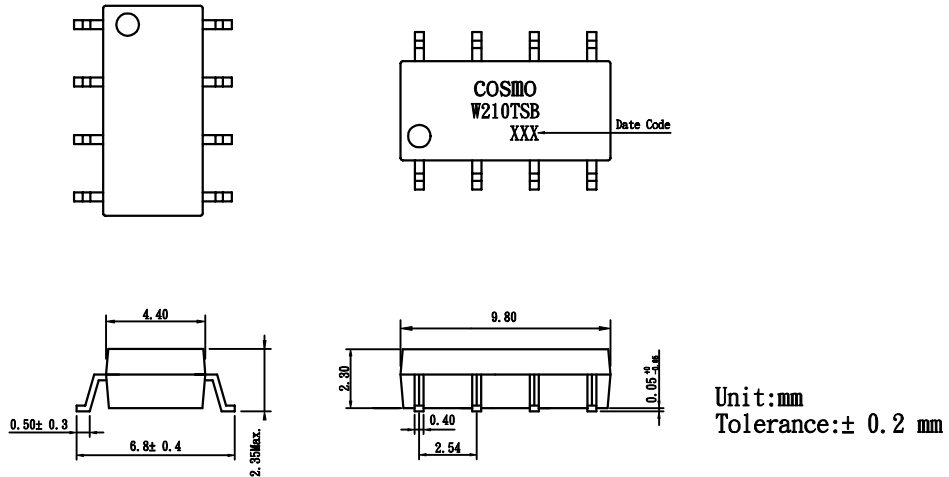


# PRODUCT SPECIFICATION

<b>COSMO</b> ELECTRONICS CO., LTD.	PHOTO MOS RELAYS: <b>KAQW210TSB</b>	SHEET 1 OF 10
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• **OUTSIDE DIMENSION :**



• **Turn on/Turn off time**



**Absolute Maximum Ratings ( $T_A=25^\circ\text{C}$ )**

**Emitter (Input)**

Reverse Voltage . . . . .	5.0V
Continuous Forward Current . . . . .	50mA
Peak Forward Current (1s) . . . . .	1A
Power Dissipation. . . . .	100mW
Derate Linearly from $25^\circ\text{C}$ . . . . .	1.3mW/ $^\circ\text{C}$

Derate Linearly from $25^\circ\text{C}$ . . . . .	2.5mW/ $^\circ\text{C}$
Storage Temperature Range . . . . .	$-40$ to $+150^\circ\text{C}$
Operating Temperature Range. . . . .	$-40$ to $+85^\circ\text{C}$
Junction Temperature . . . . .	$100^\circ\text{C}$
Soldering Temperature, 2mm from case, 10 sec. . . . .	$260^\circ\text{C}$

**Detector (Output)**

Output Breakdown Voltage . . . . .	$\pm 350\text{V}$
Continuous Load Current . . . . .	$\pm 130\text{mA}$
Power Dissipation . . . . .	500mW

**General Characteristics**

Isolation Test Voltage. . . . .	1500VAC <sub>RMS</sub>
Isolation Resistance	
$V_{10}=500\text{V}, T_A=25^\circ\text{C}$ . . . . .	$\geq 10^{10}\Omega$
Total Power Dissipation . . . . .	550mW

# PRODUCT SPECIFICATION

<b>COSMO</b> ELECTRONICS CO., LTD.	PHOTO MOS RELAYS: <b>KAQW210TSB</b>	SHEET 2 OF 10
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## Characteristics

(T<sub>A</sub> = 25° C)

