Lampiran-1 Sktech program

```
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27, 16, 2);
#include <EEPROM.h>
#include "HX711.h"
#define calibration_factor  1020
#include <Servo.h>
HX711 scale(A1, A0);
int berat=0, berat1=0, berat2=0;
int servo1= 2;  // penyortir  tengah=90 , kanan=60,
kiri=120 derajat
int servo2= 4;  //tutup=0, buka =80 derajat
int resetPin = 7; // push butti reset
int  sensor=  A2;  //ada  penghalang  val=0,  tdk  ada
val=200
int motor = 13; //Jalan=HIGH, Stop=LOW
Servo myservo1 ;
Servo myservo2 ;
bool motorJalan=true;
bool servoTutup=true;
bool overTime=false;
byte kecil, sedang, besar;
```

```
   unsigned long LEDT = 0; //lastEggTime
   unsigned long CT = 0;  //currentTime
   unsigned long LT = 30000; //limitTime=180det = 30
   detik
   unsigned long count=0;

void setup(){
   Serial.begin(9600);
     kecil  = EEPROM.read(1);// penyimpana jumlah telur
                                kecil
     sedang = EEPROM.read(2); // penyimpana jumlah telur
                                  sedang
     besar  = EEPROM.read(3); // penyimpanan jumlah
                               telur  besar

   scale.set_scale(calibration_factor);

     scale.tare();
     myservo1.attach(servo1);
     myservo2.attach(servo2);
     myservo2.write (10);
     pinMode (sensor, INPUT);
     pinMode (motor, OUTPUT);
     pinMode (resetPin, INPUT_PULLUP);
      lcd.init(); lcd.backlight(); lcd.clear();
```

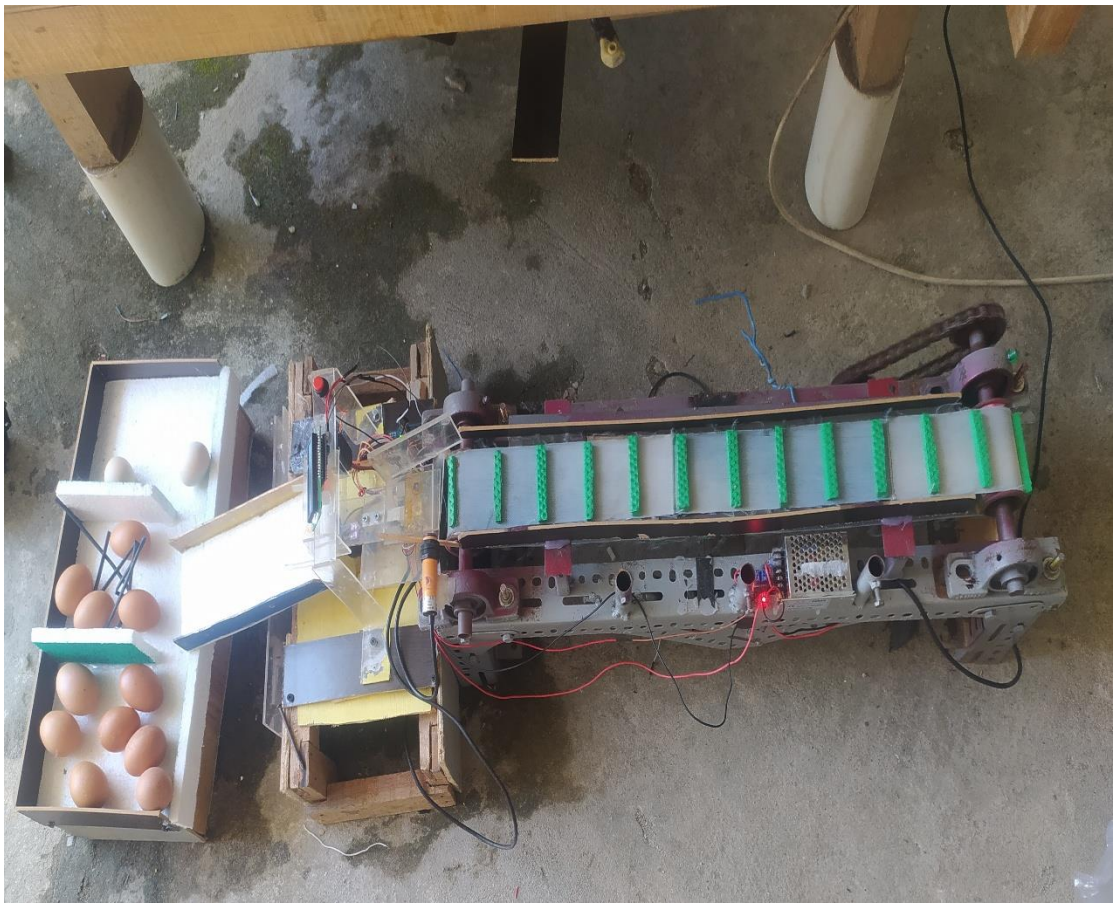
```
    lcd.setCursor(0, 0); lcd.print("Berat Telur");
    lcd.setCursor(0, 1); lcd.print(berat);
    lcd.setCursor(6, 1); lcd.print("gram");
}
//====================================== looping
void loop(){
 berat=0;
 delay(10);
 if(!digitalRead(resetPin)) {
     EEPROM.write(1,0); kecil=0;
     EEPROM.write(2,0); sedang=0;
     EEPROM.write(3,0); besar=0;
 }
 int val = analogRead(sensor);
 if(val<100 & overTime & !motorJalan){
    LEDT=0;
    overTime=0;
    motorJalan=1;
    lcd.display();
    lcd.backlight();
 }
 if(motorJalan) {
    if(val>100) { digitalWrite(motor,HIGH); }
```

```
if(val<100) {  //Jika telur terdeteksi
   motorJalan=0;
   digitalWrite(motor,LOW);
   timbang();
  if(berat>10 & berat<45) {
      kecil++;
      EEPROM.write(1,kecil);
      myservo1.write(60);
   }
   if(berat>=45 & berat<60) {
      sedang++;
      EEPROM.write(2,sedang);
      myservo1.write(90);
   }
   if(berat>=60) {
      besar++;
      EEPROM.write(3,besar);
      myservo1.write(120);
   }
   delay(1000);
   if(berat>10) myservo2.write(80);
   while(berat>10) { timbang(); }
   myservo2.write(10);
   delay(500);
```

```
            jumlahTelur();
            motorJalan=1;
            LEDT = millis();
         }
         if(millis()-LEDT>LT) {
            overTime=1;
            motorJalan=0;
            digitalWrite(motor,LOW);
            lcd.noBacklight();
            lcd.noDisplay();
         }
        }
    }
 //=========================================akhir
 looping
//=======================================void load cell
    void timbang() {
      for(byte i=0; i<10; i++) {
         berat1 = -scale.get_units(); delay(10);
         berat2 = -scale.get_units(); delay(10);
      }
      if(berat1>berat2) berat=berat1;
      else berat = berat2;
      if(berat<10)berat=0;
```

```
      lcd.clear();
      lcd.setCursor(0, 0); lcd.print("Berat Telur");
      lcd.setCursor(0, 1); lcd.print(berat);
      lcd.setCursor(6, 1); lcd.print("gram");
   }
//=======================================        void
counter
   void jumlahTelur() {
       lcd.clear();
       lcd.setCursor(0, 0); lcd.print(" S=    M=    L=
   ");
       lcd.setCursor(1, 1); lcd.print(kecil);
       lcd.setCursor(7, 1); lcd.print(sedang);
       lcd.setCursor(13,1); lcd.print(besar);
   }
```

