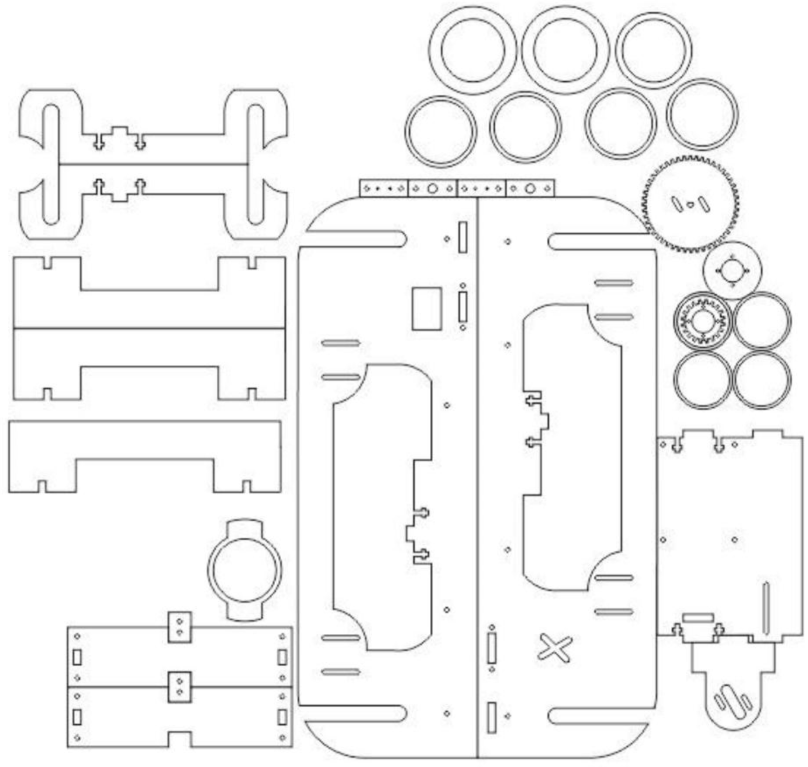
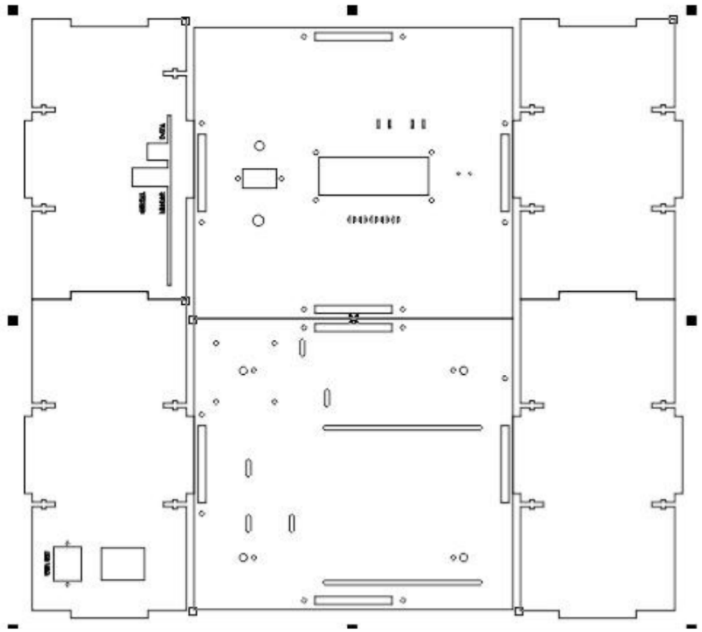
LAMPIRAN

Lampiran 1. Pola Kerangka Konveyor



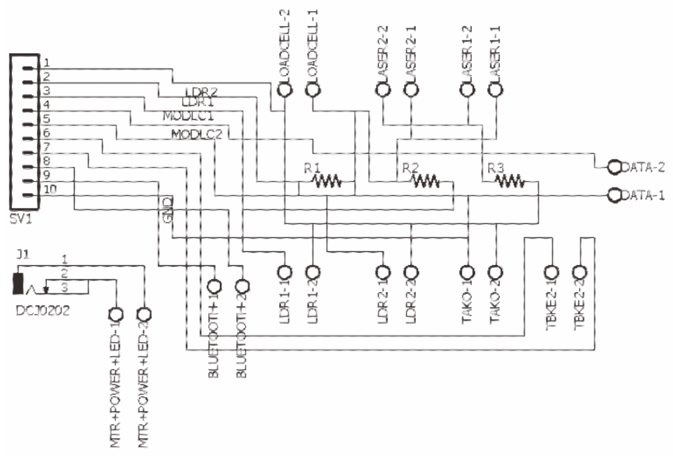
POLA KERANGKA KONVEYOR			KETERANGAN	
			A4	NO.01
TEK. ELEKTRONIKA D3 FAKULTAS TEKNIK UNIV. NEGERI YOGYAKARTA	SKA. -	DIP. Dr. MASDUKI ZAKARIJA, M.T		
	DIS. Dr. MAZDUKI ZAKARIJA, M.T	DIG. WILDA FITROH ISNAINI	NIM. 16507134048	

Lampiran 2. Disain Kendali konveyor



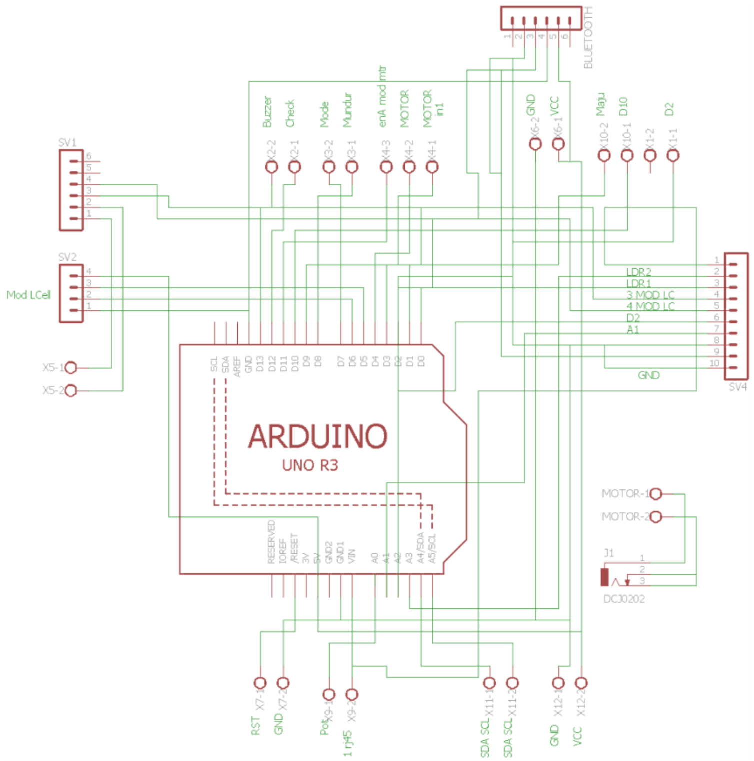
DISAIN BOX KENDALI KONVEYOR			KETERANGAN	
			A4	NO.02
TEK. ELEKTRONIKA D3 FAKULTAS TEKNIK UNIV. NEGERI YOGYAKARTA	SKA. -	DIP. Dr. MASDUKI ZAKARIJA, M.T		
	DIS. Dr. MAZDUKI ZAKARIJA, M.T	DIG. WILDA FITROH ISNAINI	NIM. 16507134048	