Description	Symbol	Min.	Typ.	Max.	Unit	Test Condition
<b>Emitter (Input)</b>						
Forward Voltage	V <sub>F</sub>		1.2	1.5	V	I <sub>F</sub> = 10mA
Operation Input Current	I <sub>FON</sub>			5	mA	V <sub>L</sub> = ± 20V, I <sub>L</sub> = 100mA, t = 10 ms
Recovery Input Current	I <sub>FOFF</sub>	0.05			mA	V <sub>L</sub> = ± 20V, I <sub>L</sub> = <5uA
<b>Detector (Output)</b>						
Output Breakdown Voltage	V <sub>B</sub>	350			V	I <sub>B</sub> = 50uA
Output Off-State Leakage	I <sub>T(OFF)</sub>		0.7	2	uA	V <sub>T</sub> = 100V, I <sub>F</sub> = 0mA
I/O Capacitance	C <sub>ISO</sub>		6		pF	I <sub>F</sub> = 0, f = 1MHz
ON Resistance	R <sub>ON</sub>		28	35	Ω	I <sub>L</sub> = 100mA, I <sub>F</sub> = 10mA
Turn-on Time	T <sub>ON</sub>		0.1	0.5	ms	I <sub>F</sub> = 10mA, V <sub>L</sub> = ± 20V
Turn-off Time	T <sub>OFF</sub>		0.3	0.5	ms	t = 10ms, I <sub>L</sub> = ± 100mA

## Mos Relay Schematic and Wiring Diagrams

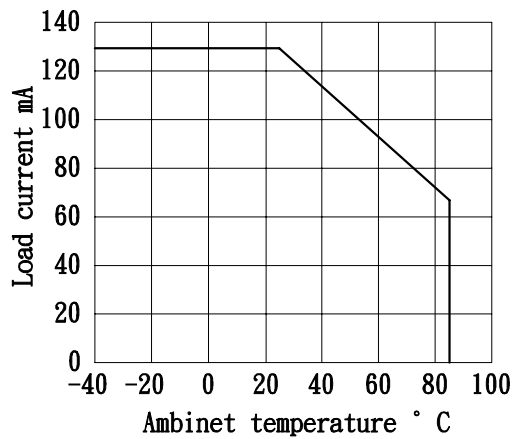
Type	Schematic	Output configuration	Load	Con-nection	Wiring diagram
KAQW210TSB		1a	AC/DC	-	

# PRODUCT SPECIFICATION

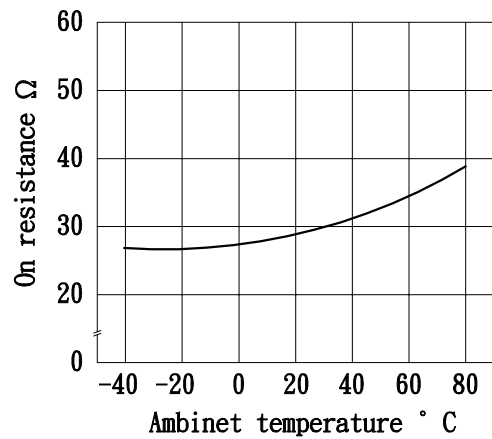
<p><b>COSMO</b> ELECTRONICS CO., LTD.</p>	<p>PHOTO MOS RELAYS: <b>KAQW210TSB</b></p>	<p>SHEET 3 OF 10</p>
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## DATA CURVE

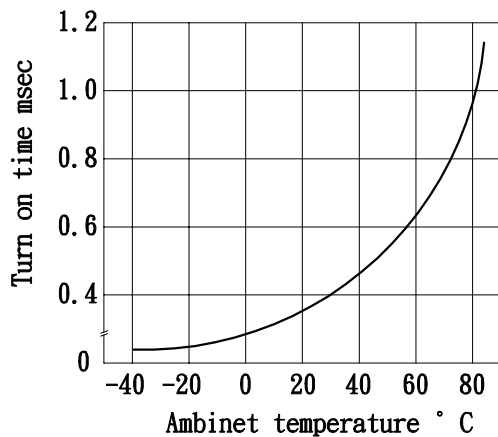
Load current vs. ambient temperature  
Allowable ambient temperature:  
-40° C+85° C



