub>
		AC, 1second, in oil	—	10000	—	
		DC, 1 minute, in oil	—	10000	—	V <sub>dc</sub>

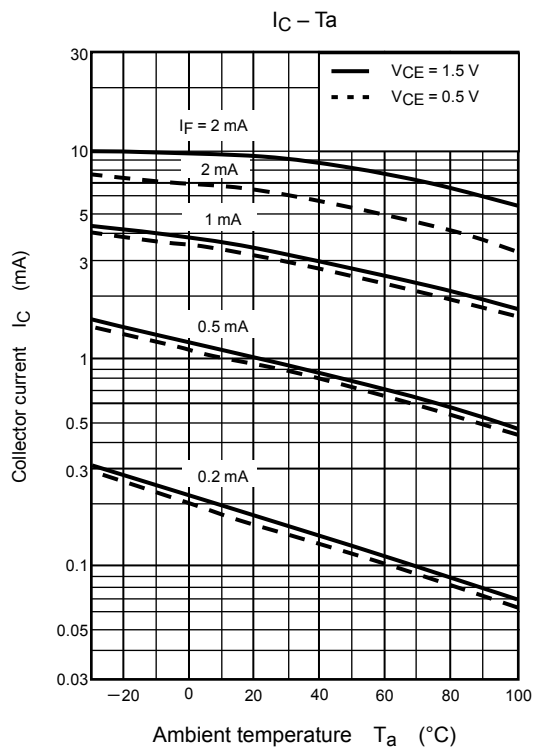
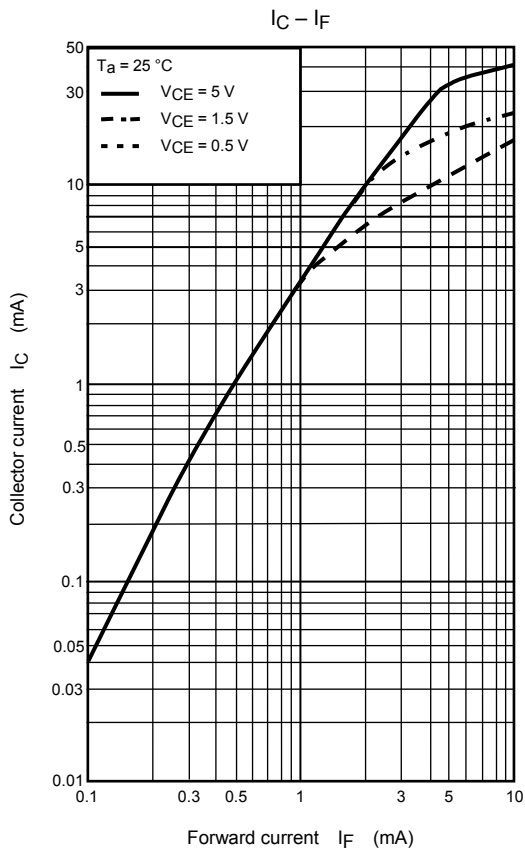
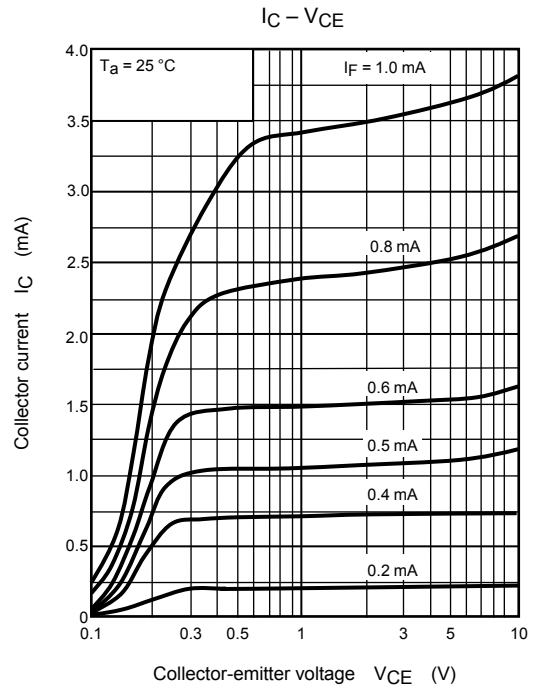
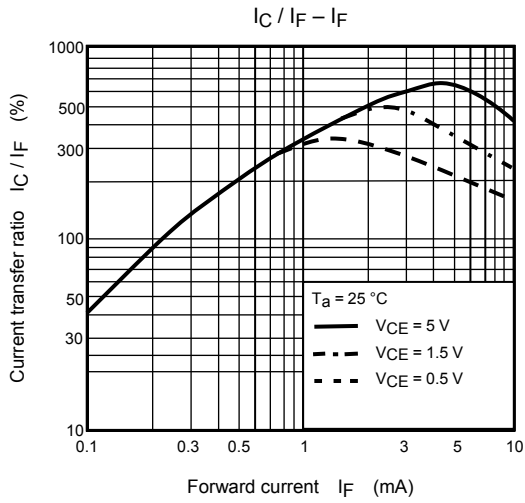
## Switching Characteristics (Ta = 25°C)

