

High Reliability Photocoupler

● Features

1. Current transfer ratio

CTR : MIN.60 at $I_i=2\text{mA}$ $V_{ce}=5\text{V}$

2. High isolation voltage between input and output (Viso:5000Vrms).
3. Compact dual-in-line package.

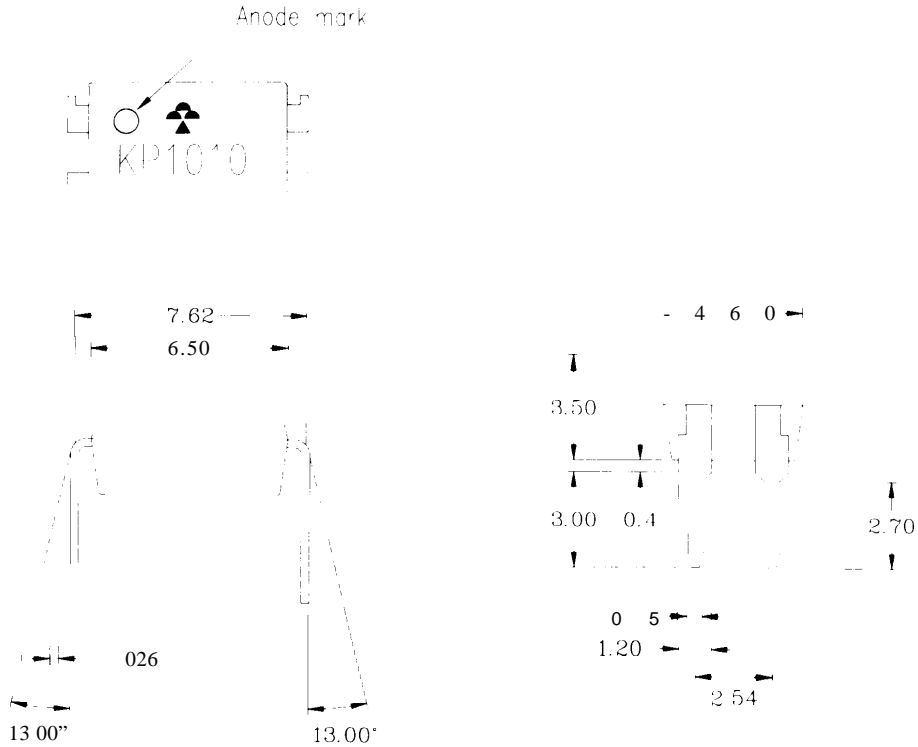
● Applications

1. Registers copiers, automatic vending machines.
2. System appliances, measuring instruments.
3. Computer terminals, programmable controllers.
4. communications. telephone, etc.
5. Electric home appliances, such as oil fan heaters, Microwave oven, Washer, Refrigerator, Air conditioner, etc.
6. Medical instruments, physical and chemical equipment.
7. Signal transmission between circuits of different potentials and impedances.
8. Facsimile equipment, Audio, Video.
9. Switching power supply, Laser beam printer.

KP1010

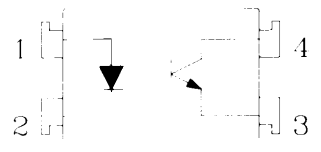
KP1010

1. OUTSIDE DIMENSION : UNIT (mm)



TOLERANCE : ±0.1mm

2. SCHEMATIC: TOP VIEW



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

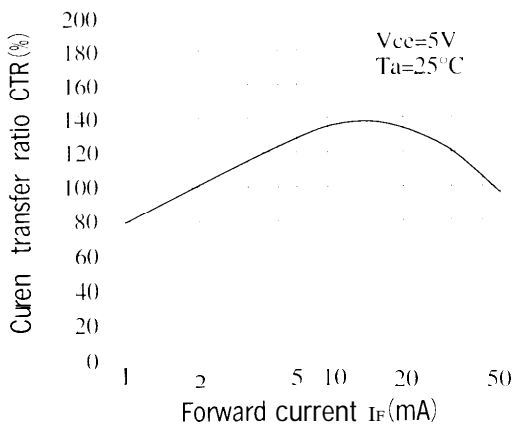
● Absolute Maximum Ratings (Ta=25°C)

Parameter	Symbol	Rating	Unit
Input	Forward current	I_F	50 mA
	Peak forward current	I_{FM}	1 A
	Reverse voltage	V_R	6 V
	Power dissipation	P_D	70 mW
output	Collector-emitter voltage	V_{CE}	60 V
	Emitter-collector voltage	V_{EC}	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}	5000 Vrms
	Operating temperature	T_{op}	-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 $I_F=20mA$	-	1.2	1.4	
	Peak forward voltage	V_{FM} $I_{FM}=0.5A$	-		3.5	
	Reverse current	I_R $V_R=4V$	-		10	μA
output	Terminal capacitance	C_T $V=0, f=1kHz$	-	30		pF
	Collector dark current	I_{CO} $V_{CE}=20V$	-		10	μA
	Current transfer ratio	CTR $I_i=2mA, V_{CE}=5V$	60		600	%
Transfer characteristics	Collector-emitter saturation voltage	$V_{CE(sat)}$ $I_i=20mA, I_C=1mA$	-	0.1	0.3	
	Isolation resistance	R_{iso} DC500V	5×10^9	10		ohm
	Floating capacitance	C_f $V=0, f=1MHz$	-	0.6	1.0	pF
	Cut-off frequency	f_c $V_{CE}=5V, I_i=2mA, R=100ohm$	-	80		kHz
	Response time (Rise)	t_r $V_{CE}=5V, I_i=2mA, R=100ohm$	-	5	20	μs
Response time (Fall)	t_f	-		20	μs	

Fig. 1 Current Transfer Ratio vs. Forward Current



Classification table of current transfer ratio is shown below

Model NO.	CTR (%)
KP1010 A	60 TO 160
KP1010 B	130 TO 260
KP1010 C	200 TO 400
KP1010 D	300 TO 600
KP1010 E	60 TO 600

Fig. 2 Collector Power Dissipation vs. Ambient Temperature

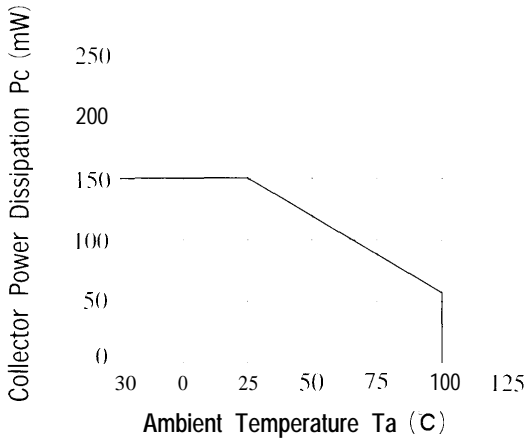


Fig. 3 Collector Dark Current vs. Ambient Temperature

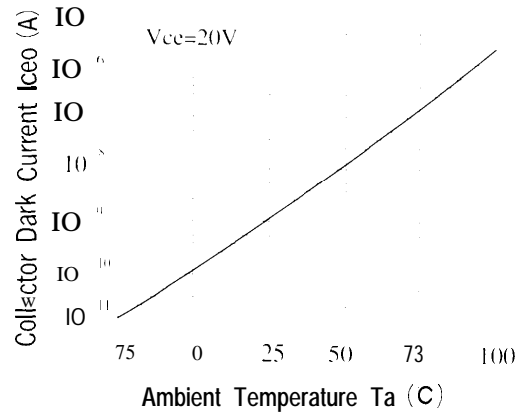


Fig. 4 Forward Current vs. Ambient Temperature

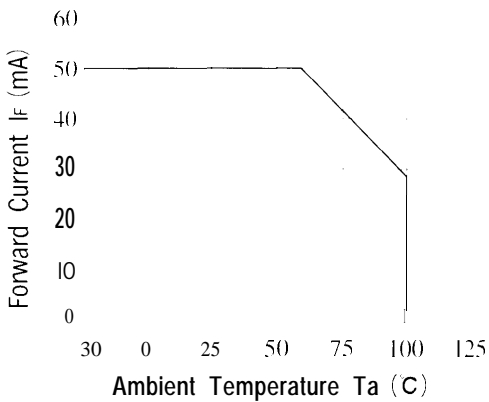


Fig. 5 Forward Current vs. Forward Voltage

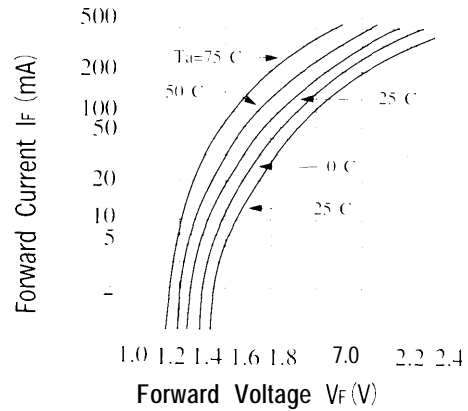


Fig. 6 Collector Current vs. Collector-emitter Voltage

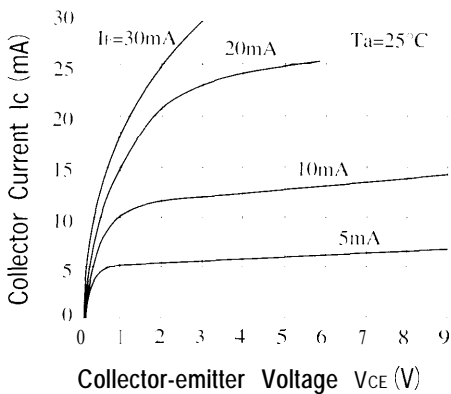


Fig. 7 Relative Current Transfer Ratio vs. Ambient Temperature

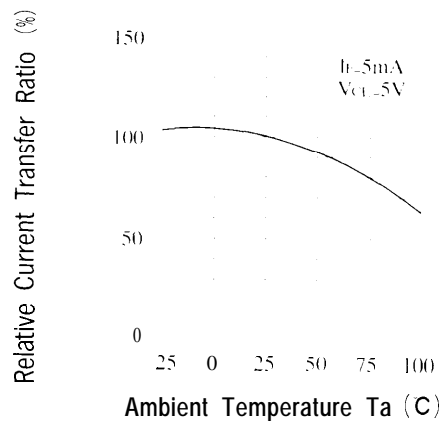


Fig. 8 Collector-emitter Saturation Voltage vs. Ambient Temperature

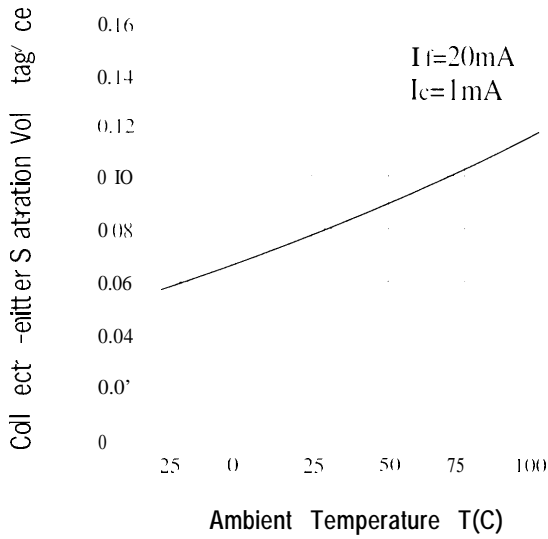


Fig. 9 Collector-emitter Saturation Voltage vs. Forward Current

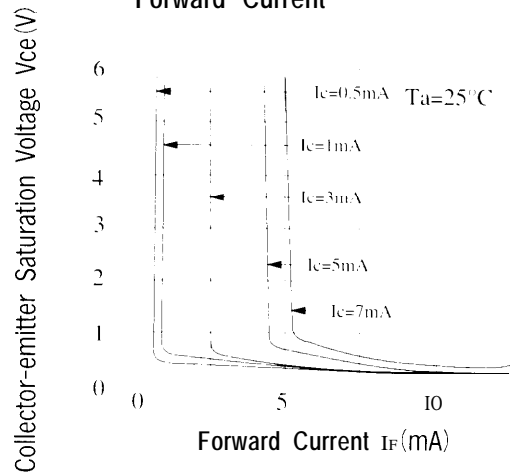


Fig. 10 Response Time vs. Load Resistance

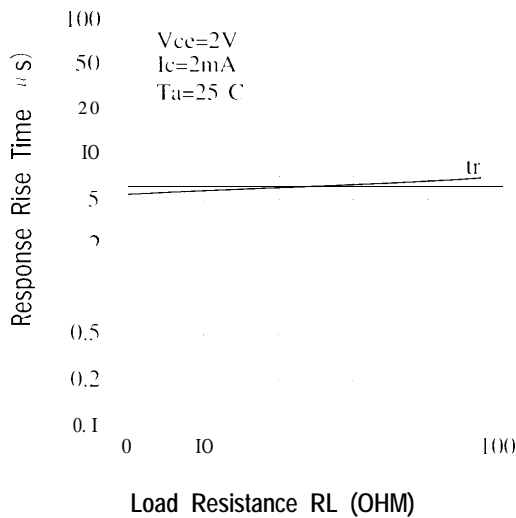
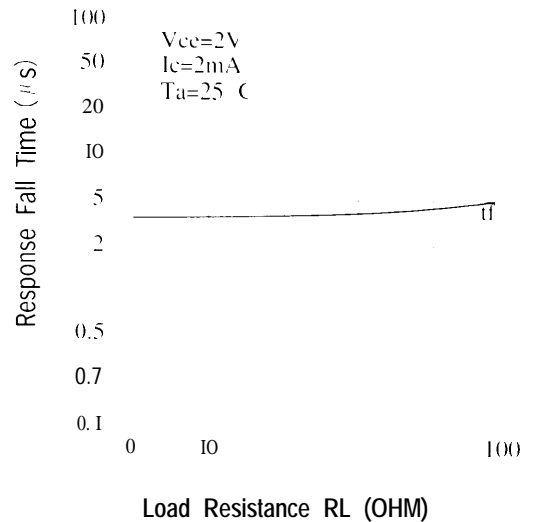


Fig. 11 Response Time vs. Load Resistance

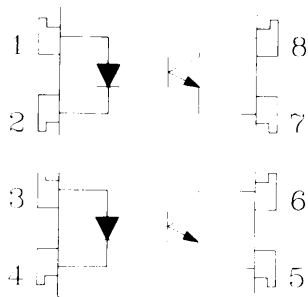


1. OUTSIDE DIMENSION : UNIT (mm)

KP1020



2. SCHEMATIC : TOP VIEW



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

● Absolute Maximum Ratings

(Ta=25°C)

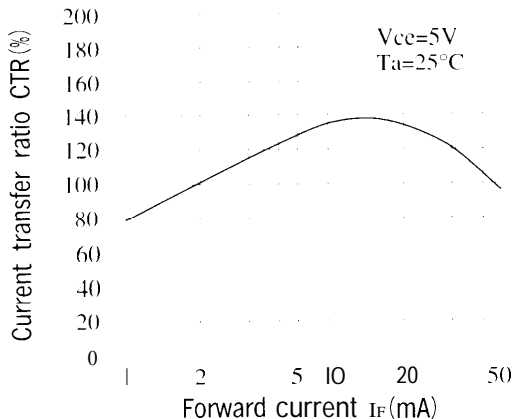
Parameter	Symbol	Rating	Unit	
Input	Forward current	50	mA	
	Peak forward current	1	A	
	Reverse voltage	6	V	
output	Power dissipation	70	mW	
	Collector-emitter voltage	60	V	
	Emitter-collector voltage	6	V	
	Collector current	50	mA	
	Collector power dissipation	150	mW	
	Total power dissipation	200	mW	
	Isolation voltage 1 minute	V	5000	Vrms
	Operating temperature	T _{op}	-30 to +100	°C
Storage temperature	T _{st}	-55 to +125	°C	
Soldering temperature 10 second	T _{sd}	260	°C	

● Electro-optical Characteristics

(Ta=25°C)

Parameter	Symbol	Conditions	MIN	TYP	MAX	Unit
Input	Forward voltage	V _F I _F =20mA	-	1.2	1.4	V
	Peak forward voltage	V _{FM} I _{FM} =0.5A	-	-	3.5	V
	Reverse current	I _R V _R =4V	-	-	10	μA
output	Terminal capacitance	C _T V=0, f=1kHz	-	30	-	pF
	Collector dark current	I _{CEO} V _{CE} =20V	-	-	10	A
Transfer characteristics	Current transfer ratio	CTR I _F =2mA, V _{CE} =5V	60	-	600	%
	Collector-emitter saturation voltage	V _{CE(sat)} I _F =20mA, I _E =1mA	-	0.1	0.3	V
	Isolation resistance	R _{is} DC500V	5x10	10	-	ohm
	Floating capacitance	C _F V=0, f=1MHz	-	0.6	1.0	pF
	Cut-off frequency	f _c V _{CE} =5V, I _F =2mA, R=100ohm	-	80	-	kHz
Response time (Rise)	t _r V _{CE} =5V, I _F =2mA, R=100ohm	-	5	20	μs	
Response time (Fall)	t _f V _{CE} =5V, I _F =2mA, R=100ohm	-	4	20	μs	

