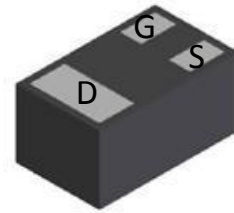
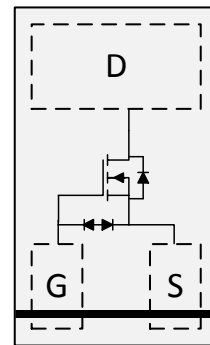


**WNM2046A-3/TR**
**Single N-Channel, 20V, 0.6A, Power MOSFET**
[Http://www.sh-willsemi.com](http://www.sh-willsemi.com)

$V_{DS}$ (V)	Typical $R_{DS(on)}$ ( $\Omega$ )
20	0.42 @ $V_{GS}=4.5V$
	0.58 @ $V_{GS}=2.5V$
	0.84 @ $V_{GS}=1.8V$


**DFN1006-3L**

**Descriptions**

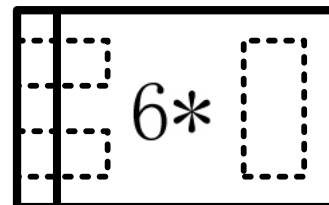
The WNM2046A-3/TR is N-Channel enhancement MOS Field Effect Transistor. Uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. This device is suitable for use in DC-DC conversion, power switch and charging circuit. Standard Product WNM2046A-3/TR is Pb-free.

**Features**

- Trench Technology
- Supper high density cell design
- Excellent ON resistance
- Extremely Low Threshold Voltage
- Small package DFN1006-3L

**Applications**

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

**Pin configuration (Top view)**


6 = Device Code

\* = Month(A~z)

**Marking**
**Order information**

Device	Package	Shipping
WNM2046A-3/TR	DFN1006-3L	10K/Tape&Reel

**Absolute Maximum ratings**

Parameter	Symbol	10 s	Steady State	Unit	
Drain-Source Voltage	$V_{DS}$	20		V	
Gate-Source Voltage	$V_{GS}$	$\pm 10$			
Continuous Drain Current <sup>a d</sup>	$I_D$	$T_A=25^\circ\text{C}$	0.6	0.55	A
		$T_A=70^\circ\text{C}$	0.48	0.44	
Maximum Power Dissipation <sup>a d</sup>	$P_D$	$T_A=25^\circ\text{C}$	0.32	0.27	W
		$T_A=70^\circ\text{C}$	0.21	0.18	
Continuous Drain Current <sup>b d</sup>	$I_D$	$T_A=25^\circ\text{C}$	0.57	0.52	A
		$T_A=70^\circ\text{C}$	0.45	0.42	
Maximum Power Dissipation <sup>b d</sup>	$P_D$	$T_A=25^\circ\text{C}$	0.29	0.25	W
		$T_A=70^\circ\text{C}$	0.18	0.16	
Pulsed Drain Current <sup>c</sup>	$I_{DM}$	1.4		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		$^\circ\text{C}$	