Lampiran 3. Skematik Rangkaian Konveyor



SKEMATIK KENDALI KONVEYOR			KETERANGAN	
			A4	NO.03
TEK. ELEKTRONIKA D3 FAKULTAS TEKNIK UNIV. NEGERI YOGYAKARTA	SKA. -	DIP. Dr. MASDUKI ZAKARIJA, M.T		
	DIS. Dr. MAZDUKI ZAKARIJA, M.T	DIG. WILDA FITROH ISNAINI	NIM. 16507134048	

Lampiran 4. Skematik Rangkaian Kendali konveyor



SKEMATIK KENDALI KONVEYOR

TEK. ELEKTRONIKA D3
FAKULTAS TEKNIK
UNIV. NEGERI YOGYAKARTA

SKA. -

DIP.
Dr. MASDUKI ZAKARIJA, M.T

DIS.
Dr. MAZDUKI ZAKARIJA, M.T

DIG.
WILDA FITROH ISNAINI

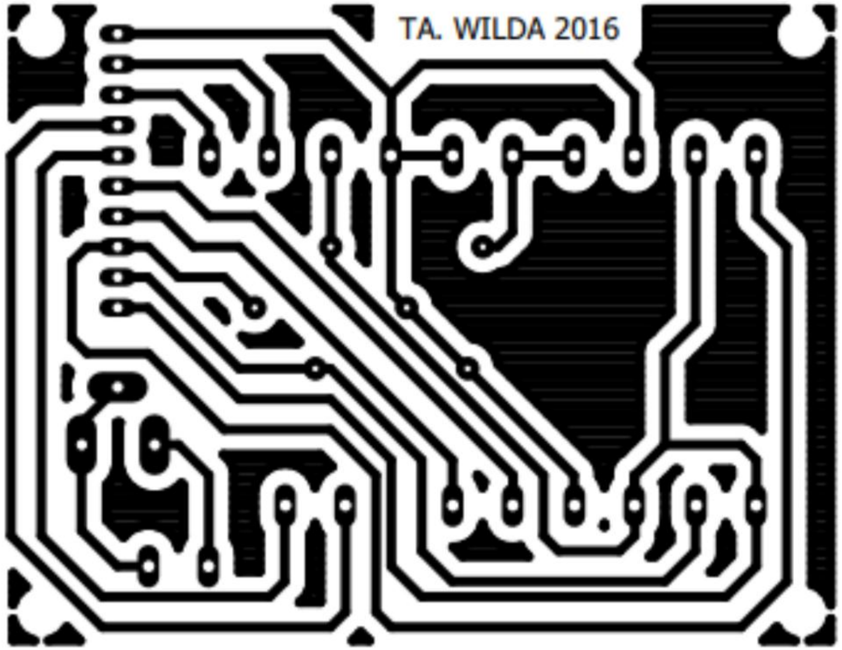
KETERANGAN

A4

NO.04

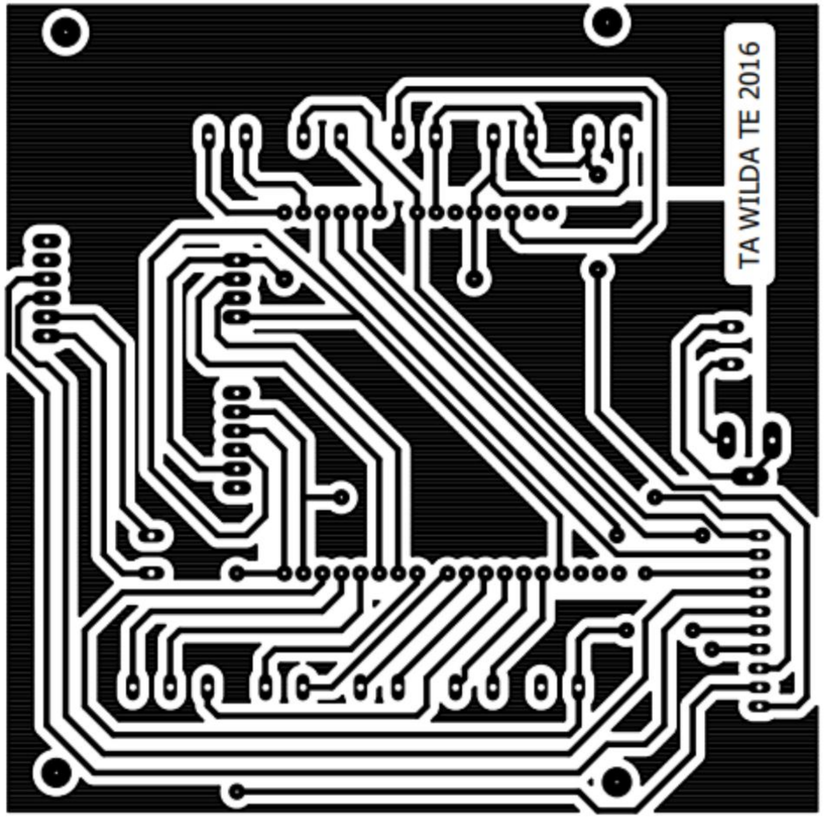
NIM. 16507134048

Lampiran 5. Layout PCB Konveyor



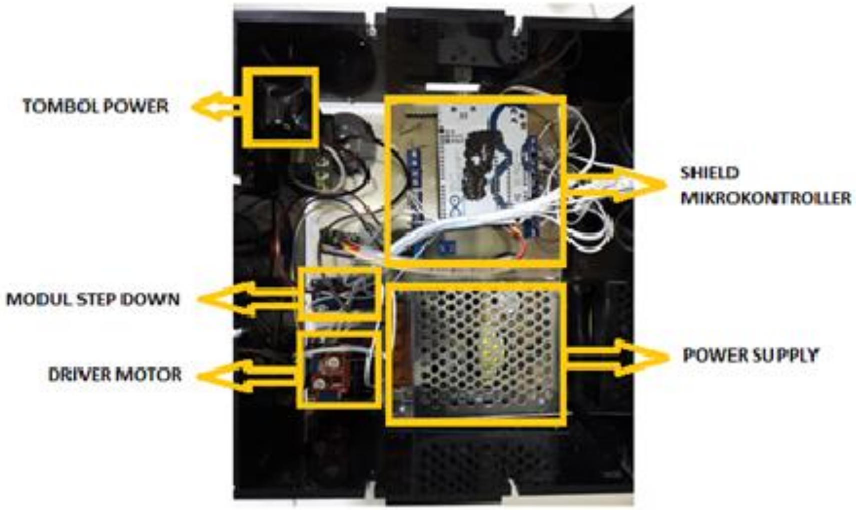
LAYOUT PCB KENDALI PADA KONVEYOR			KETERANGAN	
			A4	NO.05
TEK. ELEKTRONIKA D3 FAKULTAS TEKNIK UNIV. NEGERI YOGYAKARTA	SKA. -	DIP. Dr. MASDUKI ZAKARIJA, M.T		
	DIS. Dr. MAZDUKI ZAKARIJA, M.T	DIG. WILDA FITROH ISNAINI	NIM. 16507134048	

Lampiran 6. Layout PCB Kendali konveyor



LAYOUT PCB KENDALI KONVEYOR			KETERANGAN	
			A4	NO.06
TEK. ELEKTRONIKA D3 FAKULTAS TEKNIK UNIV. NEGERI YOGYAKARTA	SKA. -	DIP. Dr. MASDUKI ZAKARIJA, M.T		
	DIS. Dr. MAZDUKI ZAKARIJA, M.T	DIG. WILDA FITROH ISNAINI	NIM. 16507134048	

Lampiran 7. Tata Letak Komponen Dalam Box Kendali konveyor



TATA LETAK KOMPONEN DALAM BOX KONTROL PANEL			KETERANGAN	
			A4	NO.07
TEK. ELEKTRONIKA D3 FAKULTAS TEKNIK UNIV. NEGERI YOGYAKARTA	SKA. - DIS. Dr. MAZDUKI ZAKARIJA, M.T	DIP. Dr. MASDUKI ZAKARIJA, M.T DIG. WILDA FITROH ISNAINI	NIM. 16507134048	

Lampiran 8. Daftar Komponen

No	Bahan	Jumlah
1	Arduino UNO	2
2	Power Supply	1
3	Driver motor	1
4	Sensor loadcell	1
5	Modul HX711	1
6	Laser dan LDR	2
7	Resistor	20
8	Buzzer	1
9	Akrilik	100 x 200 cm
10	LCD 16 x 2	1
11	I2c	1
12	Push button	6
13	Potensiometer	1
14	Pin header, AC, dan DC	8
15	Pipa 1 ¼ inch	2 m

