LAMPIRAN

```
(* PROGRAM PROTOTYPE GERAK LEVITASI MAGNETIK *)
(* OLEH *)
(* ALI MUSTHOFA *)
(* 5103097044 *)

uses crt,dos;
var  a,b,m,n:longint;                                   {inisialisasi variable}
i,c,d,e,f,g,h:byte;
tunda_berhenti,tunda_emf,tunda:integer;
tombol,tombol2:char;
balik,utara:boolean;
hi, mi, s, hund : Word;

label    selesai;

function LeadingZero(w : Word) : String;                          {fungsi time}
var
s : String;
begin
Str(w:0,s);
if Length(s) = 1 then
s := '0' + s;
LeadingZero := s;
end;

procedure tamp(x,y,m:longint);                    {prosedur untuk menampilkan
                                                  keadaan saat ini ke layar monitor}
var i :byte;                                                {mode Teks 25 x 80 }
j,q,k,t1,t2:longint;
begin
j:=x;
q:=y;
k:=m;
textcolor(lightred);
for i:=1 to 40 do
begin
gotoxy(3+(3*((i-1) mod 24)),6+(10*(i div 25)));
if (j and $0001) = 1 then Write('1') else Write('0');
gotoxy(3+(3*((i-1) mod 24)),8+(10*(i div 25)));
if (j and $0001) = 1 then Write('1') else Write('0');
t1:= (q shl 16) and $f0000;
t2:= (m shl 16) and $f0000;
j:= j or t1;
j:= j shr 1;
q:= q or t2;
q:= q shr 1;
m:= m shr 1;
end;
textcolor(white);
end;

procedure keluar;                    {prosedur untuk mengeluarkan data ke ppi}
begin
c:=a mod 256;
d:=a div 256;
e:=b mod 256;
```

```
f:=b div 256;
g:=m mod 256;
port[$300]:=c;
port[$301]:=d;
port[$302]:=e;
port[$304]:=f;
port[$305]:=g;
end;
```

{ MAIN PROGRAM }

```
begin
  clrscr;                                                    {membersihkan layar}
{---------}
  for i:=1 to 40 do
    begin
      gotoxy(3+(3*((i-1) mod 24)),4+(10*(i div 25)));Write(i-1);

                                        {Inisialisasi tampilan ke layar monitor }

      gotoxy(3+(3*((i-1) mod 24)),10+(10*(i div 25)));Write(i-1);
    end;
{---------}
    port[$303]:=$80;                                {init ppi,semua sebagai output}
    port[$307]:=$80;
{---------}
    tunda:=150;                  {init setting waktu tunda on,emf,berhenti/mandek}
    tunda_emf:=50;
    tunda_berhenti:=10;
{---------}
    a:=$0;
    b:=$0;                                        {mula-mula mematikan semua magnet}
    m:=$0;
    port[$306]:=$00;
{---------}
    keluar;                                            {mengeluarkan data ke ppi}
{---------}
    tamp(a,b,m);                                      {mengeluarkan tampilan keadaan
                                                        saat ini ke layar monitor}
{---------}
    tombol2:=#20;
    while (tombol2<>#13) and (tombol2<>#27) do tombol2:=readkey;
    if tombol2=#27 then goto selesai;                    {tunggu tanda enter untuk
                                                      mulai dan esc untuk keluar }

GetTime(hi,mi,s,hund);
    gotoxy(1,1);Writeln('Start : ',LeadingZero(hi),':',
    LeadingZero(mi),':',LeadingZero(s),
    '.',LeadingZero(hund));

{-------------------------------------------------------------------1}
    port[$306]:=$01;
    a:=$050a;                                     {mengaktifkan kumparan 1 dan 3}
    b:=$0000;
    m:=$0000;
```

```
{---------}
    keluar;                                          {mengeluarkan data ke ppi}
{---------}
    tamp(a,b,m);                                     {keluarkan tampilan keadaan
                                                      saat ini ke layar monitor}
{---------}
    delay(tunda);                                   {menunda lama kumparan menyala}
{---------}
    a:=$0408;                          {menghilangkan emf balik pada kumparan 1 & 3}
    b:=$0000;
    m:=$0000;
    keluar;                                                  {keluarkan ke ppi}
    tamp(a,b,m);                                    {keluarkan tampilan keadaan
                                                     saat ini ke layar monitor}
{---------}
    delay(tunda_emf);                               {tunda untuk menghilangkan emf}
{---------}
    a:=$0000;                                          {matikan semua kumparan}
    b:=$0000;
    m:=$0000;
    keluar;                                          {mengeluarkan data ke ppi}
    tamp(0,0,0);                                    {keluarkan tampilan keadaan
                                                     saat ini ke layar monitor}
    delay(tunda_berhenti);                    {tunda untuk berhenti}
{---------}
    GetTime(hi,mi,s,hund);
    gotoxy(35,1);Writeln('Geser : ',LeadingZero(hi),':',
    LeadingZero(mi),':',LeadingZero(s),
    '.',LeadingZero(hund));

{-------------------------------------------------------------------2}
    if keypressed then tombol2:=readkey;
       if tombol2=#27 then goto selesai;
       port[$306]:=$02;
       a:=$50a0;                  { mengaktifkan kumparan 2 dan 4 }
       b:=$0000;
       m:=$0000;
       keluar;
       tamp(a,b,m);
       delay(tunda);
       a:=$4080;
       b:=$0000;
       m:=$0000;
       keluar;
       tamp(a,b,m);
       delay(tunda_emf);
       a:=$0000;
       b:=$0000;
       m:=$0000;
       keluar;
       tamp(0,0,0);
       delay(tunda_berhenti);
{-------------------------------------------------------------------3}

       if keypressed then tombol2:=readkey;
       if tombol2=#27 then goto selesai;
       port[$306]:=$04;
```

```
      a:=$0a00;                                  { mengaktifkan kumparan 3 dan 5 }
      b:=$0005;
      m:=$0000;
      keluar;
      tamp(a,b,m);
      delay(tunda);
      a:=$0800;
      b:=$0004;
      m:=$0000;
      keluar;
      tamp(a,b,m);
      delay(tunda_emf);
      a:=$0000;
      b:=$0000;
      m:=$0000;
      keluar;
      tamp(0,0,0);
      delay(tunda_berhenti);
{-------------------------------------------------------------------4}

      if keypressed then tombol2:=readkey;
      if tombol2=#27 then goto selesai;
      port[$306]:=$08;
      a:=$a000;                                  { mengaktifkan kumparan 4 dan 6 }
      b:=$0050;
      m:=$0000;
      keluar;
      tamp(a,b,m);
      delay(tunda);
      a:=$8000;
      b:=$0040;
      m:=$0000;
      keluar;
      tamp(a,b,m);
      delay(tunda_emf);
      a:=$0000;
      b:=$0000;
      m:=$0000;
      keluar;
      tamp(0,0,0);
      delay(tunda_berhenti);
{-------------------------------------------------------------5}
      if keypressed then tombol2:=readkey;
      if tombol2=#27 then goto selesai;
      port[$306]:=$10;
      a:=$0000;
      b:=$050a;                                  { mengaktifkan kumparan 5 dan 7 }
      m:=$0000;
      keluar;
      tamp(a,b,m);
      delay(tunda);
      a:=$0000;
      b:=$0408;
      m:=$0000;
      keluar;
      tamp(a,b,m);
      delay(tunda_emf);
```