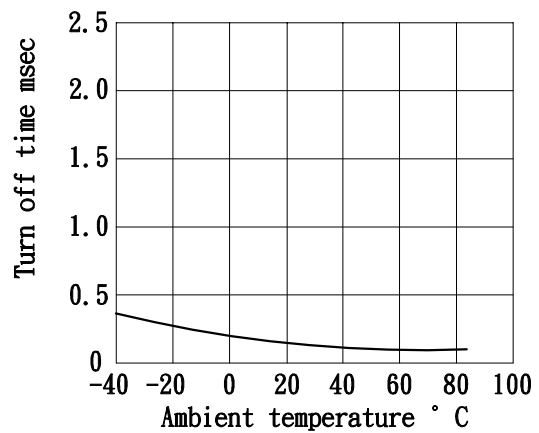
On resistance vs. ambient temperature  
Across terminals 7 and 8 pin  
LED current: 5mA  
Continuous load current: 130 mA(DC)



Turn on time vs. ambient temperature  
Load voltage 350 V(DC)  
LED current :5mA  
Continuous load current: 130mA(DC)



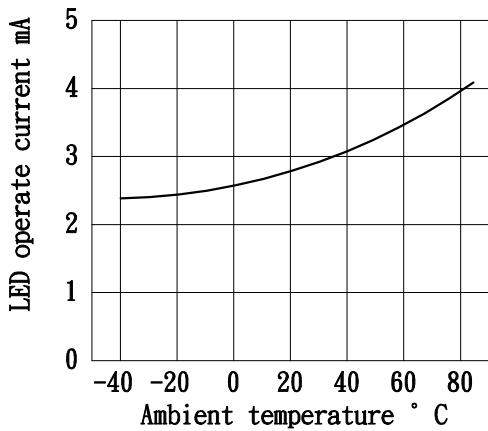
Turn off time vs. ambient temperature  
LED current: 5mA; Load voltage: 350V(DC)  
Continuous load current: 130mA(DC)



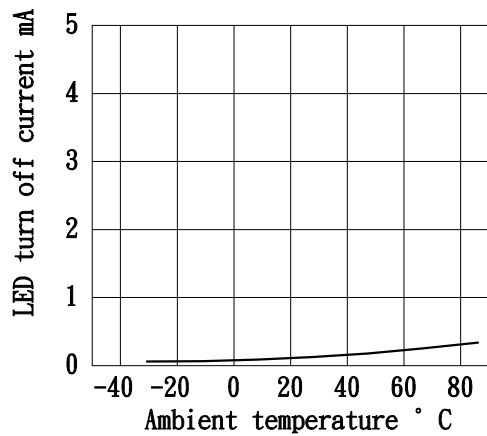
# PRODUCT SPECIFICATION

<p><b>COSMO</b> ELECTRONICS CO., LTD.</p>	<p>PHOTO MOS RELAYS: <b>KAQW210TSB</b></p>	<p>SHEET 4 OF 10</p>
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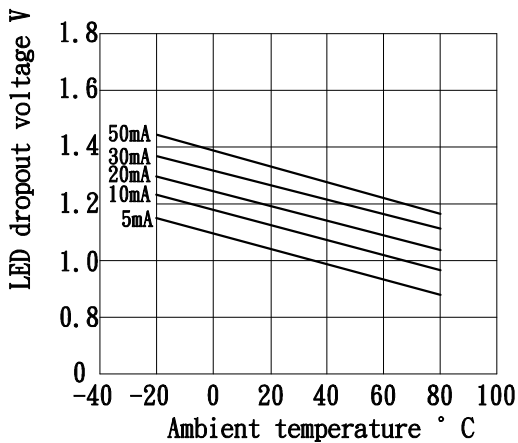
LED operate vs. ambient temperature  
Load voltage: 350V(DC)  
Continuous load current: 130mA(DC)



