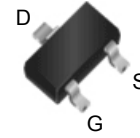
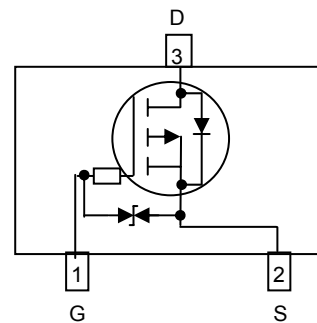


WPM2093
Single P-Channel, -20V, -0.8A, Power MOSFET
[Http://www.sh-willsemi.com](http://www.sh-willsemi.com)

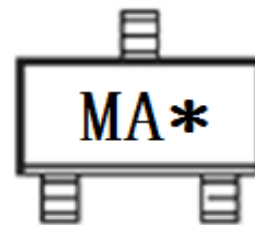
V_{DS} (V)	Typical $R_{DS(on)}$ (m Ω)
-20	220 @ $V_{GS}=-4.5V$
	280 @ $V_{GS}=-2.8V$
	335 @ $V_{GS}=-2.5V$
	500 @ $V_{GS}=-1.8V$


SOT-723
Descriptions

The WPM2093 is P-Channel enhancement MOS Field Effect Transistor. Uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This device is suitable for use in DC-DC conversion, power switch and charging circuit. Standard Product WPM2093 is Pb-free.


Pin configuration (Top view)
Features

- Trench Technology
- Supper high density cell design
- Excellent ON resistance
- Extremely Low Threshold Voltage
- Small package SOT-723



MA= Device Code

*= Month(A-Z)

Marking
Applications

- DC/DC converters
- Power supply converters circuit
- Load/Power Switching for portable device

Order information

Device	Package	Shipping
WPM2093-3/TR	SOT-723	8000/Tape&Reel

Absolute Maximum ratings

Parameter	Symbol	10 s	Steady State	Unit	
Drain-Source Voltage	V_{DS}	-20		V	
Gate-Source Voltage	V_{GS}	± 10			
Continuous Drain Current ^{a d}	I_D	$T_A=25^\circ\text{C}$	-0.82	-0.75	A
		$T_A=70^\circ\text{C}$	-0.66	-0.60	
Maximum Power Dissipation ^{a d}	P_D	$T_A=25^\circ\text{C}$	0.37	0.30	W
		$T_A=70^\circ\text{C}$	0.23	0.19	
Continuous Drain Current ^{b d}	I_D	$T_A=25^\circ\text{C}$	-0.70	-0.91	A
		$T_A=70^\circ\text{C}$	-0.56	-0.73	
Maximum Power Dissipation ^{b d}	P_D	$T_A=25^\circ\text{C}$	0.26	0.45	W
		$T_A=70^\circ\text{C}$	0.17	0.28	
Pulsed Drain Current ^c	I_{DM}	-1.5		A	
Operating Junction Temperature	T_J	-55 to 150		$^\circ\text{C}$	
Lead Temperature	T_L	260		$^\circ\text{C}$	
Storage Temperature Range	T_{stg}	-55 to 150		$^\circ\text{C}$	

Thermal resistance ratings

Single Operation					
Parameter	Symbol	Typical	Maximum	Unit	
Junction-to-Ambient Thermal Resistance ^a	$R_{\theta JA}$	$t \leq 10 \text{ s}$	280	340	$^\circ\text{C/W}$
		Steady State	345	410	
Junction-to-Ambient Thermal Resistance ^b	$R_{\theta JA}$	$t \leq 10 \text{ s}$	400	470	
		Steady State	245	280	
Junction-to-Case Thermal Resistance	$R_{\theta JC}$	280	340		

