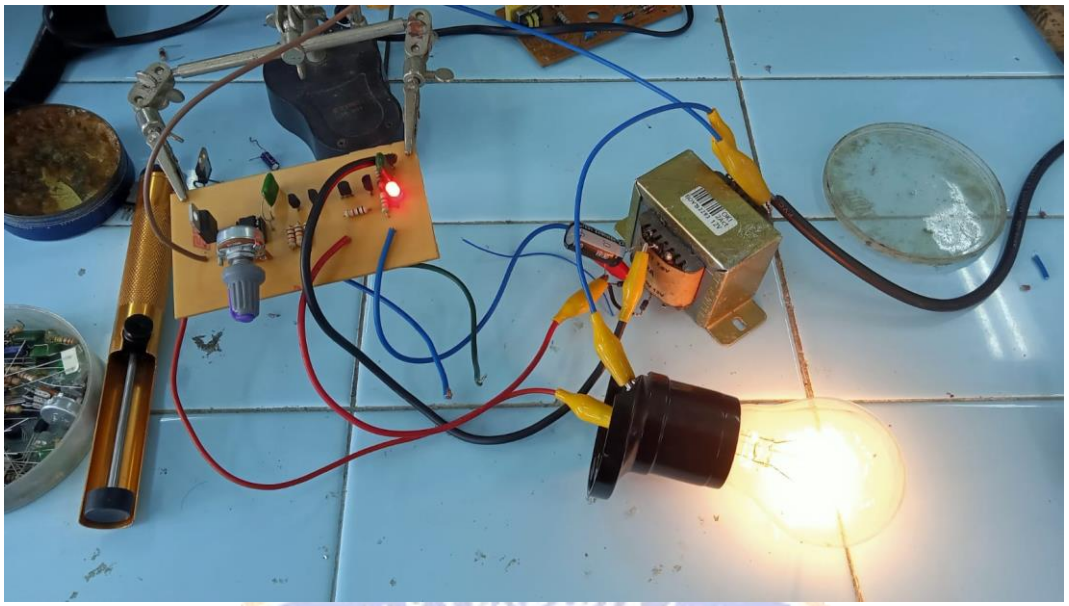
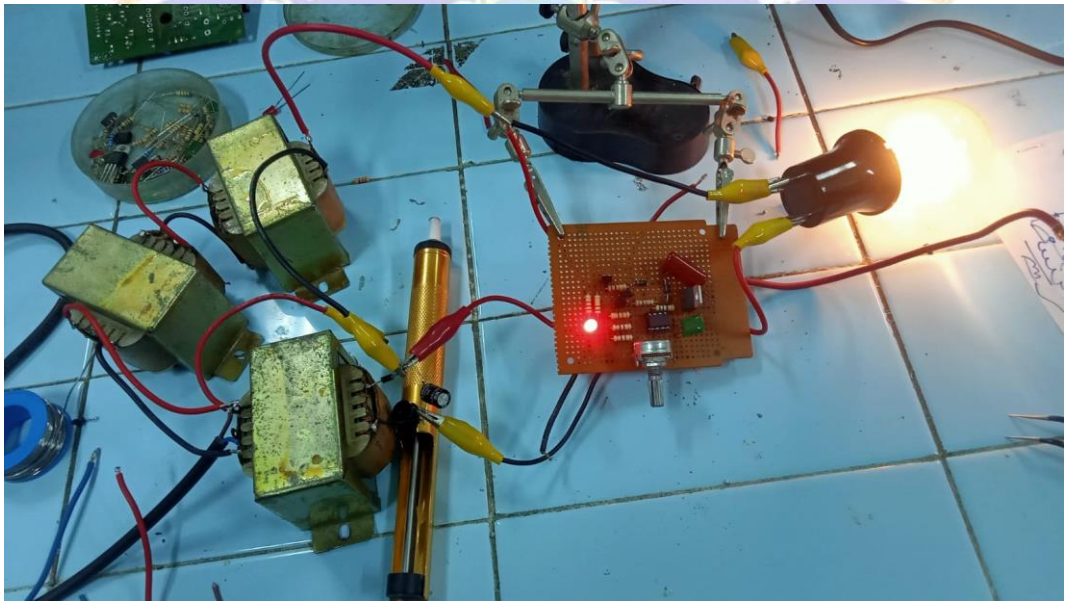
