

#### **DESCRIPTION**

The TLP521, TLP521-2 and TLP521-4 series of optically coupled isolator consist of an infrared light emitting diode and an NPN silicon photo transistor in a space efficient Dual In Line Plastic Package.

# FEATURES

- AC Isolation Voltage 5300V<sub>RMS</sub>
- CTR Selections Available
- Wide Operating Temperature Range -30°C to +100°C
- Lead Free and RoHS Compliant
- UL File E91231 Package Code "EE"
- VDE Approval Certificate No. 40028086

#### **APPLICATIONS**

- Computer Terminals
- Industrial System Controllers
- Measuring Instruments
- Signal Transmission between Systems of Different Potentials and Impedances

#### **ORDER INFORMATION**

- Add X after PN for VDE Approval
- Add G after PN for 10mm lead spacing
- Add SM after PN for Surface Mount
- Add SMT&R after PN for Surface Mount Tape & Reel (Available for TLP521SM and TLP521-2SM)

Optional Order Part No. TLP521-1 for TLP521

 Consult Factory for Tape and Reel version of TLP521-4SM

# ROHS V

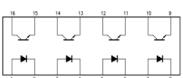
TLP521



TLP521-2



TLP521-4



#### ABSOLUTE MAXIMUM RATINGS $(T_A = 25^{\circ}C)$

Stresses exceeding the absolute maximum ratings can cause permanent damage to the device.

Exposure to absolute maximum ratings for long periods of time can adversely affect reliability.

Input

Forward Current 50mA
Reverse Voltage 6V
Power dissipation 70mW

Output

Collector to Emitter Voltage BV<sub>CEO</sub> 55V
Emitter to Collector Voltage BV<sub>ECO</sub> 6V
Collector Current 50mA
Power Dissipation 150mW

**Total Package** 

Isolation Voltage5300VRMSTotal Power Dissipation200mWOperating Temperature-30 to 100 °CStorage Temperature-55 to 125 °CLead Soldering Temperature260°C

(10s)

Lead Solderi

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# **ELECTRICAL CHARACTERISTICS** (Ambient Temperature = 25°C unless otherwise specified)

#### **INPUT**

Parameter	Symbol	Test Condition	Min	Тур.	Max	Unit
Forward Voltage	$V_{\rm F}$	$I_F = 10 \text{mA}$	1.0	1.15	1.3	V
Reverse Voltage	$V_R$	$I_R = 10\mu A$	6.0			V
Reverse Leakage	$I_R$	$V_R = 4V$			10	μΑ
Terminal Capacitance	$C_{t}$	V = 0V, $f = 1KHz$		30	250	pF

### OUTPUT

Parameter	Symbol	Test Condition	Min	Тур.	Max	Unit
Collector—Emitter breakdown Voltage	$BV_{CEO}$	$I_C = 0.5 \text{mA}, I_F = 0 \text{mA}$	55			V
Emitter—Collector breakdown Voltage	$\mathrm{BV}_{\mathrm{ECO}}$	$I_E = 100 \mu A, I_F = 0 mA$	6			V
Collector-Emitter Dark Current	$I_{CEO}$	$V_{CE} = 20V$ , $I_F = 0mA$			100	nA



# **ELECTRICAL CHARACTERISTICS** (Ambient Temperature = 25°C unless otherwise specified)

### **COUPLED**

Parameter	Symbol	Test Condition	Min	Тур.	Max	Unit
Current Transfer Ratio	CTR	$I_F = 5 \text{mA}, V_{CE} = 5 \text{V}$	50		600	%
		$\begin{array}{c} \text{Optional CTR Grades} \\ \text{GR} \\ \text{BL} \\ \text{GB} \\ \text{GB (I}_F = 1 \text{mA, V}_{CE} = 0.4 \text{V}) \end{array}$	100 200 100 30		300 600 600	
Collector—Emitter Saturation Voltage	V <sub>CE(sat)</sub>	$I_F = 8mA, I_C = 2.4mA$ GB ( $I_F = 1mA, I_C = 0.2mA$ )			0.4 0.4	V
Output Rise Time	$t_{\rm r}$	$V_{CE} = 2V$ , Ic = 2mA,		4		μs
Output Fall Time	$t_{\mathrm{f}}$	$R_{\rm L} = 100\Omega$		3		
Turn-on Time	t <sub>on</sub>			3		
Turn-off Time	$t_{\rm off}$			3		
Turn-on Time	$t_{ON}$	$V_{CC}=5V$ , $I_F=16\text{mA}$ ,		2		μs
Turn-off Time	$t_{ m OFF}$	$R_{L} = 1.9k\Omega$		25		