Fig. 1 Current Transfer Ratio vs. Forward Current



Classification table of current transfer ratio is shown below

Model NO.	CTR (%)
KP1020 A	60 TO 160
KP1020 B	130 TO 260
KP1020 C	200 TO 400
KP1020 D	300 TO 600
KP1020 E	60 TO 600

Fig. 2 Collector Power Dissipation vs. Ambient Temperature

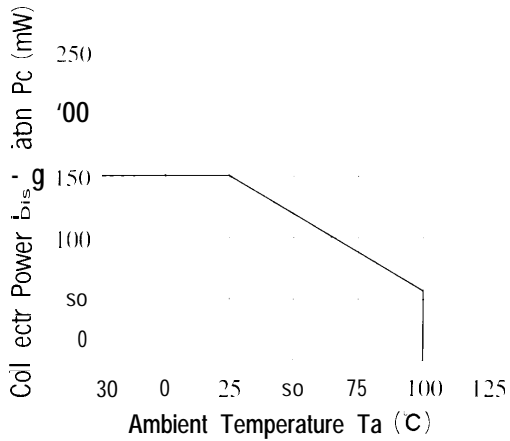


Fig. 3 Collector Dark Current vs. Ambient Temperature

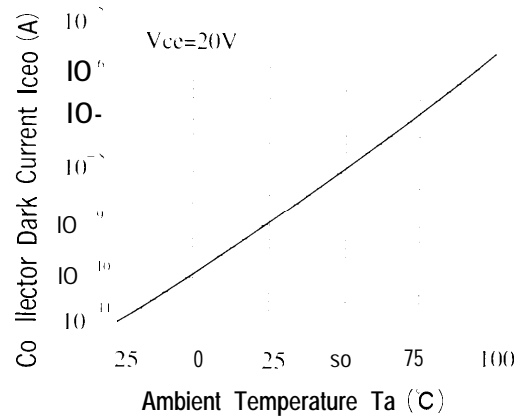


Fig. 4 Forward Current vs. Ambient Temperature

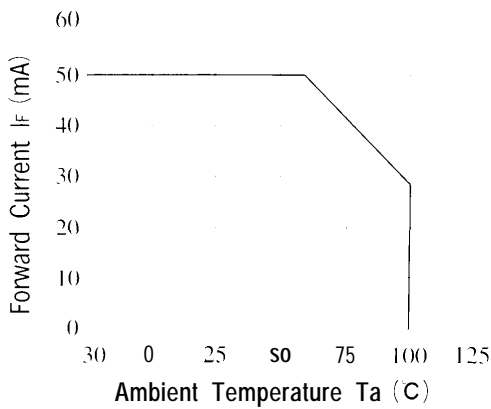


Fig. 5 Forward Current vs. Forward Voltage

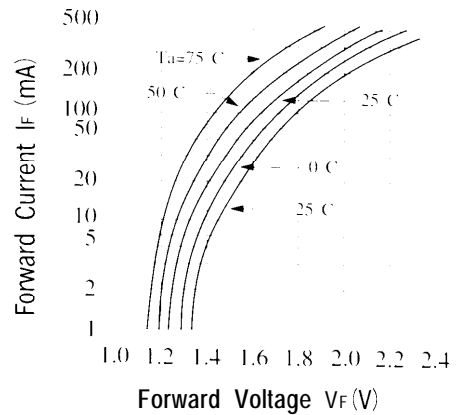


Fig. 6 Collector Current vs. Collector-emitter Voltage

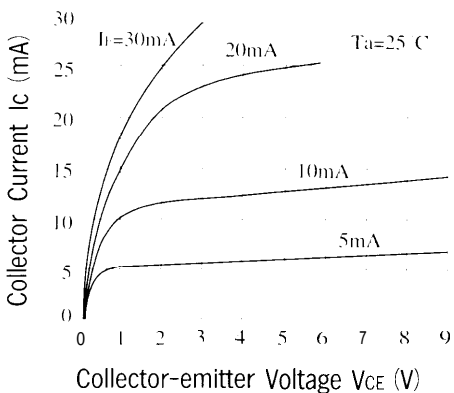


Fig. 7 Relative Current Transfer Ratio vs. Ambient Temperature

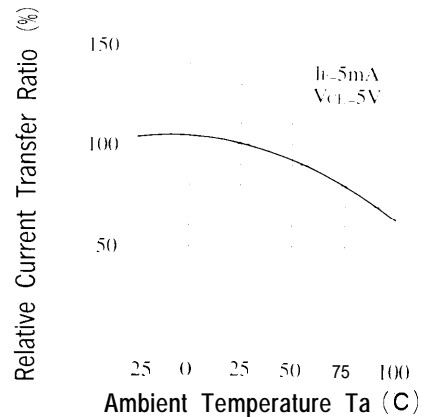


Fig. 8 Collector-emitter Saturation Voltage vs. Ambient Temperature

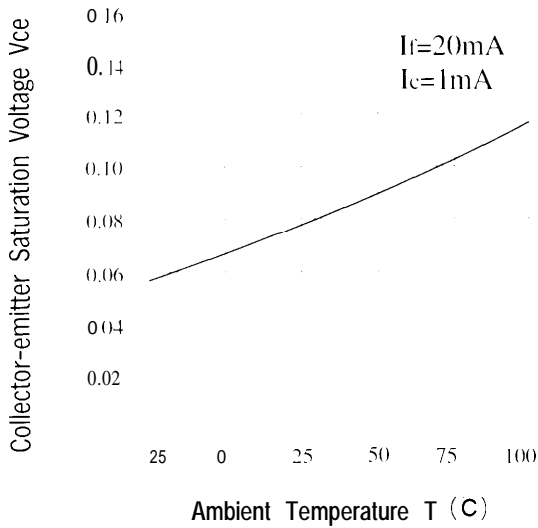


Fig. 9 Collector-emitter Saturation Voltage vs. Forward Current

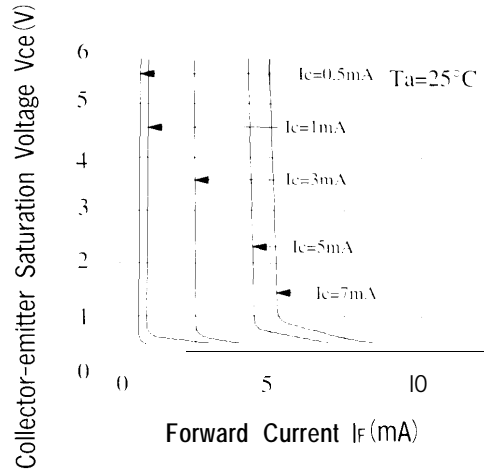


Fig. 10 Response Time vs. Load Resistance

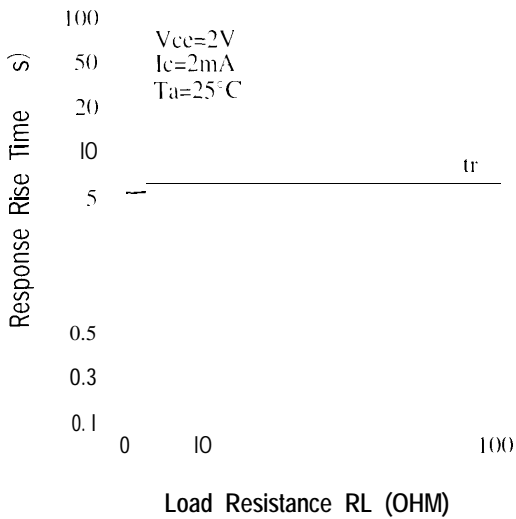
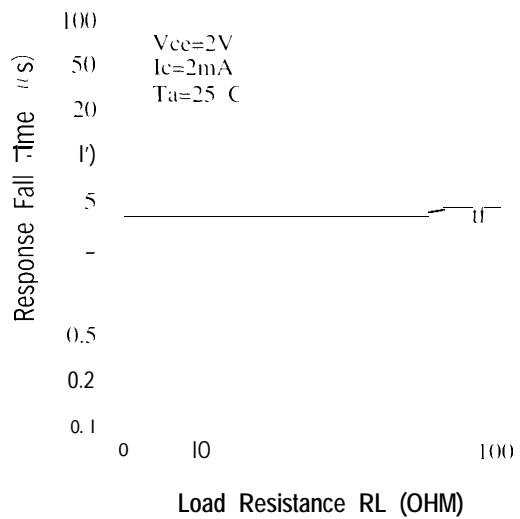


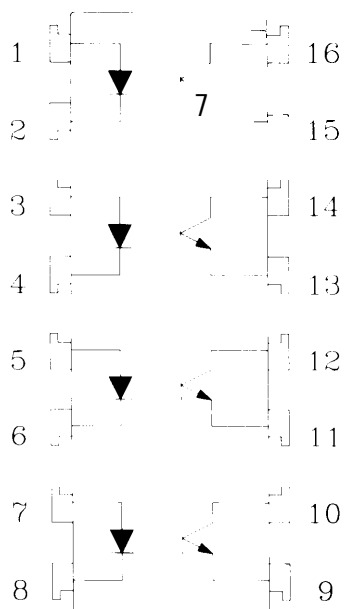
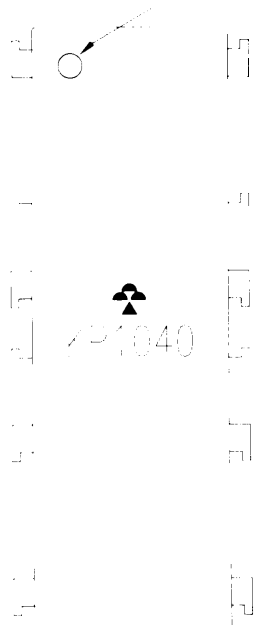
Fig. 11 Response Time vs. Load Resistance



1. OUTSIDE DIMENSION : UNIT (mm)

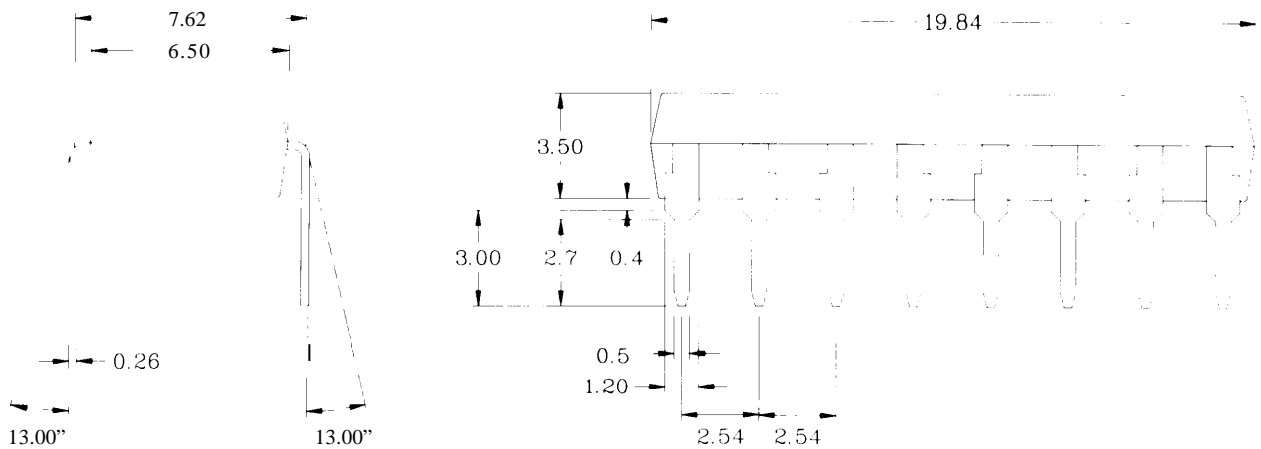
2. SCHEMATIC : TOP VIEW

Anode mark



01,03,05,07 Anode
 02,04,06,08 Cathode
 09,11,13,15 Emitter
 10,12,14,16 Collector

TOLERANCE : $\pm 0.1\text{mm}$



KP1040

● Absolute Maximum Ratings

(Ta=25C)

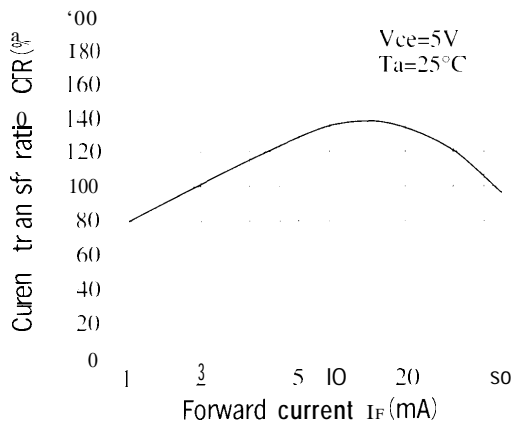
	Parameter	Symbol	Rating	Unit
Input	Forward current	I_F	50	mA
	Peak forward current	I_{FM}		A
	Reverse voltage	V_R	6	
	Power dissipation	P	70	mW
output	Collector-emitter voltage	$V_{(EO)}$	60	V
	Emitter-collector voltage	$V_{(EC)}$	6	V
	Collector current	I	50	mA
	Collector power dissipation	P_C	150	mW
	Total power dissipation	p_D	200	mW
	Isolation voltage 1 minute	V	5000	Vrms
	Operating temperature	T_{op}	-30 to +100	c
Storage temperature	T_{st}	-55 to +125	c	
	Soldering temperature 10 second	T_{s1}	260	c

● Electra-optical Characteristics

(Ta=25C)

	Parameter	Symbol	Conditions	MIN	TYP	MAX	Unit
Input	Forward voltage	V_f	$I_f=20mA$	-	1.2	1.4	V
	Peak forward voltage	V_{FM}	$I_{FM}=0.5A$	-	-	3.5	V
	Reverse current	I_R	$V_R=4V$	-	-	10	μA
	Terminal capacitance	C_t	$V=0, f=1kHz$	-	30	-	pF
output	Collector dark current	$I_{(EO)}$	$V_{(E)}=20V$	-	-	10	A
	Current transfer ratio	CTR	$I_f=2mA, V_{(E)}=5V$	60	-	600	%
Transfer characteristics	Collector-emitter saturation voltage	$V_{(E) sat}$	$I_f=20mA, I_c=1mA$	-	0.1	0.3	V
	Isolation resistance	R_{SD}	DC500V	5x10	10	-	ohm
	Floating capacitance	C_f	$V=0, f=1MHz$	-	0.6	10	pF
	Cut-off frequency	f_c	$V_{(E)}=5V, I_c=2mA, R_L=100ohm$	-	80	-	kHz
	Response time (Rise)	t_r	$V_{(E)}=5V, I_c=2mA, R_L=100ohm$	-	5	20	μs
	Response time (Fall)	t_f	$V_{(E)}=5V, I_c=2mA, R_L=100ohm$	-	4	20	μs