Lampiran - 2 Gambar alat Penyortir Ukuran telur Otomatis





Lampiran-3 data *sheet* Alat/komponen

adafruit

2877
Arduino Uno R3



Technical Details:

Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328)
SRAM	2 KB (ATmega328)
EEPROM	1 KB (ATmega328)
Clock Speed	16 MHz

Description:

The Arduino Uno R3 is the latest version after the Duemilanove with an improved USB interface chip. Like the Duemilanove, it not only has an expanded shield header with a 3.3V reference and a RESET pin (which solves the problem of how to get to the RESET pin in a shield) AND a 500mA fuse to protect your computer's USB port, but ALSO an automatic circuit to select USB or DC power without a jumper! The Uno is pin and code-compatible with the Duemilanove, Diecimilla and older Arduinos so all your shields, libraries, code will still work. The R3 (3rd revision) of the UNO has a few minor updates, with an upgrade to the USB interface chip and additional breakouts for the i2c pins and an IORef pin.

Each Arduino ordered from Adafruit still comes with 4 rubber bumpers that will help protect the board when you want to place it on a table. (Also keeps the Arduino from sliding around.)

Arduino is an open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. It's intended for artists, designers, hobbyists, and anyone interested in creating interactive objects or environments.

Arduino can sense the environment by receiving input from a variety of sensors and can affect its surroundings by controlling lights, motors, and other actuators. The microcontroller on the board is programmed using the Arduino programming language (based on Wiring) and the Arduino development environment (based on Processing). Arduino projects can be stand-alone or they can communicate with software running on a computer (e.g. Flash, Processing, Max/MSP).

Downloaded from Arrow.com.

New USB Chip

So! All of the older Arduinos (NG, Diecimila and Duemilanove) have used an FTDI chip (the FT232RL) to convert the TTL serial from the Arduino chip (Atmel ATmega). This allows for printable debugging, connecting to software like PureData/Max, Processing, Python, etc. etc. It also allows updating the firmware via the serial bootloader.

The good news about the FT232RL has royalty-free drivers and pretty much just works. The bad news is that it can -only- act as a USB/Serial port. It can't act like a keyboard, mouse, disk drive, MIDI device, etc.



The Uno has changed that by exchanging the FT232RL chip with an atmega8u2 chip. There are a few things that are possible with this new chip but before we discuss that lets make it clear that by default, this chip acts identically to the FTDI chip that it replaces. It's just a USB-serial port!

One improvement in updating the chip is that, previously, Mac users needed to install FTDI drivers. The 8u2 imitates a 'generic' CDC serial device. So now, Mac users do not have to install a driver. Windows users still need to install the .INF file but luckily there are no drivers. This means there will be fewer problems with new versions of windows. There is no way to have a serial USB device that doesn't require an INF file in windows, sadly :(

The big thing that is nice about the 8u2 is that **advanced** users can turn it into a different kind of USB device. For example it can act like a keyboard or mouse. Or a disk driver. Or a MIDI interface, etc. Right now there are no examples of how to do this, but we hope to post some shortly.

And, finally, going with the 8u2 reduced the price of the board which made up for some of the other extras.

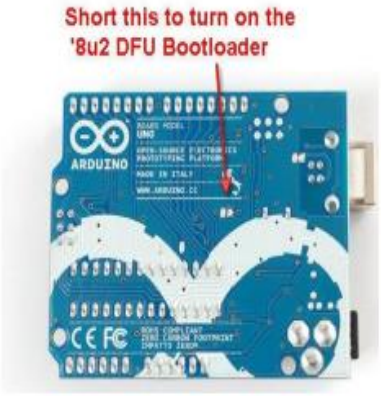
Downloaded from Arrow.com.

Why not just go with an ATMEGA32u4?

The Arduino team has indicated they thought about this but preferred that hackability of a DIP chip. Right now there are a few Arduino's with a 32u4 chip such as the Leonardo, Micro and Esplora

How can I change the USB firmware?

The 8u2 can be programmed by soldering a 6-pin ISP header (the R3 has the 6-pin header pre-soldered in) and using a standard AVR programmer. You can also use the bootloader (DFU) in the 8u2. On first generation Unos, you enable this by soldering the 10K resistor right underneath the board. (R2 and R3 versions of the Uno use the 16U2 and do not require the resistor!)





The code for the 8u2 is based on LUFA, Dean Cameran's totally awesome USB-AVR library that has great examples and documentation. It's also completely open source.