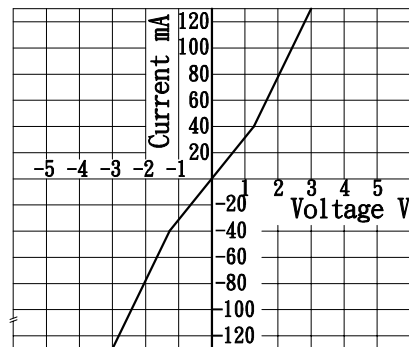
LED turn off current vs. ambient temperature  
Load voltage: 350V(DC)  
Continuons load current: 130mA(DC)



LED dropout voltage vs. ambient temperature  
LED current: 5 to 50mA



Voltage vs. current characteristics of output at MOS FET portion  
Measured portion: across terminals 7 and 8 pin  
Ambient temperature: 25° C



# PRODUCT SPECIFICATION

**COSMO**

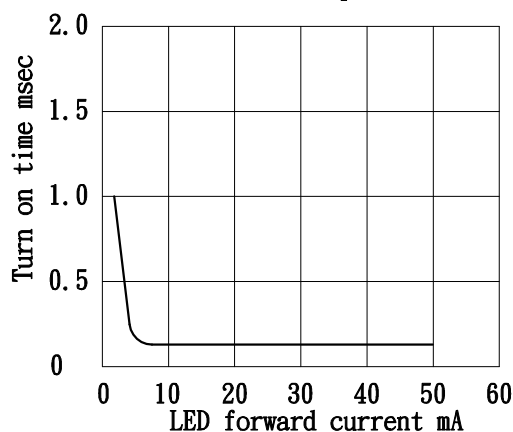
ELECTRONICS CO., LTD.

PHOTO MOS RELAYS:

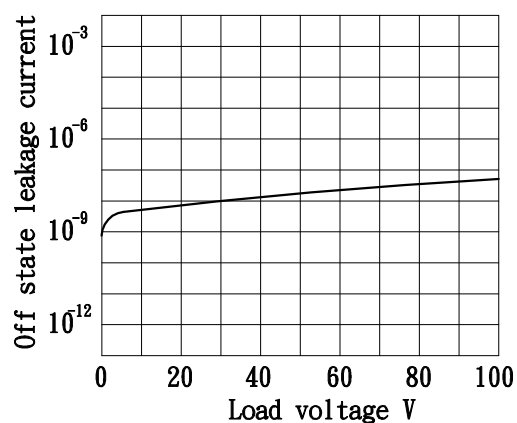
**KAQW210TSB**

SHEET 5 OF 10

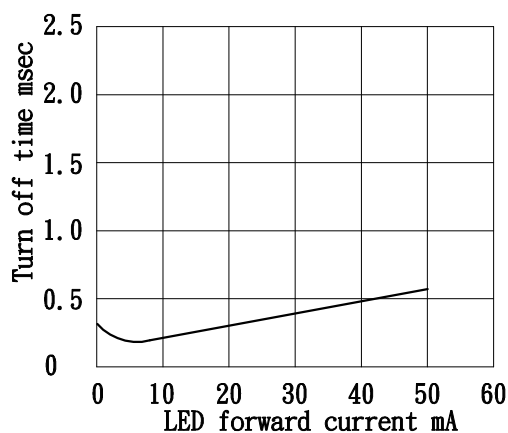
LED forward current vs. turn on time  
Across terminals 7 and 8pin; Load voltage: 350V(DC); Continuous load current: 130mA(DC); Ambient temperature: 25° C



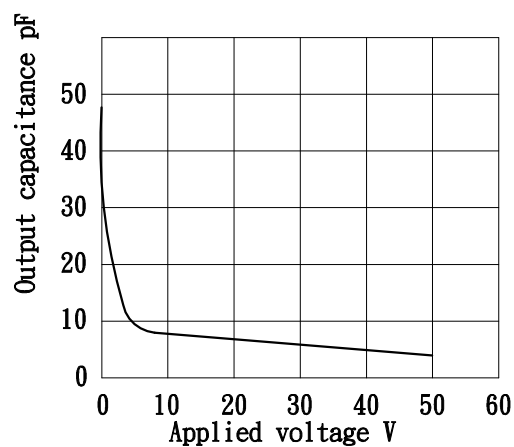
Off state leakage current  
Across terminals 7 and 8pin  
Ambient temperature: 25° C