### **ISOLATION**

Parameter	Symbol	Test Condition	Min	Тур.	Max	Unit
Input to Output Isolation Voltage	$V_{\rm ISO}$	AC 1 minute, RH = 40 to 60% Note 1	5300			$V_{RMS}$
Input to Output Isolation Resistance	$R_{\rm ISO}$	V <sub>IO</sub> = 500V Note 1	5x10 <sup>10</sup>			Ω

Note 1: Measure with input leads shorted together and output leads shorted together.



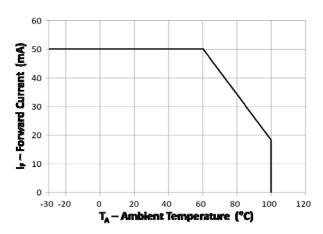


Fig 1 Forward Current vs T<sub>A</sub>

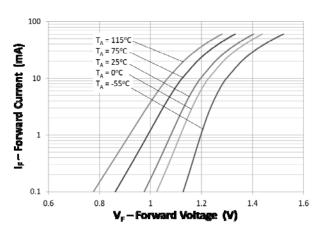


Fig 3 Forward Current vs Forward Voltage

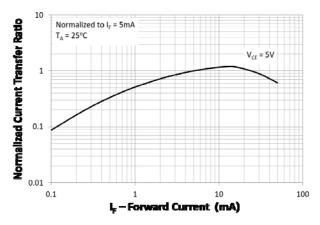


Fig 5 Normalized Current Transfer Ratio vs Forward Current

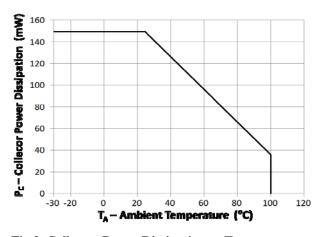


Fig 2 Collector Power Dissipation vs  $T_{\rm A}$ 

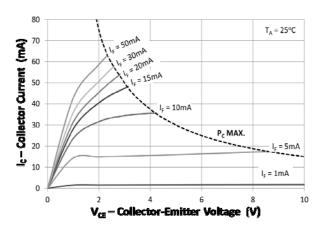


Fig 4 Collector Current vs Collector-Emitter Voltage

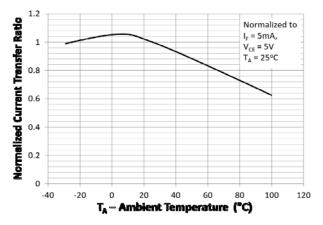


Fig 6 Normalized Current Transfer Ratio vs Ambient Temperature



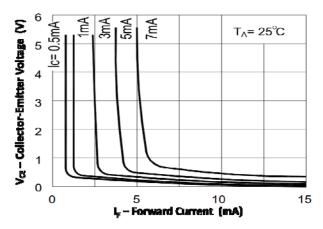


Fig 7 Collector-Emitter Voltage vs Forward Current

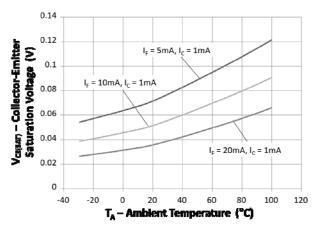


Fig 8 Collector-Emitter Voltage vs Ambient Temperature

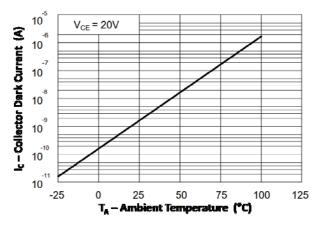


Fig 9 Collector Dark Current vs Ambient Temperture



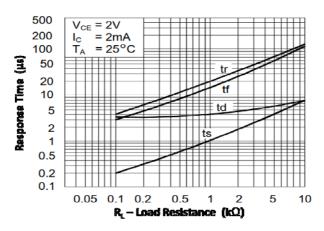
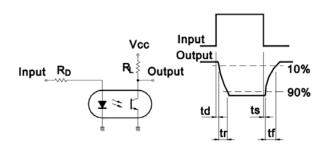