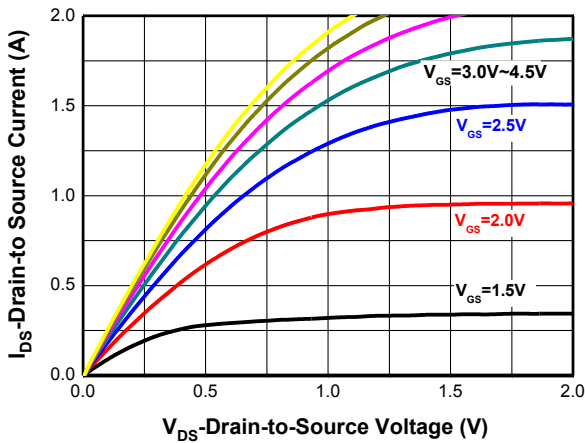
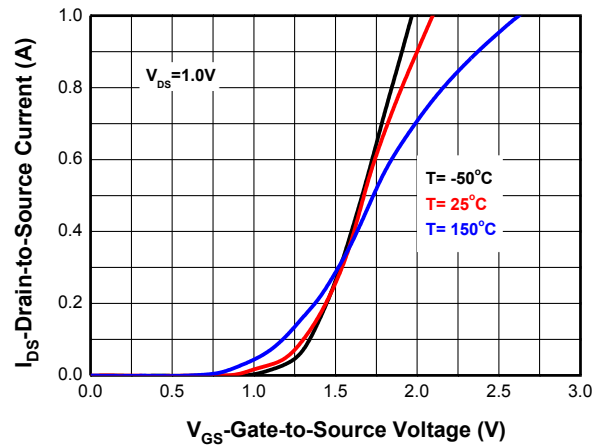
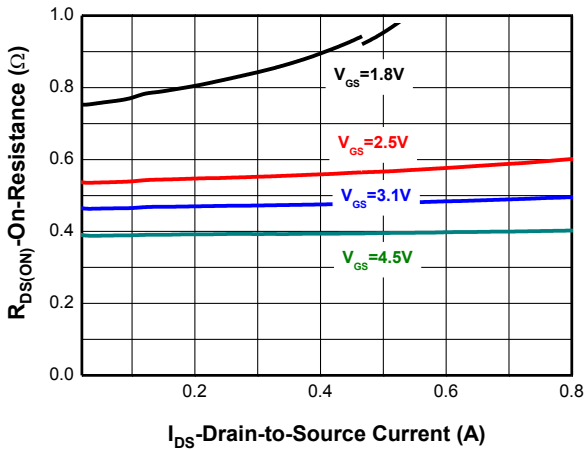
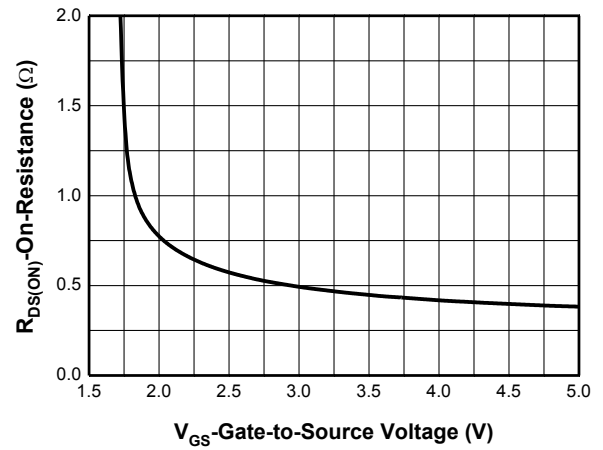
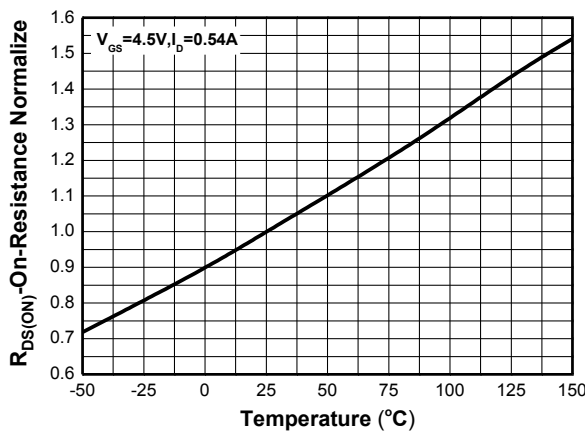
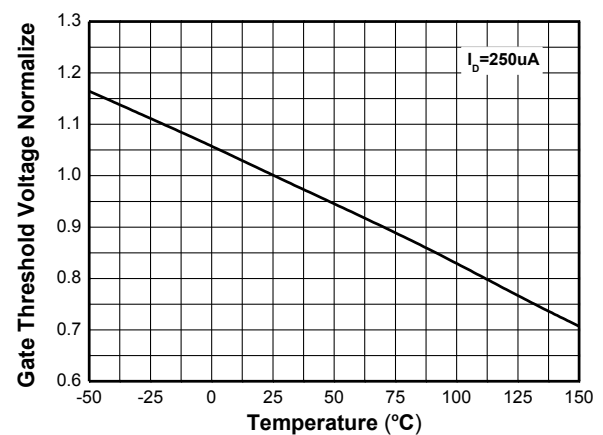
**Thermal resistance ratings**