Downloaded from Arrow.com.

Does the Uno use a resonator or a crystal for the processor clock?

The FT232RL had an internal oscillator whereas the 8u2 does not. That means there is a 16mhz crystal next to the 8u2 to allow it to keep up with precise USB timing.

On the other hand, the Atmega328p chip that is the core processor in the Arduino now has a 16mhz ceramic resonator. Ceramic resonators are slightly less precise than crystals but we have been assured that this one was specified and works quite well.



So the Arduino is not as precise, timing-wise?

The short answer is: yes. The long answer is that most things that people are doing with Arduino do not rely on 20ppm precision timing where 100ppm would fail. For people who want long term precise timekeeping we suggest going with a TCXO (temperature compensation crystal oscillator) - but you would know if you needed that.

Why not have one 16Mhz crystal shared between both?

Good question, technically you can. However, in practice the board did not make it through FCC certification with one crystal (long traces with fast squarewaves = lots of noise).

OK well lets say I don't care about that...

You can absolutely connect the CLKO out the crystal from the '8u2 to the '328p but you're on your own as we don't think there will be any tutorials about that.

Downloaded from Arrow.com.

MG996R All Metal Gear Servo Motor

MG996R All Metal Gear Servo Motor.



This High-Torque MG996R Digital Servo features metal gearing resulting in extra high 10kg stalling torque in a tiny package. It features upgraded shock-proofing and a redesigned PCB and IC control system that make it much more accurate than its predecessor MG995. The gearing and motor have also been upgraded to improve dead bandwidth and centering. This high-torque standard servo can rotate approximately 120º (60º in each direction). The MG996R Metal Gear Servo also comes with a selection of arms and hardware to get you set up nice and fast servo control projects!

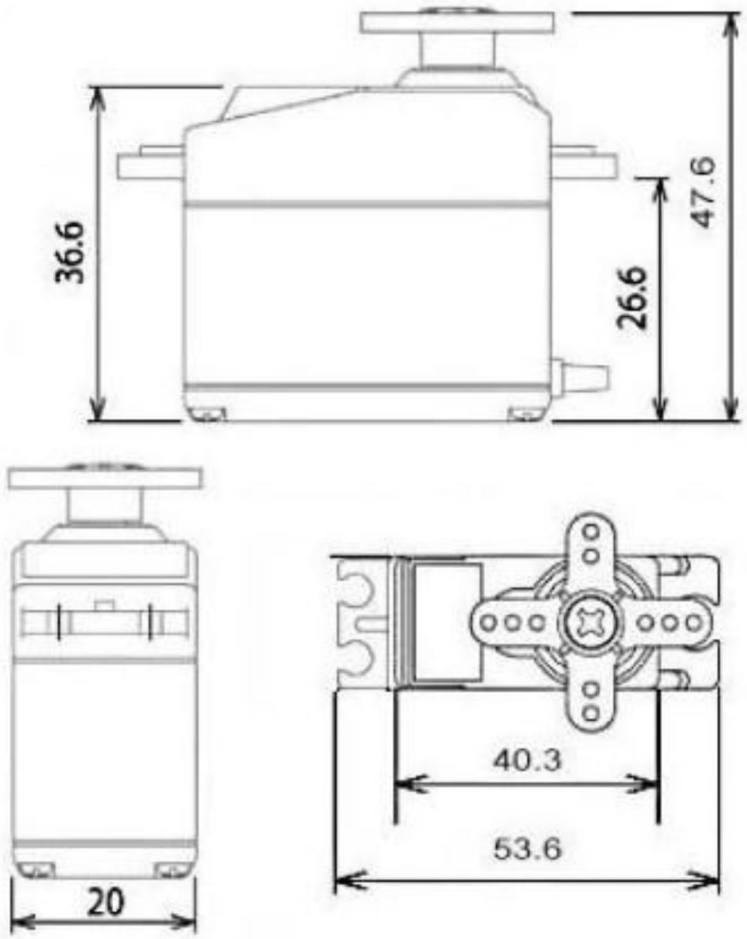
Pack of 1-piece/lot.

General Specification:

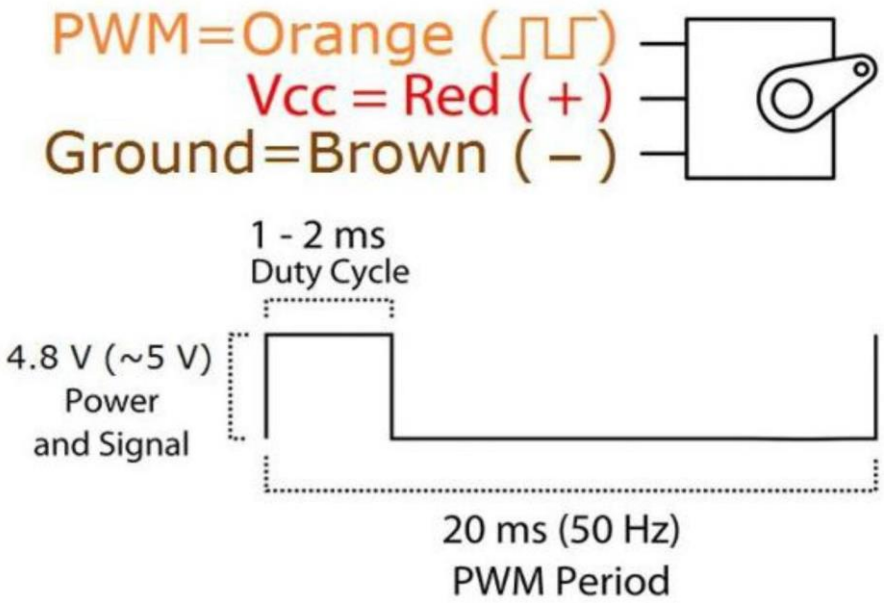
- Model : MG996R Tower Pro.
- Weight: 55g.
- Dimension: 40.7 x 19.7 x 42.9 mm approx.
- Stall torque: 9.4 kgf·cm (4.8V), 11 kgf·cm (6 V)
- Operating speed: 0.17 s/60º (4.8 V), 0.14 s/60º (6 V)
- Operating voltage: 4.8V a 7.2V
- Running Current: 500mA.
- Stall Current: 2.5A (6V).
- Dead band width: 5µs
- Stable and shock proof double ball bearing design.
- Temperature range: 0ºC ~ 55ºC.