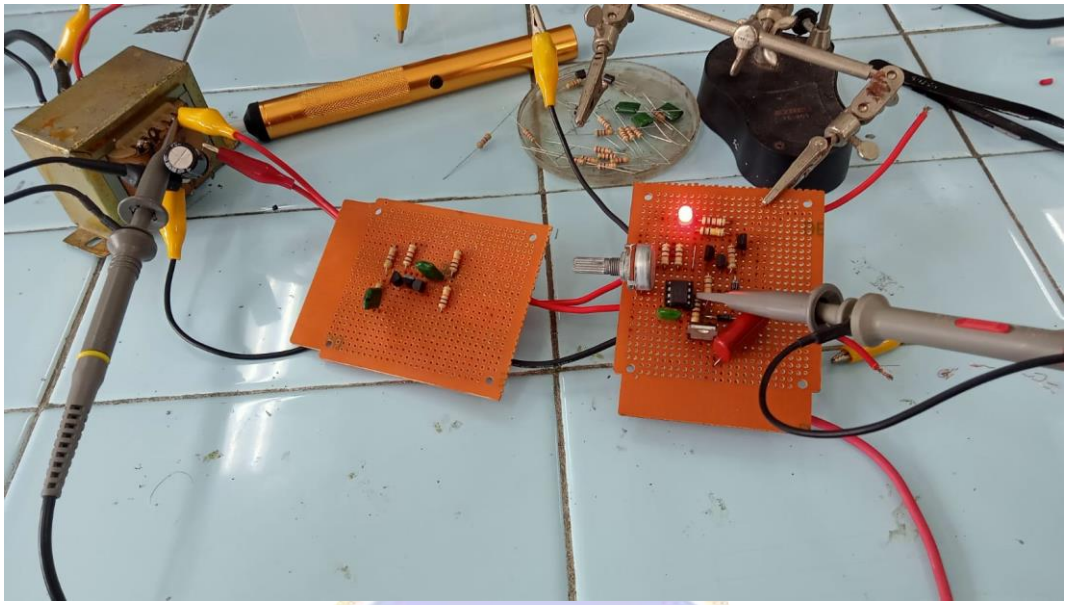
LAMPIRAN-LAMPIRAN