Fig 7 Response Time vs Load Resistance



**Response Time Test Circuit** 

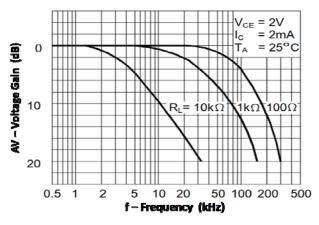
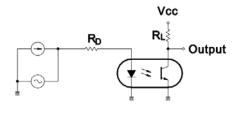


Fig 9 Frequency Response



**Frequency Response Test Circuit** 



### **ORDER INFORMATION**

	TLP521, TLP521-1 (UL Approval)					
After PN	PN	Description	Packing quantity			
None	TLP521, TLP521-1 TLP521GR, TLP521-1GR TLP521BL, TLP521-1BL, TLP521GB, TLP521-1GB	Standard DIP4	100 pcs per tube			
G	TLP521G, TLP521-1G, TLP521GRG, TLP521-1GRG, TLP521BLG, TLP521-1BLG TLP521GBG, TLP521-1GBG	10mm Lead Spacing	100 pcs per tube			
SM	TLP521SM, TLP521-1SM, TLP521GRSM, TLP521-1GRSM, TLP521BLSM, TLP521-1BLSM, TLP521GBSM, TLP521-1GBSM	Surface Mount	100 pcs per tube			
SMT&R	TLP521SMT&R, TLP521-1SMT&R TLP521GRSMT&R, TLP521-1GRSMT&R, TLP521BLSMT&R, TLP521-1BLSMT&R, TLP521GBSMT&R, TLP521-1GBSMT&R	Surface Mount Tape & Reel	1000 pcs per reel			

Note: Optional Order Part No. TLP521-1 for TLP521.



### **ORDER INFORMATION**

	TLP521-2 (UL Approval)					
After PN	PN	Description	Packing quantity			
None	TLP521-2, TLP521-2GR, TLP521-2BL, TLP521-2GB	Standard DIP8	50 pcs per tube			
G	TLP521-2G, TLP521-2GRG, TLP521-2BLG, TLP521-2GBG	10mm Lead Spacing	50 pcs per tube			
SM	TLP521-2SM, TLP521-2GRSM, TLP521-2BLSM, TLP521-2GBSM	Surface Mount	50 pcs per tube			
SMT&R	TLP521-2SMT&R, TLP521-2GRSMT&R, TLP521-2BLSMT&R, TLP521-2GBSMT&R	Surface Mount Tape & Reel	1000 pcs per reel			

	TLP521-4 (UL Approval)					
After PN	PN	Description	Packing quantity			
None	TLP521-4, TLP521-4GR, TLP521-4BL, TLP521-4GB	Standard DIP16	25 pcs per tube			
G	TLP521-4G, TLP521-4GRG, TLP521-4BLG, TLP521-4GBG	10mm Lead Spacing	25 pcs per tube			
SM	TLP521-4SM, TLP521-4GRSM, TLP521-4BLSM, TLP521-4GBSM	Surface Mount	25 pcs per tube			



### **ORDER INFORMATION**

	TLP521X, TLP521-1X (UL and VDE Approvals)				
After PN	PN	Description	Packing quantity		
None	TLP521X, TLP521-1X TLP521XGR, TLP521-1XGR TLP521XBL, TLP521-1XBL, TLP521XGB, TLP521-1XGB	Standard DIP4	100 pcs per tube		
G	TLP521XG, TLP521-1XG, TLP521XGRG, TLP521-1XGRG, TLP521XBLG, TLP521-1XBLG TLP521XGBG, TLP521-1XGBG	10mm Lead Spacing	100 pcs per tube		
SM	TLP521XSM, TLP521-1XSM, TLP521XGRSM, TLP521-1XGRSM, TLP521XBLSM, TLP521-1XBLSM, TLP521XGBSM, TLP521-1XGBSM	Surface Mount	100 pcs per tube		
SMT&R	TLP521XSMT&R, TLP521-1XSMT&R TLP521XGRSMT&R, TLP521-1XGRSMT&R, TLP521XBLSMT&R, TLP521-1XBLSMT&R, TLP521-1XBLSMT&R, TLP521XGBSMT&R, TLP521-1XGBSMT&R	Surface Mount Tape & Reel	1000 pcs per reel		

Note: Optional Order Part No. TLP521-1 for TLP521.