Detail Specification:

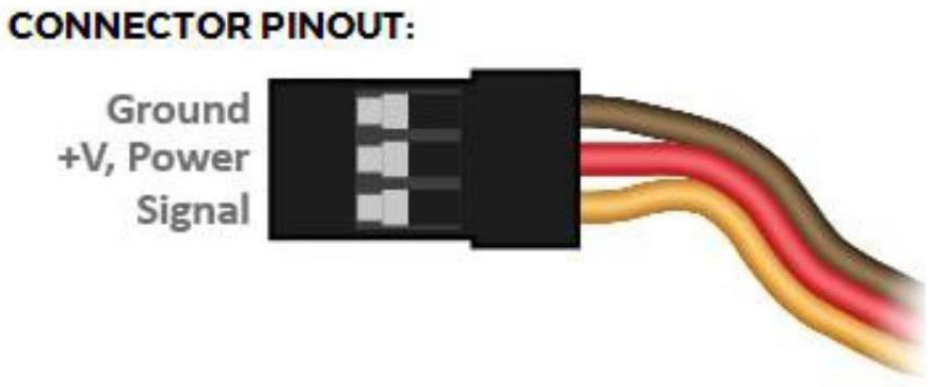
Unit: mm



Electrical Control Signal:



Position "0" (1.5ms pulse) is middle, "90" (~2ms pulse) is middle, is all the way to the right, "-90" (~1ms pulse) is all the way to the left.



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**

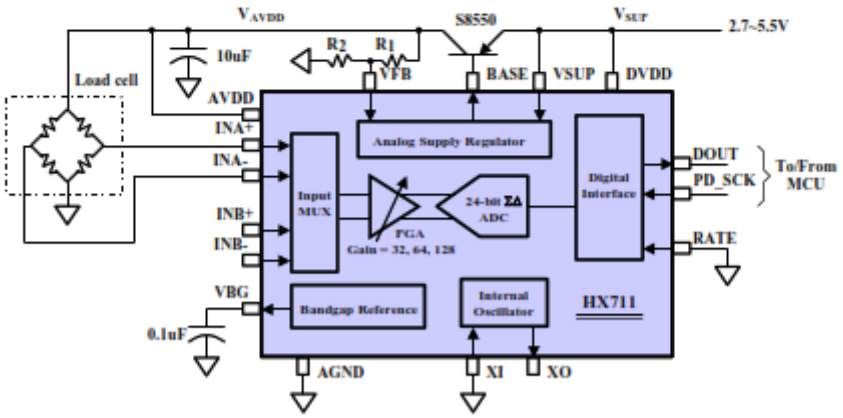
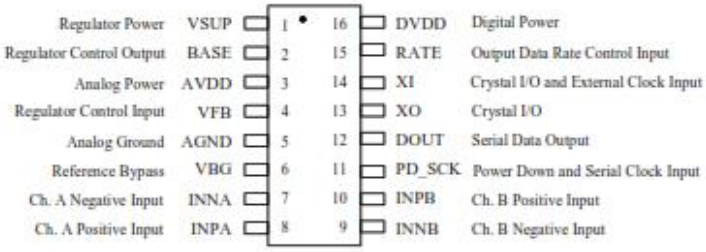


Fig. 1 Typical weigh scale application block diagram

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

KEY ELECTRICAL CHARACTERISTICS

Parameter	Notes	MIN	TYP	MAX	UNIT
Full scale differential input range	V(inp)-V(inn)		±0.5(AVDD/GAIN)		V
Common mode input		AGND+1.2		AVDD-1.3	V
Output data rate	Internal Oscillator, RATE = 0		10		Hz
	Internal Oscillator, RATE = DVDD		80		
	Crystal or external clock, RATE = 0		f_{clk}/1,105,920		
	Crystal or external clock, RATE = DVDD		f_{clk}/138,240		
Output data coding	2's complement	800000		7FFFFF	HEX
Output settling time (1)	RATE = 0		400		ms
	RATE = DVDD		50		
Input offset drift	Gain = 128		0.2		mV
	Gain = 64		0.4		
Input noise	Gain = 128， RATE = 0		50		nV(rms)
	Gain = 128， RATE = DVDD		90		
Temperature drift	Input offset（Gain = 128）		±6		nV/℃
	Gain（Gain = 128）		±5		ppm/℃
Input common mode rejection	Gain = 128， RATE = 0		100		dB
Power supply rejection	Gain = 128， RATE = 0		100		dB
Reference bypass（V_{BG}）			1.25		V
Crystal or external clock frequency		1	11.0592	20	MHz
Power supply voltage	DVDD	2.6		5.5	V
	AVDD，VSUP	2.6		5.5	
Analog supply current (including regulator)	Normal		1400		μA
	Power down		0.3		
Digital supply current	Normal		100		μA
	Power down		0.2		

（1）Settling time refers to the time from power up, reset, input channel change and gain change to valid stable output data.

Table 2 Key Electrical Characteristics

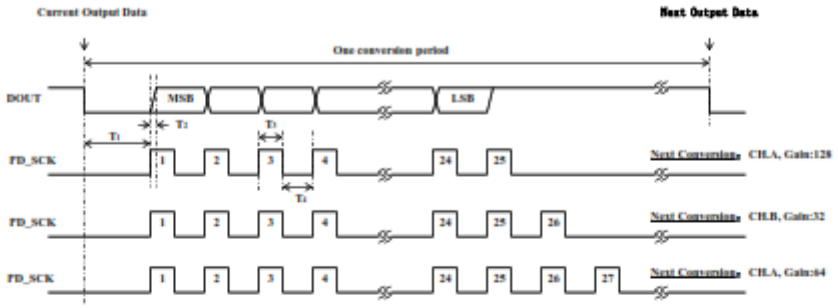


Fig.2 Data output, input and gain selection timing and control

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.