LED forward current vs. turn off time  
Across terminals 7 and 8pin; Load voltage: 350V(DC); Continuous load current: 130 mA(DC); Ambient temperature: 25° C



Applied voltage vs. output capacitance  
Across terminals 7 and 8pin  
Frequency: 1MHz; Ambient temperature: 25° C



# PRODUCT SPECIFICATION

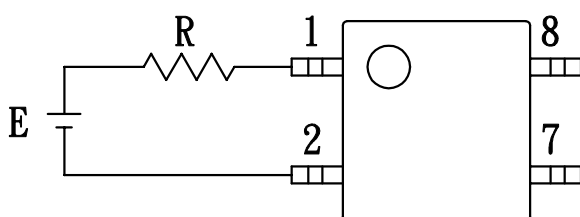
<b>COSMO</b> ELECTRONICS CO., LTD.	PHOTO MOS RELAYS: <b>KAQW210TSB</b>	SHEET 6 OF 10
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## USING METHODS

Examples of resistance value to control LED forward current  $I_F$

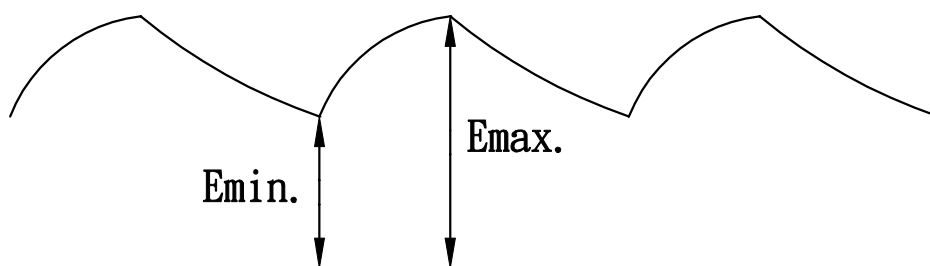
Photo MOSRELAY

( $I_F = 5\text{mA}$ )



E	R
3.3V	Approx. 240 ohm
5V	Approx. 540 ohm
12V	Approx. 1.8K ohm
15V	Approx. 2.4K ohm
24V	Approx. 4K ohm

- (1) LED forward current must be more than 5mA, at E min.
- (2) LED forward current must be less than 50mA, at E max.

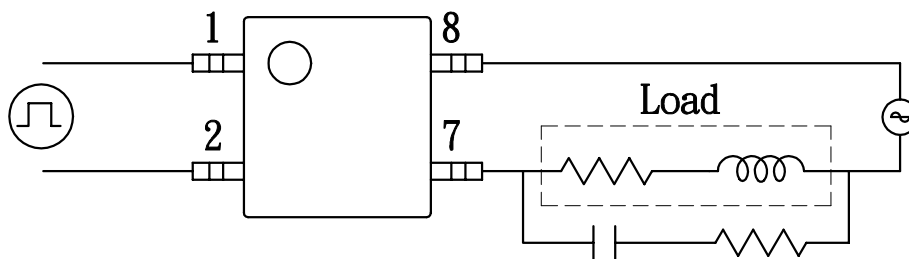
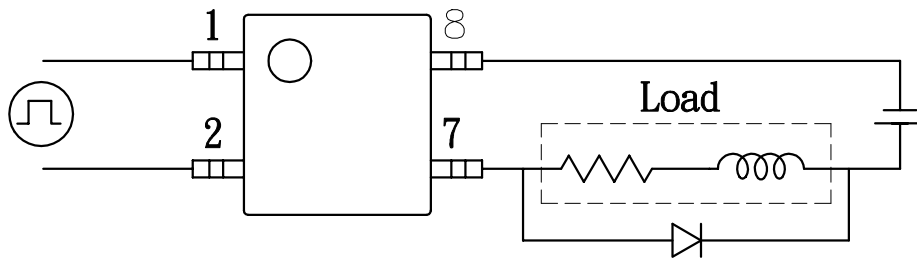