Lampiran 1. Dokumentasi







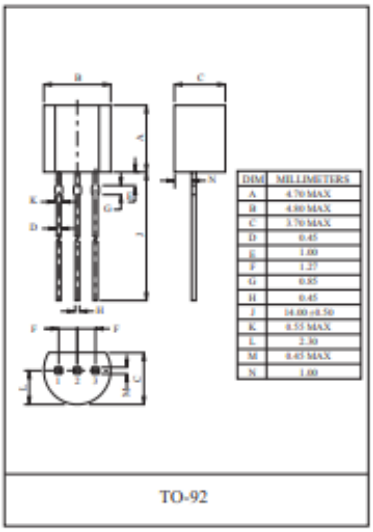
Lampiran 2. Data Sheet Komponen

KEC **SEMICONDUCTOR** **KTC9014**

TECHNICAL DATA **EPITAXIAL PLANAR NPN TRANSISTOR**

GENERAL PURPOSE APPLICATION.
SWITCHING APPLICATION.

FEATURES
- Excellent h_{FE} Linearity
  : $h_{FE}(I_C=0.1mA)/h_{FE}(I_C=2mA)=0.95(Typ.)$.
- Low Noise :NF=1dB(Typ.) at f=1kHz.
- Complementary to KTC9015.



TO-92

MAXIMUM RATING (Ta=25℃)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Collector-Base Voltage	V_{CBO}	60	V
Collector-Emitter Voltage	V_{CEO}	50	V
Emitter-Base Voltage	V_{EBO}	5	V
Collector Current	I_C	150	mA
Emitter Current	I_E	-150	mA
Collector Power Dissipation	P_C*	625	mW
		400	
Junction Temperature	T_j	150	℃
Storage Temperature Range	T_{stg}	-55~ 150	℃

* Cu Lead-Frame : 625mW
Fe Lead-Frame : 400mW

ELECTRICAL CHARACTERISTICS (Ta=25℃)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Collector Cut-off Current	I_{CBO}	V_{CB}=50V, I_E=0	-	-	50	nA
Emitter Cut-off Current	I_{EBO}	V_{EB}=5V, I_C=0	-	-	100	nA
DC Current Gain	h_{FE} (Note)	V_{CE}=5V, I_C=1mA	60	-	1000	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C=100mA, I_B=10mA	-	0.1	0.25	V
Transition Frequency	f_T	V_{CE}=10V, I_C=1mA, f=100MHz	60	-	-	MHz
Collector Output Capacitance	C_{ob}	V_{CB}=10V, I_E=0, f=1MHz	-	2.0	3.5	pF
Noise Figure	NF	V_{CE}=6V, I_C=0.1mA, Rg=10kΩ, f=1kHz	-	1.0	10	dB

Note : h_{FE} Classification A:60~ 150, B:100~ 300, C:200~ 600, D:400~ 1000

1 Characteristics

Table 1. **Absolute maximum ratings**

Symbol	Parameters			Value	Unit
$I_{T(RMS)}$	RMS on-state current (full sine wave)	D^2PAK / TO-220AB	T_c = 100 °C	25	A
		TO-220AB Ins.	T_c = 75 °C		
I_{TSM}	Non repetitive surge peak on-state current (full cycle, T_j initial = 25 °C)	f = 60 Hz	t_p = 16,7 ms	260	A
		f = 50 Hz	t_p = 20 ms	250	
I^2t	I^2t value for fusing	t_p = 10 ms		340	A^2s
dI/dt	Critical rate of rise of on-state current I_G = 2 x I_{GT} , $t_r \leq$ 100 ns	f = 120 Hz	T_j = 125 °C	50	A/µs
V_{DSM}, V_{RSM}	Non repetitive surge peak off-state voltage	t_p = 10 ms	T_j = 25 °C	V_{DRM}, V_{RRM} + 100	V
V_{DRM}, V_{RRM}	Repetitive peak off-state voltage		T_j = 25 °C	600 or 800	V
I_{GM}	Peak gate current	t_p = 20 µs	T_j = 125 °C	4	A
$P_{G(AV)}$	Average gate power dissipation		T_j = 125 °C	1	W
T_{stg}	Storage junction temperature range			-40 to +150	°C
T_j	Operating junction temperature range			-40 to +125	°C
T_L	Maximum lead temperature for soldering during 10 s			260	°C
V_{INS}	Insulation RMS voltage, 1 minute			2.5	kV

Table 2. **Electrical characteristics (T_j = 25 °C, unless otherwise specified) - Snubberless (3 quadrants) T25, BTA24-XXXXW, BTB24-XXXXW**

Symbol	Parameters	Quadrant		T25	BTA/BTB		Unit
				T2535	CW	BW	
I_{GT}(1)	V_D = 12 V, R_L = 33 Ω	I - II - III	Max.	35	35	50	mA
V_{GT}		I - II - III	Max.	1.3			V
V_{GD}	V_D = V_{DRM}, R_L = 3.3 kΩ, T_j = 125 °C	I - II - III	Min.	0.2			V
I_H(2)	I_T = 500 mA		Max.	50	50	75	mA
I_L	I_G = 1.2 I_{GT}	I - III	Max.	70	70	80	mA
		II	Max.	80	80	100	
dV/dt(2)	V_D = 67 % V_{DRM} gate open, T_j = 125 °C		Min.	500	500	1000	V/µs
(dI/dt)c(2)	Without snubber		Min.	13	13	22	A/ms

1. *Minimum I_{GT} is guaranteed at 5 % of I_{GT} max.*
2. *For both polarities of A2 referenced to A1*

Table 3. Electrical characteristics (T_j = 25 °C, unless otherwise specified) - standard (4 quadrants) BTB24-800B, BTB24-600B