Fig. 1 Current Transfer Ratio vs. Forward Current



Classification table of current transfer ratio is shown below

Model NO.	CTR (%)
KP1040 A	60 TO 160
KP1040 B	130 TO 260
KP1040 C	200 TO 400
KP1040 D	300 TO 600
KP1040 E	60 TO 600

Fig. 2 Collector Power Dissipation vs. Ambient Temperature

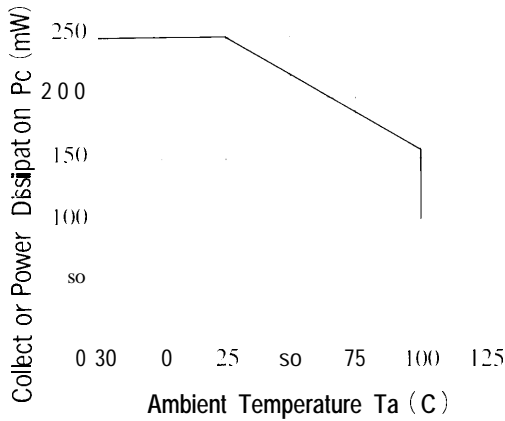


Fig. 3 Collector Dark Current vs. Ambient Temperature

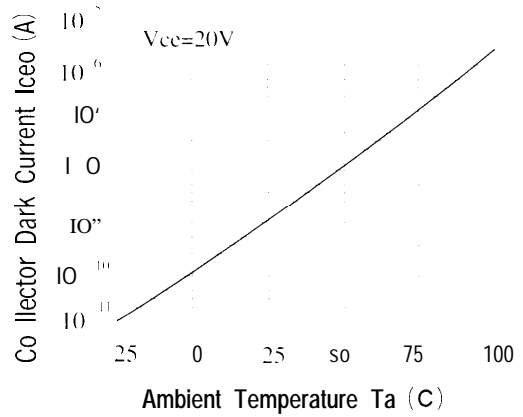


Fig. 4 Forward Current vs. Ambient Temperature

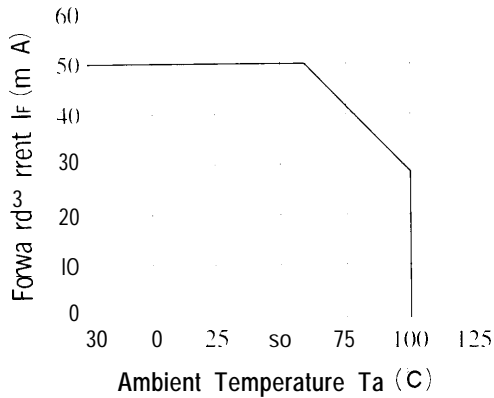


Fig. 5 Forward Current vs. Forward Voltage

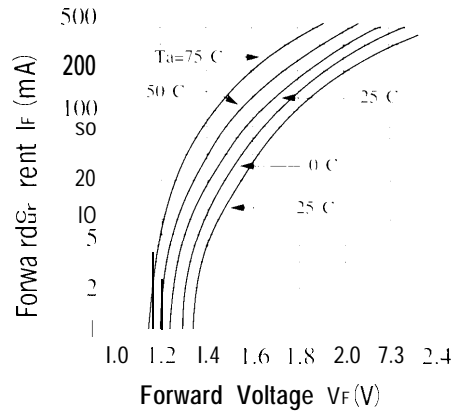


Fig. 6 Collector Current vs. Collector-emitter Voltage

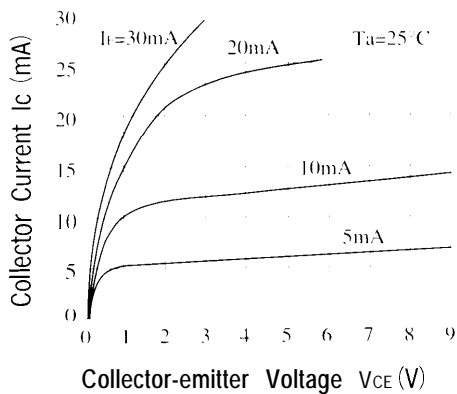


Fig. 7 Relative Current Transfer Ratio vs. Ambient Temperature

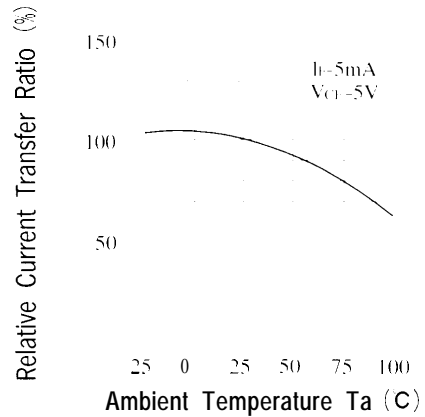


Fig. 8 Collector-emitter Saturation Voltage vs. Ambient Temperature

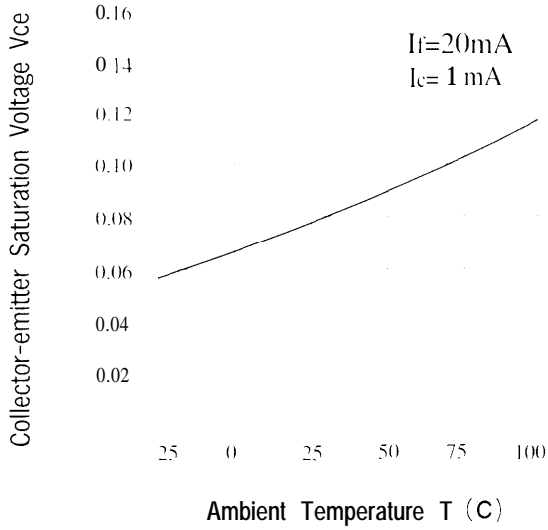


Fig. 9 Collector-emitter Saturation Voltage vs. Forward Current

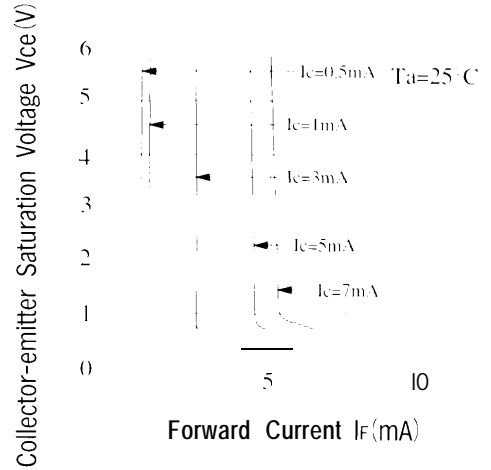


Fig. 10 Response Time vs. Load Resistance

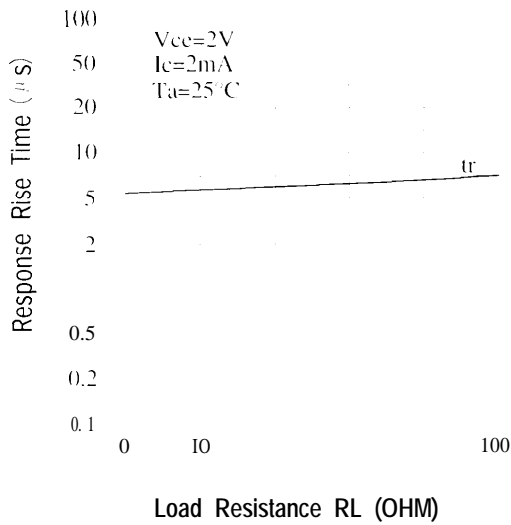
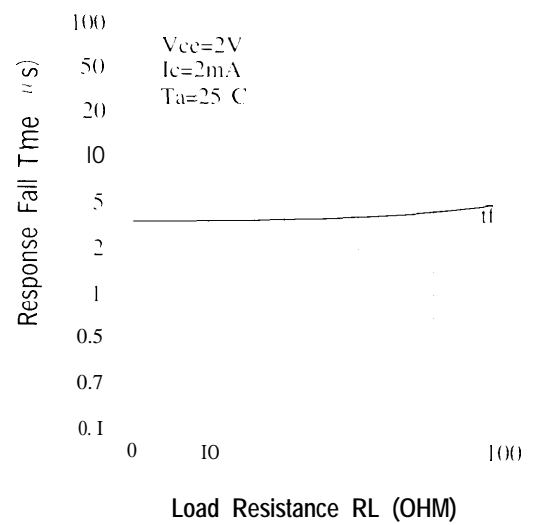
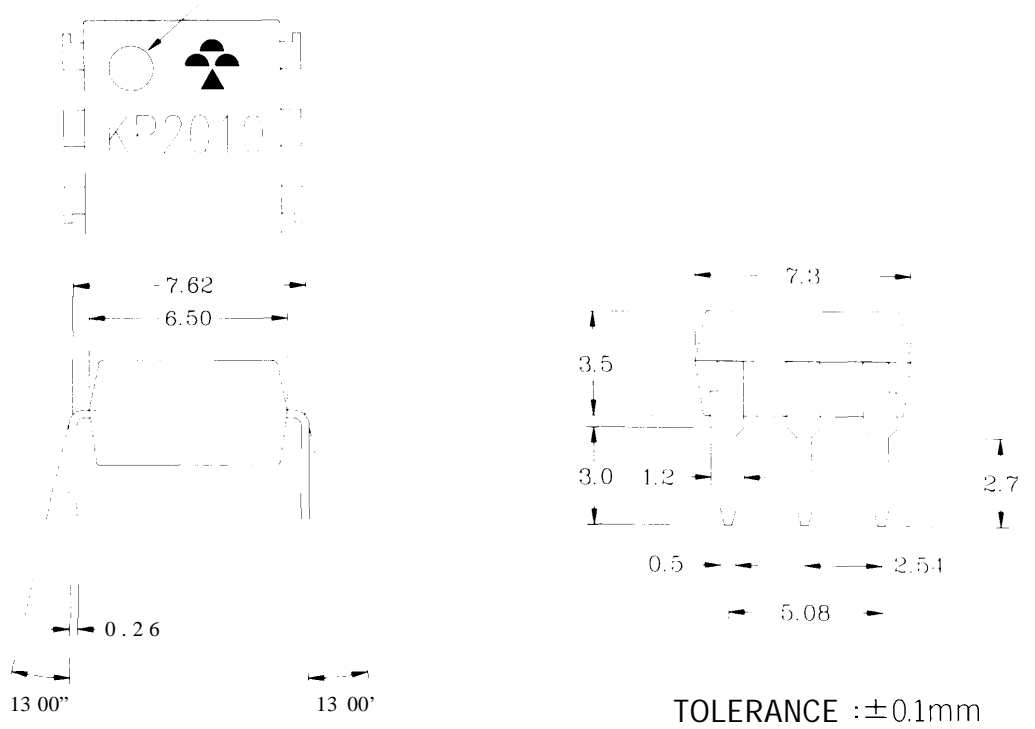


Fig. 11 Response Time vs. Load Resistance

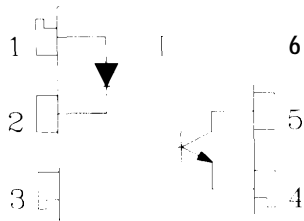


1. OUTSIDE DIMENSION : UNIT (mm)

Anode mark



2. SCHEMATIC : TOP VIEW



- 1. Anode
- 2. Cathode
- 3. NC
- 4. Emitter
- 5. Collector
- 6. Base

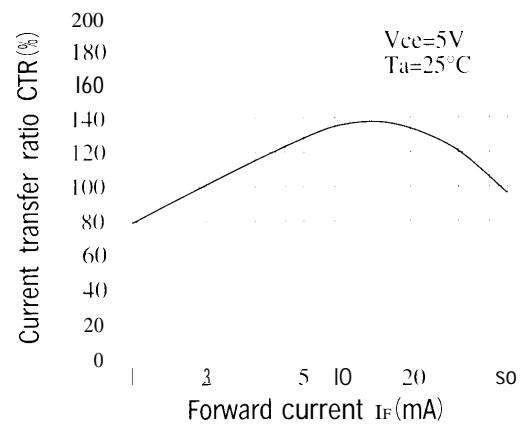
● Absolute Maximum Ratings (Ta=25°C)

Parameter	Symbol	Rating	Unit
Forward current		50	mA
Peak forward current	I_{FM}		
Reverse voltage	V_R		
Power dissipation	P_D	70	mW
Collector-emitter voltage	V_{CEO}	60	V
Emitter-collector voltage	V_{ECO}	6	
Collector-base voltage	V_{CBO}	60	
Emitter-base voltage	V_{EBO}		
Collector current		50	mA
Collector power dissipation	P_C	150	mW
Total power dissipation	P_T	200	mW
Isolation voltage 1 minute	V_{iso}	5000	Vrms
Operating temperature	T_{op}	-30 to +100	°C
Storage temperature	T_{st}	-55 to +125	°C
Soldering temperature 10 second	T_{sol}	260	°C

● Electra-optical Characteristics (Ta=25°C)

Parameter	Symbol	Conditions	MIN	TYP	MAX	Unit
Forward voltage	V_F	$I_F=20mA$	-	1.2	1.4	
Peak forward voltage	V_{FM}	$I_{FM}=0.5A$	-	-	3.5	V
Reverse current		$V_R=4V$	-	-	10	μA
Terminal capacitance	C_i	$V=0, f=1kHz$	-	30	-	pF
Collector dark current	I_{CDO}	$V_{CE}=20V$	-	-	10	μA
Current transfer ratio	CTR	$I_F=2mA, V_{CE}=5V$	60	-	600	%
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_F=20mA, I_C=1mA$	-	01	03	
Isolation resistance	R_{iso}	DC500V	5x10	10	-	ohm
Floating capacitance	C_f	$V=0, f=1MHz$	-	0.6	1.0	pF
Cut-off frequency	f_c	$V_{CE}=5V, I_F=2mA, R_L=100ohm$	-	80	-	kHz
Response time (Rise)		$V_{CE}=5V, I_F=2mA, R_L=100ohm$	-	5	20	μs
Response time (Fall)	t_f		-	4	20	μs

Fig. 1 Current Transfer Ratio vs. Forward Current



Classification table of current transfer ratio is shown below

Model NO.	CTR (%)
KP2010 A	60 TO 160
KP2010 B	130 TO 260
KP2010 C	200 TO 400
KP2010 D	300 TO 600
KP2010 E	60 TO 600

Fig. 2 Collector Power Dissipation vs. Ambient Temperature

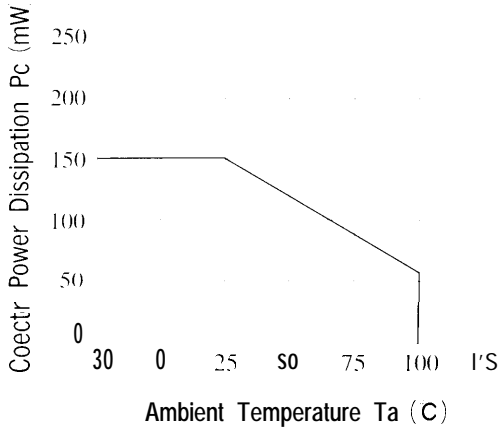


Fig. 3 Collector Dark Current vs. Ambient Temperature

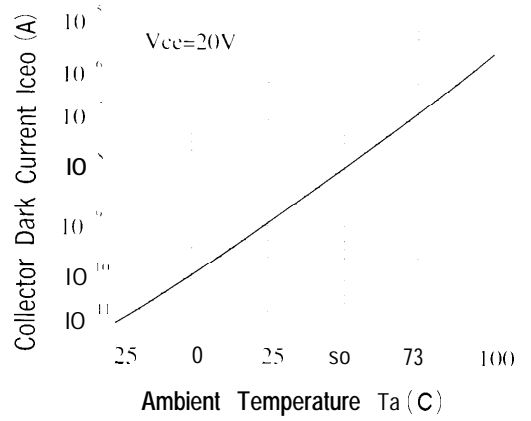


Fig. 4 Forward Current vs. Ambient Temperature

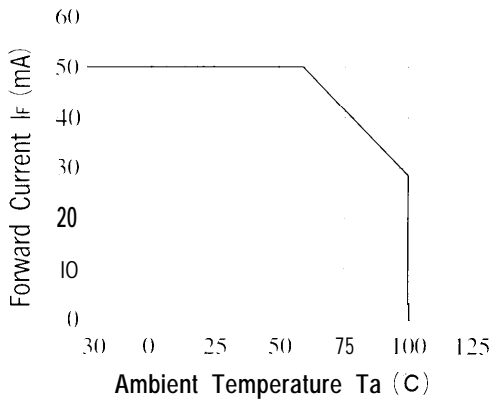


Fig. 5 Forward Current vs. Forward Voltage

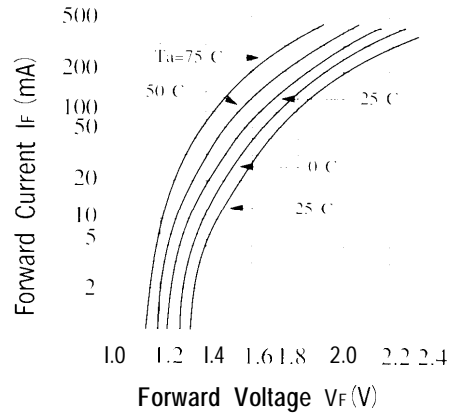


Fig. 6 Collector Current vs. Collector-emitter Voltage

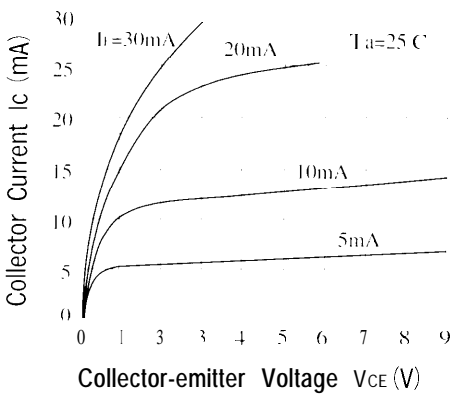


Fig. 7 Relative Current Transfer Ratio vs. Ambient Temperature

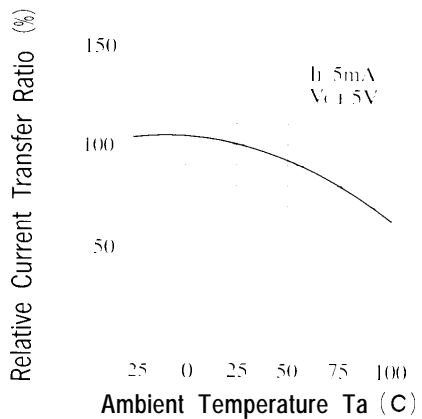


Fig. 8 Collector-emitter Saturation Voltage vs. Ambient Temperature

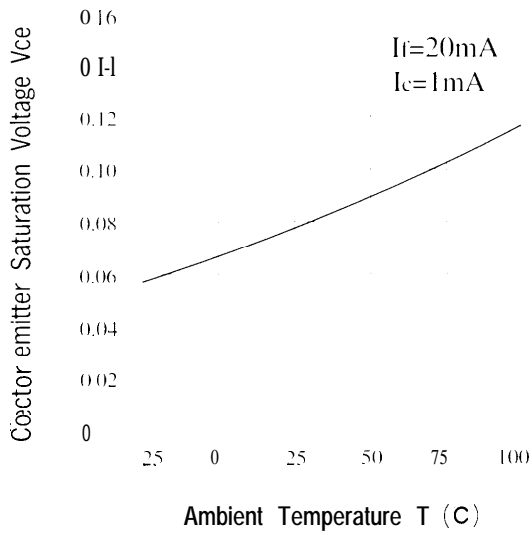


Fig. 9 Collector-emitter Saturation Voltage vs. Forward Current

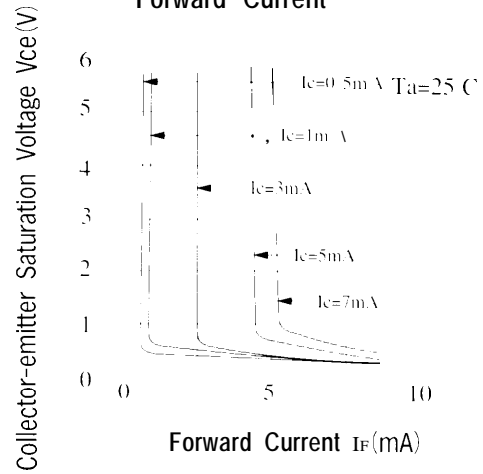


Fig. 10 Response Time vs. Load Resistance

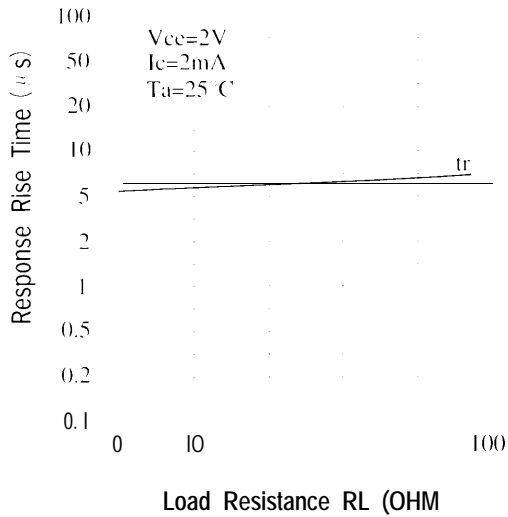
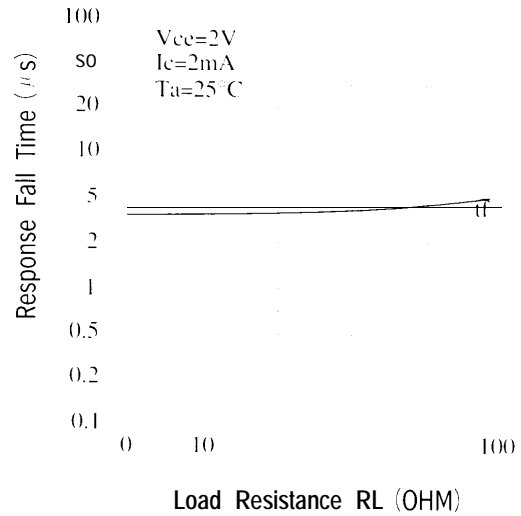