# PRODUCT SPECIFICATION

<b>COSMO</b> ELECTRONICS CO., LTD.	PHOTO MOS RELAYS: <b>KAQW210TSB</b>	SHEET 7 OF 10
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## USING METHODS

Regulate the spike voltage generated on the inductive load as follows



R-C Snubber

# PRODUCT SPECIFICATION

<b>COSMO</b> ELECTRONICS CO., LTD.	PHOTO MOS RELAYS: <b>KAQW210TSB</b>	SHEET 8 OF 10
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## • Absolute Maximum Ratings

(Ta=25°C)

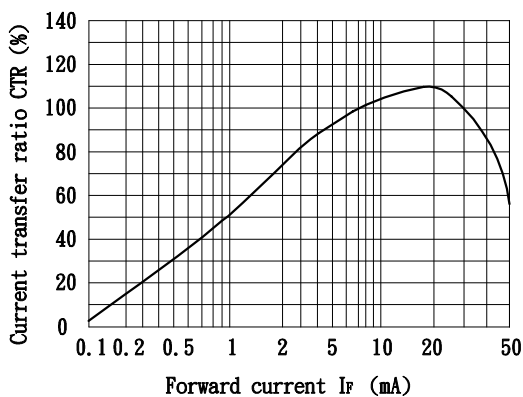
Parameter		Symbol	Rating	Unit
Input	Forward current	$I_F$	$\pm 50$	mA
	Peak forward current	$I_{FM}$	$\pm 1$	A
	Power dissipation	$P_D$	70	mW
Output	Collector-emitter voltage	$V_{CE0}$	60	V
	Emitter-collector voltage	$V_{ECO}$	6	V
	Collector current	$I_c$	50	mA
	Collector power dissipation	$P_c$	150	mW
Total power dissipation		$P_{tot}$	200	mW
Isolation voltage 1 minute		$V_{iso}$	3750	$V_{rms}$
Operating temperature		$T_{opr}$	-30 to +100	° C
Storage temperature		$T_{stg}$	-55 to +125	° C
Soldering temperature 10 second		$T_{sol}$	260	° C

## • Electro-optical Characteristics

(Ta=25°C)

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input	Forward voltage	$V_F$	$I_F = \pm 20mA$	-	1.2	1.4	V
	Peak forward voltage	$V_{FM}$	$I_{FM} = \pm 0.5A$	-	-	3.5	V
	Terminal capacitance	$C_t$	$V=0, f=1kHz$	-	30	-	pF
Output	Collector dark current	$I_{CE0}$	$V_{CE}=20V, I_F=0$	-	-	0.1	uA
	Current transfer ratio	CTR	$I_F = \pm 1mA, V_{CE}=5V$	30	100	-	%
Transfer characteristics	Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_F = \pm 20mA, I_c=1mA$	-	0.1	0.3	V
	Isolation resistance	$R_{iso}$	DC500V	$5 \times 10^{10}$	$10^{11}$	-	ohm
	Floating capacitance	$C_f$	$V=0, f=1MHz$	-	0.6	1.0	pF
	Cut-off frequency	$f_c$	$V_{CC}=5V, I_c=2mA, R_L=100ohm$	-	80	-	kHz
	Response time (Rise)	$t_r$	$V_{CC}=2V, I_c=2mA, R_L=100ohm$	-	5	20	us
	Response time (Fall)	$t_f$		-	4	20	us