Lampiran 9. *Listing Program*

```
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27,20,4);

#include "HX711.h"      //load cell
float calibration_factor = 2230;
float units;
float ounces;
HX711 scale(5,6);

int enA=11;             //motor
int in1 = 3;
int in2 = 4;
int maju = 9;
int mundur = 8;
int Gmaju,Gmundur;
int PWM = 0;
float beratLalu;
int beratTerukur;
float logarit;
float siglog;

int check = 12;                 //check button
int buttonState;

int toogle;                     //mode
int mode = 7;

int pot = A0;           //pengatur kecepatan motor

int ldr1 =A3;           //LDR

int ldr2 =A2;
int LDR1,LDR2,DLDR1,DLDR2,ONLOAD;
float OALOAD=0.0;
float y=0.0;

int buzzer = 13;                //buzzer

float counter =0.0;             //counter
float load = 0.0;               //berat
float Aload=0.0;
void setup()
{
  Serial.begin(9600);
  scale.set_scale();              //berat
  scale.tare();         //Reset the scale to 0
                                //LCD
  lcd.init();          // Print a message to the LCD.
  lcd.backlight();
```

```
                                        //pin mode
 pinMode(buzzer, OUTPUT);
 pinMode(enA, OUTPUT);
 pinMode(in1, OUTPUT);
 pinMode(in2, OUTPUT);
 pinMode(mundur, INPUT);
 pinMode(maju, INPUT);
 pinMode(check,INPUT);
 pinMode(mode,INPUT);
 pinMode(ldr1,INPUT);
 pinMode(ldr2,INPUT); }
void loop() {
                                        //pembacaan berat
 scale.set_scale(calibration_factor);
 units = scale.get_units(), 10;
 float gram = units*9.5;
 if (gram < 0){
  gram = 0.00;
 }
Serial.println(gram);
 delay (1000);
                                        //check button
 toogle = digitalRead(mode);
 buttonState = digitalRead(check);
                                        //motor
 PWM = analogRead(pot);
 PWM = map(PWM, 0, 1023, 0, 255);
 Gmaju = digitalRead(maju);
 Gmundur = digitalRead(mundur);
 Serial.println(PWM);
                                            //pembacaan proximity
   LDR1=analogRead(ldr1);
   LDR2=analogRead(ldr2);
   DLDR1=0;
   DLDR2=0;
   Serial.print(LDR1);
   Serial.print("------");
   Serial.println(LDR2);

   if(LDR2>=300){               //ANALOG TO DIGITAL
    DLDR1=LOW;
   }
   else{
    DLDR2=HIGH;
   }
   if(LDR1>=350){
    DLDR1=LOW;
   }
   else{
    DLDR1=HIGH;
   }
```

```
    if(DLDR1==HIGH){                                   //INTERLOCK
      ONLOAD = HIGH;
    }
    if(DLDR2==HIGH){
      ONLOAD = LOW;
    }

    if(gram >= 3000){                                   //limit MAX beban
      lcd.setCursor(0,0);
      lcd.print("BEBAN BERLEBIH");
      lcd.setCursor(0,1);
      lcd.print("MOHON KURANGI");
      digitalWrite(buzzer ,HIGH);
      digitalWrite(in1, LOW);
      digitalWrite(in2, LOW);
      analogWrite(enA, 0);
    }
   else{
      digitalWrite(buzzer ,LOW);

         if (toogle == LOW){                            //manual mode
        if (buttonState == LOW){                      //check sensor berat
         lcd.setCursor(0,1);
         lcd.print("P1 ");
         lcd.print(LDR1);
         lcd.print(" P2 ");
         lcd.print(LDR2);
         lcd.setCursor(0,0);
         lcd.print("                ");
         lcd.setCursor(0,1);
         lcd.print("                ");
         delay (1000);
        }

        else{                                           //menu manual utama
         lcd.setCursor(0,0);
         lcd.print("Manual");
          if (gram <=350){
         gram=gram*0.911450395;
        }
        else if ( gram > 350 && gram <=1250){
       gram =gram*0.906395038;
        } else {
       gram=gram*0.907525743;
       }
         lcd.setCursor(0,1);
         lcd.print("berat = ");
         lcd.print(gram);
         lcd.print(" gram");
```

```
                                        //maju
    if (Gmaju == HIGH) {