a Surface mounted on FR4 Board using 1 square inch pad size, 1oz copper

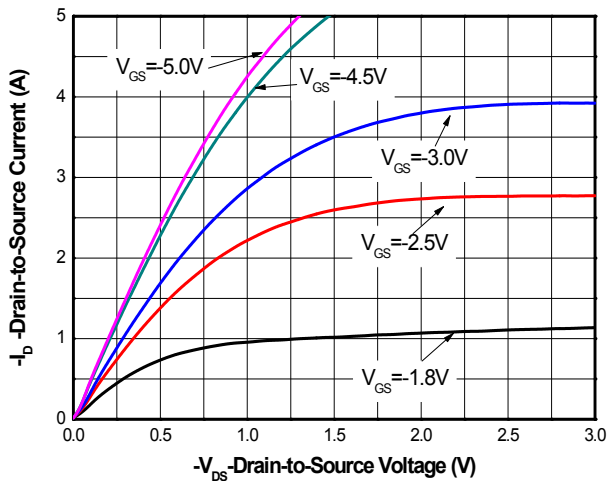
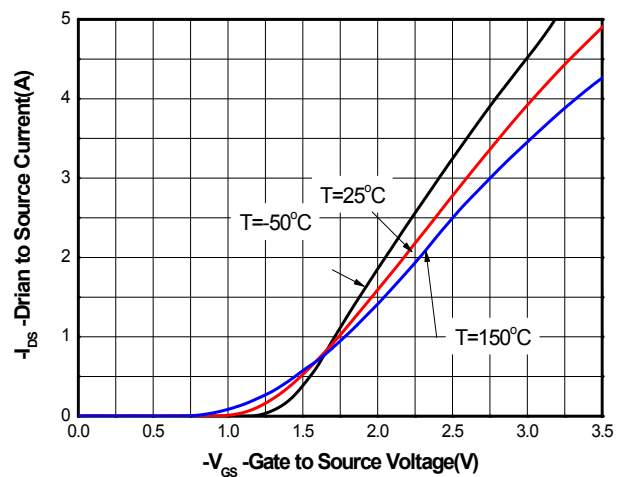
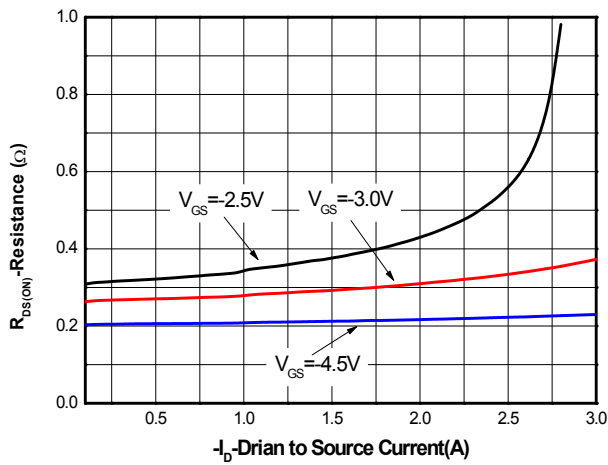
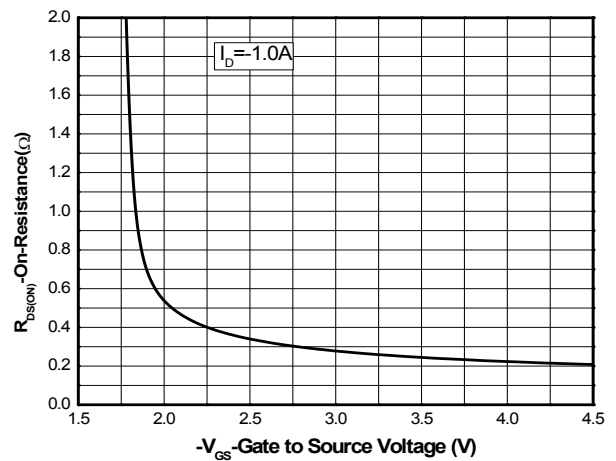
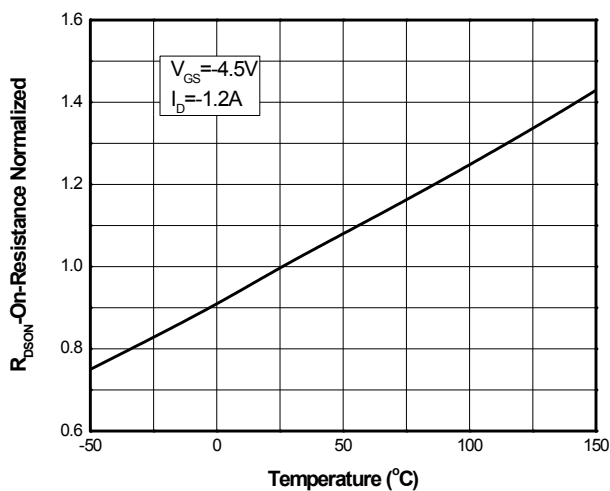
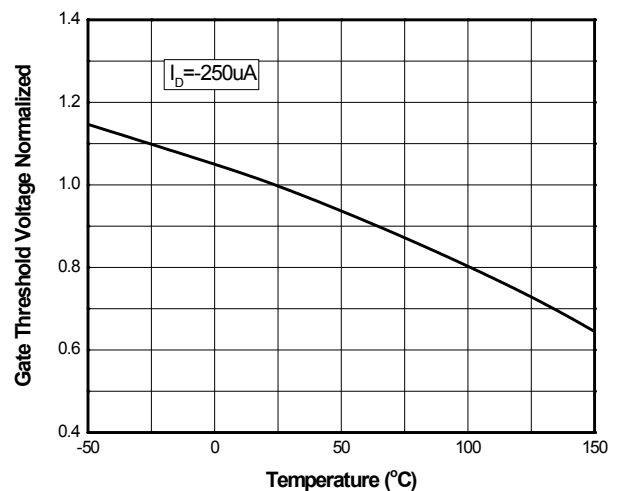
b Surface mounted on FR4 board using minimum pad size, 1oz copper

