TLP520, TLP520-2, TLP520-4

GaAs IRED & PHOTO-TRANSISTOR

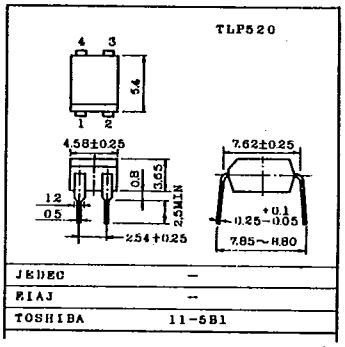
AC/DC-INPUT MODULES

PROGRAMMABLE CONTROLLERS

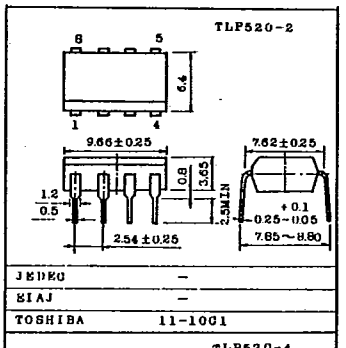
The TOSHIBA TLP520, -2 and -4 consist of two gallium arsenide infrared emitting diodes connected in inverse parallel and coupled with a silicon photo-transistor in a dual in-line package.
The TLP520-2 offers two isolated channels in a single DIP package, while the TLP520-4 provides four isolated channels per package.

- AC or Polarity Insensitive Inputs
- Built-in Reverse Polarity Input Protection
- Isolation Voltage ..... 2500V_{rms} Min.
- Current Transfer Ratio ..... 50% Min.
- BV_{CEO} : 55V Min.
- UL Recognized : File No. E67349

Unit in mm



JEDEC	—
EIAJ	—
TOSHIBA	11-5B1



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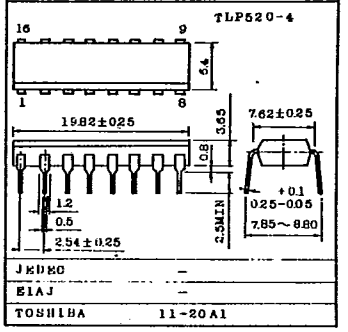
EIAJ	—
TOSHIBA	11-10G1



JEDEC	—
EIAJ	—
TOSHIBA	11-20A1

MAXIMUM RATINGS (Ta=25°C)

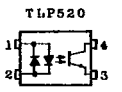
CHARACTERISTIC		SYMBOL	RATING		UNIT
			TLP520	TLP520-2, TLP520-4	
LED	Forward Current	I_F(RMS)	60	50	mA
	Forward Current Derating	ΔI_F/°C	-0.7 (Ta≥39°C)	-0.5 (Ta>25°C)	mA/°C
	Pulse Forward Current	I_{FP}	1 (100μs pulse, 100 pps)		A
DETECTOR	Collector-Emitter Voltage	V_{CEO}	55		V
	Emitter-Collector Voltage	V_{ECO}	7		V
	Collector Current	I_C	50		mA
	Collector Power Dissipation (1 Circuit)	P_C	150	100	mW
	Collector Power Dissipation Derating (1 Circuit) (Ta≥25°C)	ΔP_C/°C	-1.5	-1.0	mW/°C
Operating Temperature Range		T_{opr}	-55 ~ 100		°C
Storage Temperature Range		T_{stg}	-55 ~ 150		°C
Total Power Dissipation		P_T	250	150	mW
Total Power Dissipation Derating (Ta≥25°C)		ΔP_T/°C	-2.5	-1.5	mW/°C
Isolation Voltage		BV_S	2500 (AC, 1 min., RH≤60%)		V_{rms}

RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V_{CC}	-	5	24	V
Forward Current	I_F	-	-	20	mA
Operating Temperature Range	T_{opr}	-25	-	85	°C

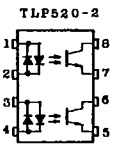
PIN CONFIGURATIONS (TOP VIEW)

TLP520



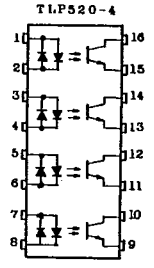
1 : ANODE
CATHODE
2 : CATHODE
ANODE
3 : EMITTER
4 : COLLECTOR

TLP520-2



1,3 : ANODE
CATHODE
2,4 : CATHODE
ANODE
5,7 : EMITTER
6,8 : COLLECTOR

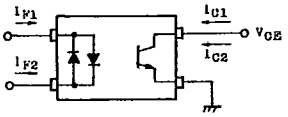
TLP520-4



1,3,5,7 : ANODE
CATHODE
2,4,6,8 ; CATHODE
ANODE
9,11,13,15 : EMITTER
10,12,14,16 : COLLECTOR

ELECTRICAL CHARACTERISTICS (Ta=25°C)

	CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
LED	Forward Voltage	V_F	I_F=±10mA	1.0	1.15	1.3	V
	Forward Current	I_F	V_F=±0.7V	-	2.5	20	μA
	Capacitance	C_T	V=0, f=1MHz	-	60	-	pF
DETECTOR	Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	I_C=0.5mA	55	-	-	V
	Emitter-Collector Breakdown Voltage	$V_{(BR)ECO}$	I_E=0.1mA	7	-	-	V
	Collector Dark Current	I_{CEO}	V_{CE}=24V	-	10	100	nA
			V_{CE}=24V, Ta=85°C	-	2	50	μA
	Capacitance Collector to Emitter	C_{CE}	V_{CE}=0, f=1MHz	-	10	-	pF
COUPLED	Current Transfer Ratio (Note 1)	I_C/I_F	I_F=±5mA, V_{CE}=5V	50	200	600	%
			I_F=±1mA, V_{CE}=0.4V	-	100	-	
	Off-State Collector Current	$I_{C(OFF)}$	V_F=0.7V, V_{CE}=24V	-	1	10	μA
	Saturation Voltage	$V_{CE(sat)}$	I_F=8mA, I_C=2.4mA	-	-	0.4	V
	Capacitance Input to Output	C_S	V=0, f=1MHz	-	0.8	-	pF
	Isolation Resistance	R_S	V=500V	5×10^{10}	10^{14}	-	Ω
	Rise and Fall Time	t_r,t_f	V_{CE}=5V, R_L=100Ω, I_C=2mA	-	2.3	-	μs
	CTR Symmetry (Note 2)	$I_{C(Ratio)}$	I_F=5mA, V_{CE}=5V	0.33	-	3	-

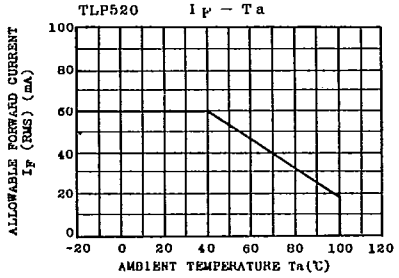


Note 1 : CTR rank

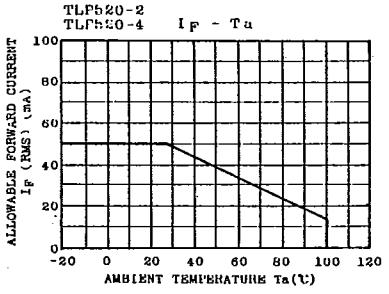
RANK NAME	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Rank GB	I_F=±5mA, V_{CE}=5V	100	200	600	%
	I_F=±1mA, V_{CE}=0.4V	50	100	-	

2 : $I_{C(Ratio)} = \frac{I_{C2}(I_F=-5mA,\ V_{CE}=5V)}{I_{C1}(I_F=+5mA,\ V_{CE}=5V)}$