Symbol	Parameters	Quadrant		Value	Unit
I_{GT}[1]	V_D = 12 V, R_L = 33 Ω	I - II - III	Max.	50	mA
		IV		100	
V_{GT}		All	Max.	1.3	V
V_{GD}	V_D = V_{DRM}, R_L = 3.3 kΩ, T_j = 125 °C	All	Min.	0.2	V
I_H[2]	I_T = 500 mA		Max.	80	mA
I_L	I_G = 1.2 I_{GT}	I - III - IV	Max.	70	mA
		II	Max.	160	
dV/dt[2]	V_D = 67 % V_{DRM} gate open, T_j = 125 °C		Min.	500	V/µs
(dV/dt)c[2]	(dI/dt)c = 13.3 A/ms, T_j = 125 °C		Min.	10	V/µs

1. *Minimum I_{GT} is guaranteed at 5 % of I_{GT} max.*
2. *For both polarities of A2 referenced to A1*

Table 4. Static electrical characteristics

Symbol	Test conditions	T_j		Value	Unit
V_{TM}[1]	I_{TM} = 35 A, t_p = 380 µs	25 °C	Max.	1.55	V
V_{TO}[1]	threshold on-state voltage	125 °C	Max.	0.85	V
R_D[1]	Dynamic resistance	125 °C	Max.	16	mΩ
I_{DRM}/I_{RRM}	V_T = V_{DRM}, V_T = V_{RRM}	25 °C	Max.	5	µA
		125 °C		3	mA

1. *For both polarities of A2 referenced to A1*

Table 5. Thermal resistance

Symbol	Parameters			Value	Unit
$R_{th(j-c)}$	Junction to case (AC)	D^2PAK / TO-220AB	Max.	0.8	°C/W
		TO-220AB insulated		1.7	
$R_{th(j-a)}$	Junction to ambient, S[1] = 2.5 cm²	D^2PAK	Typ.	45	
	Junction to ambient	TO-220AB / TO-220AB insulated		60	

1. *S = Copper surface under tab.*

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at T_A = 25°C unless otherwise noted.

Symbol	Parameter		Value	Unit
V_{CBO}	Collector-Base Voltage	BC546	80	V
		BC547 / BC550	50	
		BC548 / BC549	30	
V_{CEO}	Collector-Emitter Voltage	BC546	65	V
		BC547 / BC550	45	
		BC548 / BC549	30	
V_{EBO}	Emitter-Base Voltage	BC546 / BC547	6	V
		BC548 / BC549 / BC550	5	
I_C	Collector Current (DC)		100	mA
P_C	Collector Power Dissipation		500	mW
T_J	Junction Temperature		150	°C
T_{STG}	Storage Temperature Range		-65 to +150	°C

Electrical Characteristics

Values are at T_A = 25°C unless otherwise noted.

Symbol	Parameter		Conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector Cut-Off Current		V_{CB} = 30 V, I_E = 0			15	nA
h_{FE}	DC Current Gain		V_{CE} = 5 V, I_C = 2 mA	110		800	
V_{CE}(sat)	Collector-Emitter Saturation Voltage		I_C = 10 mA, I_B = 0.5 mA		90	250	mV
			I_C = 100 mA, I_B = 5 mA		250	600	
V_{BE}(sat)	Base-Emitter Saturation Voltage		I_C = 10 mA, I_B = 0.5 mA		700		mV
			I_C = 100 mA, I_B = 5 mA		900		
V_{BE}(on)	Base-Emitter On Voltage		V_{CE} = 5 V, I_C = 2 mA	580	660	700	mV
			V_{CE} = 5 V, I_C = 10 mA			720	
f_T	Current Gain Bandwidth Product		V_{CE} = 5 V, I_C = 10 mA, f = 100 MHz		300		MHz
C_{ob}	Output Capacitance		V_{CB} = 10 V, I_E = 0, f = 1 MHz		3.5	6.0	pF
C_{ib}	Input Capacitance		V_{EB} = 0.5 V, I_C = 0, f = 1 MHz		9		pF
NF	Noise Figure	BC546 / BC547 / BC548	V_{CE} = 5 V, I_C = 200 µA, f = 1 kHz, R_G = 2 kΩ		2.0	10.0	dB
		BC549 / BC550			1.2	4.0	
		BC549	V_{CE} = 5 V, I_C = 200 µA, R_G = 2 kΩ, f = 30 to 15000 MHz		1.4	4.0	
		BC550			1.4	3.0	

h_{FE} Classification

Classification	A	B	C
h_{FE}	110 ~ 220	200 ~ 450	420 ~ 800