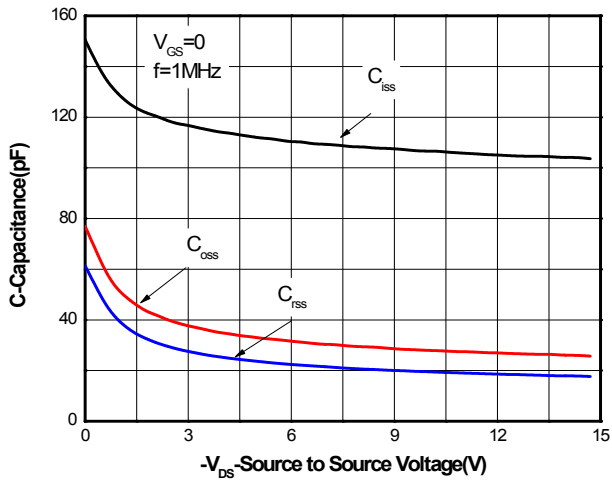
c Repetitive rating, pulse width limited by junction temperature, $t_p=10\mu\text{s}$, Duty Cycle=1%

d Repetitive rating, pulse width limited by junction temperature $T_J=150^\circ\text{C}$.

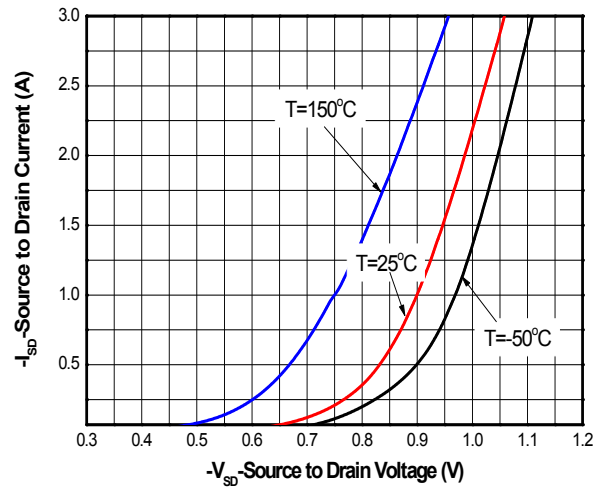
Electronics Characteristics (Ta=25°C, unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0\text{ V}, I_D = -250\mu\text{A}$	-20			V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}$			-1	μA
Gate-to-source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 10\text{ V}$			± 5.0	μA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = -250\mu\text{A}$	-0.45	0.7	-1.0	V
Drain-to-source On-resistance	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -0.8\text{ A}$		220	360	m Ω
		$V_{GS} = -2.8\text{ V}, I_D = -0.5\text{ A}$		280	400	
		$V_{GS} = -2.5\text{ V}, I_D = -0.5\text{ A}$		335	450	
		$V_{GS} = -1.8\text{ V}, I_D = -0.3\text{ A}$		500	760	
CHARGES, CAPACITANCES AND GATE RESISTANCE						
Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = -15\text{ V}$		104		pF
Output Capacitance	C_{OSS}			25		
Reverse Transfer Capacitance	C_{RSS}			19		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = -4.5\text{ V}, V_{DS} = -10\text{ V}, I_D = -1\text{ A}$		1.10		nC
Threshold Gate Charge	$Q_{G(TH)}$			0.25		
Gate-to-Source Charge	Q_{GS}			0.38		
Gate-to-Drain Charge	Q_{GD}			0.47		
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	$t_d(ON)$	$V_{GS} = -4.5\text{ V}, V_{DS} = -10\text{ V}, R_G = 6\ \Omega, I_D = -1\text{ A}$		7.2		ns
Rise Time	t_r			7.5		
Turn-Off Delay Time	$t_d(OFF)$			18.5		
Fall Time	t_f			10.7		
BODY DIODE CHARACTERISTICS						
Forward Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = -0.5\text{ A}$	-0.5	-0.8	-1.2	V