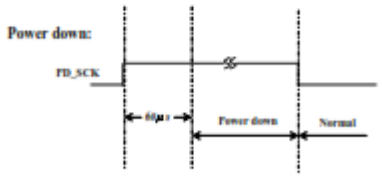


Fig.3 Power down control

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 return back to the setup conditions before power down and enter normal operation mode.

If PD_SCK pulse number is changed during the current conversion period, power down should be executed after current conversion period is completed. This is to ensure that the change is saved. When chip returns back to normal operation from power down, it will return to the set up conditions of the last change.

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.

Reference PCB Board (Single Layer)

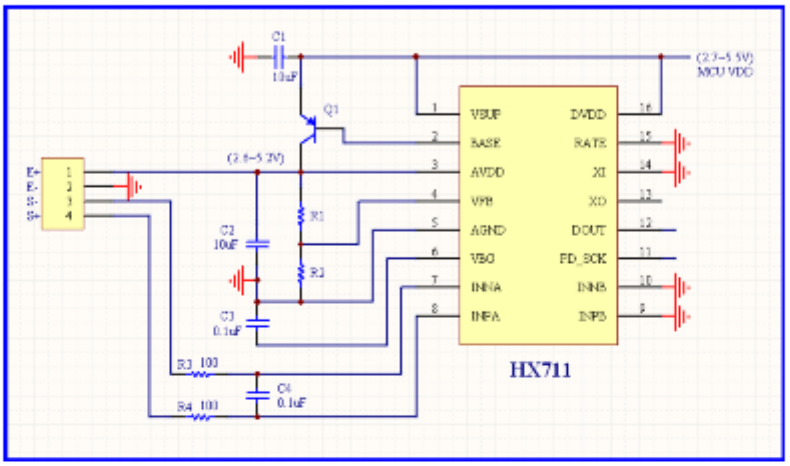


Fig.4 Reference PCB board schematic

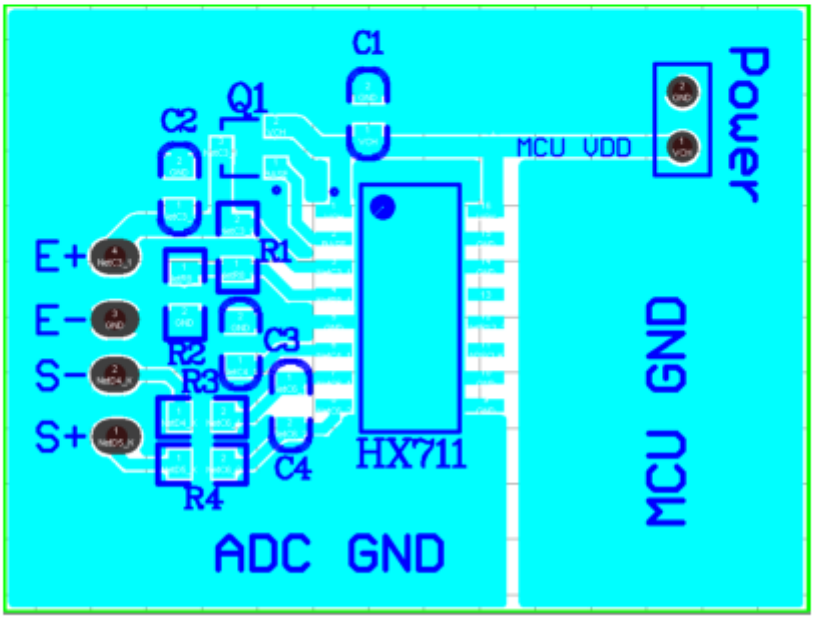
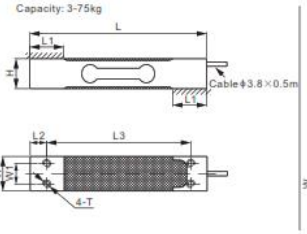


Fig.5 Reference PCB board layout

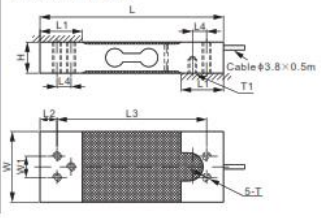
Aluminum
108BA



Capacity: 3-75kg



Capacity: 100kg; 150kg



CE RoHS

DIMENSIONS

RATED CAPACITY	H	L	L1	L2	L3	L4	W	W1	T	T1
kg/mm										
3~30	22.0	130.0	25.0	12.0	106.0	–	25.4	15.0	M6	–
35	22.0	130.0	25.0	12.0	106.0	–	30.0	15.0	M6	–
40	22.0	130.0	25.0	12.0	106.0	–	38.5	15.0	M6	–
50; 60; 75	22.0	130.0	30.0	12.0	106.0	–	38.5	15.0	M6	–
100; 150	22.0	130.0	30.0	12.0	106.0	10.0	50.0	15.0	M6	M6 Depth10
lb/inches (conversion of above dimensions)										
6.61~66.14	0.87	5.12	0.98	0.47	4.17	–	1.00	0.59	M6	–
77.16	0.87	5.12	0.98	0.47	4.17	–	1.18	0.59	M6	–
88.18	0.87	5.12	0.98	0.47	4.17	–	1.52	0.59	M6	–
110.23; 132.28; 165.35	0.87	5.12	1.18	0.47	4.17	–	1.52	0.59	M6	–
220.46; 330.69	0.87	5.12	1.18	0.47	4.17	0.39	1.97	0.59	M6	M6 Depth0.39