      digitalWrite(in1, HIGH);
      digitalWrite(in2, LOW);
      analogWrite(enA, PWM);
    }
                                        //mundur
    else if (Gmundur == HIGH) {
      digitalWrite(in1, LOW);
      digitalWrite(in2, HIGH);
      analogWrite(enA, PWM);
    }
                                                //diam
    else {
      scale.tare();  //Reset the scale to 0
      digitalWrite(in1, LOW);
      digitalWrite(in2, LOW);
      analogWrite(enA, 0);
    }
  }
}
                                                //mode otomatis
else if (toogle == HIGH) {
        //maju
      digitalWrite(in1, LOW);
      digitalWrite(in2, HIGH);
      analogWrite(enA, PWM);
        lcd.setCursor(0,0);
  lcd.print("Otomatis ");
  lcd.setCursor(0,1);


                                        //print load 1 benda
  lcd.print("Beban = ");
  lcd.print(beratTerukur/100);
  lcd.print(" ons");
  lcd.setCursor(0,0);
  lcd.print("                ");
  lcd.setCursor(0,1);
  lcd.print("                ");
  Serial.println(beratTerukur);
```

```
                                        //hitung load benda
      if(DLDR1 ==HIGH){
       Aload=0;
       load =0;
      }
      else{
       if(ONLOAD==HIGH){
        lcd.setCursor(0,0);
        lcd.print("Otomatis Active");
        lcd.print("              ");
        counter = counter + 1.0;
        load = load + gram;
        Aload=load/counter;
        OALOAD=Aload;
        beratTerukur= 1.034925 *OALOAD;//faktorkorksi pertama
       if(beratTerukur<=950)//kondsi berat <950 gram
       {
       beratTerukur=((beratTerukur*( 0.1818)+beratTerukur)+100)*1.00833755 ;
       }
       else if(beratTerukur>1200)//kondisiberat > 1200 gram)
       {
       beratTerukur=((beratTerukur*(0. 1818)+beratTerukur)+100)*1.04686969 ;
       }
      else
      if(beratTerukur>950&&beratTerukur<1200)//kondisi berat antara 950 sampai 1200
       {
       beratTerukur=((beratTerukur*(0. 1818)+beratTerukur)+100) ;
       }
       }
       else{
       counter =0;
      }
     }
    }
   }
  }
```

Lampiran 10. Spesifikasi Alat

Spesifikasi Alat

1. *Box* dari bahan akrilik yang berukuran 100 x 200 cm
2. Kendali sistem menggunakan Arduino UNO
3. Sumber tegangan yang digunakan menggunakan 220 v AC
4. Motor DC sebagai penggerak utama pada konveyor
5. Proximity sensor sebagai pendeteksi adanya objek
6. *Loadcell* sebagai komponen utama pada sistem timbangan
7. Hasil dari penimbangan ditampilkan pada LCD

Lampiran 11. Tabel Nilai Mentah Data Sensor *Load Cell*

Data Referensi	Pengambilan Data	Nilai Unit Terbaca
100	1	12,12
	2	12,13
	3	12,49
	4	12,37
	5	12,4
	6	12,45
	7	12,38
	8	12,87
	9	12,85
	10	12,5
200	1	25,69
	2	25,68
	3	25,8
	4	25,73
	5	25,87
	6	25,68
	7	25,54
	8	25,88
	9	25,61
	10	25,61
300	1	37,7
	2	37,61
	3	37,37
	4	37,24
	5	37,21
	6	37,48
	7	37,5
	8	37,15
	9	37,19
	10	37,3
400	1	45,02
	2	45,07
	3	45,4
	4	45,49
	5	45,29
	6	45,35
	7	45,26
	8	45,39
	9	45,39
	10	45,41
500	1	55,6

	2	55,59
	3	55,43
	4	55,34
	5	55,38
	6	55,24
	7	55,57
	8	55,82
	9	55,67
	10	55,42
600	1	73,1
	2	73,78
	3	73,28
	4	73,38
	5	73,76
	6	73,79
	7	73,61
	8	73,57
	9	73,51
	10	73,86
700	1	83,75
	2	83,48
	3	83,5
	4	83,73
	5	83,29
	6	83,45
	7	83,45
	8	83,23
	9	83,11
	10	83,38
800	1	95,22
	2	95,28
	3	95,22
	4	95,24
	5	95,46
	6	95,15
	7	95,13
	8	95,21
	9	95,26
	10	95,48
900	1	105,89
	2	105,77
	3	105,64
	4	105,44
	5	105,71

	6	105,56
	7	105,42
	8	105,68
	9	105,58
	10	105,88
1000	1	118,48
	2	118,32
	3	118,46
	4	118,85
	5	118,75
	6	118,53
	7	118,83
	8	118,61
	9	118,49
	10	118,41
1100	1	131,57
	2	131,1
	3	131,43
	4	131,36
	5	131,66
	6	131,45
	7	131,51
	8	131,27
	9	131,76
	10	131,86
1200	1	144,18
	2	144,38
	3	144,71
	4	144,55
	5	144,58
	6	144,7
	7	144,56
	8	144,11
	9	144,57
	10	144,5
1300	1	154,78
	2	154,95
	3	154,43
	4	154,83
	5	154,18
	6	154,74
	7	154,83
	8	154,87
	9	154,82