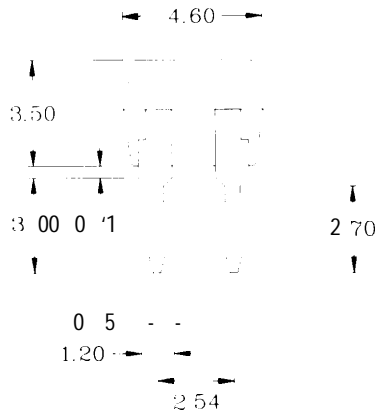
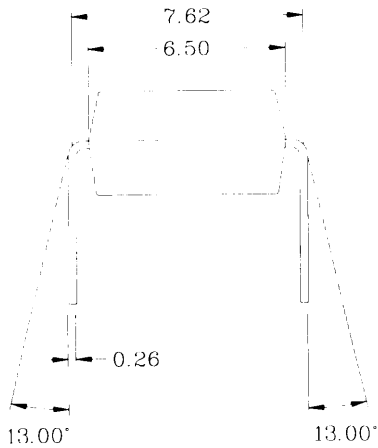
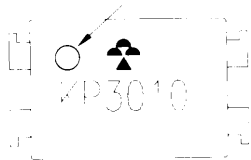
Fig. 11 Response Time vs. Load Resistance



KP2010

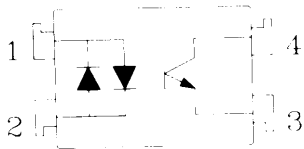
1. OUTSIDE DIMENSION : UNIT (mm)

Anode mark



TOLERANCE : ±0.1mm

2. SCHEMATIC : TOP VIEW



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

● Absolute Maximum Ratings

(Ta=25°C)

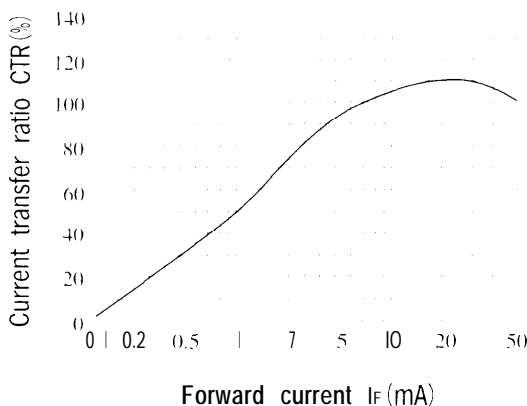
Parameter	Symbol	Rating	Unit
Input	Forward current	± 50	mA
	Peak forward current	± 1	A
	Power dissipation	70	mW
Output	Collector-emitter voltage	60	V
	Emitter-collector voltage	6	V
	Collector current	50	mA
	Collector power dissipation	150	mW
	Total power dissipation	200	mW
	Isolation voltage 1 minute	5000	Vrms
	Operating temperature	-30 to +100	°C
Storage temperature	-55 to +125	°C	
Soldering temperature 10 second	T	260	°C

● Electro-optical Characteristics

(Ta=25°C)

Parameter	Symbol	Conditions	MIN	TYP	MAX	Unit
Input	Forward voltage	$I_f = \pm 20\text{mA}$	-	1.2	1.4	V
	Peak forward voltage	$I_{fM} = \pm 0.5\text{A}$	-	-	3.5	V
	Terminal capacitance	$V = 0, f = 1\text{kHz}$	-	30	-	pF
Output	Collector dark current	$V_{CE} = 20\text{V}, I = 0$	-	-	10	A
	Current transfer ratio	$I_f = \pm 1\text{mA}, V_{CE} = 5\text{V}$	60	-	600	%
Transfer characteristics	Collector-emitter saturation voltage	$I_f = \pm 20\text{mA}, I = 1\text{mA}$	-	0.1	0.3	V
	Isolation resistance	DC500V	5×10	10	-	ohm
	Floating capacitance	$V = 0, f = 1\text{MHz}$	-	0.6	1.0	pF
	Cut-Off frequency	$V = 5\text{V}, I = 2\text{mA}, R = 100\text{ohm}$	-	80	-	kHz
	Response time (Rise)	$V = 2\text{V}, I_f = 2\text{mA}, R = 100\text{ohm}$	-	5	20	μs
Response time (Fall)	$V = 2\text{V}, I_f = 2\text{mA}, R = 100\text{ohm}$	-	4	20	μs	

Fig. 1 Current Transfer Ratio vs. Forward Current



Classification table of current transfer ratio is shown below

Model NO	Rank	mark	CTR (%)
KP3010	A	60 TO 600	
KP3010	B	60 TO 300	

Fig. 2 Collector Power Dissipation vs. Ambient Temperature

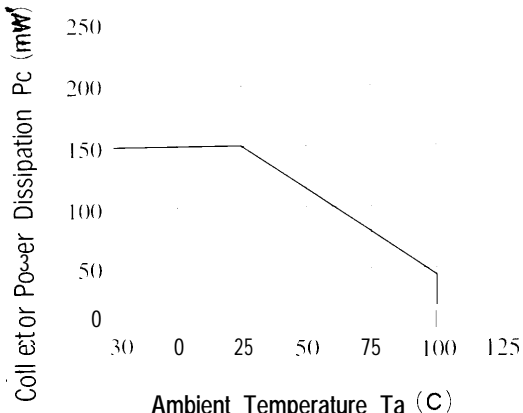


Fig. 3 Collector Dark Current vs. Ambient Temperature

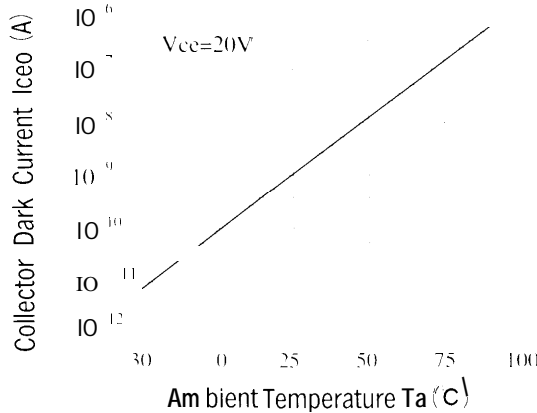


Fig. 4 Forward Current vs. Ambient Temperature

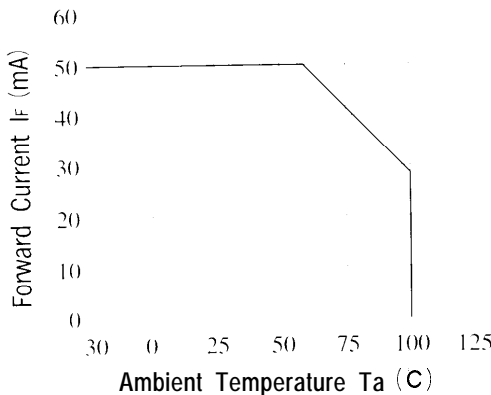


Fig. 5 Forward Current vs. Forward Voltage

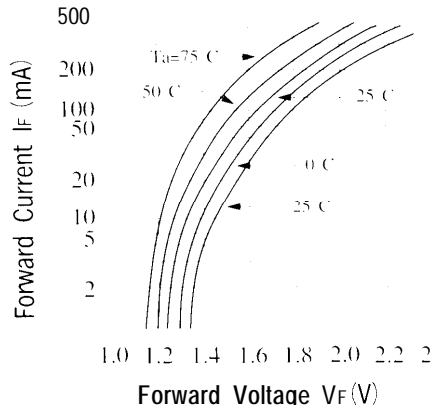


Fig. 6 Collector Current vs. Collector-emitter Voltage

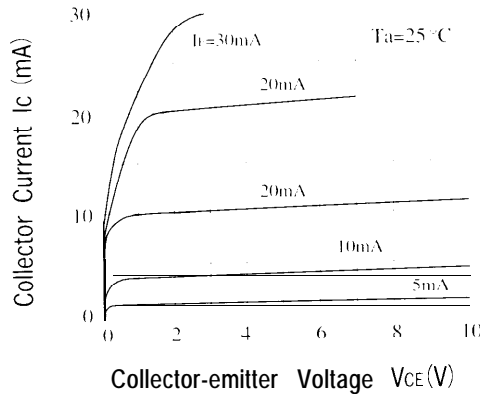
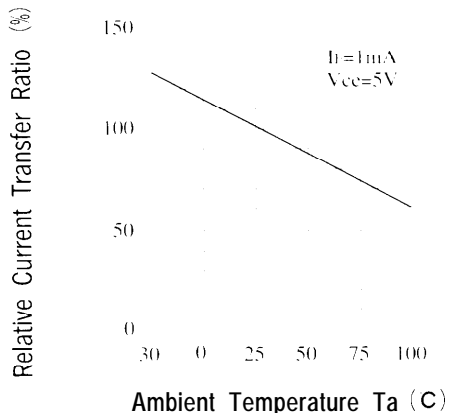


Fig. 7 Relative Current Transfer Ratio vs. Ambient Temperature



KP3010

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

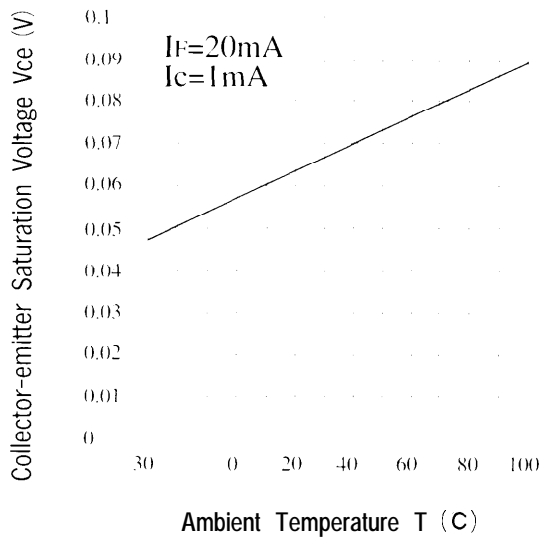


Fig. 9 Collector-emitter Saturation Voltage vs. Forward Current

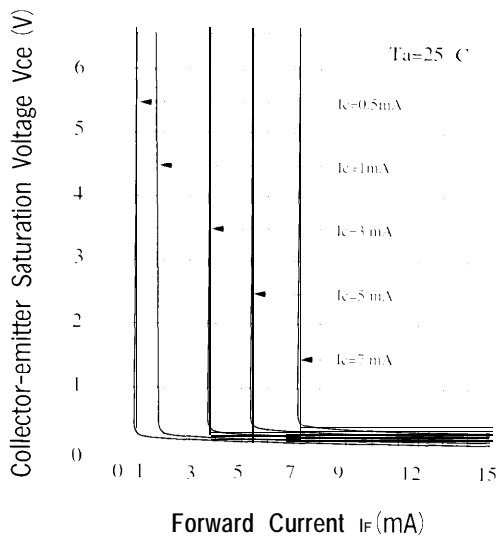


Fig. 10 Response Time vs. Load Resistance

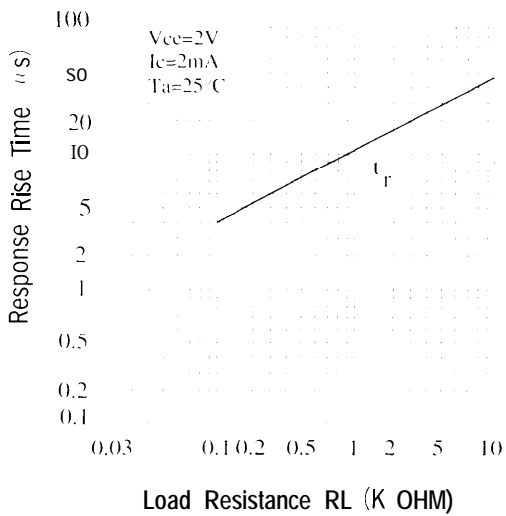
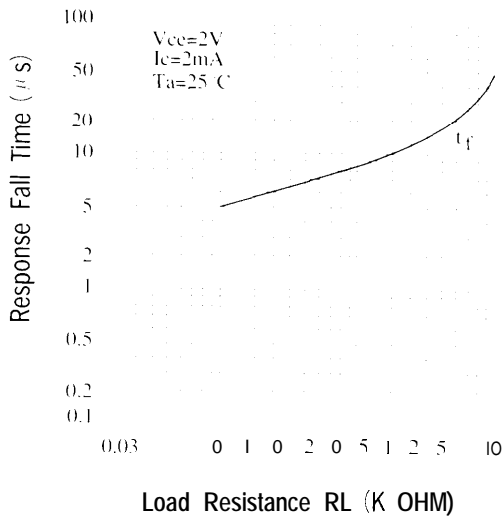
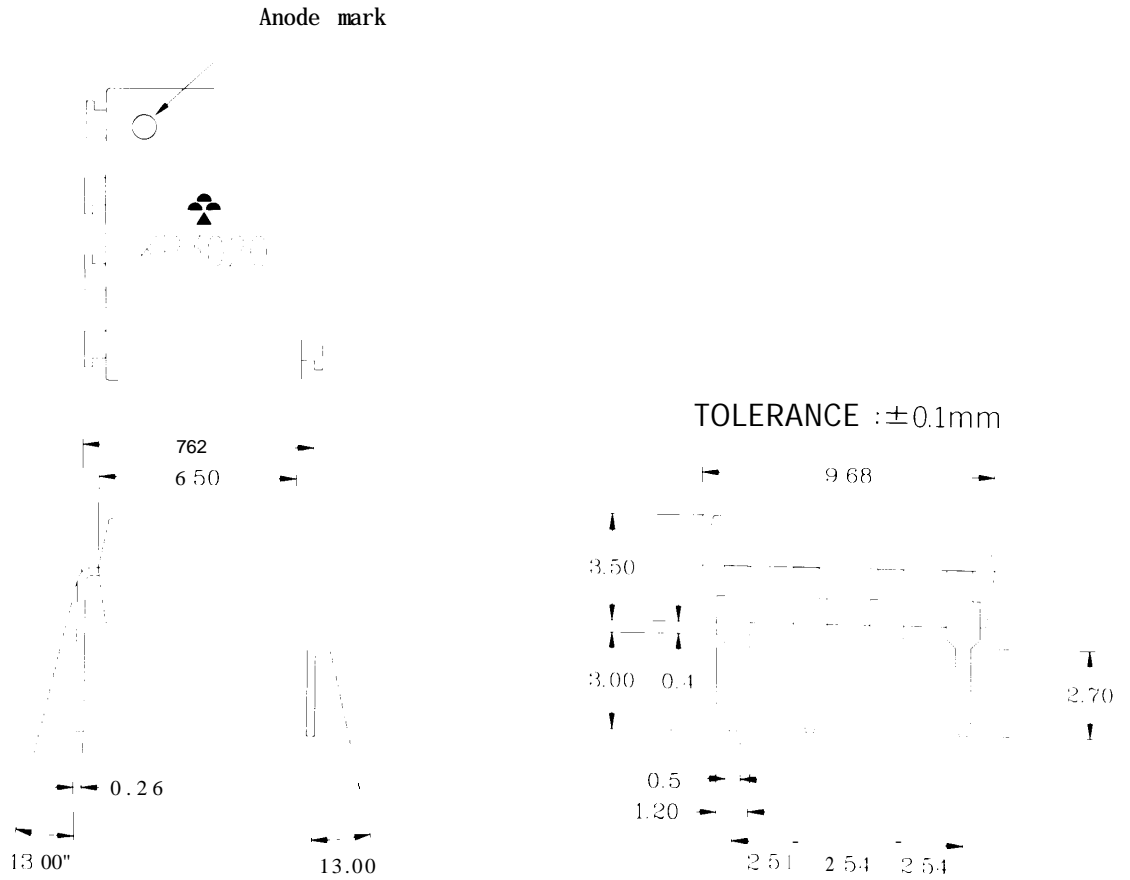


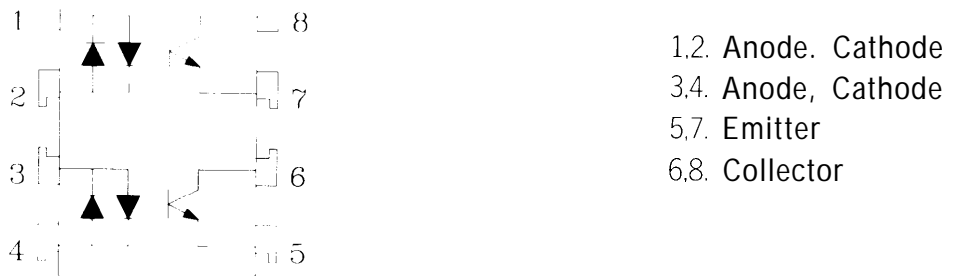
Fig. 11 Response Time vs. Load Resistance



1. OUTSIDE DIMENSION : UNIT (mm)



2. SCHEMATIC : TOP VIEW



KP3020

● Absolute Maximum Ratings

(Ta=25°C)

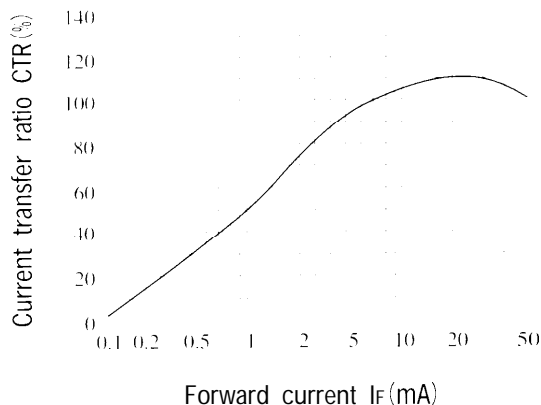
	Parameter	Symbol	Rating	Unit
Input	Forward current	I_f	± 50	mA
	Peak forward current	I_{fM}	± 1	A
	Power dissipation	P_D	70	mW
output	Collector-emitter voltage	V_{CE}	60	
	Emitter-collector voltage	V_{EC}	6	
	Collector current	I_C	50	mA
	Collector power dissipation	P_C	150	mW
	Total power dissipation	P_{tot}	200	mW
	Isolation voltage 1 minute	V	5000	Vrms
	Operating temperature	T_{op}	-30 to +100	°C
Storage temperature	T_{stg}	-55 to +125	°C	
	Soldering temperature 10 second	T	260	°C

● Electra-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_{C0}	$V_{CE} = 20V, I_f = 0$	-	-	10	A
	Current transfer ratio	CTR	$I_f = \pm 1mA, V_{CE} = 5V$	60	-	600	%
Transfer characteristics	Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_f = \pm 20mA, I_C = 1mA$	-	0.1	0.3	V
	Isolation resistance	R	DC500V	5×10^9	10		ohm
	Floating capacitance	C_f	$V = 0, f = 1MHz$		0.6	1.0	pF
	Cut-off frequency	f_c	$V = 5V, I_f = 2mA, R = 100ohm$	-	80	-	kHz
	Response time ' Rise	t_r	$V = 2V, I_f = 2mA, R = 100ohm$	-	5	20	µs
	Response time ' Fall			-	4	20	µs