SPECIFICATIONS

Full Scale Output	2.0 mV/V ± 10%	**Recommended Excitation**	10V (15V Maximum)
Zero Balance	± 0.02 mV/V	**Reference Max.Platform Size**	400×400 mm
Non-linearity	< ± 0.017%	**Insulation Resistance**	>2 〔50V DC〕GΩ
Repeatability	< ± 0.017%	**Nominal Temperature Range**	-10°C to 40°C / 14°F to 104°F
Hysteresis Error	< ± 0.017%	**Safe Overload**	150% of full scale
Creep in 30 min.	< ± 0.023%	**Breaking Overload**	300% of full scale
Input Resistance	415Ω ± 15	**Seal Type / IP Rating**	Environmentally Sealed / IP66
Output Resistance	350Ω ± 3	**Cable Color Code**	Exc+ Red Exc- Black
Element Material	Aluminum		Sig+ Green Sig- White Shield Bare

SINGLE POINTS

PART NUMBER

Rated Capacity	Part No.	Shipping Weight (kg) Approx.
3kg	108BA-3kg	0.2
6kg	108BA-6kg	0.2
7kg	108BA-7kg	0.2
10kg	108BA-10kg	0.2
15kg	108BA-15kg	0.2
20kg	108BA-20kg	0.2
30kg	108BA-30kg	0.2
35kg	108BA-35kg	0.2
40kg (W=38.5mm)	108BA-40kg	0.2
40kg (W=30mm)	108BA-W1-40kg	0.2
50kg	108BA-50kg	0.26
60kg	108BA-60kg	0.26
75kg	108BA-75kg	0.26
100kg	108BA-100kg	0.35
150kg	108BA-150kg	0.35

INTERCHANGEABLE PRODUCTS

Manufacturer	Model
Coti Global	CG-22
Mettler-Toledo	MT1022
HBM	PW6C*
HBM	PW6K
Rice Lake	RL1521A
Vishay Celtron	LPS ME 6-35kg
Vishay Tedea-Huntleigh	1022

** Full scale output of PW6C: 2.2 ± 0.2% mV/V*

AVAILABLE OPTIONS

■ 1m cable

NTEP 1:5 000 Class III, Single Cell

6kg-40kg: OIML MAA C4, Y=15 000;
50kg-150kg: OIML MAA C5, Y=12 300

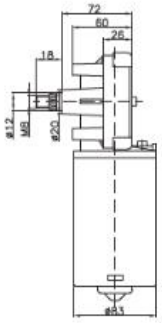
iSweek www.isweek.com
Add: 16/F, Bldg. #3, Zhongke Mansion, No.1 Hi-Tech S. Rd, Hi-Tech Park South, Shenzhen, Guangdong, 518067 P.R.China
Tel: + 86-755-83289036 Fax: + 86-755-83289052 E-mail: sales@isweek.com

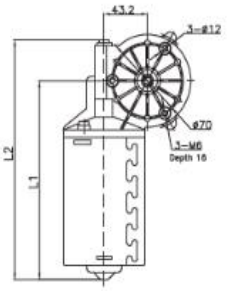
Wiper Motor -WD1160/1160-B

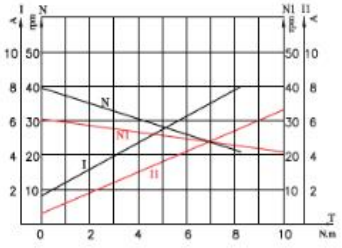


- 12VDC and 24VDC Available
- Aluminum Diecasting Gearbox
- Rolled Steel Housing Construction
- Dual Speed Design
- Dynamically Balanced Rotor

Mechanical

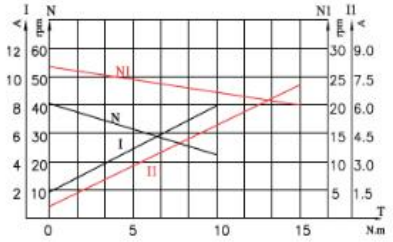






WD1160

---BLK High Speed,



WD1160-B

---RED Low Speed

Performance Data at Rated 12V DC

Type	No-Load Speed	Rated			Peak Torque	L1	L2
		Speed	Current	Torque			
		rpm	A	N.m	N.m	mm	mm
WD1160	40	28	5.6	5.2	8.5	182	225
	31	24	4.8	7	10		
WD1160-B	40.5	28	5.8	6.5	10	199	235
	27	21.5	6.3	13.2	15		

Datasheet

I2C 1602 Serial LCD Module





Product features:

The I2C 1602 LCD module is a 2 line by 16 character display interfaced to an I2C daughter board. The I2C interface only requires 2 data connections, +5 VDC and GND to operate

For in depth information on I2C interface and history, visit: http://www.wikipedia/wiki/i2c

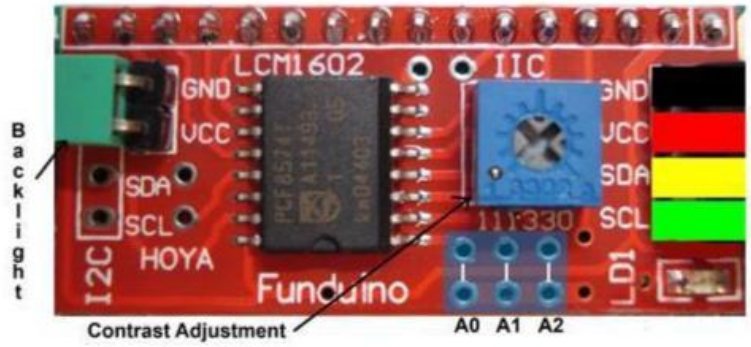
Specifications:

	2 lines by 16 character
I2C Address Range	0x20 to 0x27 (Default=0x27, addressable)
Operating Voltage	5 Vdc
Backlight	White
Contrast	Adjustable by potentiometer on I2c
Size	interface 80mm x 36mm x 20 mm 66mm x
Viewable area	16mm

Power:

The device is powered by a single 5Vdc connection.