	10	154,5
1400	1	164,53
	2	164,85
	3	164,21
	4	164,5
	5	164,47
	6	164,87
	7	164,75
	8	164,78
	9	164,35
	10	164,38
1500	1	176,53
	2	176,72
	3	176,43
	4	176,19
	5	176,66
	6	176,02
	7	176,72
	8	176,35
	9	176,42
	10	176,08

Lampiran 12. Tabel Data Hasil dalam Satuan Gram

Data Referensi (gram)	Pengambilan Data	Nilai Gram Terbaca
100	1	106,75
	2	106,46
	3	106,13
	4	102,61
	5	106,72
	6	104,44
	7	105,02
	8	105,97
	9	105,83
	10	104,83
200	1	204,91
	2	206,99
	3	203,6
	4	204,71
	5	206,39
	6	204,64
	7	204,8
	8	204,58
	9	203,56
	10	207,91
300	1	323,28
	2	320,49
	3	321,7
	4	320,05
	5	319,07
	6	322,68
	7	318,47
	8	320,87
	9	321,76
	10	321,68
400	1	410,48
	2	411,92
	3	413,32
	4	413,87
	5	411,19
	6	413,03
	7	412,87
	8	412,81
	9	412,37
	10	411,69
500	1	501,65

	2	502,37
	3	502,77
	4	503,17
	5	499,54
	6	502,15
	7	500,6
	8	501,89
	9	503,66
	10	503,94
600	1	595,03
	2	598,67
	3	597,69
	4	600,29
	5	597,87
	6	579,8
	7	597,81
	8	597,44
	9	600,36
	10	595,31
700	1	719,14
	2	720,87
	3	722,93
	4	724,35
	5	721,06
	6	720,54
	7	717,65
	8	722,51
	9	721,95
	10	721,8
800	1	823,12
	2	822,17
	3	823,12
	4	823,78
	5	824,19
	6	821,03
	7	822,38
	8	819,41
	9	823,2
	10	823,39
900	1	920,33
	2	919,67
	3	918,78
	4	917,82
	5	918,52

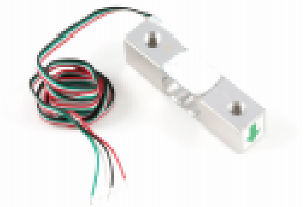
	6	918,93
	7	919,17
	8	919,76
	9	919,66
	10	920,67
1000	1	1024,31
	2	1025,16
	3	1022,88
	4	1022,87
	5	1020,06
	6	1023,59
	7	1023,69
	8	1023,26
	9	1024,95
	10	1025,12
1100	1	1153,78
	2	1157,61
	3	1157,65
	4	1158,16
	5	1158
	6	1157,99
	7	1156,1
	8	1156,05
	9	1159,73
	10	1156,68
1200	1	1267,25
	2	1270,85
	3	1268,05
	4	1268,15
	5	1270,52
	6	1269,17
	7	1268,98
	8	1268,41
	9	1270,66
	10	1270,17
1300	1	1362,68
	2	1365,49
	3	1363,31
	4	1366,77
	5	1365,37
	6	1368,09
	7	1366,54
	8	1366,84
	9	1365,18

	10	1366,2
1400	1	1430,15
	2	1430,22
	3	1431,96
	4	1429,23
	5	1433,15
	6	1430,62
	7	1429,73
	8	1429,79
	9	1429,09
	10	1429,95
1500	1	1576,48
	2	1577,58
	3	1577,58
	4	1576,68
	5	1578,86
	6	1579,08
	7	1575,68
	8	1576,65
	9	1578,53
	10	1576,62

Lampiran 13. Datasheet *Load Cell*

Datasheet

3134 - Micro Load Cell (0-20kg) - CZL635



Contents

What do you have to know?

A load cell is a force sensing module - a carefully designed metal structure, with small elements called strain gauges mounted in precise locations on the structure. Load cells are designed to measure a specific force, and ignore other forces being applied. The electrical signal output by the load cell is very small and requires specialized amplification. Fortunately, **the 1046 PhidgetBridge will perform all the amplification and measurement of the electrical output.**

Load cells are designed to measure force in one direction. They will often measure force in other directions, but the sensor sensitivity will be different, since parts of the load cell operating under compression are now in tension, and vice versa.

How does it work - For curious people

Strain-gauge load cells convert the load acting on them into electrical signals. The measuring is done with very small resistor patterns called strain gauges - effectively small, flexible circuit boards. The gauges are bonded onto a beam or structural member that deforms when weight is applied, in turn deforming the strain-gauge. As the strain gauge is deformed, it's electrical resistance changes in proportion to the load.

The changes to the circuit caused by force is much smaller than the changes caused by variation in temperature. Higher quality load cells cancel out the effects of temperature using two techniques. By matching the expansion rate of the strain gauge to the expansion rate of the metal it's mounted on, undue strain on the gauges can be avoided as the load cell warms up and cools down. The most important method of temperature compensation involves using multiple strain gauges, which all respond to the change in temperature with the same change in resistance. Some load cell designs use gauges which are never subjected to any force, but only serve to counterbalance the temperature effects on the gauges that measuring force. Most designs use 4 strain gauges, some in compression, some under tension, which maximizes the sensitivity of the load cell, and automatically cancels the effect of temperature.

Installation

This Single Point Load Cell is used in small jewelry scales and kitchen scales. It's mounted by bolting down the end of the load cell where the wires are attached, and applying force on the other end **in the direction of the arrow.** Where the force is applied is not critical, as this load cell measures a shearing effect on the beam, not the bending of the beam. If you mount a small platform on the load cell, as would be done in a small scale, this load cell provides accurate readings regardless of the position of the load on the platform.

Calibration

A simple formula is usually used to convert the measured mv/V output from the load cell to the measured force:

$$\textit{Measured Force} = A * \textit{Measured mV/V} + B \text{ (offset)}$$

It's important to decide what unit your measured force is - grams, kilograms, pounds, etc.

This load cell has a rated output of 1.0±0.15mv/v which corresponds to the sensor's capacity of 20kg.

