

**1B Integrated Design Project**  
**Component Catalogue**  
**Version 0.1.9**

**Michaelmas Term 2018**

## IDP Component Catalogue

This catalogue is the paper (pdf) version of the IDP on-line catalogue that can be found at [www.eng.cam.ac.uk/DesignOffice/idp](http://www.eng.cam.ac.uk/DesignOffice/idp). These catalogues are being developed as part of the Multi-disciplinary Design Project (MDP) which is a programme to develop teaching material and kits to aid the running of mechnronics projects in Universities and Schools. The project is being carried out with support from the Cambridge-MIT Institute undergraduate teaching programe.

Wherever possible commercially available components and software are being used and the support material developed inconjunction with a number of industrial sponsors. In particular, Premier Farnell PLC and P.T.C. (Parametric Technology Corporation).

For more information about the project please visit the MDP website at <http://www.eng.cam.ac.uk/DesignOffice/mdp> or contact

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For information about the CMI initiative please see

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### Catalogue Details

The catalogue layout is based around the product characterisation scheme developed by the United Nations (UNSPSC - United Nations Standard Products and Service Code). Currently this scheme is beginning to be used in Electronic Commerce and users should find Farnell and local suppliers able to cross reference particular product codes.

The basic scheme gives a unique 8 digit number to all products, generated from 4 pairs of numbers that allow the user to 'drill down' to a particular product code, e.g. for a Cap Head screw the code is

Hierarchy	Category Number and Name
	Seg.    Fam.    Class    Com.
<i>Segment</i>	$\implies$ 31 Manufacturing Components and Supplies .. ..
<i>Family</i>	$\implies$ 16 Hardware (Fasteners) .. ..
<i>Class</i>	$\implies$ 15 Screws .. ..
<i>Commodity</i>	$\implies$ 01 Caphead

The coding scheme is continually under development and this will manifest itself with some better layout/organisation of some classes etc. in the next year or so. If you wish to know more about the scheme see [www.unspsc.org](http://www.unspsc.org).

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# Part I Stationary

I



## Contents

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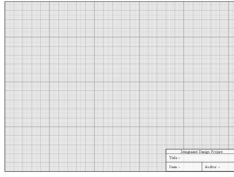
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## I

## PAPER

## Graph Isometric paper



	Order Code	Price (each)
1cm Graph (A4)	A4-1/10mm-gp (mdp)	0.03
Isopaper (A4)	A4-5mm-ISO (mdp)	0.03
1cm Graph (A3)	A3-1/10mm-gp (mdp)	0.05
Isopaper (A3)	A3-5mm-ISO (mdp)	0.05

Manufacturer:-  
<http://www.eng.cam.ac.uk/DesignOffice/mdp>

# Part II

## Power/Wire

II

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II

**DC Motor (Permanent Magnet)**



		Order Code	Price (each)
Mclennan [1271]	18 rpm	3999932 (far)	13.96
Mclennan [1271]	40 rpm	3999920 (far)	13.96



		Order Code	Price (each)
Maxon [924]	20 rpm	123 (rs)	120
Maxon [924]	40 rpm	123 (rs)	120

**Equipment Wire - stranded**



		Order Code	Price (each)
Black	[7 x 0.2]	140-311 (far)	2.71
Brown	[7 x 0.2]	140-312 (far)	2.71
Red	[7 x 0.2]	140-313 (far)	2.71
Orange	[7 x 0.2]	140-314 (far)	2.71
Yellow	[7 x 0.2]	140-315 (far)	2.71
Green	[7 x 0.2]	140-316 (far)	2.71
Blue	[7 x 0.2]	140-317 (far)	2.71
Mauve	[7 x 0.2]	140-318 (far)	2.71
Grey	[7 x 0.2]	140-319 (far)	2.71
White	[7 x 0.2]	140-320 (far)	2.71
Pink	[7 x 0.2]	140-321 (far)	2.71

**WIRE**

**Equipment Wire - Single Core**



		Order Code	Price (each)
Black	[1x0.6]	140-418 (far)	2.71
Brown	[1x0.6]	140-419 (far)	2.71
Red	[1x0.6]	140-420 (far)	2.71
Orange	[1x0.6]	140-421 (far)	2.71
Yellow	[1x0.6]	140-422 (far)	2.71
Green	[1x0.6]	140-423 (far)	2.71
Blue	[1x0.6]	140-424 (far)	2.71
Mauve	[1x0.6]	140-425 (far)	2.71
Grey	[1x0.6]	140-426 (far)	2.71
White	[1x0.6]	140-427 (far)	2.71
Pink	[1x0.6]	140-428 (far)	2.71