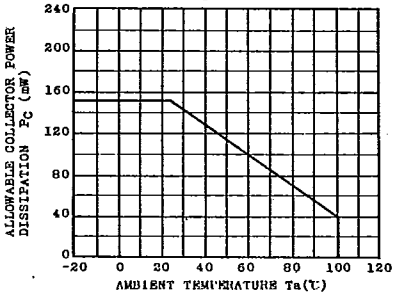
TLP520 $I_F - Ta$



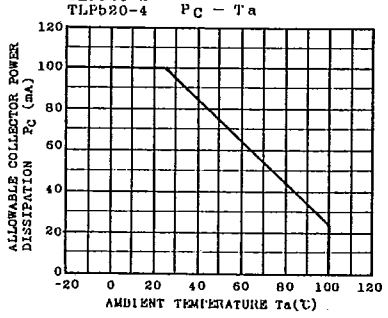
TLP520-2 TLP520-4 $I_F - Ta$



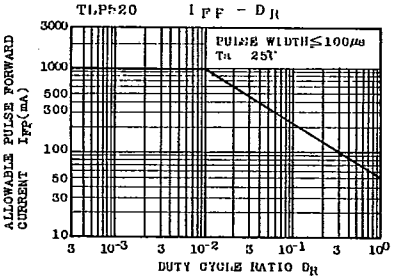
TLP520 $P_C - Ta$



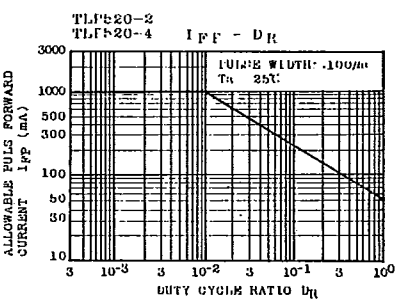
TLP520-2 TLP520-4 $P_C - Ta$

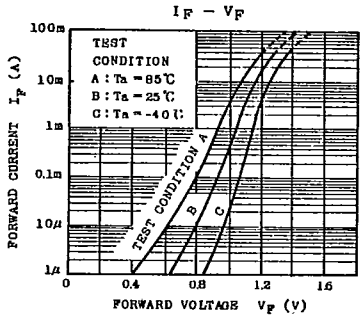


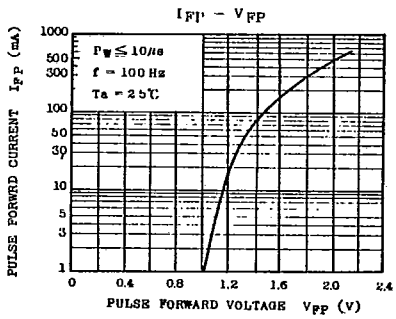
TLP520 $I_{FP} - D_R$

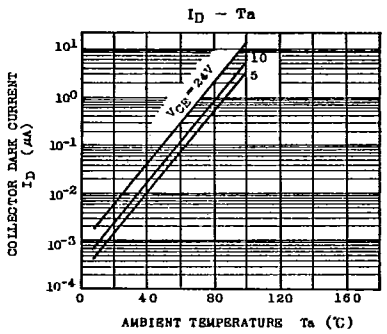


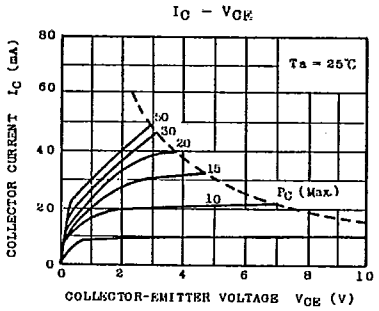
TLP520-2 TLP520-4 $I_{FP} - D_R$

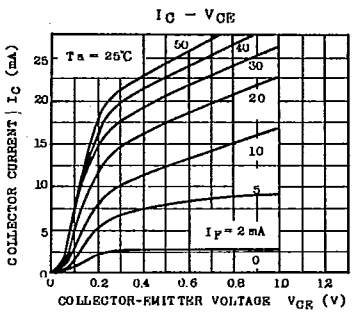


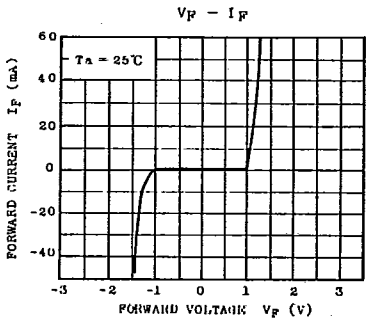

$I_F - V_F$
TEST CONDITION
A : Ta = 85℃
B : Ta = 25℃
C : Ta = -40℃
TEST CONDITION A
B
C
FORWARD CURRENT I_F (A)
FORWARD VOLTAGE V_F (V)

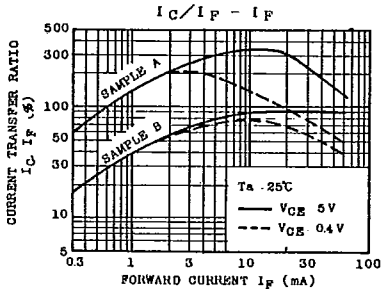

$I_{FP} - V_{FP}$
$P_W \leq 10\mu s$
f = 100 Hz
Ta = 25℃
PULSE FORWARD CURRENT I_{FP} (mA)
PULSE FORWARD VOLTAGE V_{FP} (V)

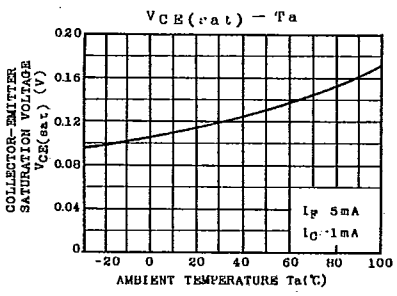

$I_D - Ta$
V_{CE} = 24V
10
5
COLLECTOR DARK CURRENT I_D (μA)
AMBIENT TEMPERATURE Ta (℃)