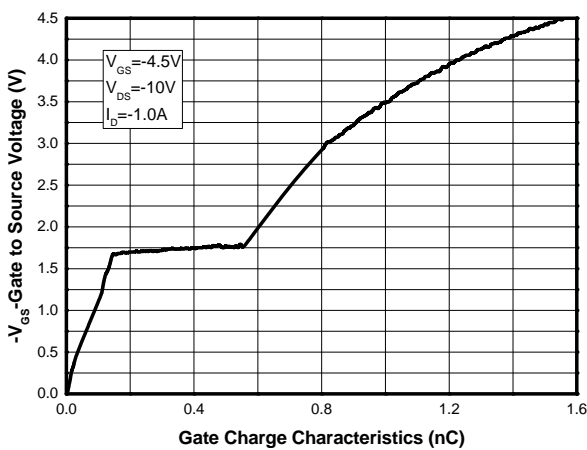
Typical Characteristics (Ta=25°C, unless otherwise noted)

Output characteristics

Transfer characteristics

On-Resistance vs. Drain current

On-Resistance vs. Gate-to-source voltage

On-Resistance vs. Junction temperature

Threshold voltage vs. Temperature



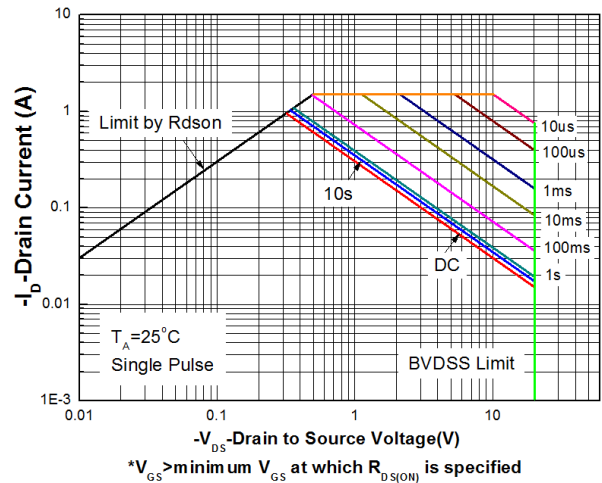
Capacitance