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III



## WRENCHES AND DRIVERS

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### Short handle 2mm AF Hex (Allen) Key



III

		Order Code	Price (each)
Hex Key	2mm AF	102101 (far)	0.08
Hex Key	2.5mm AF	102102 (far)	0.08
Hex Key	3mm AF	102103 (far)	0.08
Hex Key	4mm AF	102104 (far)	0.08
Hex Key	5mm AF	102105 (far)	0.22

Manufacturer:-  
<http://www.buckhickman.co.uk/>

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**ANGLE**

**Non ferrous alloy angles**



		Order Code	Price (m)
6082 Equal Angle	H6 - 12.6 x 1.6	()	2.67

**BAR**

**Non ferrous alloy bar - Round**



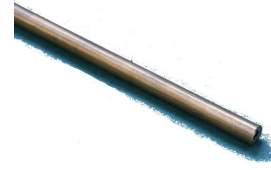
		Order Code	Price (m)
6082 Round	8mm	()	1.5

**Steel bar - Round**



		Order Code	Price (m)
Mild Steel Round	Br. Drawn 4mm	()	1.3
Mild Steel Round	Br. Drawn 5mm	()	1.45
Mild Steel Round	Br. Drawn 6mm	()	2.1

**Brass bar - Round**



		Order Code	Price (m)
Round	6mm	()	4.56

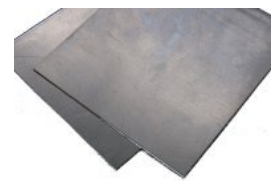
**Brass bar - Hex**



		Order Code	Price (m)
Hex	6mm AF	()	7.65

**SHEET**

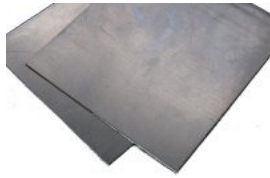
**Non ferrous alloy sheet**



		Order Code	Price (1.5x2m)
5251	H22 - 1.5mm	()	35.46

IV

**Steel sheet**



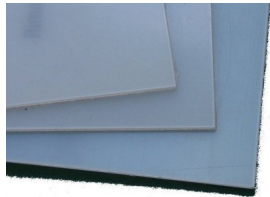
		Order Code	Price (1.5x2m)
CR4	22SWG - 0.7mm	()	17.65

**Non ferrous alloy tubing**



		Order Code	Price (m)
6082	H6 - 19mm x 20SWG	()	3.4

**Plastic sheet**



		Order Code	Price (1x1m)
Polypropylene	1.5mm White	()	12.45

**TUBING**

**Steel tubing**



		Order Code	Price (m)
Mild Seamless	5/16 x 20SWG	()	1.65
Mild Seamless	3/8 x 22SWG	()	1.8

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# Part V

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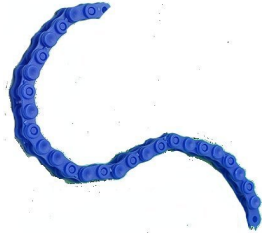
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**CHAIN**

**Plastic Chain**



		Order Code	Price (each)
Chain	8mx7	450-158 (JPR)	5.4
Manufacturer:- <a href="http://www.jpr.co.uk">http://www.jpr.co.uk</a>			

**CORDS**

**Yellow Polyester twine 0.9mm diameter Tensile S**



		Order Code	Price (m)
pe twine	Dia 0.9 UTS.	450-152 (JPR)	0.1
PP cord	Dia 2mm UTS	92337 (Aldi)	0.2
Manufacturer:- <a href="http://www.jpr.co.uk">http://www.jpr.co.uk</a>			