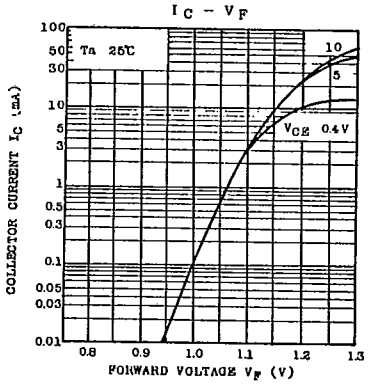

$I_C - V_{CE}$
Ta = 25℃
P_C (Max.)
COLLECTOR CURRENT I_C (mA)
COLLECTOR-EMITTER VOLTAGE V_{CE} (V)

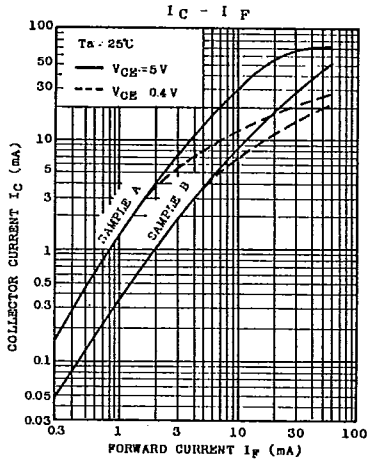

$I_C - V_{CE}$
Ta = 25℃
I_F = 2 mA
COLLECTOR CURRENT I_C (mA)
COLLECTOR-EMITTER VOLTAGE V_{CE} (V)

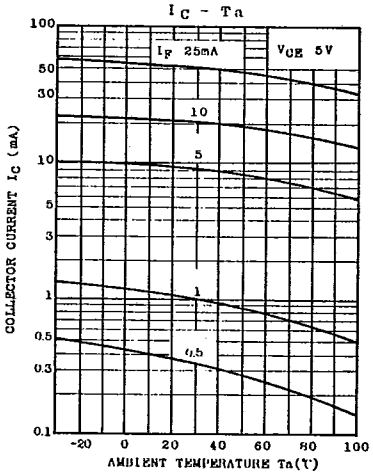

$V_F - I_F$
Ta = 25℃
FORWARD CURRENT I_F (mA)
FORWARD VOLTAGE V_F (V)

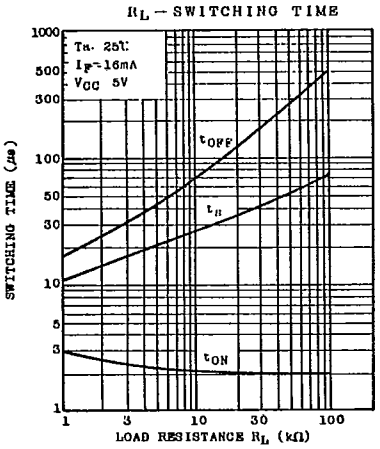

$I_C / I_F - I_F$
SAMPLE A
SAMPLE B
Ta = 25℃
V_{CE} 5V
V_{CE} 0.4V
CURRENT TRANSFER RATIO I_C / I_F (%)
FORWARD CURRENT I_F (mA)

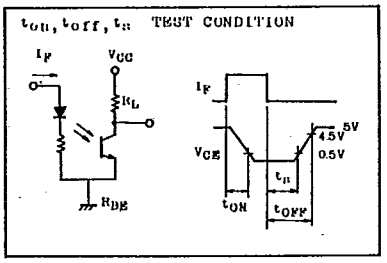

$V_{CE(sat)} - Ta$
I_F 5mA
I_C 1mA
COLLECTOR-EMITTER SATURATION VOLTAGE $V_{CE(sat)}$ (V)
AMBIENT TEMPERATURE Ta(℃)


$I_C - V_F$
Ta 25℃
10
5
V_{CE} 0.4V
COLLECTOR CURRENT I_C (mA)
FORWARD VOLTAGE V_F (V)


$I_C - I_F$
Ta = 25℃
V_{CE} = 5V
V_{CE} 0.4V
SAMPLE A
SAMPLE B
COLLECTOR CURRENT I_C (mA)
FORWARD CURRENT I_F (mA)


$I_C - Ta$
I_F 25mA
V_{CE} 5V
10
5
1
0.5
COLLECTOR CURRENT I_C (mA)
AMBIENT TEMPERATURE Ta(℃)


R_L — SWITCHING TIME
Ta: 25℃
I_F=16mA
V_{CC} 5V
1000
500
300
100
50
30
10
5
3
1
t_{OFF}
t_R
t_{ON}
1
3
10
30
100
SWITCHING TIME (μs)
LOAD RESISTANCE R_L (kΩ)


t_{on}, t_{off}, t_R TEST CONDITION
I_F
V_{CC}
R_L
R_{BE}
I_F
V_{CE}
4.5V
5V
0.5V
t_R
t_{ON}
t_{OFF}