Fig. 1 Current Transfer Ratio vs. Forward Current



Classification table of current transfer ratio is shown below

Model NO	Rank	mark	CTR (%)
KP3020	A		60 TO 600
KP3020	B		60 TO 300

Fig. 2 Collector Power Dissipation vs. Ambient Temperature

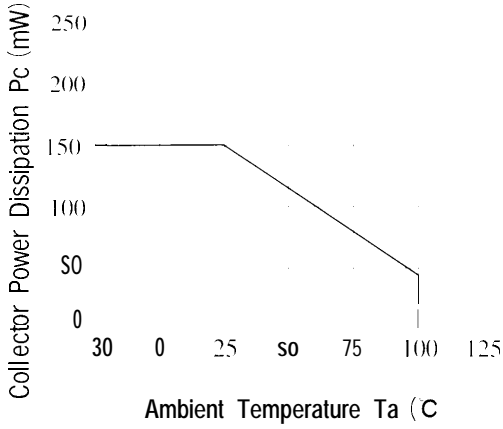


Fig. 3 Collector Dark Current vs. Ambient Temperature

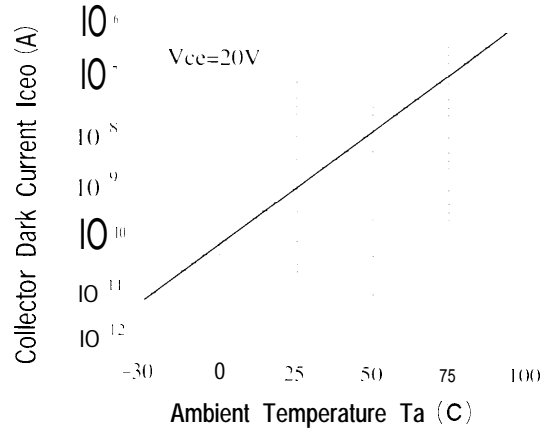


Fig. 4 Forward Current vs. Ambient Temperature

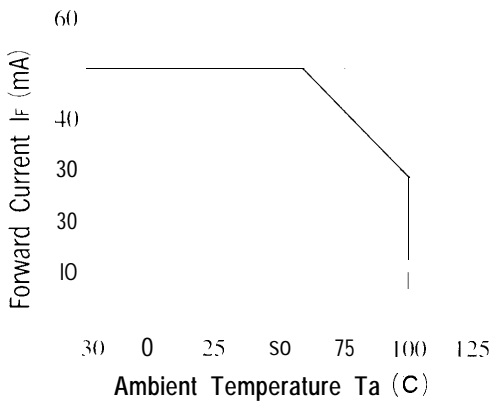


Fig. 5 Forward Current vs. Forward Voltage

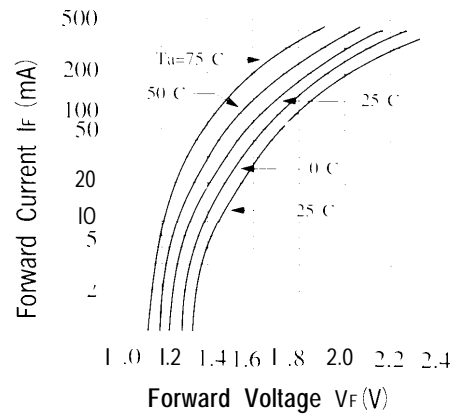


Fig. 6 Collector Current vs. Collector-emitter Voltage

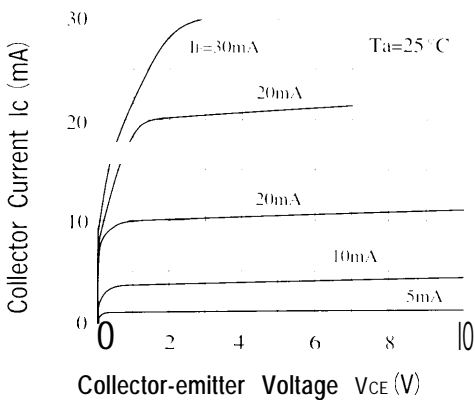


Fig. 7 Relative Current Transfer Ratio vs. Ambient Temperature

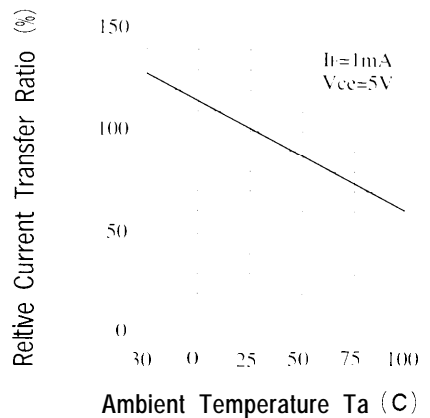


Fig. 8 Collector-emitter Saturation Voltage vs. Ambient Temperature

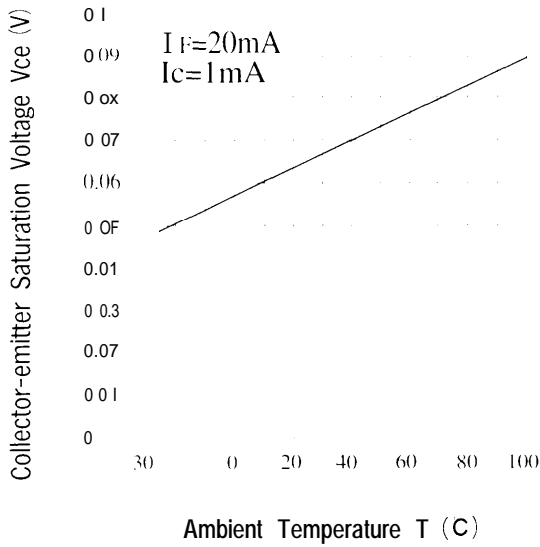


Fig. 9 Collector-emitter Saturation Voltage vs. Forward Current

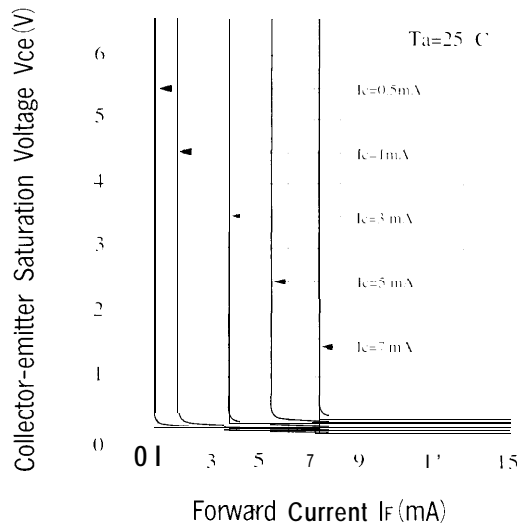


Fig. 10 Response Time vs. Load Resistance

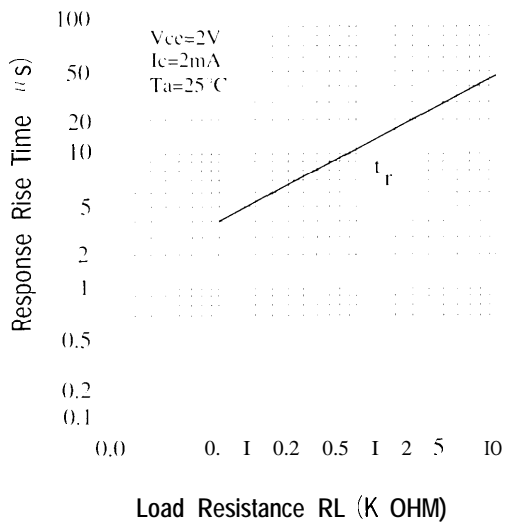
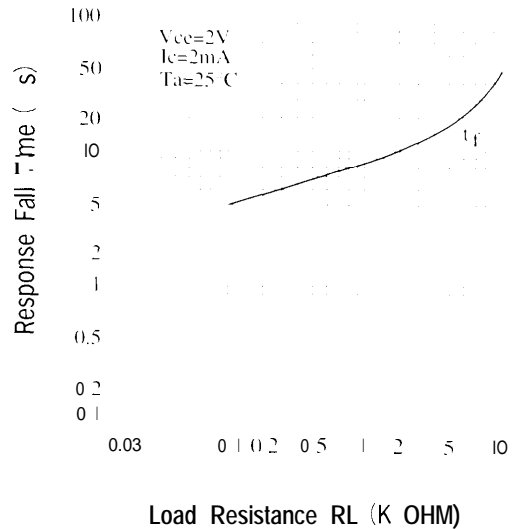


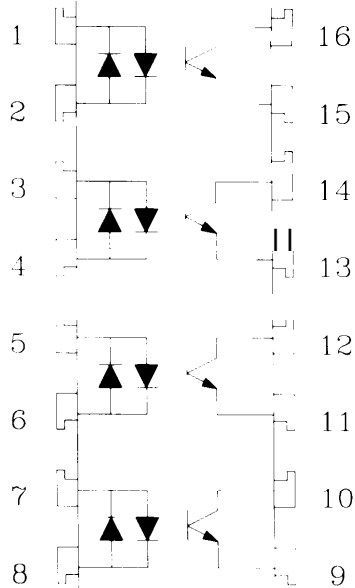
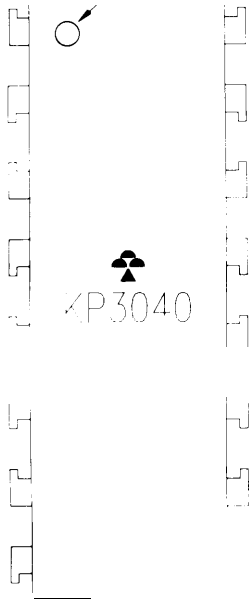
Fig. 11 Response Time vs. Load Resistance



1. OUTSIDE DIMENSION : UNIT (mm)

2. SCHEMATIC : TOP VIEW

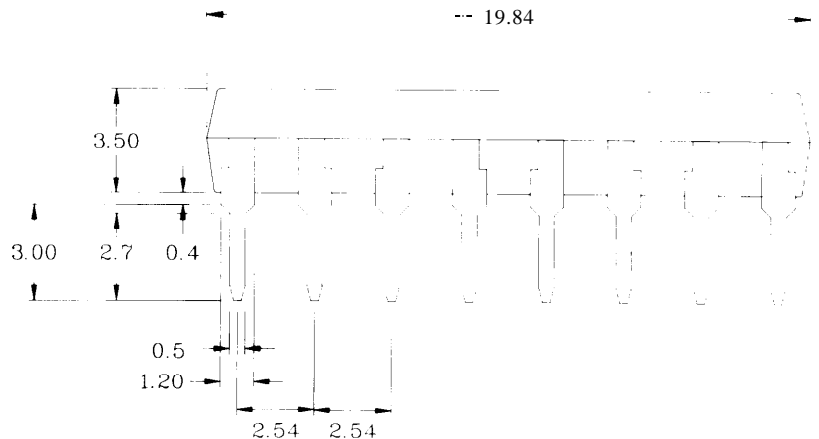
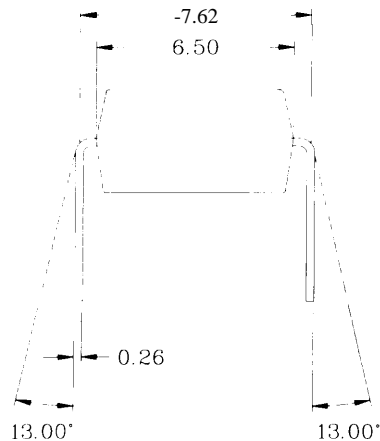
Anode mark



- 01,02 Anode,Cathode
- 03,04 Anode, Cathode
- 05,06 Anode, Cathode
- 07,08 Anode,Cathode
- 09,11,13,15 Emitter
- 10,12,14,16 Collector

KP3040

TOLERANCE : $\pm 0.1\text{mm}$



● Absolute Maximum Ratings

(Ta=25°C)

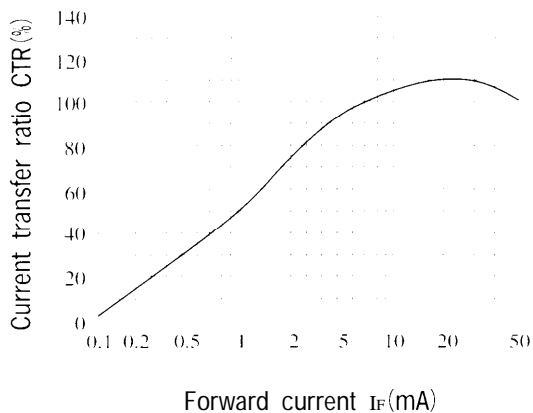
	Parameter	Symbol	Rating	Unit
Input	Forward current	I _F	±50	mA
	Peak forward current	I _{FM}	±1	A
	Power dissipation	P _F	70	mW
output	Collector-emitter voltage	V _C	60	V
	Emitter-collector voltage	V _{EC}	6	
	Collector current	I _C	50	mA
	Collector power dissipation	P _C	150	mW
	Total power dissipation	P _{TOT}	200	mW
	Isolation voltage 1 minute	V _I	5000	V _{rms}
	Operating temperature	T _{OP}	-30 to +100	°C
	Storage temperature	T _t	-55 to +125	°C
	Soldering temperature 10 second	T	260	°C

● Electra-optical Characteristics

(Ta=25°C)

	Parameter	Symbol	Conditions	MIN	TYP	MAX	Unit
Input	Forward voltage	V _F	I _F = ±20mA	-	12	1.4	V
	Peak forward voltage	V _{FM}	I _{FM} = ±0.5A	-	-	3.5	V
	Terminal capacitance	C _I	V=0, f=1kHz	-	30	-	pF
Output	Collector dark current	I _{CEO}	V _{CE} =20V I _B =0	-	-	10	A
	Current transfer ratio	CTR	I _F = ±1mA, V _{CE} = 5V	60	-	600	%
Transfer characteristics	Collector-emitter saturation voltage	V _{CE(sat)}	I _F = ±20mA, I _E = 1mA	-	0.1	0.3	V
	Isolation resistance	R	DC500V	5x10	10	-	ohm
	Floating capacitance	C _F	V=0, f=1MHz	-	0.6	10	pF
	Cut-off frequency	f	V _{CE} =5V I _F =2mA R _L =100ohm	-	80	-	kHz
	Response time (Rise)		V _{CE} =2V I _F =2mA R _L =100ohm	-	5	20	μs
	Response time (Fall)			-	4	20	μs