Fig.1 Current Transfer Ratio vs. Forward Current





# PRODUCT SPECIFICATION

<p><b>COSMO</b> ELECTRONICS CO., LTD.</p>	<p>PHOTO MOS RELAYS: <b>KAQW210TSB</b></p>	<p>SHEET 9 OF 10</p>
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Fig. 2 Collector Power Dissipation vs. Ambient Temperature

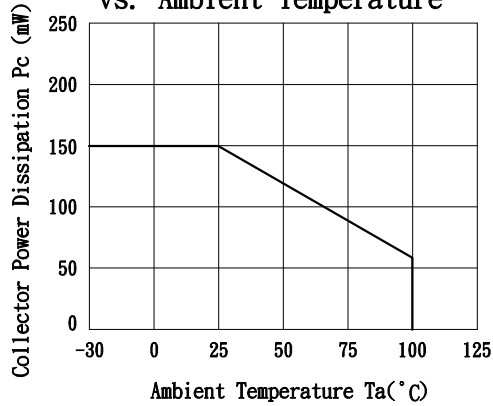


Fig. 3 Collector Dark Current vs. Ambient Temperature

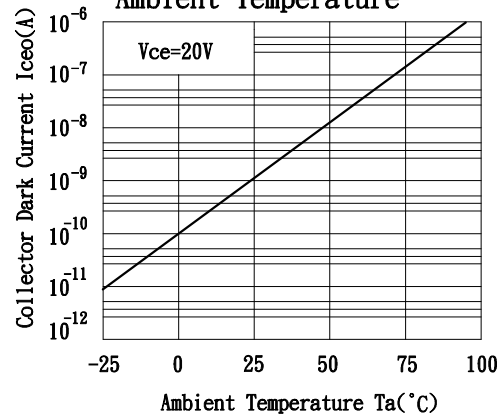


Fig. 4 Forward Current vs. Ambient Temperature

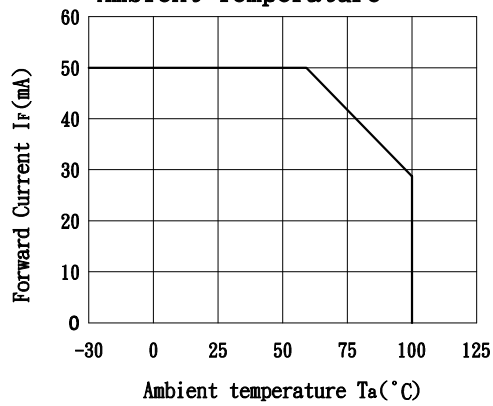


Fig. 5 Forward Current vs. Forward Voltage

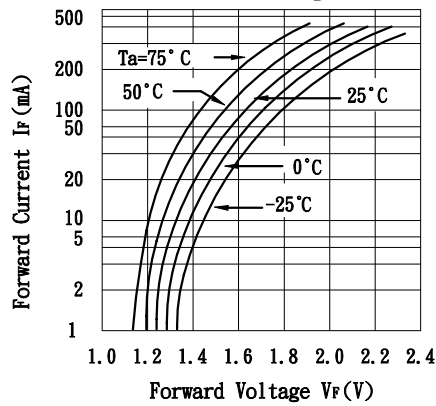


Fig. 6 Collector Current vs. Collector-emitter Voltage

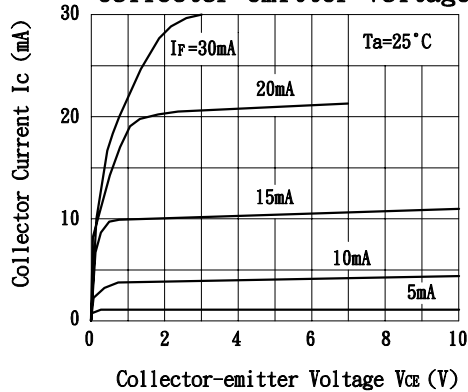
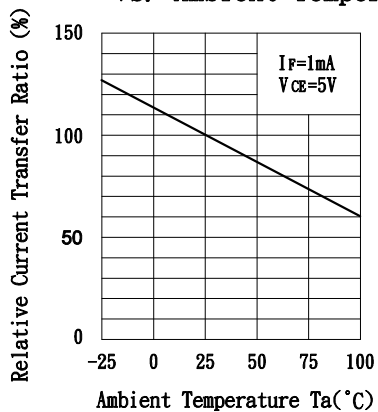