### **ORDER INFORMATION**

	TLP521-2X (UL and VDE Approvals)					
After PN	PN	Description	Packing quantity			
None	TLP521-2X, TLP521-2XGR, TLP521-2XBL, TLP521-2XGB	Standard DIP8	50 pcs per tube			
G	TLP521-2XG, TLP521-2XGRG TLP521-2XBLG, TLP521-2XGBG	10mm Lead Spacing	50 pcs per tube			
SM	TLP521-2XSM, TLP521-2XGRSM, TLP521-2XBLSM, TLP521-2XGBSM	Surface Mount	50 pcs per tube			
SMT&R	TLP521-2XSMT&R, TLP521-2XGRSMT&R, TLP521-2XBLSMT&R, TLP521-2XGBSMT&R	Surface Mount Tape & Reel	1000 pcs per reel			

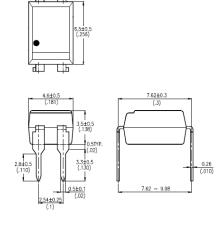
	TLP521-4X (UL and VDE Approvals)					
After PN	PN	Description	Packing quantity			
None	TLP521-4X, TLP521-4XGR, TLP521-4XBL, TLP521-4XGB	Standard DIP16	25 pcs per tube			
G	TLP521-4XG, TLP521-4XGRG, TLP521-4XBLG, TLP521-4XGBG	10mm Lead Spacing	25 pcs per tube			
SM	TLP521-4XSM, TLP521-4XGRSM, TLP521-4XBLSM, TLP521-4XGBSM	Surface Mount	25 pcs per tube			