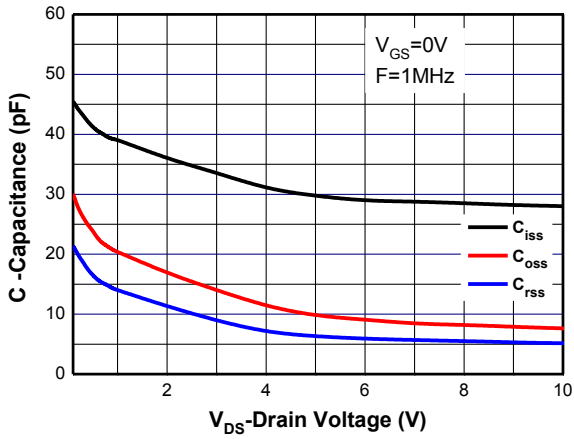
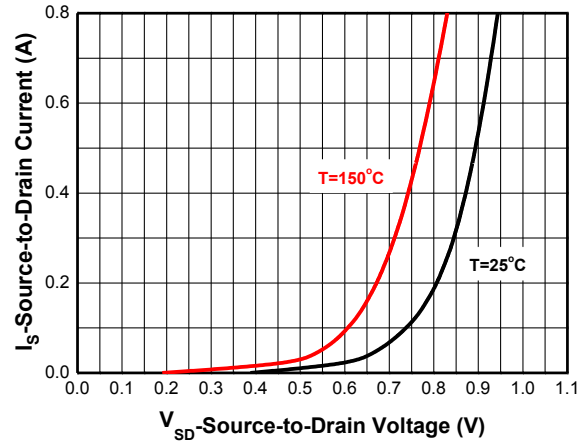
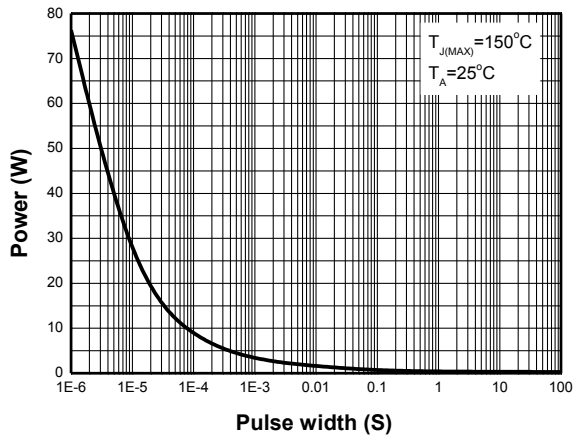
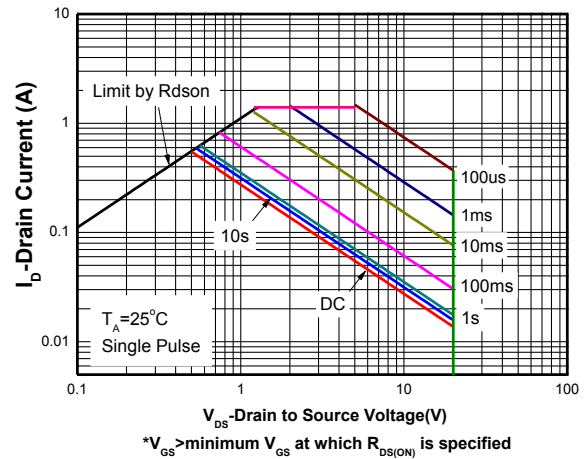
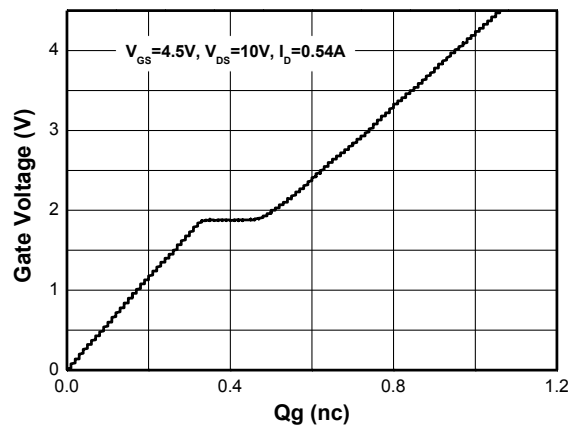
Parameter	Symbol	Typical	Maximum	Unit	
Junction-to-Ambient Thermal Resistance <sup>a</sup>	$R_{\theta JA}$	$t \leq 10 \text{ s}$	350	390	$^\circ\text{C/W}$
		Steady State	395	455	
Junction-to-Ambient Thermal Resistance <sup>b</sup>	$R_{\theta JA}$	$t \leq 10 \text{ s}$	397	435	
		Steady State	445	505	
Junction-to-Case Thermal Resistance	$R_{\theta JC}$	240	280		