**SCREWS**

**Socket Head Cap Screws (SHCS)**



- Grade 12.9
- ISO4762
- BS4168

		Order Code	Price (50)
Screw(sh)	M2.5x12	103064B (far)	23.72
Screw(sh)	M3x10	100167 (far)	8.16
Screw(sh)	M3x16	100165 (far)	10.98
Screw(sh)	M3x20	100170 (far)	10.47
Screw(sh)	M4x10	103075B (far)	2.62
Screw(sh)	M4x16	100046 (far)	14.25
Screw(sh)	M4x20	100047 (far)	14.76
Screw(sh)	M4x25	100048 (far)	17.22
Screw(sh)	M5x16	100175 (far)	7.86
Screw(sh)	M5x20	100176 (far)	8.28
Screw(sh)	M5x25	100177 (far)	9.18
Screw(sh)	M6x12	100182 (far)	8.22
Screw(sh)	M6x25	100186 (far)	9.06
Screw(sh)	M6x40	103106 (far)	3.91
Manufacturer:- <a href="http://www.spstech.com/unbrako/htm/unbrako.html">http://www.spstech.com/unbrako/htm/unbrako.html</a>			

**BOLTS**

**Threaded rod/Studding Steel (metric)**



- BZP Mild steel - Grade 4.6
- M3 - Stainless Steel - Grade A2

		Order Code	Price (each)
studding-st	M3x1m	517380 (far)	1.58
studding-st	M4x1m	107207b (far)	0.8
studding-st	M6x1m	107209b (far)	0.72
Manufacturer:- <a href="http://www.buckhickman.co.uk/">http://www.buckhickman.co.uk/</a>			

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**NUTS**

**Steel**



		Order Code	Price (100)
Nut (st)	M2.5	149679 (far)	1.01
Nut (st)	M3	149680 (far)	1.04
Nut (st)	M4	149682 (far)	0.97
Nut (st)	M5	149683 (far)	1.13
Nut (st)	M6	149684 (far)	1.7

Manufacturer:-  
<http://www.trfasteners.com>

**WASHERS**

**Flat washers (steel)**



		Order Code	Price (100)
Washer (pl st)	M2.5	149686 (far)	0.33
Washer (pl st)	M3	149687 (far)	0.33
Washer (pl st)	M4	149689 (far)	0.56
Washer (pl st)	M5	149690 (far)	0.49
Washer (pl st)	M6	149691 (far)	0.71

Manufacturer:-  
<http://www.trfasteners.com>

**SPRINGS**

**Compression springs**



		Order Code	Price (100)
Spring-C	6x38	LC016C15MW (lee)	41
Spring-C	12x50	LC042G10MW (lee)	56.7
Spring-C	Mixed	X1098 (pr)	2.95

**Extension springs**



		Order Code	Price (each)
Spring-E	6x64	LE026C9MW (lee)	0.76
Spring-E	8x38	LE030CD5MW (lee)	0.72
Spring-E	Mixed	X1099 (pr)	2.95

**Torsion springs**



		Order Code	Price (each)
Spring-T	11x32	LTR035G4MW (lee)	0.76

Manufacturer:-  
<http://www.leespring.com>

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### RIVETS

#### Pop Riverts



		Order Code	Price (100)
Pop rivet	3.2mm	TLPD424BS (af)	10.8
Manufacturer:- <a href="http://www.emhart.com/products/pop.html">http://www.emhart.com/products/pop.html</a>			

### Wheels



		Order Code	Price (each)
Rub. Wheel	100mm	100RL02 (ai)	1.96
Rub. Wheel	75mm	75RL02 (ai)	1.32
Rub. Wheel	100mmx4id	100RL02 (ai)	2.3
Rub. Wheel	75mmx4id	75RL02 (ai)	1.8
Manufacturer:- <a href="http://www.revvo.co.uk/">http://www.revvo.co.uk/</a>			

### ROLLING HARDWARE

#### Castors



		Order Code	Price (each)
Rub. castor	50mm	050GPAB8 (ai)	4.56
Manufacturer:- <a href="http://www.revvo.co.uk/">http://www.revvo.co.uk/</a>			

### BEARINGS

#### Deep Grove



		Order Code	Price (each)
Ball Brg	623ZZ-3x10x4	()	0.72
Ball Brg	624ZZ-4x13x5	()	1.49
Ball Brg	625ZZ-5x16x5	()	0.75
Ball Brg [Flanged]	FF623ZZ-3x10x4	()	1.62
Ball Brg [Flanged]	FF624ZZ-4x13x5	()	1.17
Ball Brg [Flanged]	FF625ZZ-5x16x5	()	1.78

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### BUSHINGS

#### Flange Bushing



		Order Code	Price (50)
Pl. Brg	M3x3	891381 (far)	1.81
Pl. Brg	M4x3	891447 (far)	1.78
Pl. Brg	M6x4	891540 (far)	2.16
Pl. Brg	M8x6	891599 (far)	2.37