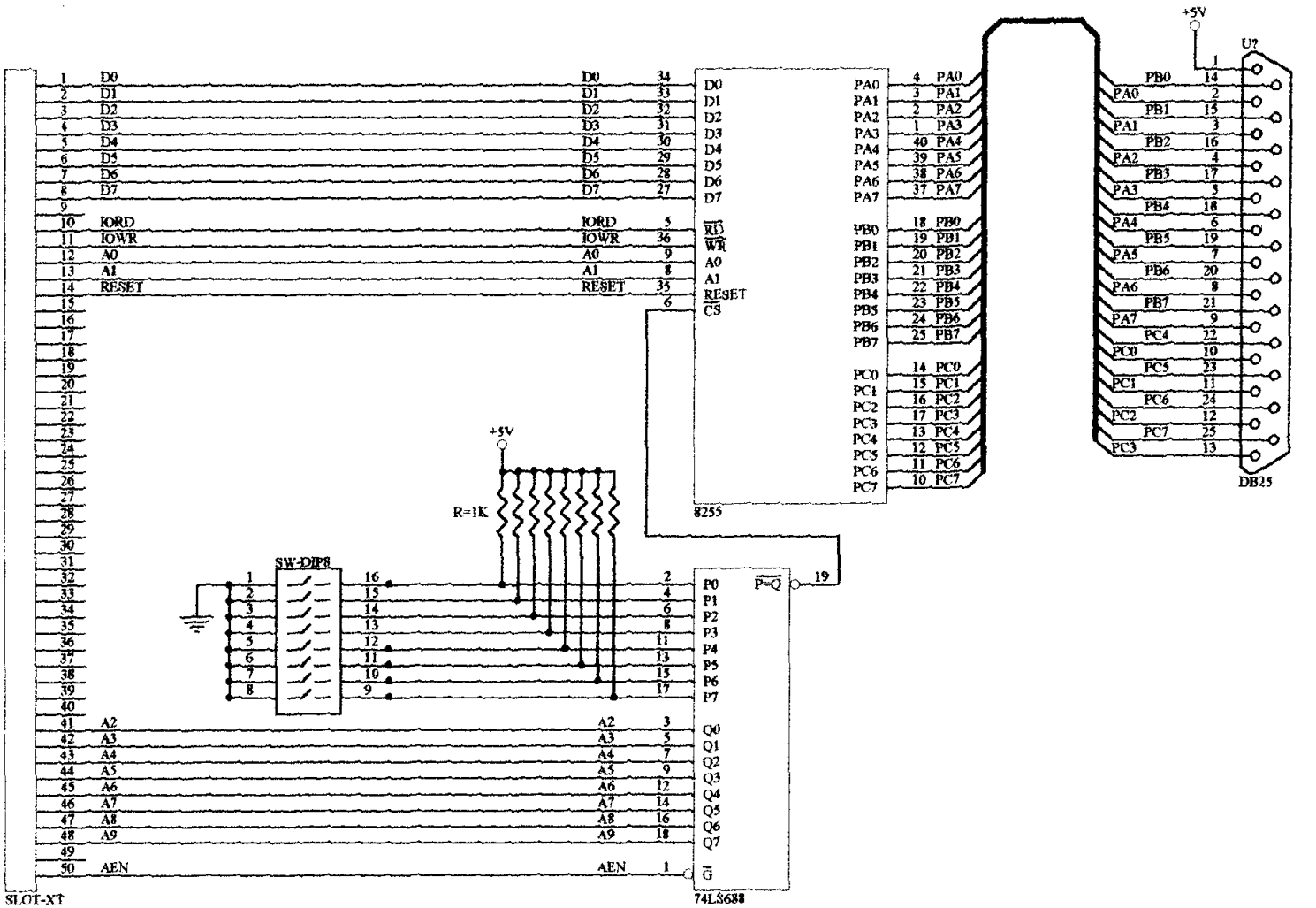
```
        a:=$0000;
        b:=$0000;
        m:=$0000;
        keluar;
        tamp(0,0,0);
        delay(tunda_berhenti);
{-------------------------------------------------------------6}
        if keypressed then tombol2:=readkey;
        if tombol2=#27 then goto selesai;
        port[$306]:=$20;
        a:=$0000;
        b:=$50a0;                              { mengaktifkan kumparan 6 dan 8 }
        m:=$0000;
        keluar;
        tamp(a,b,m);
        delay(tunda);
        a:=$0000;
        b:=$4080;
        m:=$0000;
        keluar;
        tamp(a,b,m);
        delay(tunda_emf);
        a:=$0000;
        b:=$0000;
        m:=$0000;
        keluar;
        tamp(0,0,0);
        delay(tunda_berhenti);
{-------------------------------------------------------------7}
        if keypressed then tombol2:=readkey;
        if tombol2=#27 then goto selesai;
        port[$306]:=$40;
        a:=$0000;
        b:=$0a00;                              { mengaktifkan kumparan 7 dan 9 }
        m:=$0005;
        keluar;
        tamp(a,b,m);
        delay(tunda);
        a:=$0000;
        b:=$0800;
        m:=$0004;
        keluar;
        tamp(a,b,m);
        delay(tunda_emf);
        a:=$0000;
        b:=$0000;
        m:=$0000;
        keluar;
        tamp(0,0,0);
        delay(tunda_berhenti);
{-------------------------------------------------------------8}
        if keypressed then tombol2:=readkey;
        if tombol2=#27 then goto selesai;

        port[$306]:=$80;
        a:=$0000;
        b:=$a000;                             { mengaktifkan kumparan 8 dan 10 }
```

```
      m:=$0050;
      keluar;
      tamp(a,b,m);
      delay(tunda);
      a:=$0000;
      b:=$8000;
      m:=$0040;
      keluar;
      tamp(a,b,m);
      delay(tunda_emf);
      a:=$0000;
      b:=$0000;
      m:=$0000;
      keluar;
      tamp(0,0,0);
      delay(tunda_berhenti);

      delay(5000);
{ Vehicle mundur }
{-------------------------------------------------------8 balik}
      if keypressed then tombol2:=readkey;
      if tombol2=#27 then goto selesai;
      port[$306]:=$80;
      a:=$0000;
      b:=$5000;                              { mengaktifkan kumparan 10 dan 8 }
      m:=$00a0;
      keluar;
      tamp(a,b,m);
      delay(tunda);
      a:=$0000;
      b:=$4000;
      m:=$0080;
      keluar;
      tamp(a,b,m);
      delay(tunda_emf);
      a:=$0000;
      b:=$0000;
      m:=$0000;
      keluar;
      tamp(0,0,0);
      delay(tunda_berhenti);
{-------------------------------------------------------7 balik}
      if keypressed then tombol2:=readkey;
      if tombol2=#27 then goto selesai;
      port[$306]:=$40;
      a:=$0000;
      b:=$0500;                               { mengaktifkan kumparan 9 dan 7 }
      m:=$000a;
      keluar;
      tamp(a,b,m);
      delay(tunda);
      a:=$0000;
      b:=$0400;
      m:=$0008;
      keluar;
      tamp(a,b,m);
      delay(tunda_emf);
```

```
        a:=$0000;
        b:=$0000;
        m:=$0000;
        keluar;
        tamp(0,0,0);
        delay(tunda_berhenti);

{-------------------------------------------------------6 balik}
        if keypressed then tombol2:=readkey;
        if tombol2=#27 then goto selesai;
        port[$306]:=$20;
        a:=$0000;
        b:=$a050;                                { mengaktifkan kumparan 8 dan 6 }
        m:=$0000;
        keluar;
        tamp(a,b,m);
        delay(tunda);
        a:=$0000;
        b:=$80a0;
        m:=$0000;
        keluar;
        tamp(a,b,m);
        delay(tunda_emf);
        a:=$0000;
        b:=$0000;
        m:=$0000;
        keluar;
        tamp(0,0,0);
        delay(tunda_berhenti);
{-------------------------------------------------------5 balik}
        if keypressed then tombol2:=readkey;
        if tombol2=#27 then goto selesai;
        port[$306]:=$10;
        a:=$0000;
        b:=$0a05;                                { mengaktifkan kumparan 7 dan 5 }
        m:=$0000;
        keluar;
        tamp(a,b,m);
        delay(tunda);
        a:=$0000;
        b:=$0804;
        m:=$0000;
        keluar;
        tamp(a,b,m);
        delay(tunda_emf);
        a:=$0000;
        b:=$0000;
        m:=$0000;
        keluar;
        tamp(0,0,0);
        delay(tunda_berhenti);

{-------------------------------------------------------4 balik}
        if keypressed then tombol2:=readkey;
        if tombol2=#27 then goto selesai;
        port[$306]:=$08;
        a:=$5000;                                { mengaktifkan kumparan 6 dan 4 }
```

```
      b:=$00a0;
      m:=$0000;
      keluar;
      tamp(a,b,m);
      delay(tunda);
      a:=$4000;
      b:=$0080;
      m:=$0000;
      keluar;
      tamp(a,b,m);
      delay(tunda_emf);
      a:=$0000;
      b:=$0000;
      m:=$0000;
      keluar;
      tamp(0,0,0);
      delay(tunda_berhenti);
{-------------------------------------------------------------3 balik}
      if keypressed then tombol2:=readkey;
      if tombol2=#27 then goto selesai;
      port[$306]:=$04;
      a:=$0500;                              { mengaktifkan kumparan  5 dan 3 }
      b:=$000a;
      m:=$0000;
      keluar;
      tamp(a,b,m);
      delay(tunda);
      a:=$0400;
      b:=$0008;
      m:=$0000;
      keluar;
      tamp(a,b,m);
      delay(tunda_emf);
      a:=$0000;
      b:=$0000;
      m:=$0000;
      keluar;
      tamp(0,0,0);
      delay(tunda_berhenti);

{-------------------------------------------------------------2 balik}
      if keypressed then tombol2:=readkey;
      if tombol2=#27 then goto selesai;
      port[$306]:=$02;
      a:=$a050;                              { mengaktifkan kumparan  4 dan 2 }
      b:=$0000;
      m:=$0000;
      keluar;
      tamp(a,b,m);
      delay(tunda);
      a:=$8040;
      b:=$0000;
      m:=$0000;
      keluar;
      tamp(a,b,m);
      delay(tunda_emf);
      a:=$0000;
```

```
        b:=$0000;
        m:=$0000;
        keluar;
        tamp(0,0,0);
        delay(tunda_berhenti);
{-------------------------------------------------------1 balik}
        if keypressed then tombol2:=readkey;
        if tombol2=#27 then goto selesai;
        port[$306]:=$01;
        a:=$0a05; b                              { mengaktifkan kumparan 3 dan 1 }
        b:=$0000;
        m:=$0000;
        keluar;
        tamp(a,b,m);
        delay(tunda);
        a:=$0804;
        b:=$0000;
        m:=$0000;
        keluar;
        tamp(a,b,m);
        delay(tunda_emf);
        a:=$0000;
        b:=$0000;
        m:=$0000;
        keluar;
        tamp(0,0,0);
        delay(tunda_berhenti);

        selesai:
        port[$306]:=$00;
readln;
end.
```