Pinout Diagram:



Pin/Control Descriptions:

Pin #	Name	Type	Description
1	GND	Power	Supply & Logic ground
2	VCC	Power	Digital I/O 0 or RX (serial receive)
3	SDA	I/O	Serial Data line
4	SCL	CLK	Serial Clock line
A0	A0	Jumper	Optional address selection A0 - see below
A1	A1	Jumper	Optional address selection A1 - see below
A2	A2	Jumper	Optional address selection A2 - see below
Backlight		Jumper	Jumpered - enable backlight, Open - disable backlight
Contrast		Pot	Adjust for best viewing

Addressing:

A0	A1	A2	Address
Open	Open	Open	0x27
Jumper	Open	Open	0x26
Open	Jumper	Open	0x25
Jumper	Jumper	Open	0x24
Open	Open	Jumper	0x23
Jumper	Open	Jumper	0x22
Open	Jumper	Jumper	0x21
Jumper	Jumper	Jumper	0x20

IR-Sensor Switch E18 This is Sensor Infrared device for distance detection that can be adjusted in the range of 6 cm.-80 cm.; and Output is Logic TTL; 0 (GND) and 1 (5V).

Specifications -Adjust distance detection in the range of 6 cm.-80 cm. by Adjustable VR and display the status by LED

- Sensing device should be opaque material or any material that allows less light to pass through; black color is the best because Sensor device works well by using reflection of Infrared

-OUTPUT is Open Collector; it has to connect R 10 K Pull Up at Out Putt

-Signal Output is Digital TTL; 0 = GND and 1 = 5V

-Use Power Supply DC 5V Current 100mA

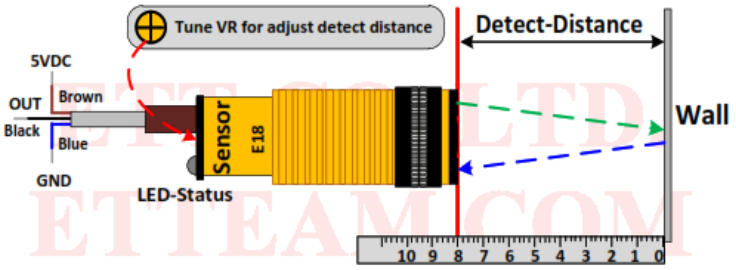
How to setup distance detection: Before using, it has to setup preferable distance detection for using with Sensor as follows;

1) Provide 5V Power Supply (brown cable) and GND (blue cable) to Sensor

2) Turn the head of Sensor upright to the ground or wall (it is the best if ground or wall is black color)

3) Measure the preferable distance detection from ground or wall to the head of Sensor by ruler; and hold Sensor at the preferable position to detect for awhile

4) Adjust VR at the end of Sensor. Look at the change of LED at the end of Sensor as described below;



- If LED is OFF (OUTPUT = 1), please adjust VR in a clockwise direction until LED becomes ON (OUTPUT = 0) and then stop adjusting VR. The position that LED changes the state is the specified distance detection. This is conditional operation; *if the distance of Sensor is less than or equal to the distance detection*, LED Status is ON and OUTPUT becomes Logic 0; but if the distance of Sensor is greater than the distance detection, LED Status is OFF and OUTPUT becomes Logic 1 instead.

- If LED is ON (OUTPUT = 0), please adjust VR in an anticlockwise direction until LED becomes OFF (OUTPUT = 1) and then stop adjusting VR. The position that LED changes the state is the specified distance detection. This is conditional operation; *if the distance of Sensor is greater than or equal to the distance detection*, LED Status is OFF and OUTPUT becomes Logic 1; but if the distance of Sensor is less than the distance detection, LED Status is ON and OUTPUT becomes Logic 0 instead.

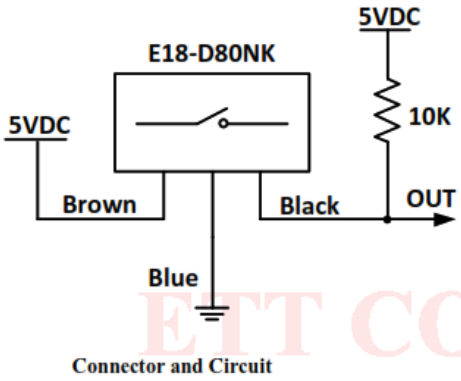
5) Test the operation of Sensor by moving Sensor. When the head of Sensor moves and passes the specified distance detection, LED of Sensor is lit up if the distance of Sensor is less or equal to the specified distance detection; but LED is OFF if the distance of Sensor is greater than or equal to the specified distance detection. If it does not accord with any conditional operation described above, it means that it fails to setup any distance detection for Sensor.

Referred to experiment in use, it found that color of ground or wall or any material that is used to reflect to Sensor is not enough dark. If the wall that is used to reflect is light color, the least distance detection of Sensor is also higher; so, the specified distance detection of user is lower than the least distance detection of Sensor. In this case, it should use wall with the dark color or it may setup the

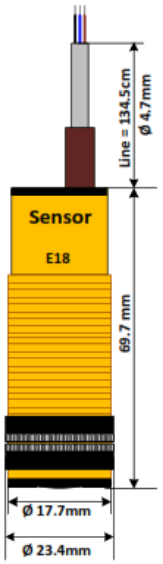
distance detection higher, depend on material of user. User has to test and setup distance detection by self because each color of wall that reflects to Sensor is different; and finally, user needs to return to step 1-5. Referred to experiment, the least distance detection of the black wall that can reflect to Sensor is 6 cm; the operating result accords with step 5, it means that it succeeds and Sensor is ready to use and connect.

How to use Sensor after setup distance detection

Please look at the circuit below and connect Sensor with Connectors according to the specified color; Brown Cable is 5VDC Power Supply, Blue Cable is GND, and Black Cable is OUTPUT(TTL). Next, please look at the conditional operation of Sensor to write program correctly.