Manufacturer:-  
<http://www.allthread.co.uk>

### GEARS

#### Spur gears

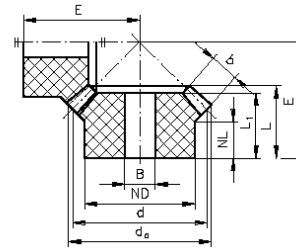
- Mod 1.0



		Order Code	Price (each)
Spur	10t MOD 1.0	3469669 (far)	0.42
Spur	20t MOD 1.0	3469750 (far)	0.74
Spur	30t MOD 1.0	3472425 (far)	1.1
Spur	40t MOD 1.0	3469967 (far)	1.27
Spur	50t MOD 1.0	3470015 (far)	1.58
Spur	60t MOD 1.0	3470088 (far)	2

Manufacturer:-  
<http://www.huco.com/>

#### Bevel gears



		Order Code	Price (each)
Bevel Gear	20t MOD1.0 - 2:1	3470386 (far)	0.66

Manufacturer:-  
<http://www.huco.com/>

#### Rack gears



		Order Code	Price (each)
Rack	m1.0x100	3470295 (far)	0.5

Manufacturer:-  
<http://www.huco.com/>

#### Worm (MOD 1.0 x 20mm)



		Order Code	Price (10)
Worm gear	m1.0x20	450.142 (jpr)	4.15

**INDUSTRIAL WHEELS**

**V pulley 10mm**



		Order Code	Price (10)
Pulley-10	10mm	450-160 ()	2.05
Pulley-20	20mm	450-162 ()	2.4
Pulley-30	30mm	450-166 ()	4.15
Pulley-40	40mm	450-168 ()	4.2
Pulley-50	50mm	450-169 ()	4.85
Pulley-60	60mm	450-170 ()	4.85

**SPROCKETS**

**Plastic Sprocket**



		Order Code	Price (each)
Sprocket 10th	10t-dia 28	450-152 (JPR)	1.05
Sprocket 20th	20t-dia 54	450-154 (JPR)	1.1
Sprocket 30th	30t-dia 80	450-156 (JPR)	1.17

Manufacturer:-  
<http://www.jpr.co.uk>

**Shaft adaptors**



	Order Code	Price (each)
Shaft adpt 4F-4F	s-adpt-4f-4f (CUED)	2
Shaft adpt 4F-4M	s-adpt-4f-4f (CUED)	2
Shaft adpt 4F-6F	s-adpt-4f-6f (CUED)	2
Shaft adpt 6F-4M	s-adpt-6f-4m (CUED)	2
Shaft adpt 6F-8M	s-adpt-6f-8m (CUED)	3.5

**TAPE**

**Foam Tape**



	Order Code	Price ()
Foam tape	far	()

**ADHESIVES**

**Epoxy bond**



		Order Code	Price (each)
Epoxy	Rapid	300521 (far)	2.72
Epoxy	Precision	300520 (far)	2.29

Manufacturer:-  
<http://www.bostik-findley.co.uk>

**Cyanoacrylate adhesive**



		Order Code	Price (each)
HS Cyano. C2	(3g)	146535 (far)	1.46

Manufacturer:-  
<http://www.permabond.com/>

**Acrylic adhesive**

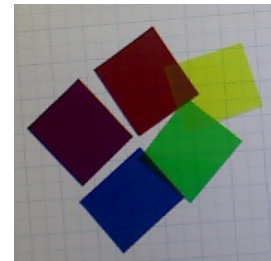


		Order Code	Price (each)
Flexon	(3g)	224352 (far)	3.75

Manufacturer:-  
<http://www.permabond.com/>

**COLOUR FILTER**

**Acetate Filter**



		Order Code	Price (/cm <sup>2</sup> )
Filter-blue	450-550nm	()	0.2
Filter-green	650-750nm	()	0.2
Filter-magenta	620-750nm	()	0.2
Filter-red	480-610nm	()	0.2
Filter-yellow	460-750nm	()	0.2

## Part VI

## Electronic Components and Supplies

## Contents

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**CIRCUIT ASSEMBLIES**

**Detectors**



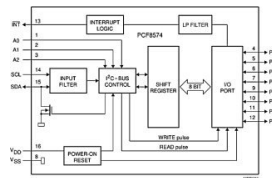
	Order Code	Price (each)
GP2Y0A21YK IRdis/sen	4142688 (far)	15.91
Manufacturer:- <a href="http://sharp-world.com/products/device/">http://sharp-world.com/products/device/</a>		