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Date: 3-Aug-2002	Sheet of	
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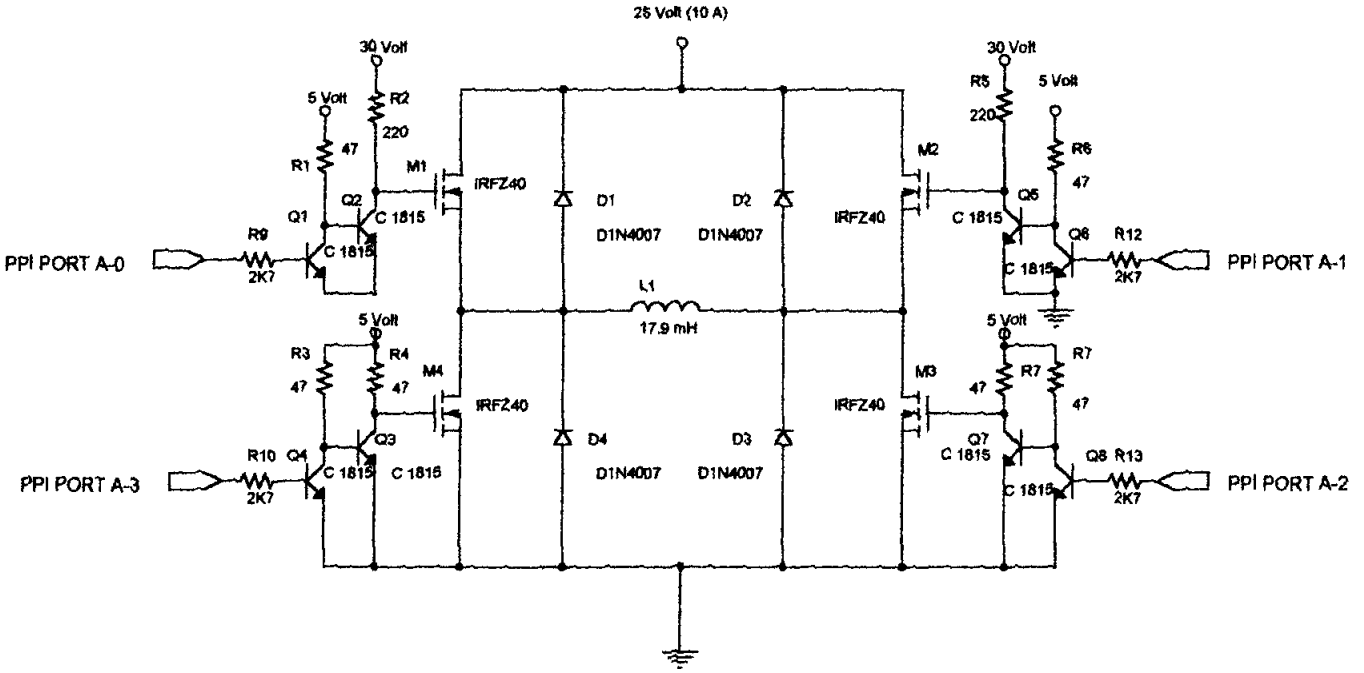