To find A we use

$$\textit{Capacity} = A * \textit{Rated Output}$$

$$A = \textit{Capacity} / \textit{Rated Output}$$

$$A = 20 / 1.0$$

$$A = 20$$

Since the Offset is quite variable between individual load cells, it's necessary to calculate the offset for each sensor. Measure the output of the load cell with no force on it and note the mv/V output measured by the PhidgetBridge.

$$\text{Offset} = 0 - 20 * \text{Measured Output}$$

Product Specifications	
Mechanical	
Housing Material	Aluminum Alloy
Load Cell Type	Strain Gauge
Capacity	20kg
Dimensions	55.25x12.7x12.7mm
Mounting Holes	M5 (Screw Size)
Cable Length	550mm
Cable Size	30 AWG (0.2mm)
Cable - no. of leads	4
Electrical	
Precision	0.05%
Rated Output	1.0±0.15 mv/V
Non-Linearity	0.05% FS
Hysteresis	0.05% FS
Non-Repeatability	0.05% FS
Creep (per 30 minutes)	0.1% FS
Temperature Effect on Zero (per 10°C)	0.05% FS
Temperature Effect on Span (per 10°C)	0.05% FS
Zero Balance	±1.5% FS
Input Impedance	1130±10 Ohm
Output Impedance	1000±10 Ohm
Insulation Resistance (Under 50VDC)	≥5000 MOhm
Excitation Voltage	5 VDC
Compensated Temperature Range	-10 to ~+40°C
Operating Temperature Range	-20 to ~+55°C
Safe Overload	120% Capacity
Ultimate Overload	150% Capacity

Lampiran 14. Datasheet HX711

海芯科技 AVIA Semiconductor

HX711

24-Bit Analog-to-Digital Converter (ADC) for Weigh Scales

DESCRIPTION

Based on Avia Semiconductor's patented technology, HX711 is a precision 24-bit analog-to-digital converter (ADC) designed for weigh scales and industrial control applications to interface directly with a bridge sensor.

The input multiplexer selects either Channel A or B differential input to the low-noise programmable gain amplifier (PGA). Channel A can be programmed with a gain of 128 or 64, corresponding to a full-scale differential input voltage of ±20mV or ±40mV respectively, when a 5V supply is connected to AVDD analog power supply pin. Channel B has a fixed gain of 32. On-chip power supply regulator eliminates the need for an external supply regulator to provide analog power for the ADC and the sensor. Clock input is flexible. It can be from an external clock source, a crystal, or the on-chip oscillator that does not require any external component. On-chip power-on-reset circuitry simplifies digital interface initialization.

There is no programming needed for the internal registers. All controls to the HX711 are through the pins.

FEATURES

- **Two selectable differential input channels**
- **On-chip active low noise PGA with selectable gain of 32, 64 and 128**
- **On-chip power supply regulator for load-cell and ADC analog power supply**
- **On-chip oscillator requiring no external component with optional external crystal**
- **On-chip power-on-reset**
- **Simple digital control and serial interface: pin-driven controls, no programming needed**
- **Selectable 10SPS or 80SPS output data rate**
- **Simultaneous 50 and 60Hz supply rejection**
- **Current consumption including on-chip analog power supply regulator: normal operation < 1.5mA, power down < 1uA**
- **Operation supply voltage range: 2.6 ~ 5.5V**
- **Operation temperature range: -40 ~ +85℃**
- **16 pin SOP-16 package**

APPLICATIONS

- **Weigh Scales**
- **Industrial Process Control**

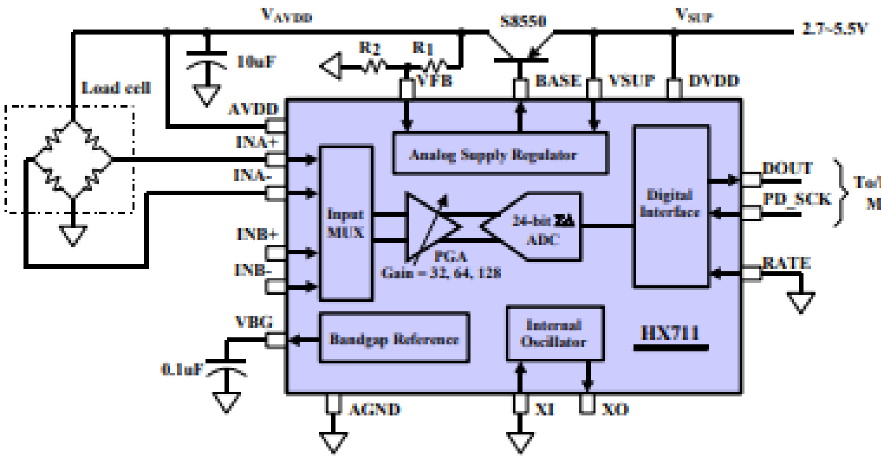
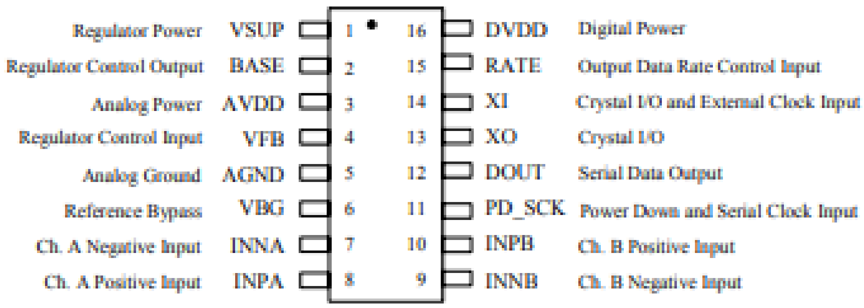


Fig. 1 Typical weigh scale application block diagram

TEL: (592) 252-9530 (P. R. China)
EMAIL: market@aviaic.com

Pin Description



SOP-16L Package

Pin #	Name	Function	Description
1	VSUP	Power	Regulator supply: 2.7 ~ 5.5V
2	BASE	Analog Output	Regulator control output（NC when not used）
3	AVDD	Power	Analog supply: 2.6 ~ 5.5V
4	VFB	Analog Input	Regulator control input（connect to AGND when not used）
5	AGND	Ground	Analog Ground
6	VBG	Analog Output	Reference bypass output
7	INA-	Analog Input	Channel A negative input
8	INA+	Analog Input	Channel A positive input
9	INB-	Analog Input	Channel B negative input
10	INB+	Analog Input	Channel B positive input
11	PD_SCK	Digital Input	Power down control (high active) and serial clock input
12	DOUT	Digital Output	Serial data output
13	XO	Digital I/O	Crystal I/O (NC when not used）
14	XI	Digital Input	Crystal I/O or external clock input, 0: use on-chip oscillator
15	RATE	Digital Input	Output data rate control, 0: 10Hz; 1: 80Hz
16	DVDD	Power	Digital supply: 2.6 ~ 5.5V

Table 1 Pin Description

Analog Inputs

Channel A differential input is designed to interface directly with a bridge sensor's differential output. It can be programmed with a gain of 128 or 64. The large gains are needed to accommodate the small output signal from the sensor. When 5V supply is used at the AVDD pin, these gains correspond to a full-scale differential input voltage of ±20mV or ±40mV respectively.