	Order Code	Price (each)
SS495A Hall effect sens.	2166231 (rs)	1.37
Manufacturer:- <a href="http://www.honeywell.com/">http://www.honeywell.com/</a>		

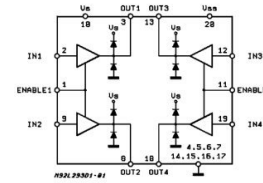
**INTEGRATED CIRCUITS**

**CMOS**



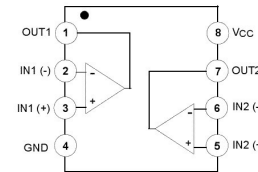
	Order Code	Price (each)
PCF8574A I2C I/O Exp	390197 (far)	4.4
Manufacturer:- <a href="http://www.semiconductors.philips.com">http://www.semiconductors.philips.com</a>		

**Motor Drive IC**



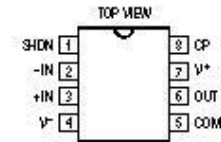
	Order Code	Price (each)
L293 4 Ch. Driver	3236079 (far)	3.5
Manufacturer:- <a href="http://www.st.com/">http://www.st.com/</a>		

**Operational amplifiers**



	Order Code	Price (each)
lm358 Dual OpAmp	9486810 (far)	0.58

**Zero drift op amp**

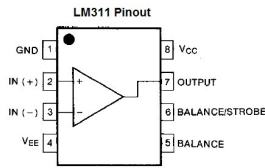


	Order Code	Price (each)
LTC 1152 ZD OA	3862483 (far)	4.96
Manufacturer:- <a href="http://www.linear-tech.com/">http://www.linear-tech.com/</a>		

VI



**Comparator**



	Order Code	Price (each)
LM311	LM311 1648675 (far)	0.36

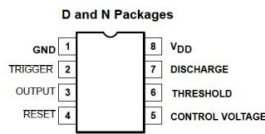
Manufacturer:-  
<http://www.ti.com>

**8 bit microcontroller**



	Order Code	Price (each)
Idp-1840	Idp-1840 (CUEd)	1.2

**Timers**



	Order Code	Price (each)
ICM7555CN	555 Timer 409250 (far)	0.46

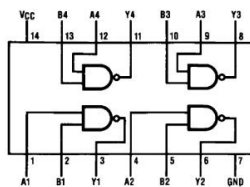
Manufacturer:-  
<http://www.semiconductors.philips.com/>

**32 bit high end microcontroller**



	Order Code	Price (each)
MDP Balloon3	lloon3-mdp (CUEd)	280

**74HC series**

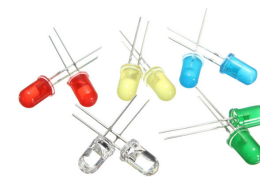


	Order Code	Price (each)
74HC00N	4xNAND 3548582 (far)	0.15
74HC08N	4xAND 378276 (far)	0.15
74HC14N	6xInv(Sc) 378306 (far)	0.19
74HC74AN	2x D-flipflop 378379 (far)	0.23
74HC85N	comparator 380489 (far)	0.64
74HC112N	2xJKflipflop ()	
74HC123AN	2xm/stable 378446 (far)	0.26
74HC273N	D flipflop 378835 (far)	0.34
74HC393N	4bit counter 378940 (far)	0.32

Manufacturer:-  
<http://www.fairchildsemi.com>

**DIODES**

**3mm LED's**



	Order Code	Price (each)
LED Red Low Curr.	637087 (far)	0.09
LED Green Low Curr.	637087 (far)	0.09
LED Orange Low Curr.	637087 (far)	0.09
LED Yellow Low Curr.	637087 (far)	0.09
LED Blue Low Curr.	637087 (far)	0.09

Manufacturer:-  
[http://www.kingbright-europe.de/index\\_en.htm](http://www.kingbright-europe.de/index_en.htm)

VI



		Order Code	Price (each)
LED	White (bright)	637087 (far)	0.09
Manufacturer:- <a href="http://www.kingbright-europe.de/index_en.htm">http://www.kingbright-europe.de/index_en.htm</a>			