Fig. 1 Current Transfer Ratio vs. Forward Current



Classification table of current transfer ratio is shown below

Model NO.	Rank mark	CTR (%)
KP3040	A	60 TO 600
KP3040	B	60 TO 300

Fig. 2 Collector Power Dissipation vs. Ambient Temperature

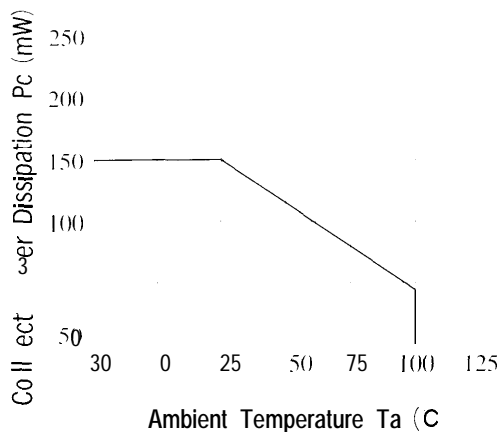


Fig. 3 Collector Dark Current vs. Ambient Temperature

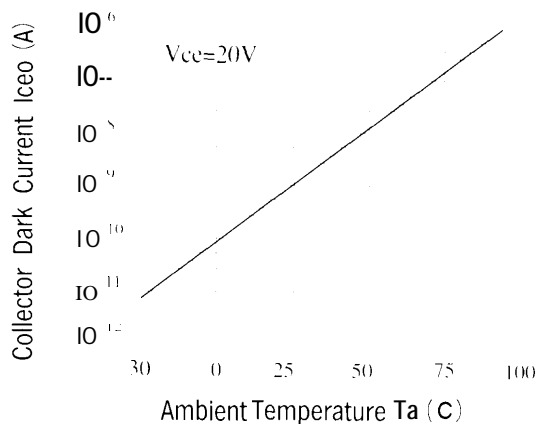


Fig. 4 Forward Current vs. Ambient Temperature

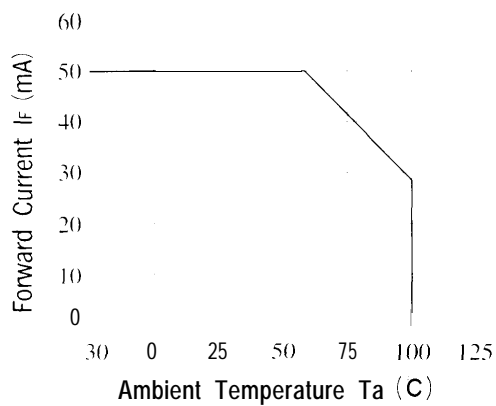


Fig. 5 Forward Current vs. Forward Voltage

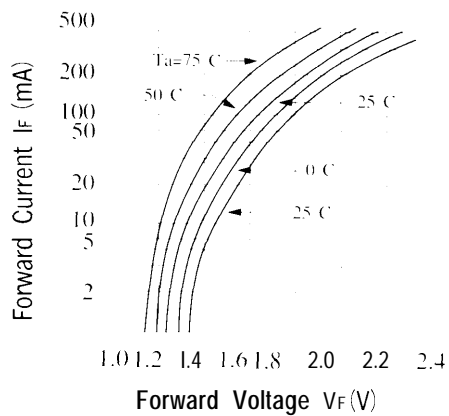


Fig. 6 Collector Current vs. Collector-emitter Voltage

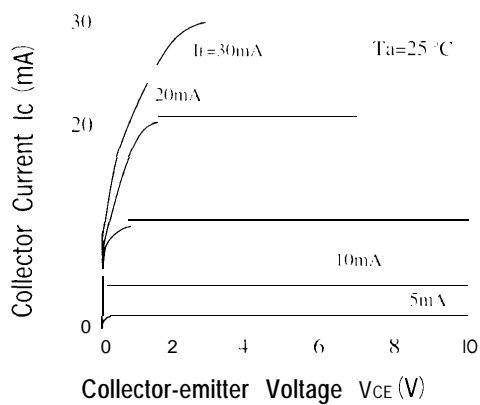


Fig. 7 Relative Current Transfer Ratio vs. Ambient Temperature

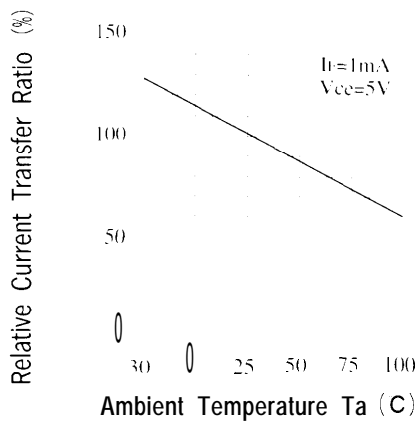


Fig. 8 Collector-emitter Saturation Voltage vs. Ambient Temperature

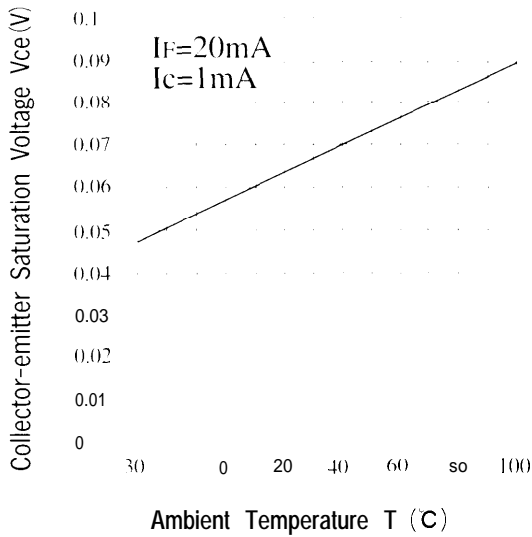


Fig. 9 Collector-emitter Saturation Voltage vs. Forward Current

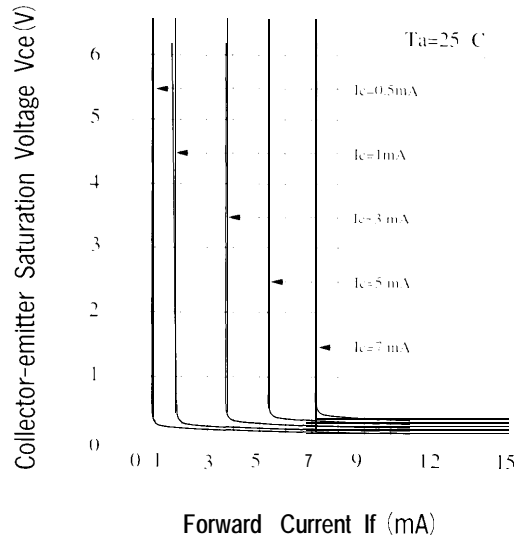


Fig. 10 Response Time vs. Load Resistance

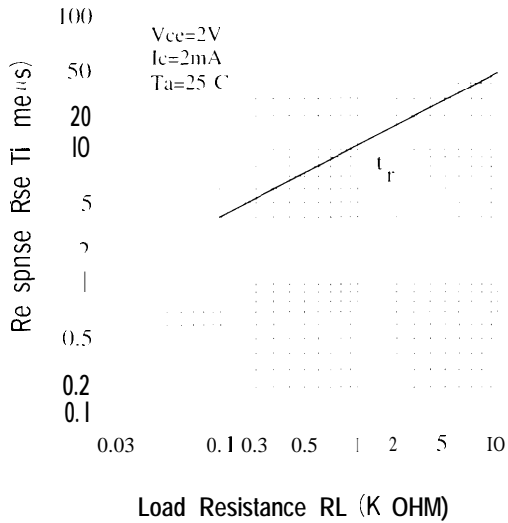
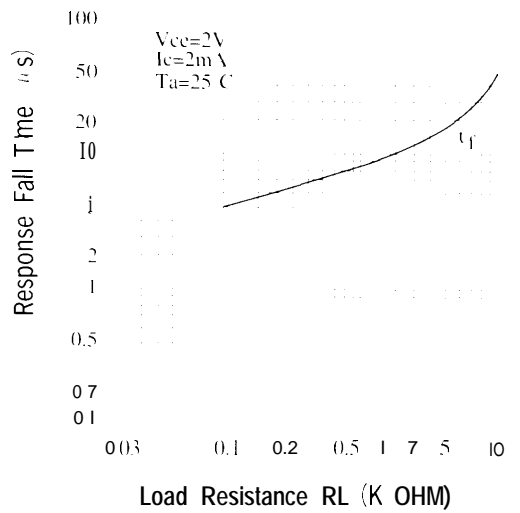


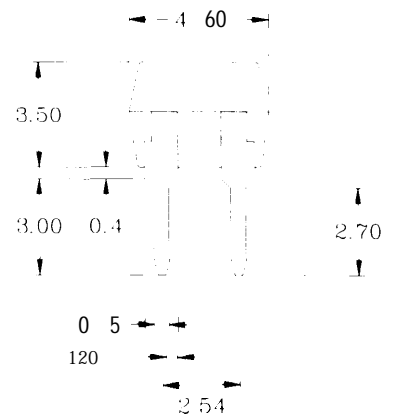
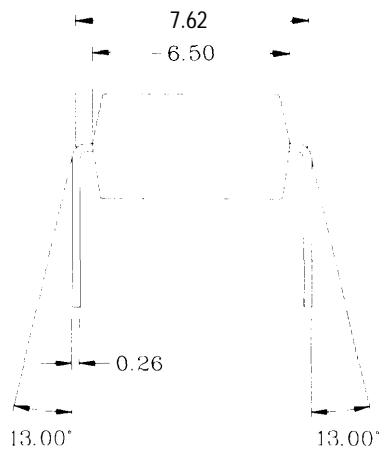
Fig. 11 Response Time vs. Load Resistance



KP3040

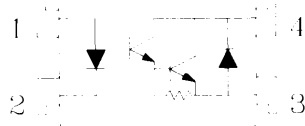
1. OUTSIDE DIMENSION : UNIT (mm)

Anode mark



TOLERANCE : ±0.1mm

2. SCHEMATIC : TOP VIEW



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

● Absolute Maximum Ratings

(Ta=25°C)

	Parameter	Symbol	Rating	Unit
Input	Forward current	I_f	50	mA
	Peak forward current	I_{FM}	1	A
	Reverse voltage	V_r	6	
	Power dissipation	P	70	mW
Output	Collector-emitter voltage	V_{CE0}	300	
	Emitter-collector voltage	V_{EC0}	0.1	
	Collector current	I_c	150	mA
	Collector power dissipation	P	200	mW
	Total power dissipation	P_{TOT}	200	mW
	Isolation voltage 1 minute	V_i	5000	Vrms
	Operating temperature	T_{OP}	-30 to +100	°C
	Storage temperature	T_{ST}	-55 to +125	°C
	Soldering temperature 10 second	T	260	°C

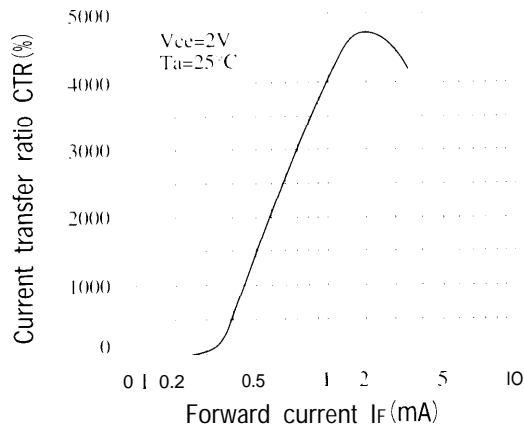
● Electro-optical Characteristics

(Ta=25°C)

	Parameter	Symbol	Conditions	MIN	TYP	MAX	Unit
Input	Forward voltage	V_f	$I_f=20mA$		1.2	1.4	V
	Peak forward voltage	V_{FM}	$I_{FM}=0.5A$			3.5	V
	Reverse current	I_r	$V_r=4V$			10	μA
Output	Terminal capacitance	C_T	$V=0, f=1kHz$	-	30	-	pF
	Collector dark current	I_{CLO}	$V_{CE}=200V, I_f=0$			10 ⁻⁶	A
	Current transfer ratio	CTR	$I_f=1mA, V_{CE}=2V$	600		9000	%
Transfer characteristics	Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_f=20mA, I_c=5mA$			1.5	V
	Isolation resistance	R_i	DC500V	5x10	-	-	ohm
	Floating capacitance	C_f	$V=0, f=1MHz$		0.6	1.0	pF
	Cut-off frequency		$V_{CE}=5V, I_f=2mA, R_i=100ohm$	-	7	-	kHz
	Response time (Rise)	t_r	$V_{CE}=2V, I_f=20mA, R_i=100ohm$	-	60	300	μs
	Response time (Fall)	t_f		-	50	250	μs

K4010

Fig. 1 Current Transfer Ratio vs. Forward Current



Classification table of current transfer ratio is shown below.

Model NO	CTR(%)
KP4010A	600 TO 2000
KP4010B	1500 TO 4000
KP4010C	3000 TO 6000
KP4010D	5000 TO 9000
KP4010E	600 TO 9000

Fig. 2 Collector Power Dissipation vs. Ambient Temperature

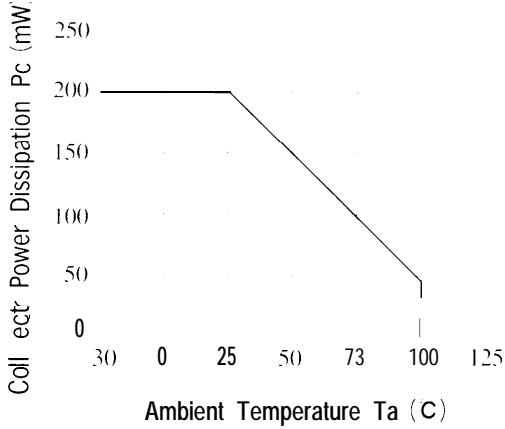


Fig. 3 Collector Dark Current vs. Ambient Temperature

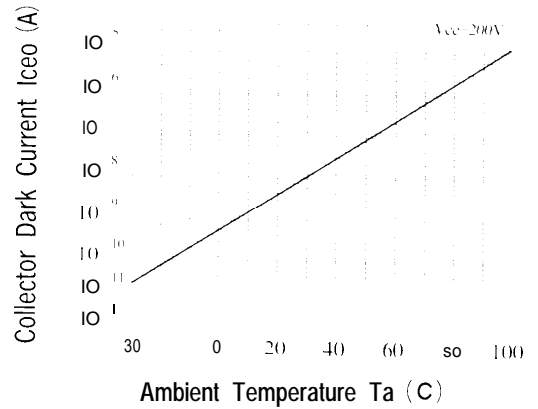


Fig. 4 Forward Current vs. Ambient Temperature

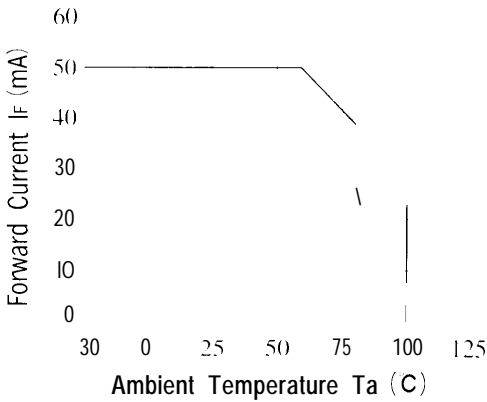


Fig. 5 Forward Current vs. Forward Voltage

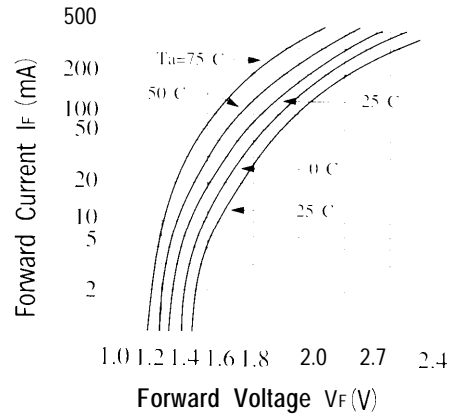


Fig. 6 Collector Current vs. Collector-emitter Voltage

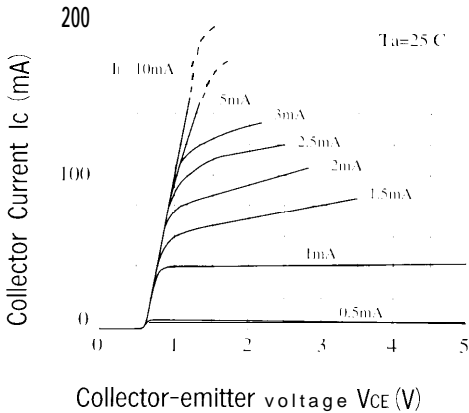
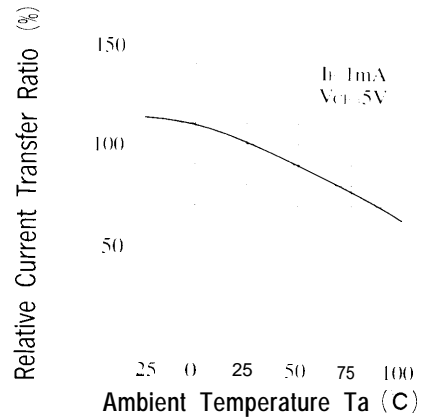


Fig. 7 Relative Current Transfer Ratio vs. Ambient Temperature



KP4010

Fig. 8 Collector-emitter Saturation Voltage vs. Forward Current

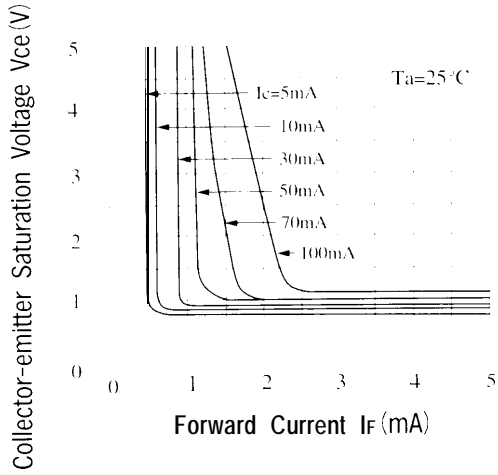
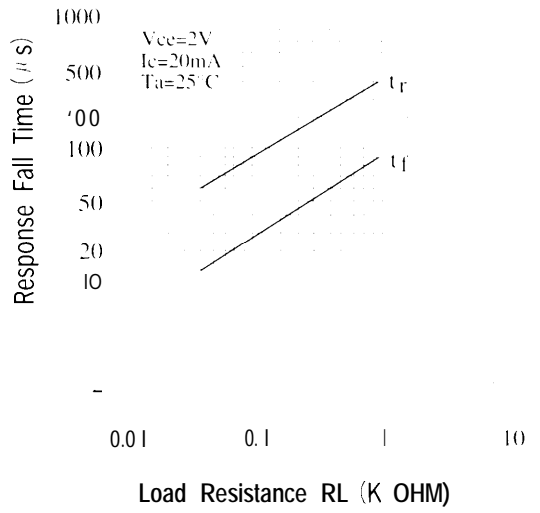
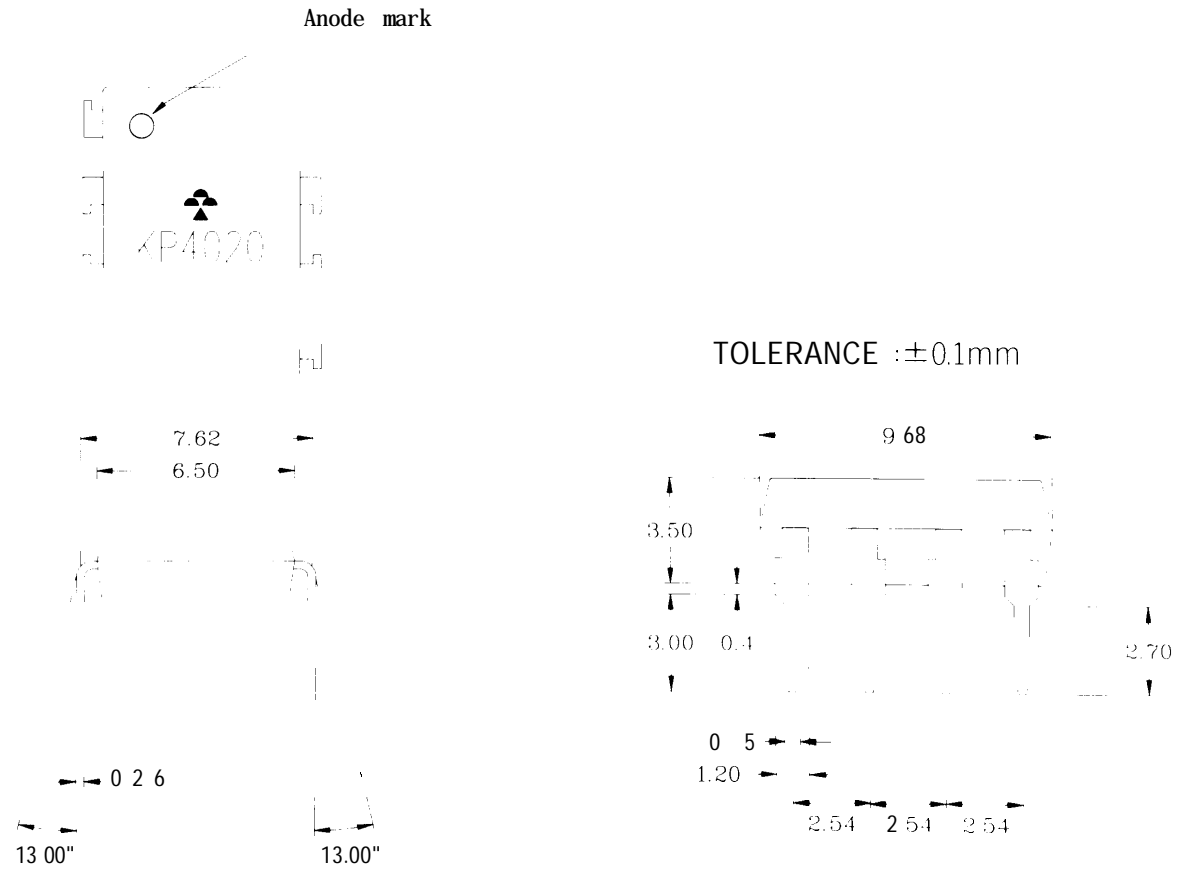