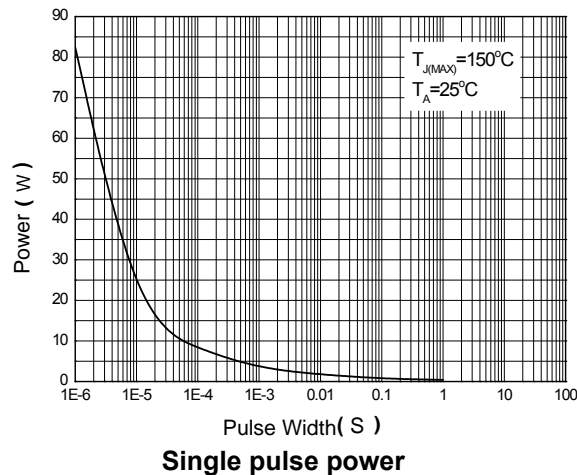
Body diode forward voltage



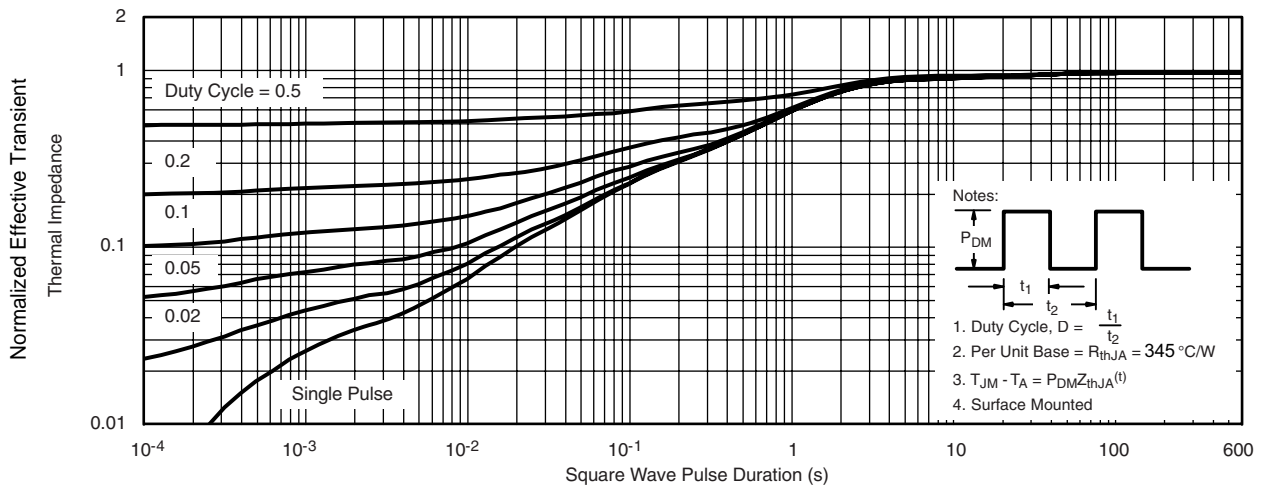
Gate Charge Characteristics



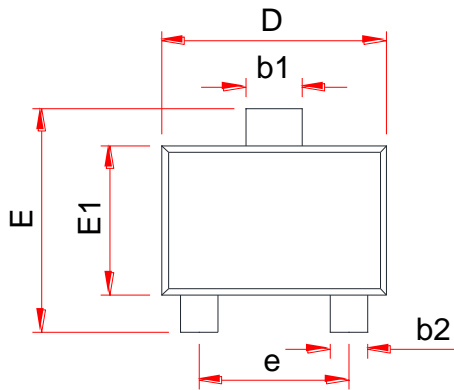
Safe operating power



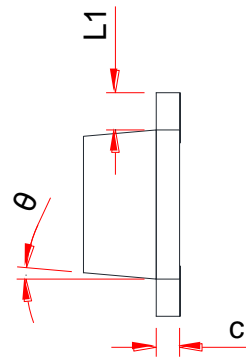
Single pulse power



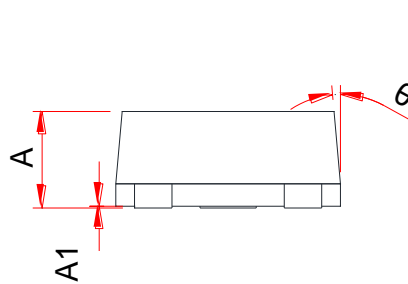
Transient thermal response (Junction-to-Ambient)