**5mm LED's**



		Order Code	Price (each)
LED	Red Low Curr.	637087 (far)	0.09
SFH485P	880nm IR 5mm	212684 (far)	0.42
Manufacturer:- <a href="http://www.osram-os.com/">http://www.osram-os.com/</a>			

**Power Diodes**



		Order Code	Price (each)
Diode	1A 50V	251677 (far)	0.05
Manufacturer:- <a href="http://www.fairchildsemi.com">http://www.fairchildsemi.com</a>			

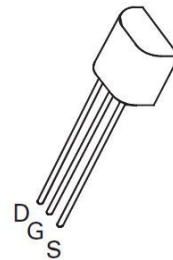
**TRANSISTORS**

**Photo sensitive transistors**



		Order Code	Price (each)
SFH313FA	850nm	2841336 (rs)	0.43
Manufacturer:- <a href="http://www.osram-os.com/">http://www.osram-os.com/</a>			

**MOSFET's**



**E-Line  
T092 Compatible**

		Order Code	Price (each)
ZVN4306A	60V Enhan.	259706 (far)	0.96
Manufacturer:- <a href="http://www.zetex.com/">http://www.zetex.com/</a>			

VI

**CAPACITORS**

**Fixed capacitors (Ceramic)**



		Order Code	Price (each)
Cap.(Cer)	10nF-50v	750890 (far)	0.11
Cap.(Cer)	100nF-50v	750955 (far)	0.14
Cap.(Cer)	220nF-50v	750967 (far)	0.32
Cap.(Cer)	470nF-50v	751030 (far)	0.46
Cap.(Cer)	1uF-50v	750979 (far)	1.24

Manufacturer:-  
<http://www.spctechnology.com>

**Fixed capacitors (Electrolitic)**



		Order Code	Price (each)
Cap.(Elec)	470uF-16v	286333 (far)	0.27

Manufacturer:-  
<http://www.vishay.com/>

**Fixed capacitors (Tantulum)**



		Order Code	Price (each)
Cap.(Tant)	100nF-35v	4164416 (far)	0.14
Cap.(Tant)	220nF-35v	4164428 (far)	0.14
Cap.(Tant)	4.7uF-35v	4164490 (far)	0.3
Cap.(Tant)	10uF-35v	4164519 (far)	0.4
Cap.(Tant)	22uF-35v	4164532 (far)	1.29
Cap.(Tant)	47uF-35v	4164544 (far)	2.36

Manufacturer:-  
<http://www.spctechnology.com>

**RESISTORS(FIXED-VAR)**

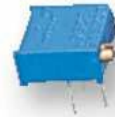
**Variable Resistors (Single Turn - Cermet)**



		Order Code	Price (each)
Trimmer(ST)	10 K	346410 (far)	0.51
Trimmer(ST)	20K	346421 (far)	0.51
Trimmer(ST)	200K	346457 (far)	0.51

Manufacturer:-  
<http://www.bourns.com/>

**Variable Resistors (Multit Turn - Cermet)**



		Order Code	Price (each)
Trimmer(MT)	500ohm	237565 (far)	1.27
Trimmer(MT)	10K	237516 (far)	0.51

Manufacturer:-  
<http://www.bourns.com/>

Potentiometer 1turn 1k



	Order Code	Price (each)
Pot 1trn 1k	(gen)	0.2
Pot 1trn 2k	(gen)	0.2
Pot 1trn 2.5k	(gen)	0.2
Pot 1trn 5k	(gen)	0.2
Pot 1trn 10k	(gen)	0.2
Pot 1trn 100k	(gen)	0.2

Fixed resistor (Carbon Film)