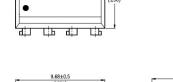
# **PACKAGE DIMENSIONS in mm (inch)**

DIP

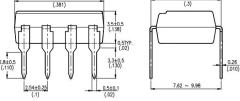




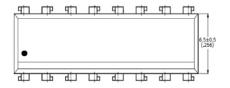
### TLP521-2

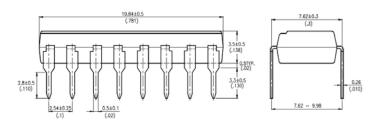


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## TLP521-4



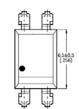


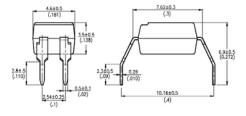


# **PACKAGE DIMENSIONS** in mm (inch)

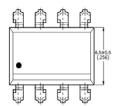
### **G** Form

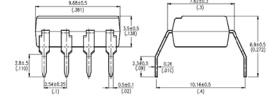
### **TLP521G**



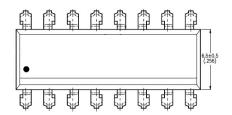


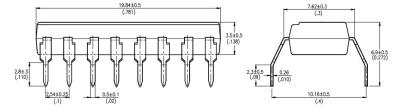
### TLP521-2G





# TLP521-4G



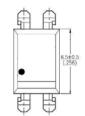


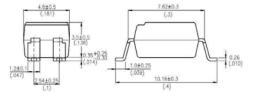


# **PACKAGE DIMENSIONS in mm (inch)**

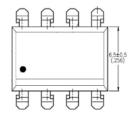
#### **SMD**

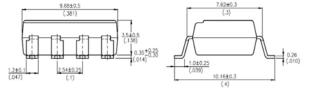
### TLP521SM



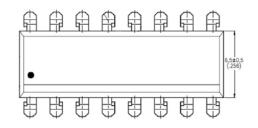


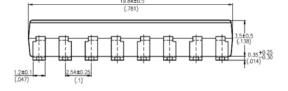
#### **TLP521-2SM**

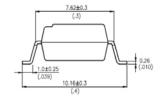




## **TLP521-4SM**



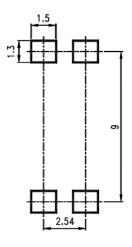




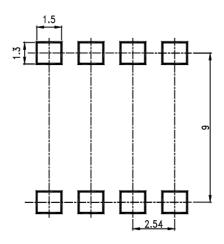


# **RECOMMENDED PAD LAYOUT FOR SMD (mm)**

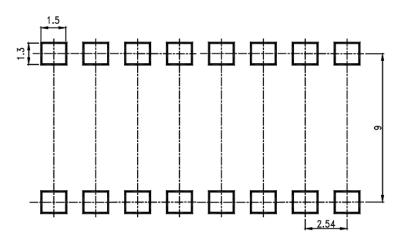




### **TLP521-2SM**

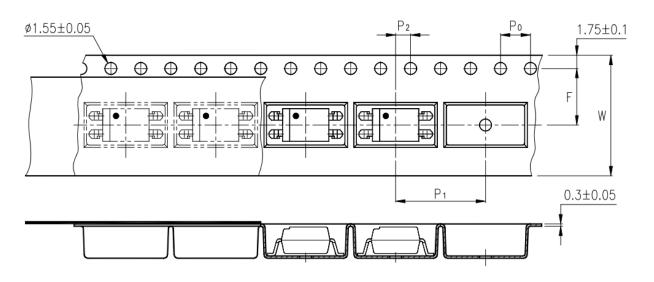


#### **TLP521-4SM**

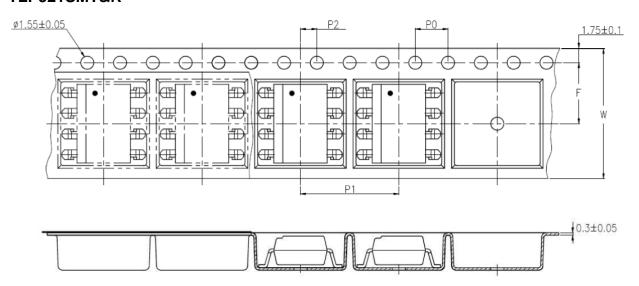




#### **TAPE AND REEL PACKAGING**



#### TLP521SMT&R

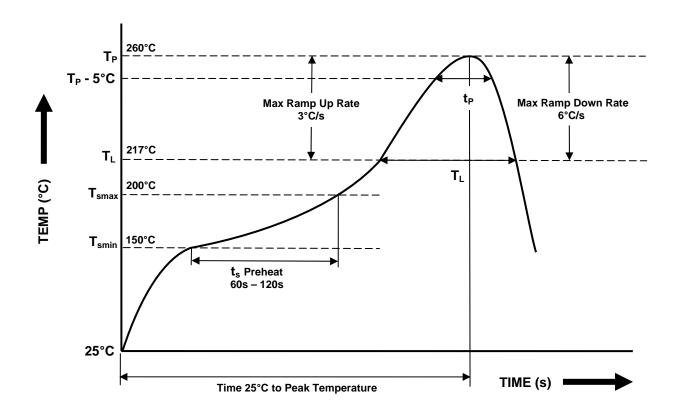


### TLP521-2SMT&R

Description	Symbol	Dimensions in mm (inches)
Tape wide	W	$16 \pm 0.3  (.63)$
Pitch of sprocket holes	P <sub>0</sub>	4 ± 0.1 ( .15 )
Distance of commontment	F	$7.5 \pm 0.1 ( .295 )$
Distance of compartment	P <sub>2</sub>	$2 \pm 0.1 (.079)$
Distance of compartment to compartment	P1	12 ± 0.1 ( .472 )



# IR REFLOW SOLDERING TEMPERATURE PROFILE FOR SMD (One Time Reflow Soldering is Recommended)



Profile Details	Conditions
$ \begin{array}{l} \textbf{Preheat} \\ \textbf{- Min Temperature } (T_{SMIN}) \\ \textbf{- Max Temperature } (T_{SMAX}) \\ \textbf{- Time } T_{SMIN} \text{ to } T_{SMAX} \left(t_s\right) \end{array} $	150°C 200°C 60s - 120s
$\begin{tabular}{lll} \textbf{Soldering Zone} \\ - & \begin{tabular}{l} - $	260°C 10s max 217°C 30s max 60s - 100s 3°C/s max 6°C/s max
Average Ramp Up Rate (T <sub>smax</sub> to T <sub>P</sub> )	3°C/s max
Time 25°C to Peak Temperature	8 minutes max



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- Do not immerse device body in solder paste.



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