Fig. 9 Response Time vs. Load Resistance

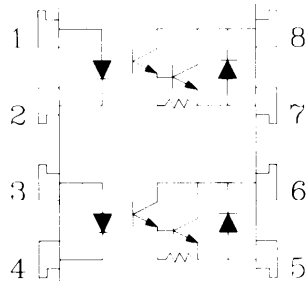


1. OUTSIDE DIMENSION : UNIT (mm)



KP4020

2. SCHEMATIC : TOP VIEW



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

● Absolute Maximum Ratings

(Ta=25°C)

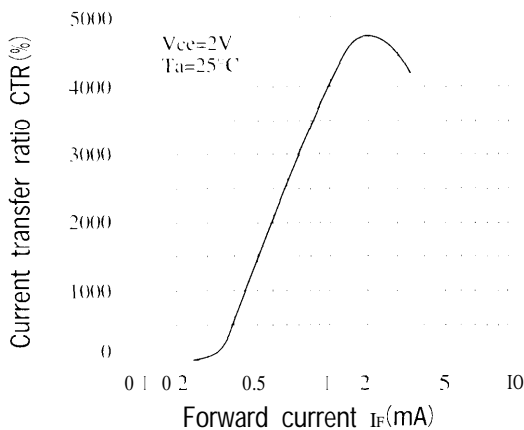
	Parameter	Symbol	Rating	Unit
Input	Forward current		50	mA
	Peak forward current	I_{FM}	1	A
	Reverse voltage	V_i	b	
	Power dissipation	P	70	mW
Output	Collector-emitter voltage	V_{CE0}	300	
	Emitter-collector voltage	V_{EC0}	0.1	
	Collector current	I_c	150	mA
	Collector power dissipation	P_c	200	mW
	Total power dissipation	P_{Tot}	200	mW
	Isolation voltage 1 minute	V_{iso}	5000	Vrms
	Operating temperature	T_{op}	-30 to +100	°C
	Storage temperature	T_{stg}	-55 to +125	°C
	Soldering temperature 10 second	T_{sld}	260	°C

● Electra-optical Characteristics

(Ta=25°C)

	Parameter	Symbol	Conditions	MIN	TYP	MAX	Unit	
Input	Forward voltage	V_f	$I_f=20mA$		1.2	1.4	V	
	Peak forward voltage	V_{FM}	$I_{FM}=0.5A$	-		3.5	V	
	Reverse current	I_R	$V_R=4V$			10	μA	
	Terminal capacitance	C_t	$V=0, f=1kHz$		30	-	pF	
Output	Collector dark current	I_{CDO}	$V_{CE} = 200V, I_f = 0$			10 ⁻⁷	A	
	Current transfer ratio	CTR	$I_f = 1mA, V_{CE} = 2V$	600		9000	%	
Transfer characteristics	Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_f = 20mA, I_c = 5mA$			1.5	V	
	Isolation resistance	R_{iso}	DC500V	5x10		-	ohm	
	Floating capacitance	C_f	$V=0, f=1MHz$		06	1.0	pF	
	Cut-off frequency		$V_f = 5V, I_f = 2mA, R = 100ohm$		7	-	kHz	
	Response time (Rise)	t_r			-	60	300	μs
	Response time (Fall)	t_f				50	250	μs

Fig. 1 Current Transfer Ratio vs. Forward Current



Classification table of current transfer ratio is shown below

Model NO	CTR (%)
KP4020A	600 TO 2000
KP4020B	1500 TO 4000
KP4020C	3000 TO 6000
KP4020D	5000 TO 9000
KP4020E	600 TO 9000

Fig. 2 Collector Power Dissipation vs. Ambient Temperature

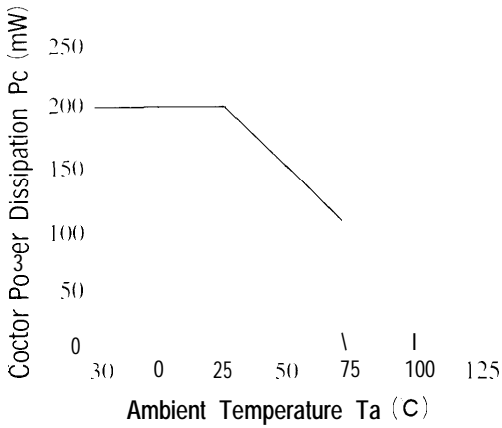


Fig. 3 Collector Dark Current vs. Ambient Temperature

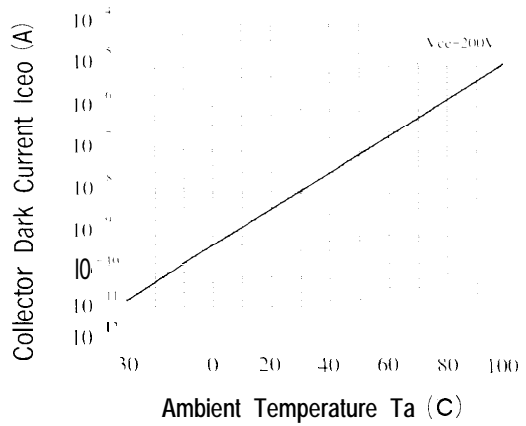


Fig. 4 Forward Current vs. Ambient Temperature

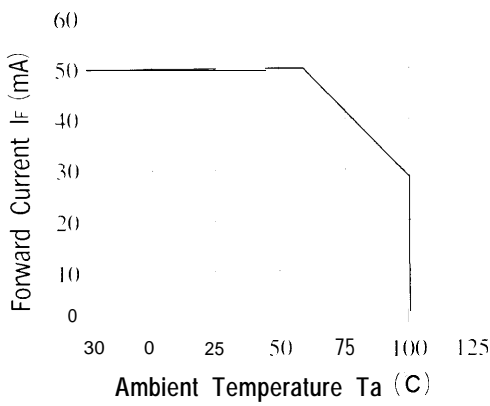


Fig. 5 Forward Current vs. Forward Voltage

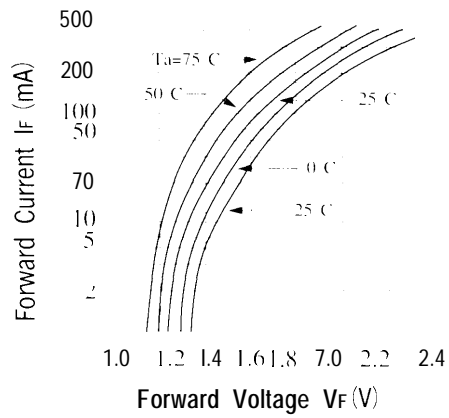


Fig. 6 Collector Current vs. Collector-emitter Voltage

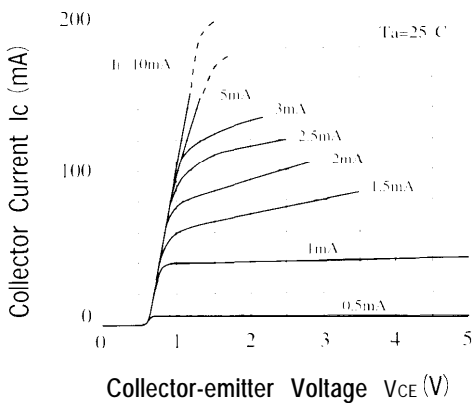


Fig. 7 Relative Current Transfer Ratio vs. Ambient Temperature

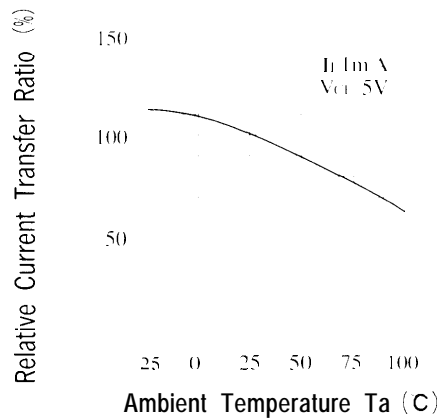


Fig. 8 Collector-emitter Saturation Voltage vs. Forward Current

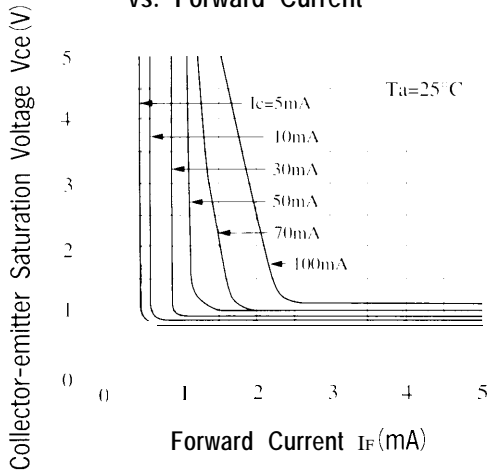
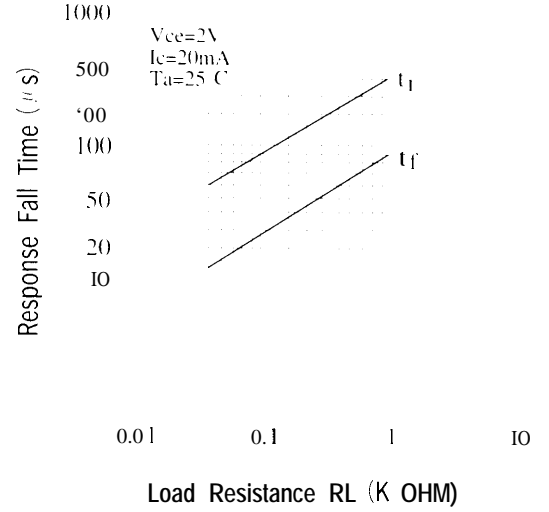


Fig. 9 Response Time vs. Load Resistance

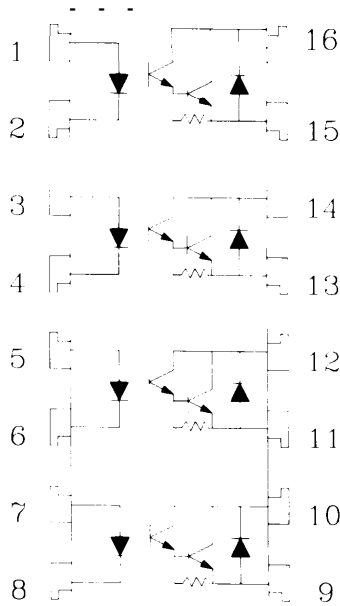
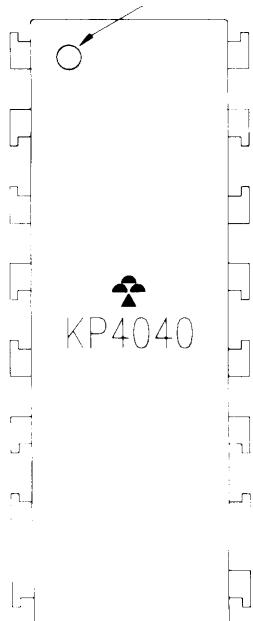


KP4040

1. OUTSIDE DIMENSION : UNIT (mm)

2. SCHEMATIC : TOP VIEW

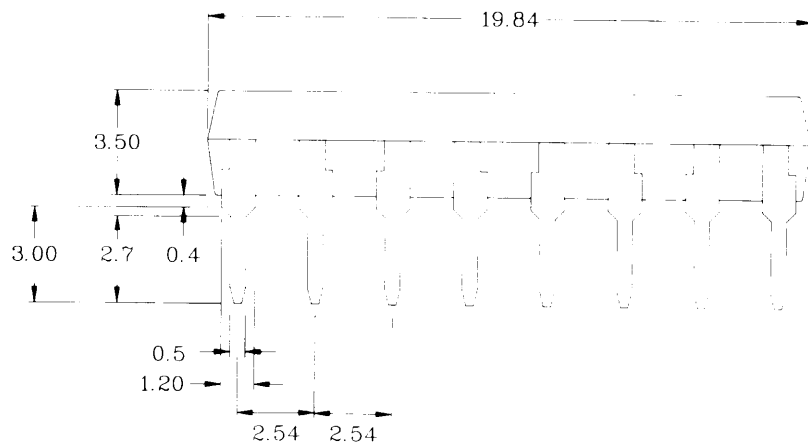
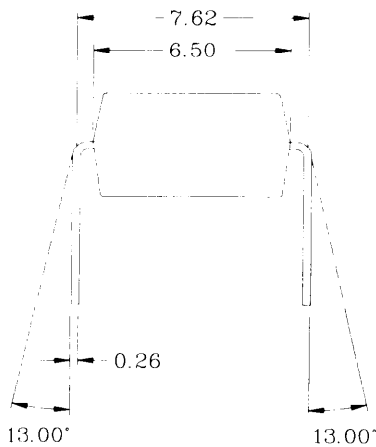
Anode mark



01,03,05,07 Anode
 02,04,06,08 Cathode
 09,11,13,15. Emitter
 10,12,14,16. Collector

KP4040

TOLERANCE : $\pm 0.1\text{mm}$



● Absolute Maximum Ratings

(Ta=25°C)

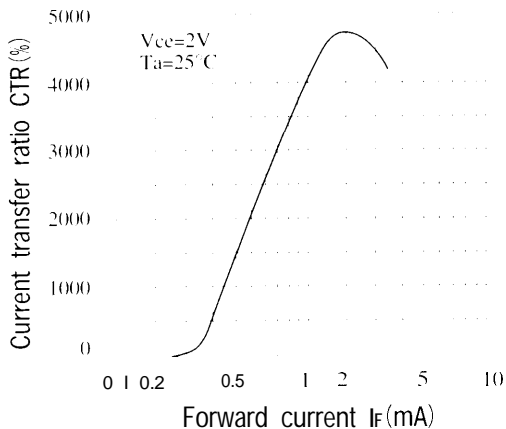
	Parameter	Symbol	Rating	Unit
Input	Forward current	I_F	50	mA
	Peak forward current	I_{FM}	1	A
	Reverse voltage	V_R	6	V
	Power dissipation	P	70	mW
output	Collector-emitter voltage	V_{CE}	300	V
	Emitter-collector voltage	V_{EC}	01	V
	Collector current	I	150	mA
	Collector power dissipation	P_C	200	mW
	Total power dissipation	P_T	200	mW
	Isolation voltage 1 minute	V_{ic}	5000	Vrms
	Operating temperature	T_{op}	-30 to +100	°C
Storage temperature	T_{stg}	-55 to +125	°C	
	Soldering temperature 10 second	T_{sd}	260	°C

● Electra-optical Characteristics

(Ta=25°C)

	Parameter	Symbol	Conditions	MIN	TYP	MAX	Unit
Input	Forward voltage	V_F	$I_F=20mA$	-	1.2	1.4	V
	Peak forward voltage	V_{FM}	$I_{FM}=0.5A$	-	-	3.5	V
	Reverse current	I_R	$V_R=4V$	-	-	10	μA
output	Terminal capacitance	Ci	$V=0, f=1kHz$	-	30	-	pF
	Collector dark current	I_{CEO}	$V_{CE}=200V, I_F=0$	-	-	10	μA
Transfer characteristics	Current transfer ratio	CTR	$I_F=1mA, V_{CE}=2V$	600	-	9000	%
	Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_F=20mA, I_E=5mA$	-	-	1.5	V
	Isolation resistance	R_{ic}	DC500V	5x10	-	-	ohm
	Floating capacitance	Ci	$V=0, f=1MHz$	-	0.6	10	pF
	Cut-off frequency	f_c	$V_{CE}=5V, I_F=2mA, R_L=100ohm$	-	7	-	kHz
	Response time (Rise)	t_r	$V_{CE}=2V, I_F=20mA, R_L=100ohm$	-	60	300	μs
Response time (Fall)	t_f		-	50	250	μs	