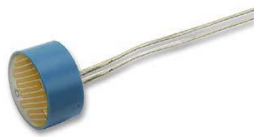


		Order Code	Price (each)
Res.(Cfilm)	10ohms	508-925 (far)	0.01
Res.(Cfilm)	12ohms	508-937 (far)	0.01
Res.(Cfilm)	15ohms	508-949 (far)	0.01
Res.(Cfilm)	18ohms	508-950 (far)	0.01
Res.(Cfilm)	22ohms	508-962 (far)	0.01
Res.(Cfilm)	27ohms	508-974 (far)	0.01
Res.(Cfilm)	33ohms	508-986 (far)	0.01
Res.(Cfilm)	39ohms	508-998 (far)	0.01
Res.(Cfilm)	47ohms	509-000 (far)	0.01
Res.(Cfilm)	56ohms	509-012 (far)	0.01
Res.(Cfilm)	68ohms	509-024 (far)	0.01
Res.(Cfilm)	82ohms	509-036 (far)	0.01
Res.(Cfilm)	100ohms	509-048 (far)	0.01
Res.(Cfilm)	120ohms	509-050 (far)	0.01
Res.(Cfilm)	150ohms	509-061 (far)	0.01
Res.(Cfilm)	180ohms	509-073 (far)	0.01
Res.(Cfilm)	220ohms	509-085 (far)	0.01
Res.(Cfilm)	270ohms	509-097 (far)	0.01
Res.(Cfilm)	330ohms	509-103 (far)	0.01
Res.(Cfilm)	390ohms	509-115 (far)	0.01
Res.(Cfilm)	470ohms	509-127 (far)	0.01
Res.(Cfilm)	560ohms	509-139 (far)	0.01
Res.(Cfilm)	680ohms	509-140 (far)	0.01
Res.(Cfilm)	820ohms	509-152 (far)	0.01
Res.(Cfilm)	1kohms	509-164 (far)	0.01
Res.(Cfilm)	1.2Kohms	509-176 (far)	0.01
Res.(Cfilm)	1.5Kohms	509-188 (far)	0.01
Res.(Cfilm)	1.8Kohms	509-190 (far)	0.01
Res.(Cfilm)	2.2Kohms	509-206 (far)	0.01
Res.(Cfilm)	2.7Kohms	509-218 (far)	0.01
Res.(Cfilm)	3.3Kohms	509-220 (far)	0.01
Res.(Cfilm)	3.9Kohms	509-231 (far)	0.01
Res.(Cfilm)	4.7Kohms	509-243 (far)	0.01
Res.(Cfilm)	5.6Kohms	509-255 (far)	0.01
Res.(Cfilm)	6.8Kohms	509-267 (far)	0.01
Res.(Cfilm)	8.2Kohms	509-279 (far)	0.01
Res.(Cfilm)	10Kohms	509-280 (far)	0.01
Res.(Cfilm)	12Kohms	509-292 (far)	0.01
Res.(Cfilm)	15Kohms	509-309 (far)	0.01
Res.(Cfilm)	18Kohms	509-310 (far)	0.01
Res.(Cfilm)	22Kohms	509-322 (far)	0.01
Res.(Cfilm)	27Kohms	509-334 (far)	0.01
Res.(Cfilm)	33Kohms	509-346 (far)	0.01
Res.(Cfilm)	39Kohms	509-358 (far)	0.01
Res.(Cfilm)	47Kohms	509-360 (far)	0.01
Res.(Cfilm)	56Kohms	509-371 (far)	0.01
Res.(Cfilm)	68Kohms	509-383 (far)	0.01
Res.(Cfilm)	82Kohms	509-395 (far)	0.01
Res.(Cfilm)	100Kohms	509-401 (far)	0.01
Res.(Cfilm)	120Kohms	509-413 (far)	0.01
Res.(Cfilm)	150Kohms	509-425 (far)	0.01
Res.(Cfilm)	180Kohms	509-437 (far)	0.01
Res.(Cfilm)	220Kohms	509-449 (far)	0.01
Res.(Cfilm)	270Kohms	509-450 (far)	0.01
Res.(Cfilm)	330Kohms	509-462 (far)	0.01
Res.(Cfilm)	390Kohms	509-474 (far)	0.01
Res.(Cfilm)	470Kohms	509-486 (far)	0.01
Res.(Cfilm)	560Kohms	509-498 (far)	0.01
Res.(Cfilm)	680Kohms	509-504 (far)	0.01
Res.(Cfilm)	820Kohms	509-516 (far)	0.01
Res.(Cfilm)	1Mohms	509-528 (far)	0.01

Manufacturer:-  
<http://www.spctechology.com>

VI

LDR's



	Order Code	Price (each)
LDR 0.4K @ 1 Klux	327700 (far)	1.54

Manufacturer:-  
<http://www.silonex.com/>

Thermistor

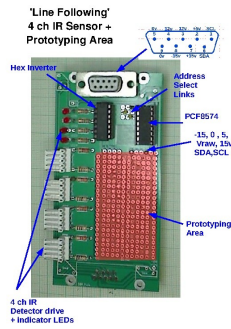


	Order Code	Price (each)
NTC Therm.	33K 5265706 (far)	0.44

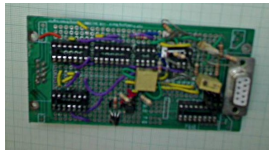
Manufacturer:-  
<http://www.vishay.com/>