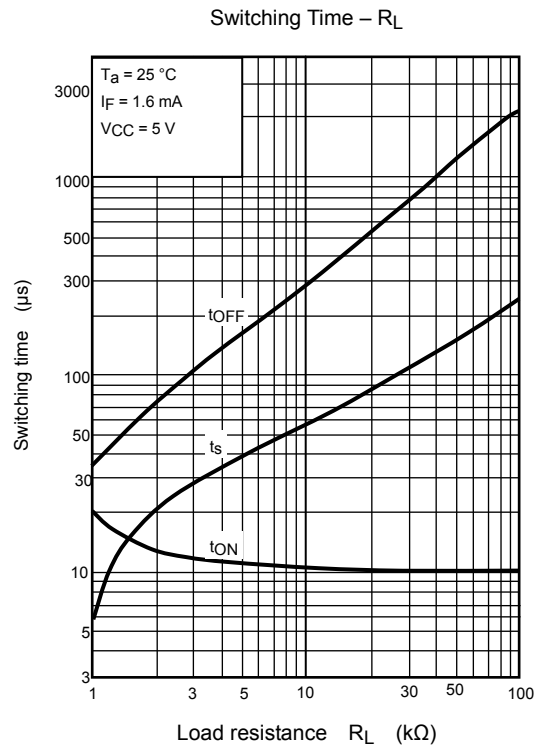
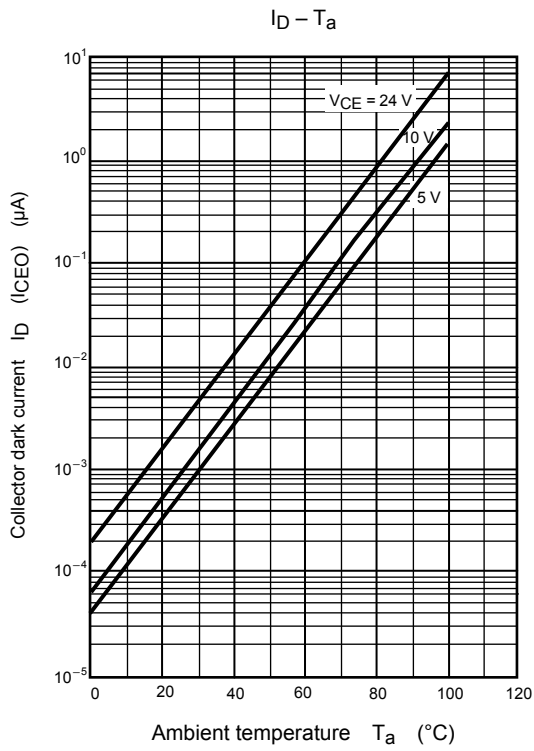
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Rise time	t <sub>r</sub>	V <sub>CC</sub> = 10V, I <sub>C</sub> = 2mA R <sub>L</sub> = 100Ω	—	8	—	μs
Fall time	t <sub>f</sub>		—	8	—	
Turn-on time	t <sub>on</sub>		—	10	—	
Turn-off time	t <sub>off</sub>		—	8	—	
Turn-on time	t <sub>ON</sub>	R <sub>L</sub> = 4.7 kΩ (Fig.1) V <sub>CC</sub> = 5 V, I <sub>F</sub> = 1.6mA	—	10	—	μs
Storage time	t <sub>S</sub>		—	50	—	
Turn-off time	T <sub>OFF</sub>		—	300	—	

Fig. 1 Switching time test circuit









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Тел: +7 (812) 336 43 04 (многоканальный)  
Email: [org@lifeelectronics.ru](mailto:org@lifeelectronics.ru)