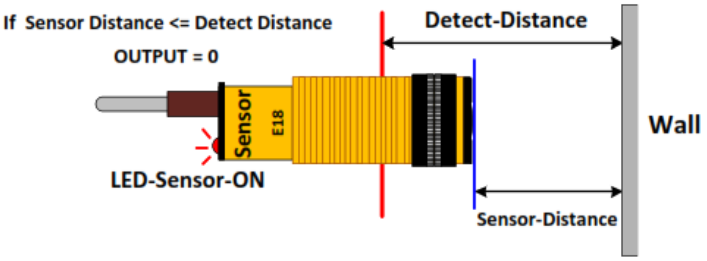


Connector and Circuit

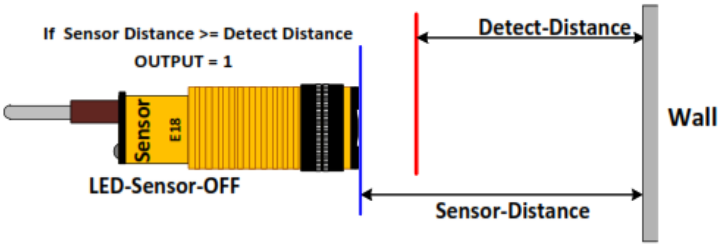


Dimensions of Sensor

ETT CO.,LTD.
ETTEAM.COM



When distance of Sensor <= the specified distance detection, LED Status is ON and OUTPUT = 0



When distance of Sensor >= the specified distance detection, LED Status is OFF and OUTPUT = 1

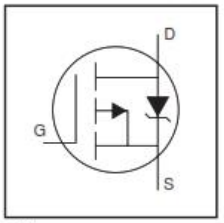
International
IOR Rectifier

PD - 91402A

IRFR/U5305

HEXFET® Power MOSFET

- Ultra Low On-Resistance
- Surface Mount (IRFR5305)
- Straight Lead (IRFU5305)
- Advanced Process Technology
- Fast Switching
- Fully Avalanche Rated



V_{DSS} = -55V

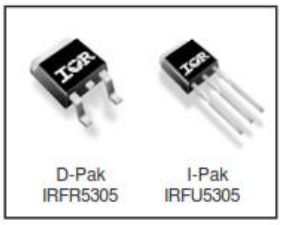
$R_{DS(on)}$ = 0.065Ω

I_D = -31A

Description

Fifth Generation HEXFETs from International Rectifier utilize advanced processing techniques to achieve extremely low on-resistance per silicon area. This benefit, combined with the fast switching speed and ruggedized device design that HEXFET® Power MOSFETs are well known for, provides the designer with an extremely efficient and reliable device for use in a wide variety of applications.

The D-Pak is designed for surface mounting using vapor phase, infrared, or wave soldering techniques. The straight lead version (IRFU series) is for through-hole mounting applications. Power dissipation levels up to 1.5 watts are possible in typical surface mount applications.



D-Pak IRFR5305 | I-Pak IRFU5305

Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ -10V	-31	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ -10V	-22	
I_{DM}	Pulsed Drain Current ①⑥	-110	
P_D @T_C = 25°C	Power Dissipation	110	W
	Linear Derating Factor	0.71	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy②⑥	280	mJ
I_{AR}	Avalanche Current①⑥	-16	A
E_{AR}	Repetitive Avalanche Energy①	11	mJ
dv/dt	Peak Diode Recovery dv/dt ③⑥	-5.0	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 175	°C
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	
	Mounting torque, 6-32 or M3 srew	10 lbf•in (1.1N•m)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	1.4	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB mount)*	—	50	
$R_{\theta JA}$	Junction-to-Ambient**	—	110	

10/23/00

Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	-55	—	—	V	V_{GS} = 0V, I_D = -250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	-0.034	—	V/°C	Reference to 25°C, I_D = -1mA
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.065	Ω	V_{GS} = -10V, I_D = -16A ④
$V_{GS(th)}$	Gate Threshold Voltage	-2.0	—	-4.0	V	V_{DS} = V_{GS}, I_D = -250µA
g_{fs}	Forward Transconductance	8.0	—	—	S	V_{DS} = -25V, I_D = -16A⑥
I_{DSS}	Drain-to-Source Leakage Current	—	—	-25	µA	V_{DS} = -55V, V_{GS} = 0V
		—	—	-250		V_{DS} = -44V, V_{GS} = 0V, T_J = 150°C
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	V_{GS} = 20V
	Gate-to-Source Reverse Leakage	—	—	-100		V_{GS} = -20V
Q_g	Total Gate Charge	—	—	63	nC	I_D = -16A
Q_{gs}	Gate-to-Source Charge	—	—	13		V_{DS} = -44V
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	29		V_{GS} = -10V, See Fig. 6 and 13 ④⑥
$t_{d(on)}$	Turn-On Delay Time	—	14	—	ns	V_{DD} = -28V
t_r	Rise Time	—	66	—		I_D = -16A
$t_{d(off)}$	Turn-Off Delay Time	—	39	—		R_G = 6.8Ω
t_f	Fall Time	—	63	—		R_D = 1.6Ω, See Fig. 10 ④⑥
L_D	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6mm (0.25in.) from package and center of die contact ⑤
L_S	Internal Source Inductance	—	7.5	—		
C_{iss}	Input Capacitance	—	1200	—	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	—	520	—		V_{DS} = -25V
C_{rss}	Reverse Transfer Capacitance	—	250	—		f = 1.0MHz, See Fig. 5 ⑥

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	-31	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	-110		
V_{SD}	Diode Forward Voltage	—	—	-1.3	V	T_J = 25°C, I_S = -16A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	—	71	110	ns	T_J = 25°C, I_F = -16A
Q_{rr}	Reverse Recovery Charge	—	170	250	nC	di/dt = -100A/µs ④⑥

Notes:

① Repetitive rating; pulse width limited by max. junction temperature. (See Fig. 11)

② V_{DD} = -25V, starting T_J = 25°C, L = 2.1mH R_G = 25Ω, I_{AS} = -16A. (See Figure 12)

③ I_{SD} ≤ -16A, di/dt ≤ -280A/µs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 175°C

④ Pulse width ≤ 300µs; duty cycle ≤ 2%.

⑤ This is applied for I-PAK, L_S of D-PAK is measured between lead and center of die contact.

⑥ Uses IRF5305 data and test conditions.

* When mounted on 1" square PCB (FR-4 or G-10 Material).
For recommended footprint and soldering techniques refer to application note #AN-994.

** Uses typical socket mount.