Package outline dimensions
SOT-723


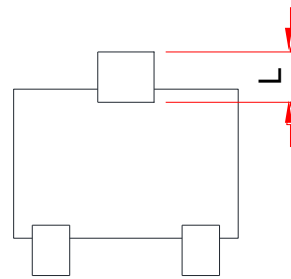
Top View



Side View

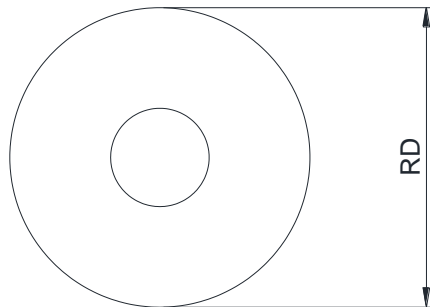
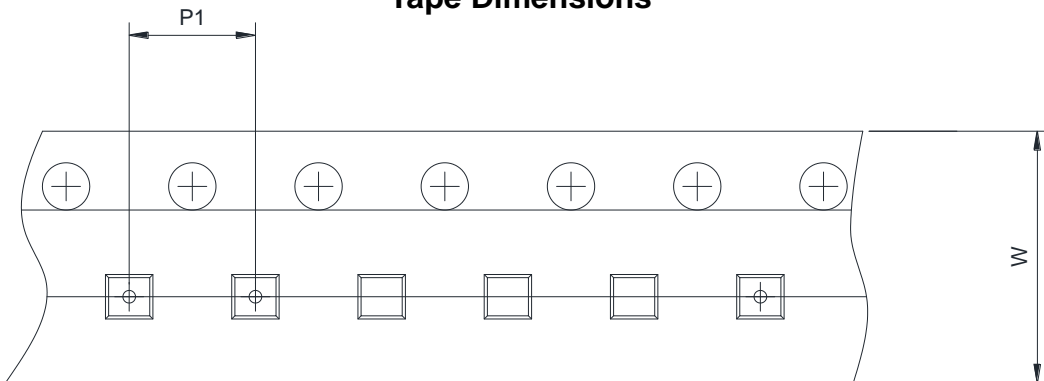
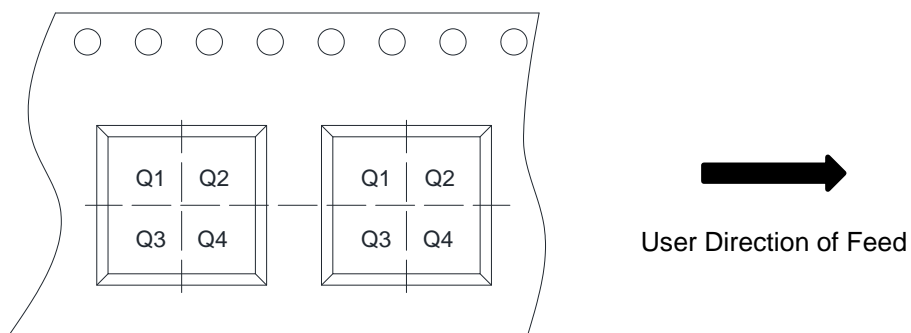


Side View



Bottom View

Symbol	Dimensions in Millimeters		
	Min.	Typ.	Max.
A	0.43	-	0.55
A1	0.00	-	0.05
c	0.08	0.13	0.18
b1	0.27	-	0.37
b2	0.17	-	0.27
L	0.27 Ref.		
L1	0.15	0.20	0.25
D	1.15	1.20	1.25
E	1.15	1.20	1.25
E1	0.75	0.80	0.85
e	0.80 Typ.		
θ	7 ° Ref.		

TAPE AND REEL INFORMATION
Reel Dimensions

Tape Dimensions

Quadrant Assignments For PIN1 Orientation In Tape


RD	Reel Dimension	<input checked="" type="checkbox"/> 7inch	<input type="checkbox"/> 13inch
W	Overall width of the carrier tape	<input checked="" type="checkbox"/> 8mm	<input type="checkbox"/> 12mm <input type="checkbox"/> 16mm
P1	Pitch between successive cavity centers	<input checked="" type="checkbox"/> 2mm	<input type="checkbox"/> 4mm <input type="checkbox"/> 8mm
Pin1	Pin1 Quadrant	<input type="checkbox"/> Q1	<input type="checkbox"/> Q2 <input checked="" type="checkbox"/> Q3 <input type="checkbox"/> Q4