Channel B differential input has a fixed gain of 32. The full-scale input voltage range is ±80mV, when 5V supply is used at the AVDD pin.

Power Supply Options

Digital power supply (DVDD) should be the same power supply as the MCU power supply.

When using internal analog supply regulator, the dropout voltage of the regulator depends on the external transistor used. The output voltage is equal to $V_{AVDD}=V_{BG}*(R1+R2)/R1$ (Fig. 1). This voltage should be designed with a minimum of 100mV below VSUP voltage.

If the on-chip analog supply regulator is not used, the VSUP pin should be connected to either AVDD or DVDD, depending on which voltage is higher. Pin VFB should be connected to Ground and pin BASE becomes NC. The external 0.1uF bypass capacitor shown on Fig. 1 at the VBG output pin is then not needed.

Clock Source Options

By connecting pin XI to Ground, the on-chip oscillator is activated. The nominal output data rate when using the internal oscillator is 10 (RATE=0) or 80SPS (RATE=1).

If accurate output data rate is needed, crystal or external reference clock can be used. A crystal can be directly connected across XI and XO pins. An external clock can be connected to XI pin, through a 20pF ac coupled capacitor. This external clock is not required to be a square wave. It can come directly from the crystal output pin of the MCU chip, with amplitude as low as 150 mV.

When using a crystal or an external clock, the internal oscillator is automatically powered down.

Output Data Rate and Format

When using the on-chip oscillator, output data rate is typically 10 (RATE=0) or 80SPS (RATE=1).

When using external clock or crystal, output data rate is directly proportional to the clock or crystal frequency. Using 11.0592MHz clock or crystal results in an accurate 10 (RTE=0) or 80SPS (RATE=1) output data rate.

The output 24 bits of data is in 2's complement format. When input differential signal goes out of the 24 bit range, the output data will be saturated at 800000h (MIN) or 7FFFFFh (MAX), until the input signal comes back to the input range.

Serial Interface

Pin PD_SCK and DOUT are used for data retrieval, input selection, gain selection and power down controls.

When output data is not ready for retrieval, digital output pin DOUT is high. Serial clock input PD_SCK should be low. When DOUT goes to low, it indicates data is ready for retrieval. By applying 25~27 positive clock pulses at the PD_SCK pin, data is shifted out from the DOUT output pin. Each PD_SCK pulse shifts out one bit, starting with the MSB bit first, until all 24 bits are shifted out. The 25th pulse at PD_SCK input will pull DOUT pin back to high (Fig.2).

Input and gain selection is controlled by the number of the input PD_SCK pulses (Table 3). PD_SCK clock pulses should not be less than 25 or more than 27 within one conversion period, to avoid causing serial communication error.

PD_SCK Pulses	Input channel	Gain
25	A	128
26	B	32
27	A	64

Table 3 Input Channel and Gain Selection

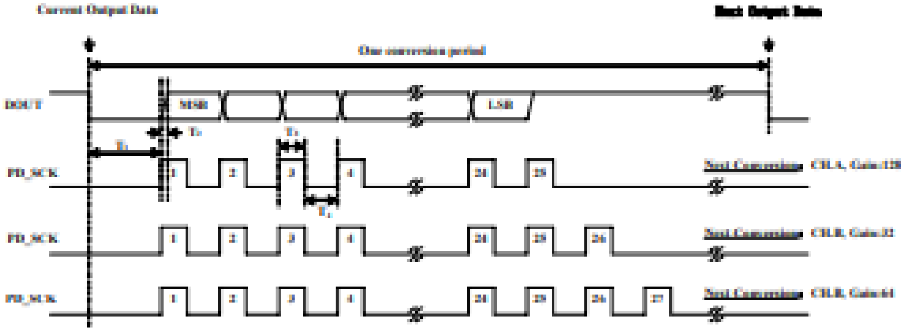


Fig.2 Data output, input and gain selection timing and control

Symbol	Note	MIN	TYP	MAX	Unit
T_1	DOUT falling edge to PD_SCK rising edge	0.1			µs
T_2	PD_SCK rising edge to DOUT data ready			0.1	µs
T_3	PD_SCK high time	0.2	1	50	µs
T_4	PD_SCK low time	0.2	1		µs

Reset and Power-Down

When chip is powered up, on-chip power on rest circuitry will reset the chip.

Pin PD_SCK input is used to power down the HX711. When PD_SCK Input is low, chip is in normal working mode.

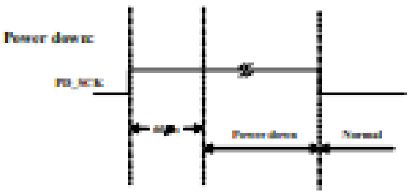


Fig.3 Power down control

When PD_SCK pin changes from low to high and stays at high for longer than 60µs, HX711 enters power down mode (Fig.3). When internal regulator is used for HX711 and the external transducer, both HX711 and the transducer will be powered down. When PD_SCK returns to low, chip will reset and enter normal operation mode.

After a reset or power-down event, input selection is default to Channel A with a gain of 128.

Application Example

Fig.1 is a typical weigh scale application using HX711. It uses on-chip oscillator (XI=0), 10Hz output data rate (RATE=0). A Single power supply （2.7~5.5V） comes directly from MCU power supply. Channel B can be used for battery level detection. The related circuitry is not shown on Fig. 1.

Lampiran 15. Datasheet Driver Motor L298N

Handson Technology

User Guide

L298N Dual H-Bridge Motor Driver

This dual bidirectional motor driver, is based on the very popular L298 Dual H-Bridge Motor Driver Integrated Circuit. The circuit will allow you to easily and independently control two motors of up to 2A each in both directions.It is ideal for robotic applications and well suited for connection to a microcontroller requiring just a couple of control lines per motor. It can also be interfaced with simple manual switches, TTL logic gates, relays, etc. This board equipped with power LED indicators, on-board +5V regulator and protection diodes.