Title	<Title>	**Rangkaian Coil kontrol**
Size: A	Document Number: <Doc>	**Ali Musthofa / 5103097044**
		Rev: <RevCode>

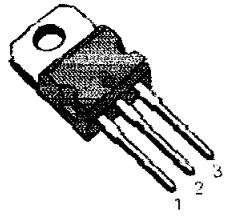
SGS-THOMSON MICROELECTRONICS

IRFZ40
IRFZ40FI

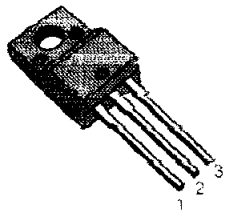
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
IRFZ40	50 V	< 0.028 Ω	50 A
IRFZ40FI	50 V	< 0.028 Ω	27 A

- TYPICAL $R_{DS(on)}$ = 0.022 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE



TO-220

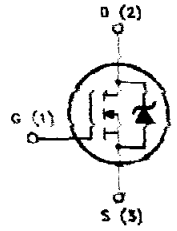


ISOWATT220

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		IRFZ40	IRFZ40FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	50	50	V
V_{DGR}	Drain - gate Voltage (R_{GS} = 20 kΩ)	50	50	V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (cont.) at T_c = 25 °C	50	27	A
I_D	Drain Current (cont.) at T_c = 100 °C	35	19	A
I_{DM}(•)	Drain Current (pulsed)	200	200	A
P_{tot}	Total Dissipation at T_c = 25 °C	150	45	W
	Derating Factor	1	0.3	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	1	3.33	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
$R_{thc\text{-}s}$	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	50	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 25$ V)	400	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	100	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	35	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	50			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10$V $I_D = 29$ A		0.022	0.028	Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	50			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 29$ A	17	22		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V $f = 1$ MHz $V_{GS} = 0$		1700 630 200	2200 850 260	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING RESISTIVE LOAD

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Time	V_{DD} = 25 V I_D = 29 A		50	70	ns
t_r	Rise Time	R_G = 4.7 Ω V_{GS} = 10 V		110	160	ns
$t_{d(off)}$	Turn-off Delay Time	(see test circuit)		60	90	ns
t_f	Fall Time			25	35	ns
Q_g	Total Gate Charge	I_D = 64 A V_{GS} = 10 V		50	70	nC
Q_{gs}	Gate-Source Charge	V_{DD} = Max Rating x 0.8		15		nC
Q_{gd}	Gate-Drain Charge	(see test circuit)		27		nC

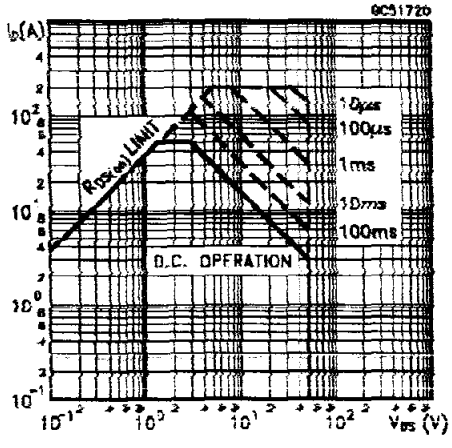
SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				50	A
I_{SDM}(•)	Source-drain Current (pulsed)				200	A
V_{SD} (*)	Forward On Voltage	V_{GS} = 0 I_{SD} = 50 A			2	V
t_{rr}	Reverse Recovery Time	I_{SD} = 50 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C		150		ns
Q_{rr}	Reverse Recovery Charge			0.45		µC

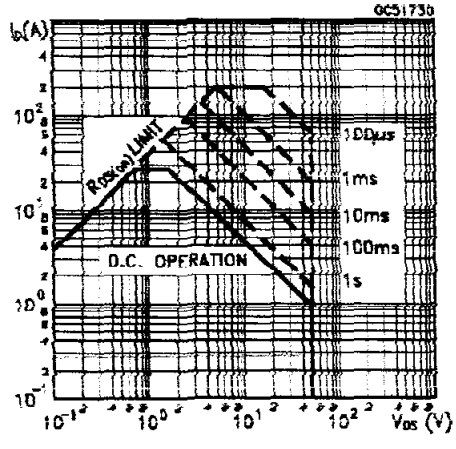
(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %

(•) Pulse width limited by safe operating area

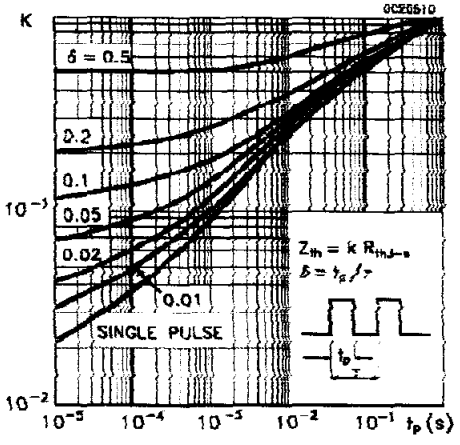
Safe Operating Area for TO-220



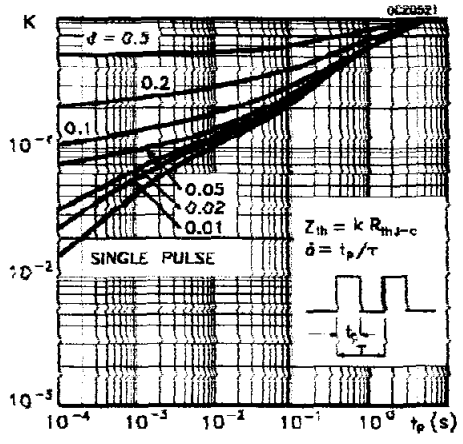
Safe Operating Area for ISOWATT220



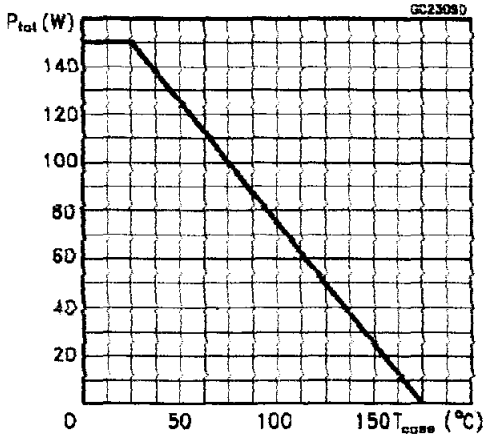
Thermal impedance for TO-220



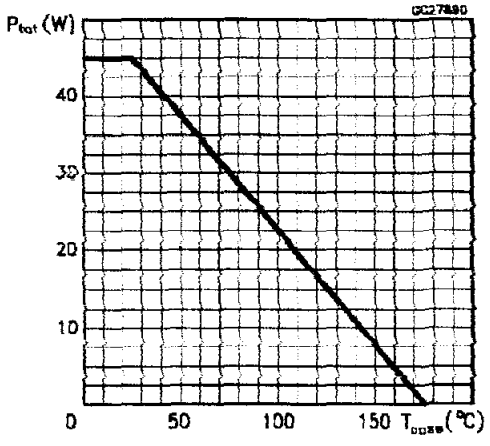
Thermal impedance for ISOWATT220



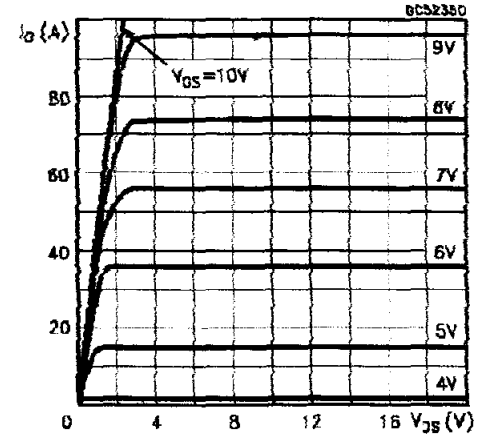
Derating Curve for TO-220



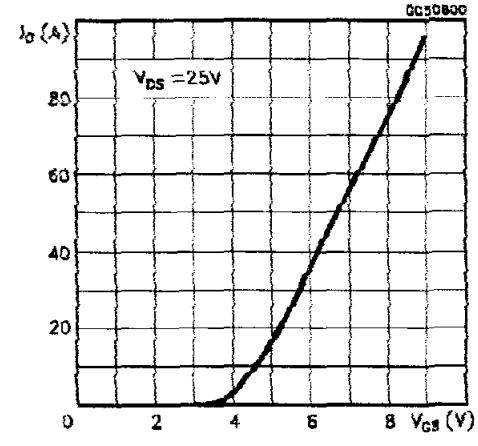
Derating Curve for ISOWATT220



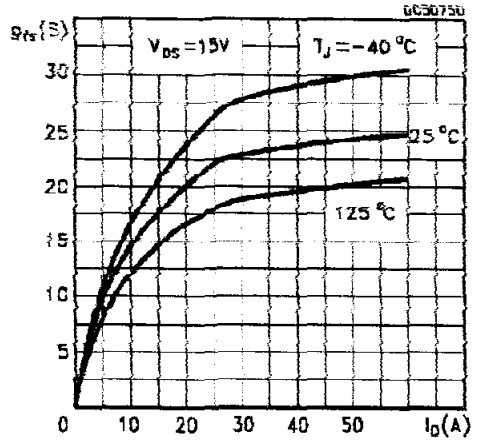
Output Characteristics



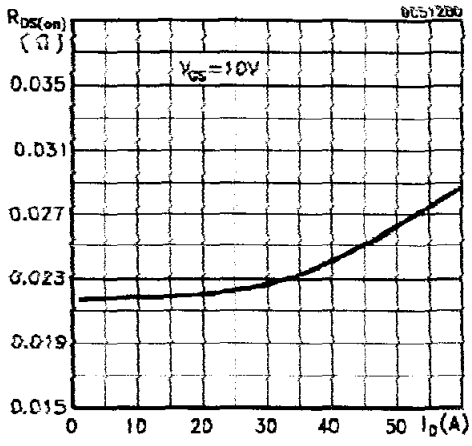
Transfer Characteristics



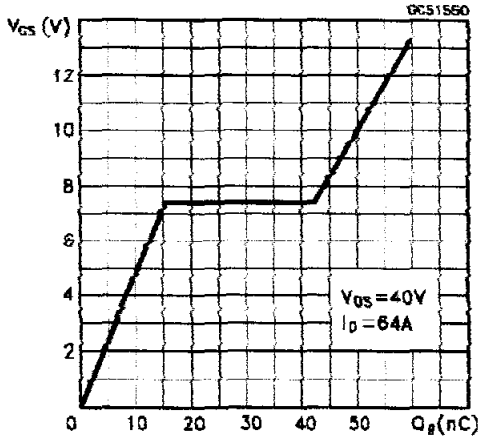
Transconductance



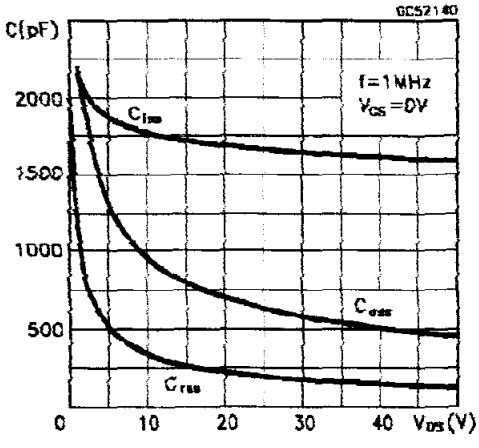
Static Drain-source On Resistance



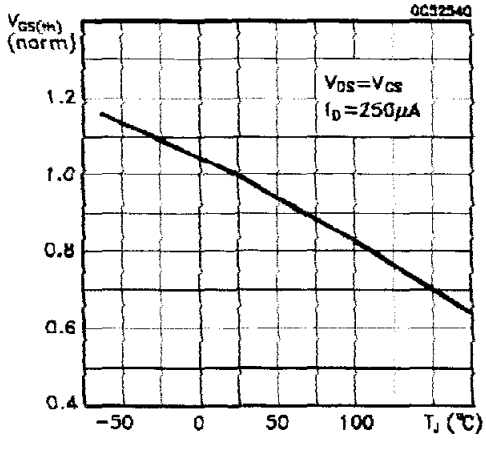
Gate Charge vs Gate-source Voltage



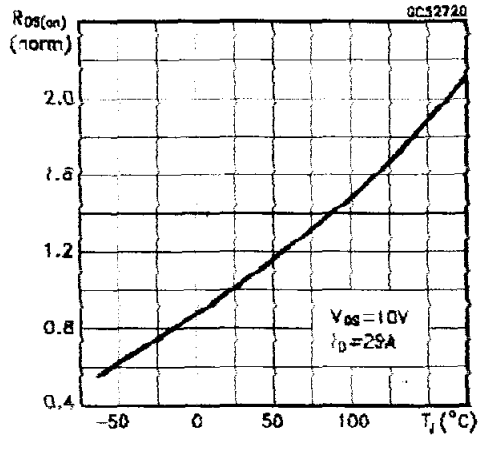
Capacitance Variations



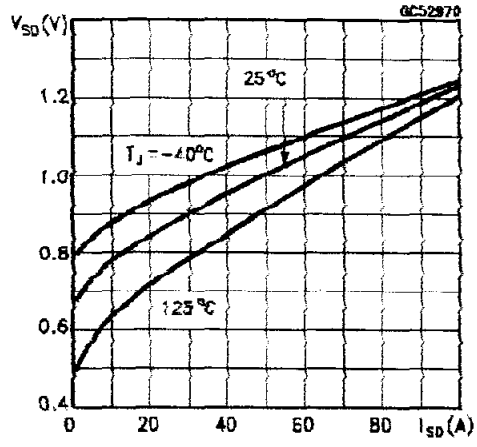
Normalized Gate Threshold Voltage vs Temperature