Fig. 7 Relative Current Transfer Ratio vs. Ambient Temperature



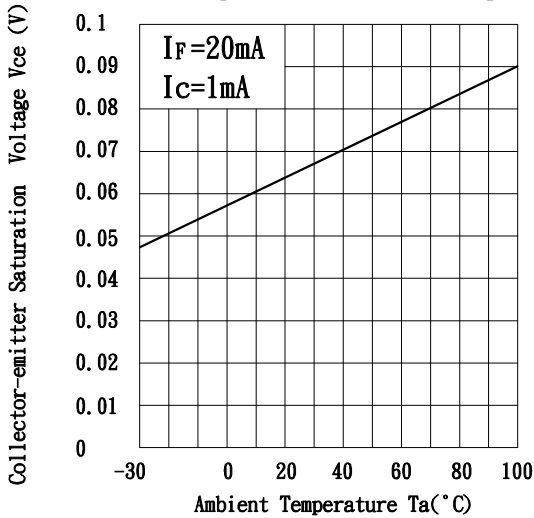
# PRODUCT SPECIFICATION

**COSMO**  
ELECTRONICS CO., LTD.

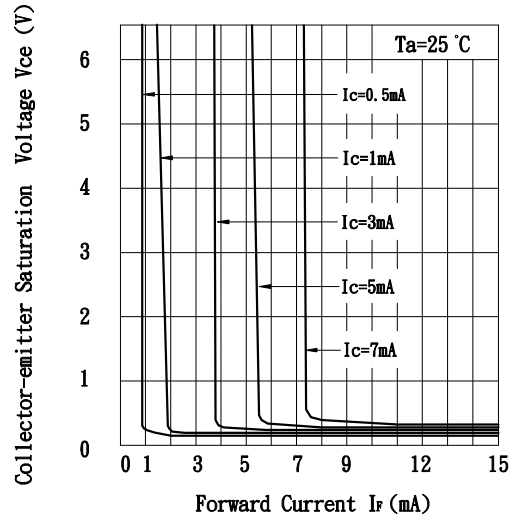
PHOTO MOS RELAYS:  
**KAQW210TSB**

SHEET 10 OF 10

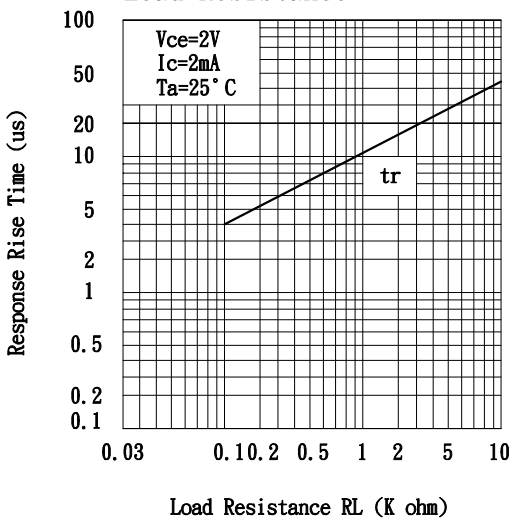
**Fig. 8** Collector-emitter Saturation Voltage vs. Ambient Temperature



**Fig. 9** Collector-emitter Saturation Voltage vs. Forward Current



**Fig. 10** Response Time vs. Load Resistance



**Fig. 11** Response Time vs. Load Resistance