SKU: MDU-1049

Brief Data:

- Input Voltage: 3.2V~40Vdc.
- Driver: L298N Dual H Bridge DC Motor Driver
- Power Supply: DC 5 V - 35 V
- Peak current: 2 Amp
- Operating current range: 0 ~ 36mA
- Control signal input voltage range :
- Low: -0.3V ≤ Vin ≤ 1.5V.
- High: 2.3V ≤ Vin ≤ Vss.
- Enable signal input voltage range :
  - Low: -0.3 ≤ Vin ≤ 1.5V (control signal is invalid).
  - High: 2.3V ≤ Vin ≤ Vss (control signal active).
- Maximum power consumption: 20W (when the temperature T = 75 ℃).
- Storage temperature: -25 ℃ ~ +130 ℃.
- On-board +5V regulated Output supply (supply to controller board i.e. Arduino).
- Size: 3.4cm x 4.3cm x 2.7cm

Lampiran 16. Datasheet Step Down LM2596

LM2596 SIMPLE SWITCHER® Power Converter 150-kHz 3-A Step-Down Voltage Regulator

1 Features

- 3.3-V, 5-V, 12-V, and Adjustable Output Versions
- Adjustable Version Output Voltage Range: 1.2-V to 37-V ± 4% Maximum Over Line and Load Conditions
- Available in TO-220 and TO-263 Packages
- 3-A Output Load Current
- Input Voltage Range Up to 40 V
- Requires Only 4 External Components
- Excellent Line and Load Regulation Specifications
- 150-kHz Fixed-Frequency Internal Oscillator
- TTL Shutdown Capability
- Low Power Standby Mode, I_Q, Typically 80 μA
- High Efficiency
- Uses Readily Available Standard Inductors
- Thermal Shutdown and Current-Limit Protection
- Create a Custom Design Using the LM2596 with the WEBENCH Power Designer

2 Applications

- Simple High-Efficiency Step-Down (Buck) Regulator
- On-Card Switching Regulators
- Positive to Negative Converter

3 Description

The LM2596 series of regulators are monolithic integrated circuits that provide all the active functions for a step-down (buck) switching regulator, capable of driving a 3-A load with excellent line and load regulation. These devices are available in fixed output voltages of 3.3 V, 5 V, 12 V, and an adjustable output version.

Requiring a minimum number of external components, these regulators are simple to use and include internal frequency compensation, and a fixed-frequency oscillator.

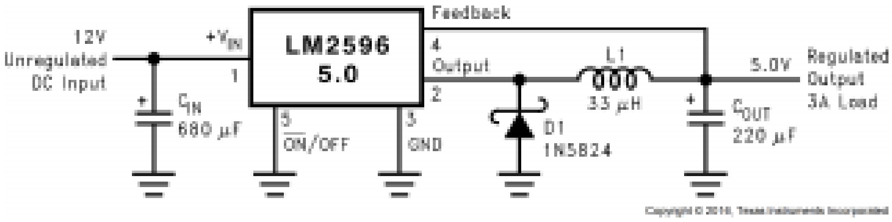
The LM2596 series operates at a switching frequency of 150 kHz, thus allowing smaller sized filter components than what would be required with lower frequency switching regulators. Available in a standard 7-pin TO-220 package with several different lead bend options, and a 7-pin TO-263 surface mount package.

Device Information(1)

PART NUMBER	PACKAGE	BODY SIZE (NOM)
LM2596	TO-220 (7)	14.986 mm × 10.16 mm
	TO-263 (7)	10.10 mm × 8.89 mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.

Typical Application



(Fixed Output Voltage Versions)

7 Specifications

7.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)[(1)(2)]

			MIN	MAX	UNIT
Maximum supply voltage (V_{IN})				45	V
$\overline{SD}$/SS pin input voltage[(3)]				6	V
Delay pin voltage[(3)]				1.5	V
Flag pin voltage			–0.3	45	V
Feedback pin voltage			–0.3	25	V
Output voltage to ground, steady-state				–1	V
Power dissipation			Internally limited		
Lead temperature	KTW package	Vapor phase (60 s)		215	°C
		Infrared (10 s)		245	°C
	NDZ package, soldering (10 s)			260	°C
Maximum junction temperature				150	°C
Storage temperature, T_{stg}			–65	150	°C

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
(2) If Military/Aerospace specified devices are required, please contact the Texas Instruments Sales Office/ Distributors for availability and specifications.
(3) Voltage internally clamped. If clamp voltage is exceeded, limit current to a maximum of 1 mA.

7.2 ESD Ratings

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001[(1)]	±2000	V

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.

7.3 Operating Conditions

	MIN	MAX	UNIT
Supply voltage	4.5	40	V
Temperature	–40	125	°C

7.4 Thermal Information

THERMAL METRIC[(1)]			LM2596 KTW (TO-263) 7 PINS	LM2596 NDZ (TO-220) 7 PINS	UNIT
$R_{\theta JA}$	Junction-to-ambient thermal resistance[(2)(3)]	See[(4)]	—	50	°C/W
		See[(5)]	50	—	°C/W
		See[(6)]	30	—	°C/W
		See[(7)]	20	—	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance		2	2	°C/W

(1) For more information about traditional and new thermal metrics, see the *Semiconductor and IC Package Thermal Metrics* application report, SPRA953.
(2) The package thermal impedance is calculated in accordance to JESD 51-7.
(3) Thermal Resistances were simulated on a 4-layer, JEDEC board.
(4) Junction to ambient thermal resistance (no external heat sink) for the package mounted TO-220 package mounted vertically, with the leads soldered to a printed circuit board with (1 oz.) copper area of approximately 1 in^2.
(5) Junction to ambient thermal resistance with the TO-263 package tab soldered to a single sided printed circuit board with 0.5 in^2 of 1-oz copper area.
(6) Junction to ambient thermal resistance with the TO-263 package tab soldered to a single sided printed circuit board with 2.5 in^2 of 1-oz copper area.
(7) Junction to ambient thermal resistance with the TO-263 package tab soldered to a double sided printed circuit board with 3 in^2 of 1-oz copper area on the LM2596S side of the board, and approximately 16 in^2 of copper on the other side of the PCB.