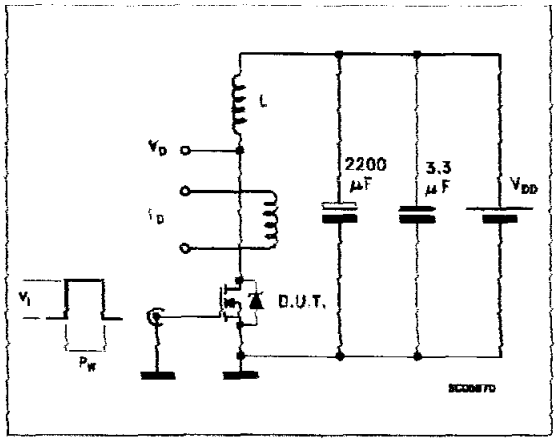
Normalized On Resistance vs Temperature



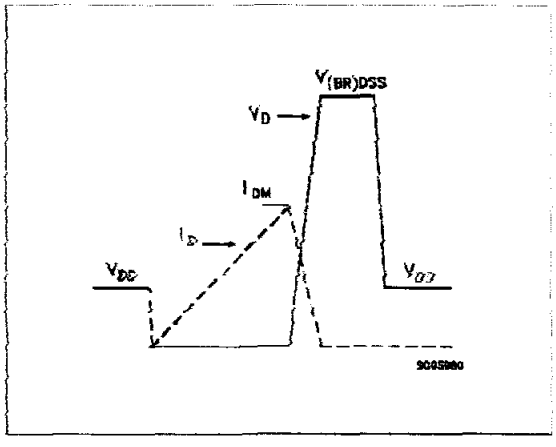
Source-drain Diode Forward Characteristics



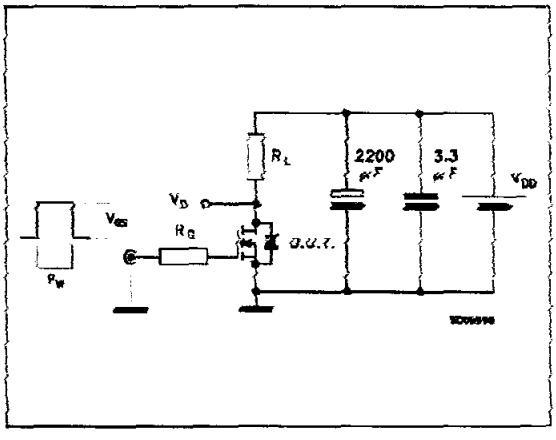
Unclamped Inductive Load Test Circuit



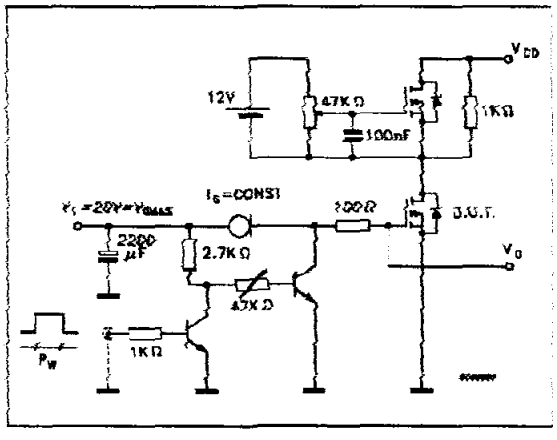
Unclamped Inductive Waveforms



Switching Time Test Circuit

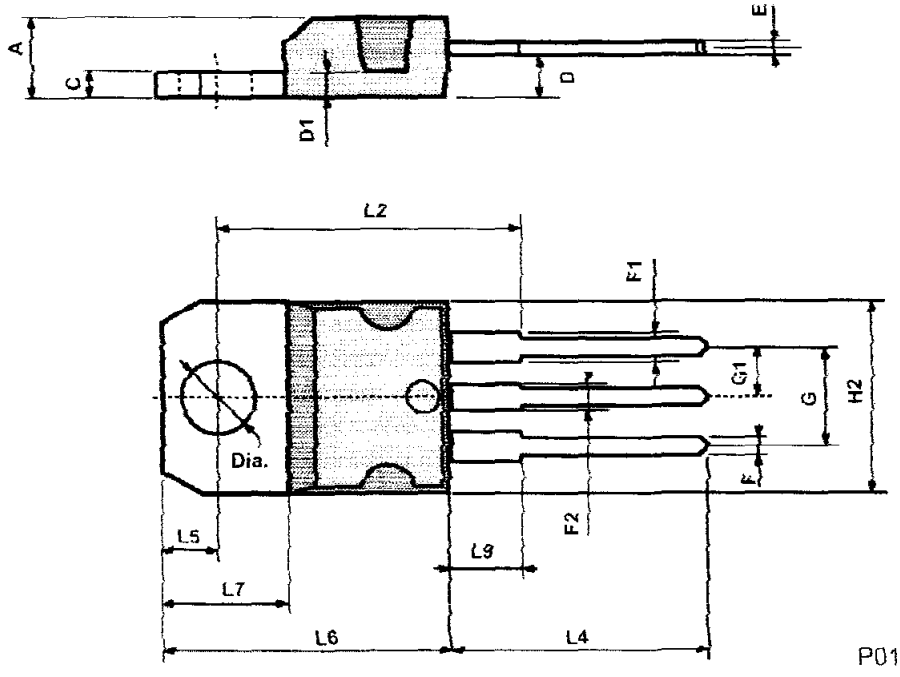


Gate Charge Test Circuit



TO-220 MECHANICAL DATA

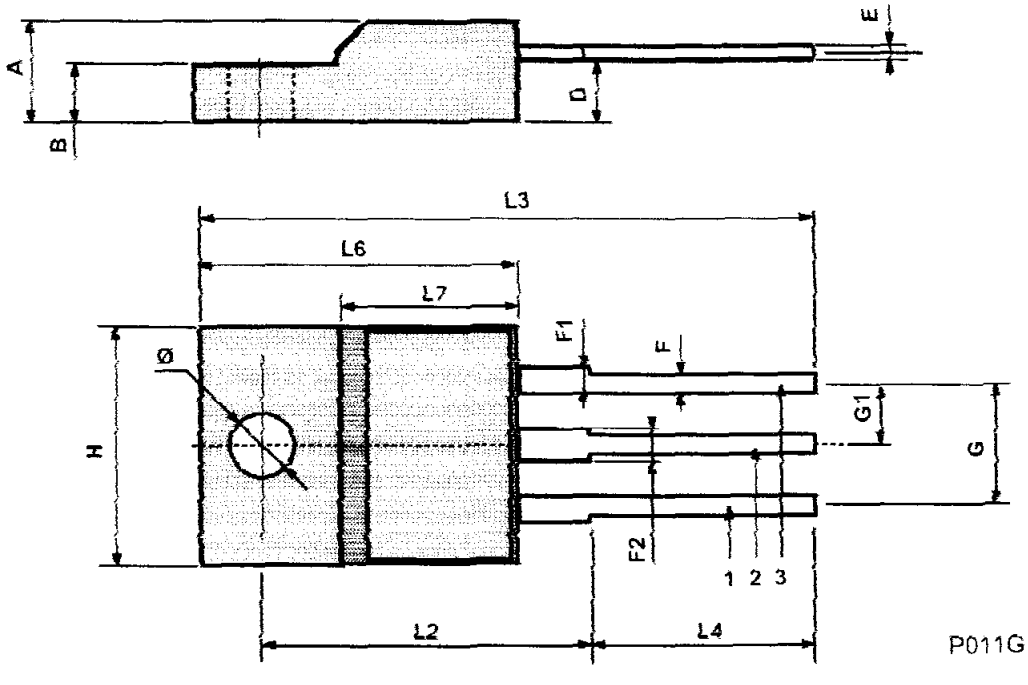
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.2		6.6	0.244		0.260
L9	3.5		3.93	0.137		0.154
DIA.	3.75		3.85	0.147		0.151