Fig. 1 Current Transfer Ratio vs. Forward Current



Classification table of current transfer ratio is shown below

Model NO.	CTR (%)
KP4040A	600 TO 2000
KP4040B	1500 TO 4000
KP4040C	3000 TO 6000
KP4040D	5000 TO 9000
KP4040E	600 TO 9000

KP4040

Fig. 2 Collector Power Dissipation vs. Ambient Temperature

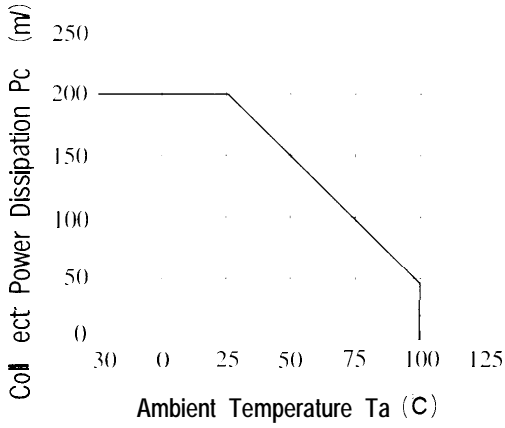


Fig. 3 Collector Dark Current vs. Ambient Temperature

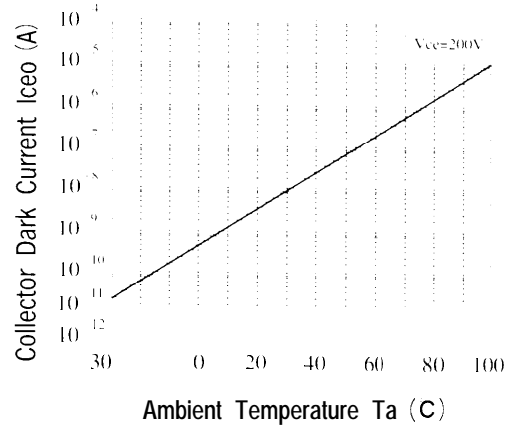


Fig. 4 Forward Current vs. Ambient Temperature

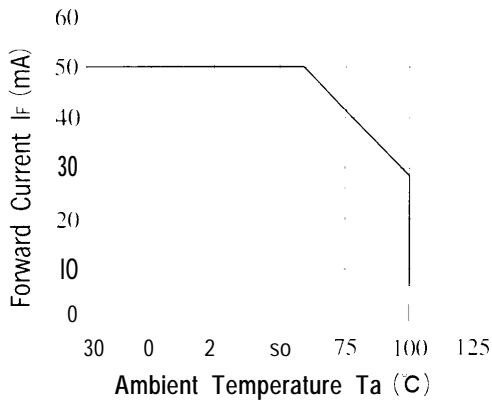


Fig. 5 Forward Current vs. Forward Voltage

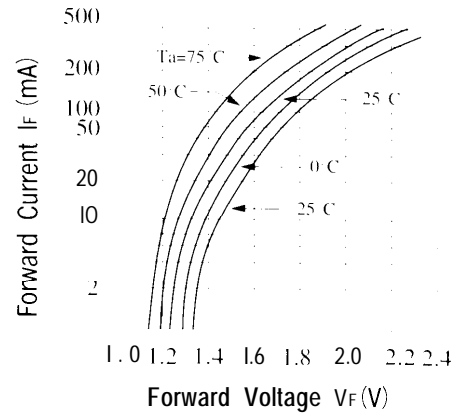


Fig. 6 Collector Current vs. Collector-emitter Voltage

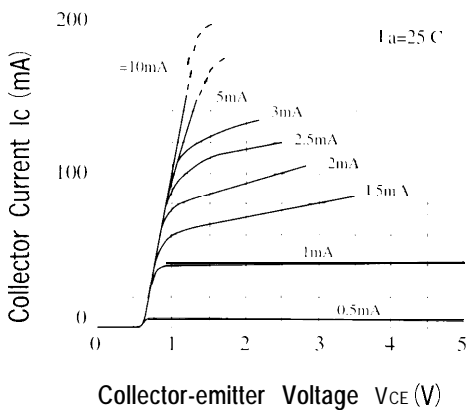


Fig. 7 Relative Current Transfer Ratio vs. Ambient Temperature

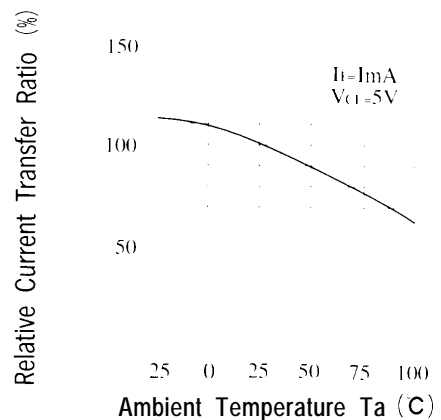


Fig. 8 Collector-emitter Saturation Voltage vs. Forward Current

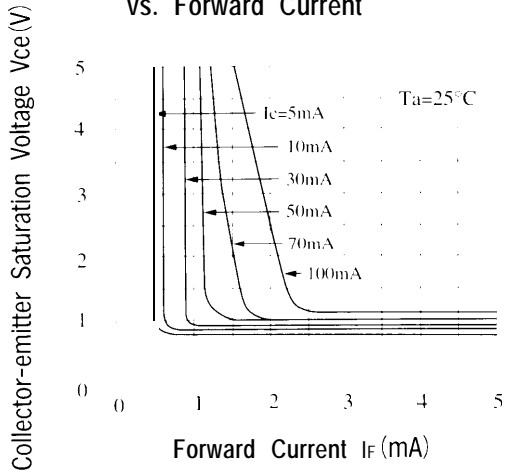
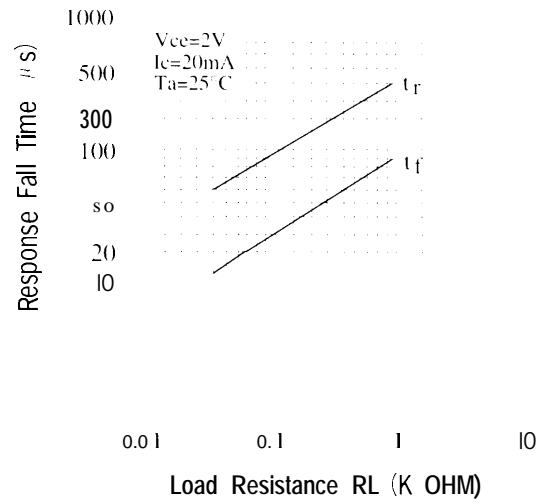
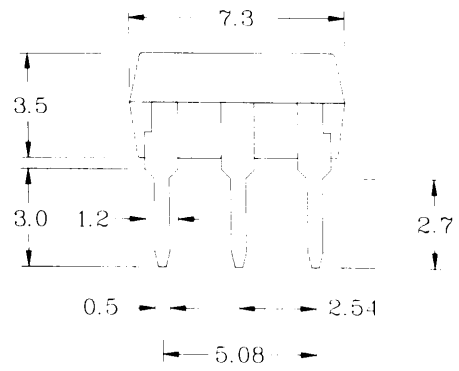
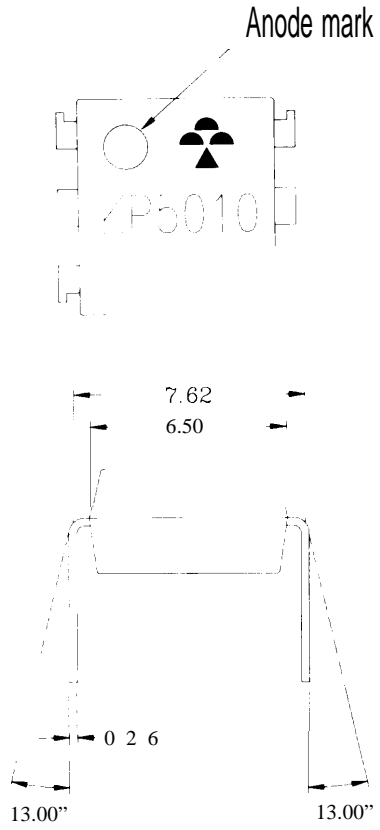


Fig. 9 Response Time vs. Load Resistance

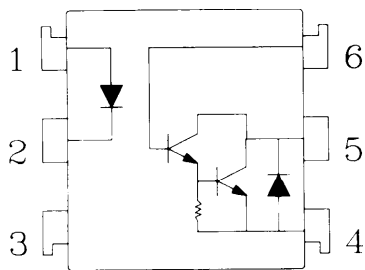


1. OUTSIDE DIMENSION : UNIT (mm)



TOLERANCE : $\pm 0.1\text{mm}$
SCALE 4=1

2. SCHEMATIC : TOP VIEW



- 1. Anode
- 2. Cathode
- 3. NC
- 4. Emitter
- 5. Collector
- 6. Base

● Absolute Maximum Ratings

(Ta=25°C)

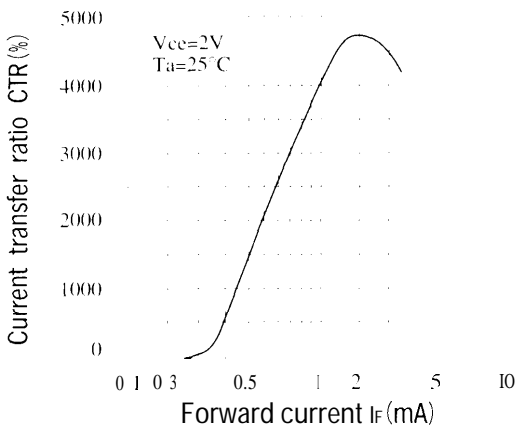
	Parameter	Symbol	Rating	Unit
Input	Forward current		50	mA
	Peak forward current	I_{FM}		A
	Reverse voltage	V_R	6	
	Power dissipation	P	70	mW
output	Collector-emitter voltage	V_{CEO}	300	
	Collector-base voltage	V_{CB0}	300	
	Emitter-base voltage	V_{EB0}	b	
	Collector current		150	mA
	Collector power dissipation	P_c	200	mW
	Total power dissipation	P_{tot}	200	mW
	Isolation voltage 1 minute	V_{iso}	5000	Vrms
	Operating temperature	T_{opr}	-30 to +100	°C
Storage temperature	T_{stg}	-55 to +125	°C	
Soldering temperature 10 second	T_{sd}	260	°C	

● Electro-optical Characteristics

(Ta=25°C)

	Parameter	Symbol	Conditions	MIN	TYP	MAX	Unit
Input	Forward voltage	V_f	$I_f = 20mA$	-	1.2	1.4	V
	Peak forward voltage	V_{fM}	$I_{fM} = 0.5A$	-	-	3.5	V
	Reverse current	I_R	$V_R = 4V$	-	-	10	μA
output	Terminal capacitance	C_t	$V = 0, f = 1kHz$	-	30	-	pF
	Collector dark current	I_{CEO}	$V_{CE} = 200V, I_B = 0$	-	-	10	μA
	Current transfer ratio	CTR	$I_f = 1mA, V_{CE} = 2V$	600	-	9000	%
Transfer characteristics	Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_f = 20mA, I_c = 5mA$	-	-	1.5	V
	Isolation resistance	R_{iso}	DC500V	5x10	-	-	ohm
	Floating capacitance	C_f	$V = 0, f = 1MHz$	-	0.6	10	pF
	Cut-off frequency	f_c	$V_{CE} = 5V, I_f = 2mA, R_L = 100ohm$	-	7	-	kHz
	Response time (Rise)	t_r	$V_{CE} = 2V, I_f = 20mA, R_L = 100ohm$	-	60	300	μs
Response time (Fall)	t_f				50	250	μs

Fig. 1 Current Transfer Ratio vs. Forward Current



Classification table of current transfer ratio is shown below.

Model NO.	CTR (%)
KP5010A	600 TO 2000
KP5010B	1500 TO 4000 ⁰
KP5010C	3000 TO 6000
KP5010D	5000 TO 9000
KP5010E	600 TO 9000

Fig. 2 Collector Power Dissipation vs. Ambient Temperature

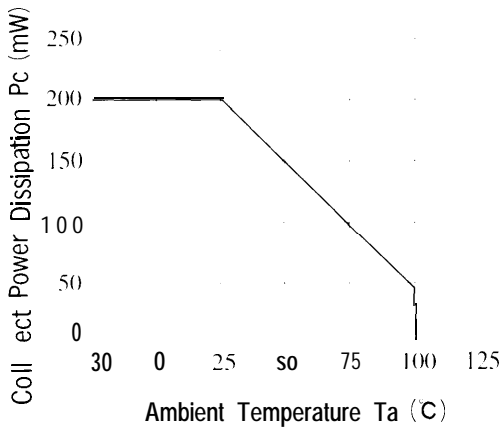


Fig. 3 Collector Dark Current vs. Ambient Temperature

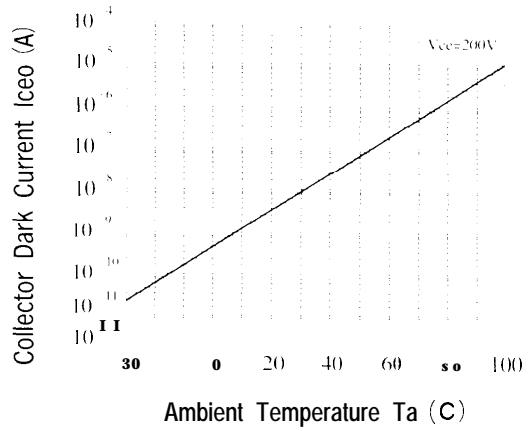


Fig. 4 Forward Current vs. Ambient Temperature

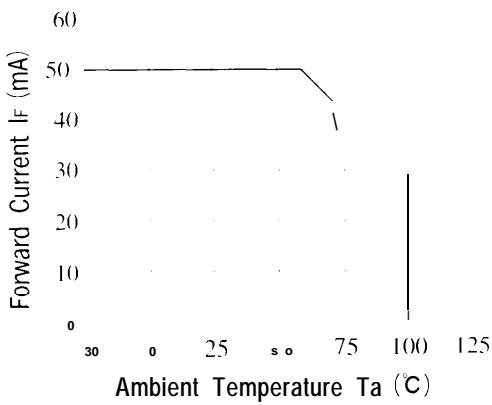


Fig. 5 Forward Current vs. Forward Voltage

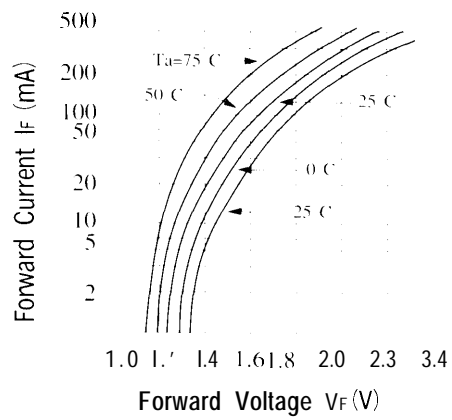


Fig. 6 Collector Current vs. Collector-emitter Voltage

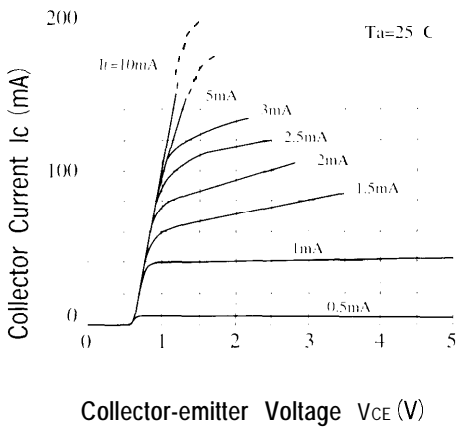


Fig. 7 Relative Current Transfer Ratio vs. Ambient Temperature

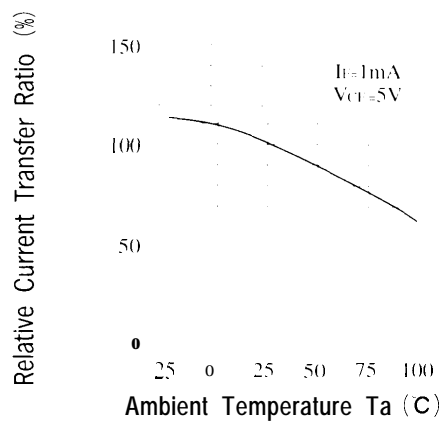


Fig. 8 Collector-emitter Saturation Voltage vs. Forward Current

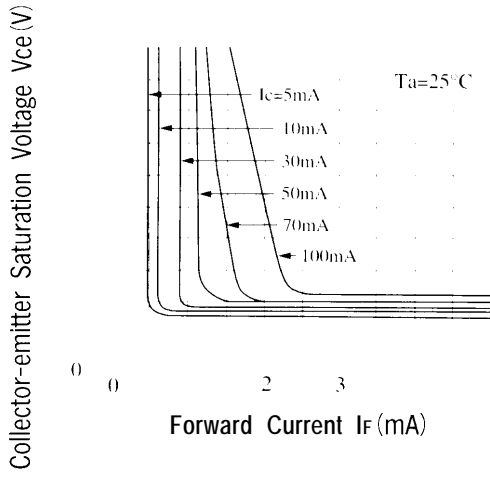
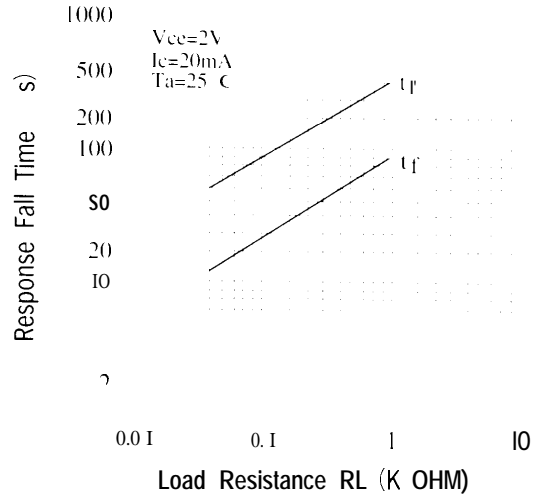
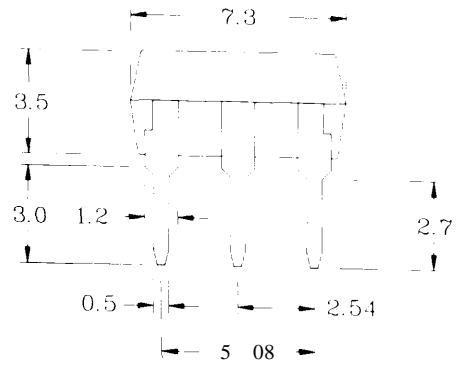
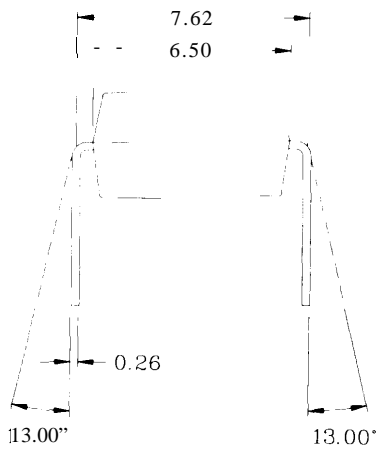
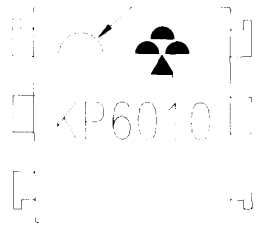


Fig. 9 Response Time vs. Load Resistance



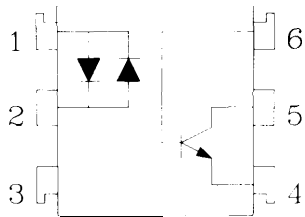
1. OUTSIDE DIMENSION : UNIT (mm)

Anode mark



TOLERANCE : $\pm 0.1\text{mm}$

2. SCHEMATIC : TOP VIEW



- 1. Anode, Cathode
- 2. Anode, Cathode
- 3. NC
- 4. Emitter
- 5. Collector
- 6. Base