**ELEC. COMPONENTS - PARTS**

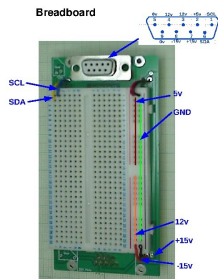
**D Sided PCBs (Bare)**



	Order Code	Price (each)
Lf board	(CUED)	6.3



	Order Code	Price (each)
Proto board	(CUED)	6.3



	Order Code	Price (each)
Bread b	(CUED)	7.2

VI

## Part VII

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Grommet . . . . .	33
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**CONNECTORS**

**Minature crimp**



	Order Code	Price (each)
2w- head	143-132 (far)	0.25
2w-head Fr	143-139 (far)	0.27
2w-house	143-126 (far)	0.12
3w-head	143-133 (far)	0.3
3w-head Fr	143-140 (far)	0.32
3w-head 90	143-145* (far)	0.49
3w-socket	143-151* (far)	0.35
3w-house	143-127 (far)	0.13
5w-head	143-135 (far)	0.37
5w-house	146-256 (far)	0.16
crimp	143-201 (far)	33.68

Manufacturer:-  
<http://www.molex.com>



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		Order Code	Price (100)
Sleeve 1.2x20 [Red]	1.2x20 [Red]	1169015 (far)	2.44

VII



**ELECTRICAL HARDWARE**

**Sleeve**



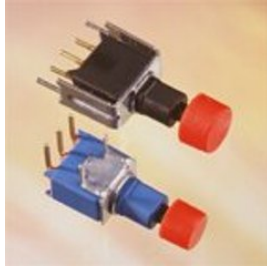
		Order Code	Price (100)
Sleeve 1.2x20 [Black]	1.2x20 [Black]	1169017 (far)	2.13

	Order Code	Price (248ml)
Lubricant [sleeve]	101619 (far)	4.13



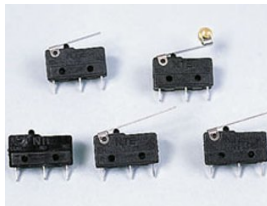
**SWITCHES**

**Push button switches**



		Order Code	Price (each)
Moment. Push	SPST N/O	664-323 (rs)	1.68
Manufacturer:- <a href="http://www.apem.com/">http://www.apem.com/</a>			

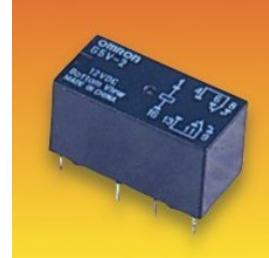
**Micro Switch**



		Order Code	Price (5)
Microswitch	SPDT Lever	SW00411 (cpc)	2.12
Manufacturer:- <a href="http://www.camdenelec.com">http://www.camdenelec.com</a>			

**RELAYS**

**Socket relays**



		Order Code	Price (each)
Submin.	12V DC	179-351 (far)	1.69
Manufacturer:- <a href="http://www.omron.com">http://www.omron.com</a>			

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**Part VIII**  
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**LENGTH MEASUREMENT**

**Strain Gauge**



	Order Code	Price ( )
StrainG-3mm-A1 SG-3mm-23	FA-3-23 ( )	2.34

**ELEC MEASURE TESTING**

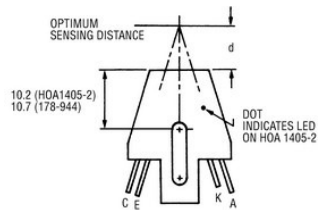
**Multimeters**



	Order Code	Price (ea)
Multimeter My-64	My-64 ( )	54

**SENSORS-DAQ**

**Proximity sensors**



	Order Code	Price (each)
OPB704 IR dist. sens.	178944 (far)	4.71

Manufacturer:-  
<http://www.optekinc.com/>

**Oscilloscope**



	Order Code	Price (ea)
Oscilloscope 4ch 60MHz	gds-2064 ( )	850

**Signal Generator**



	Order Code	Price (ea)
Signal Generator 1Hz-3Mhz	sfg-2104 ( )	180

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