P011C

ISOWATT220 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.4		0.7	0.015		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.7	0.045		0.067
F2	1.15		1.7	0.045		0.067
G	4.95		5.2	0.195		0.204
G1	2.4		2.7	0.094		0.106
H	10		10.4	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.8		10.6	0.385		0.417
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		0.366
Ø	3		3.2	0.118		0.126



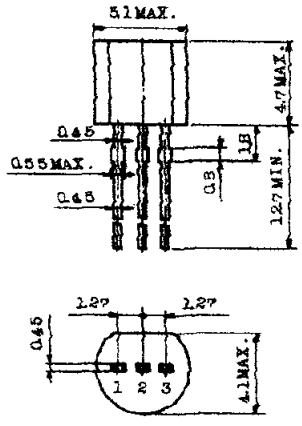
TOSHIBA TRANSISTOR SILICON NPN EPITAXIAL TYPE (PCT PROCESS)

2SC1815

AUDIO FREQUENCY GENERAL PURPOSE AMPLIFIER APPLICATIONS.
DRIVER STAGE AMPLIFIER APPLICATIONS.

- High Voltage and High Current
  : V_{CEO} = 50V (Min.), I_C = 150mA (Max.)
- Excellent h_{FE} Linearity
  : $h_{FE(2)}$ = 100 (Typ.) at V_{CE} = 6V, I_C = 150mA
  : h_{FE} (I_C = 0.1mA) / h_{FE} (I_C = 2mA) = 0.95 (Typ.)
- Low Noise : NF = 1dB (Typ.) at f = 1kHz
- Complementary to 2SA1015 (O, Y, GR class)

Unit in mm



1. EMITTER
2. COLLECTOR
3. BASE

JEDEC	TO-92
EIAJ	SC-43
TOSHIBA	2-5F1B

Weight : 0.21g

MAXIMUM RATINGS (Ta = 25°C)

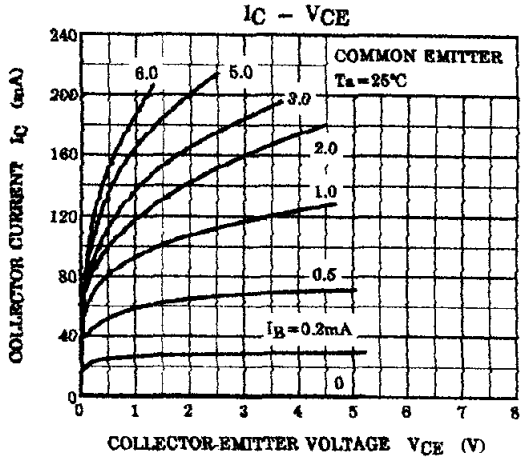
CHARACTERISTIC	SYMBOL	RATING	UNIT
Collector-Base Voltage	V_{CBO}	60	V
Collector-Emitter Voltage	V_{CEO}	50	V
Emitter-Base Voltage	V_{EBO}	5	V
Collector Current	I_C	150	mA
Base Current	I_B	50	mA
Collector Power Dissipation	P_C	400	mW
Junction Temperature	T_j	125	°C
Storage Temperature Range	T_{stg}	−55~125	°C

ELECTRICAL CHARACTERISTICS (Ta = 25°C)

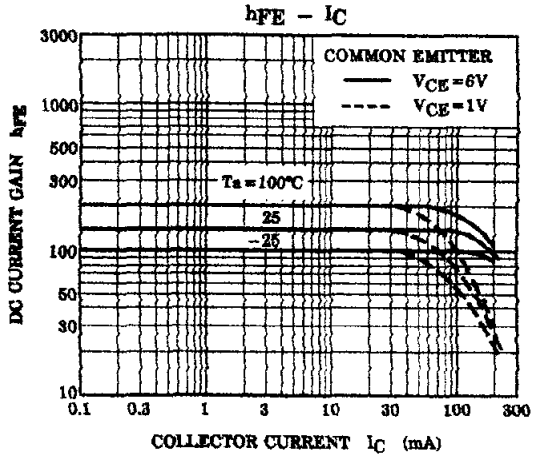
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Collector Cut-off Current	I_{CBO}	V_{CB} = 60V, I_E = 0	—	—	0.1	μA
Emitter Cut-off Current	I_{EBO}	V_{EB} = 5V, I_C = 0	—	—	0.1	μA
DC Current Gain	$h_{FE(1)}$ (Note)	V_{CE} = 6V, I_C = 2mA	70	—	700	
	$h_{FE(2)}$	V_{CE} = 6V, I_C = 150mA	25	100	—	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 100mA, I_B = 10mA	—	0.1	0.25	V
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	I_C = 100mA, I_B = 10mA	—	—	1.0	V
Transition Frequency	f_T	V_{CE} = 10V, I_C = 1mA	80	—		MHz
Collector Ouput Capacitance	C_{ob}	V_{CB} = 10V, I_E = 0, f = 1MHz	—	2.0	3.5	pF
Base Intrinsic Resistance	$r_{bb'}$	V_{CE} = 10V, I_E = −1mA f = 30MHz	—	50	—	Ω
Noise Figure	NF	V_{CE} = 6V, I_C = 0.1mA f = 1kHz, R_G = 10kΩ	—	1.0	10	dB

Note : h_{FE} Classification O : 70~140 Y : 120~240 GR : 200~400 BL : 350~700

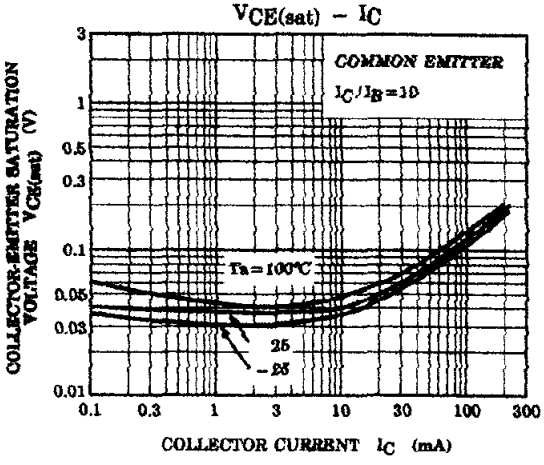
I_C – V_{CE}



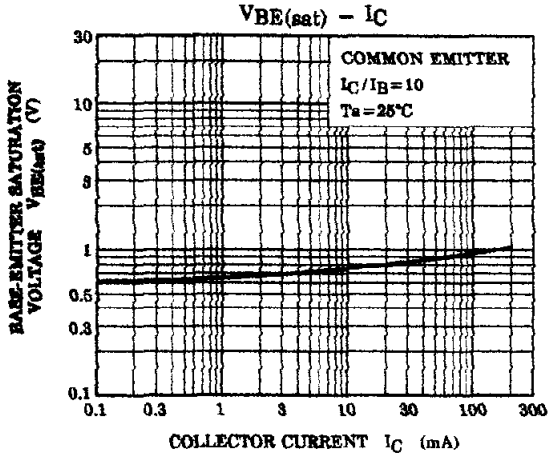
h_{FE} – I_C



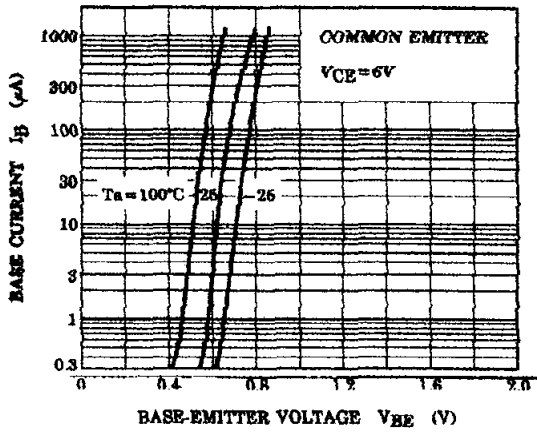
$V_{CE(sat)}$ – I_C



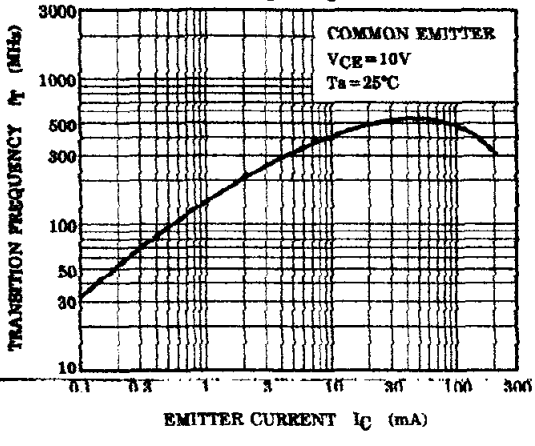
$V_{BE(sat)}$ – I_C



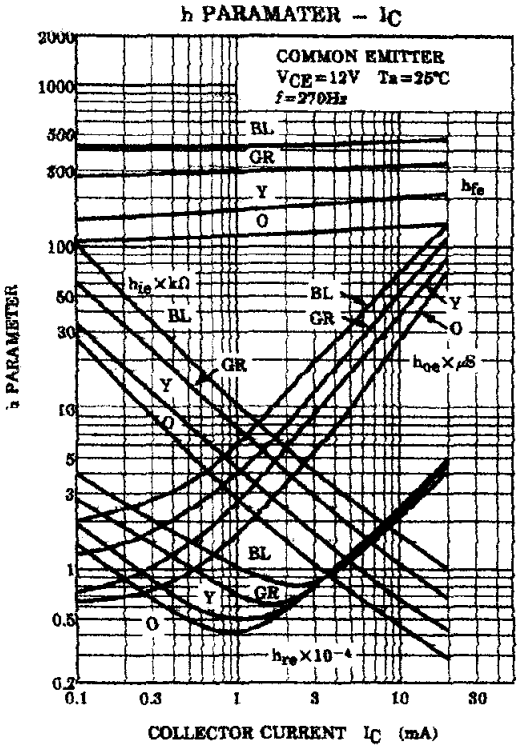
I_B – V_{BE}



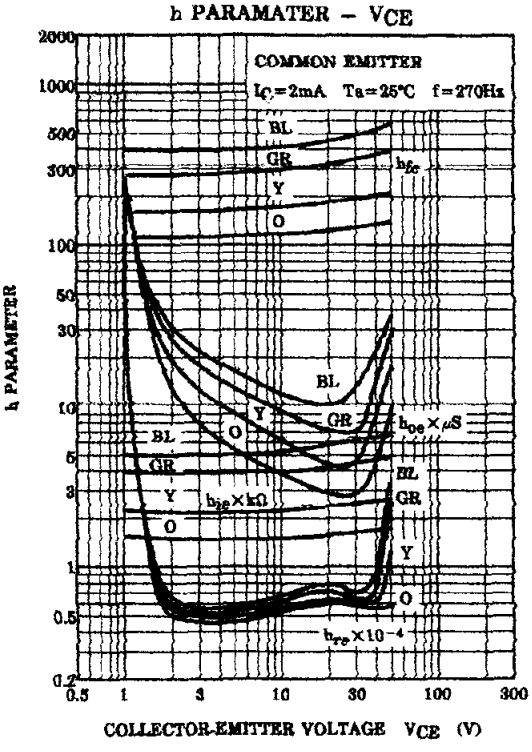
f_T – I_C



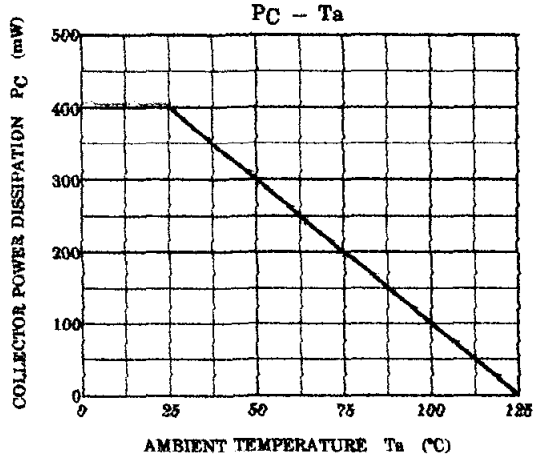
h PARAMATER – I_C



h PARAMATER – V_{CE}



P_C – Ta



BIODATA

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Agama	: Islam
Alamat	: Jl. Buntaran I / 35 Tandes Surabaya.

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- TK Muslimat Tandes Surabaya tahun 1979-1980.
- SD Nurul Ulum Surabaya tahun 1980-1986.
- SMP Darul Ulum Surabaya tahun 1986-1989.
- STM Negeri II Surabaya tahun 1989-1992.
- Sebagai Teknisi di PT Polynesia Industri Corp tahun 1992-1994.
- Institute Emanuel Indonesia (IEI) tahun 1995-1996
- Universitas Katolik Widya Mandala Surabaya Fakultas Teknik Jurusan Teknik Elektro tahun 1997 - 2002.