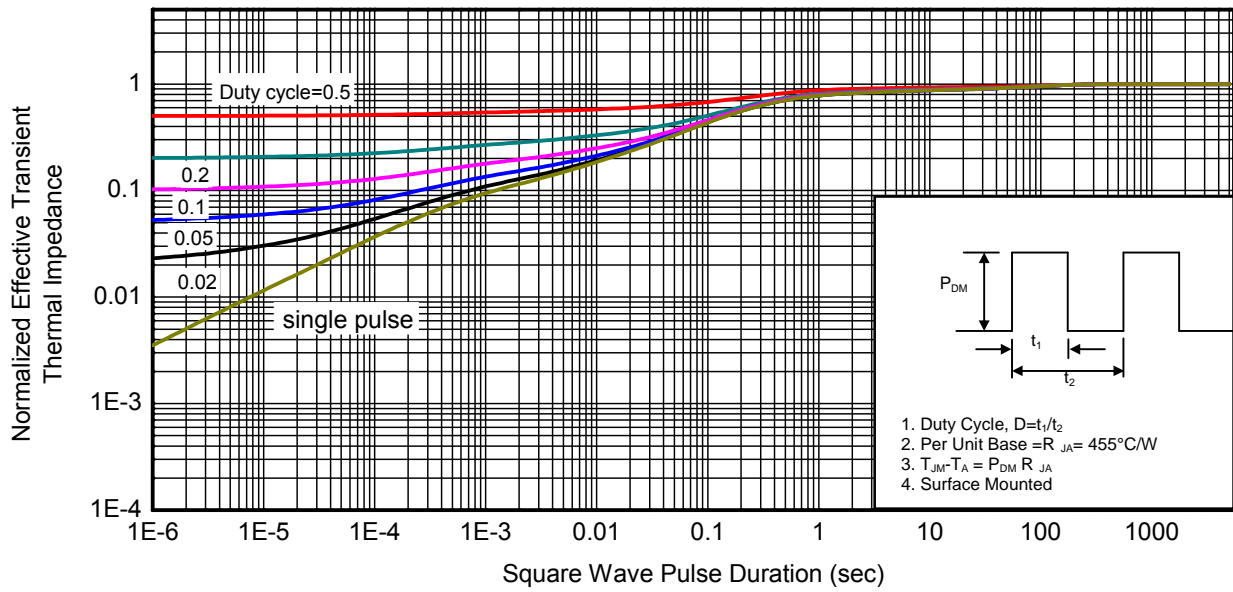
- a. Surface mounted on FR4 Board using 1 in sq pad size, 1oz Cu.
- b. Surface mounted on FR4 board using the minimum recommended pad size, 1oz Cu.
- c. Repetitive rating, pulse width limited by junction temperature,  $t_p=10\mu\text{s}$ , Duty Cycle=1%.
- d. Repetitive rating, pulse width limited by junction temperature  $T_J(\text{MAX})=150^\circ\text{C}$ .

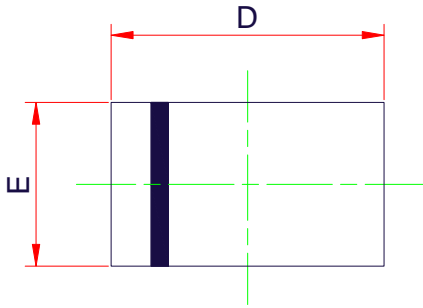
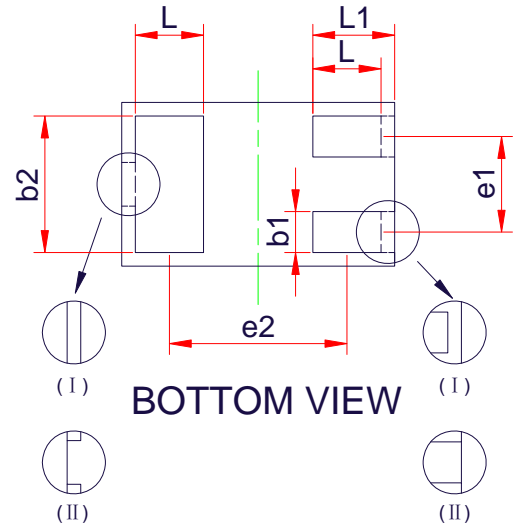
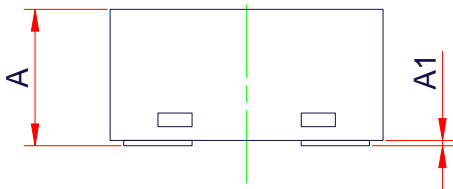
**Electronics Characteristics (Ta=25°C, unless otherwise noted)**

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-to-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250uA	20			V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V			1	uA
Gate-to-source Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±10V			±5	uA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250uA	0.45	0.70	1.0	V
Drain-to-source On-resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 0.35A		420	600	mΩ
		V <sub>GS</sub> = 3.1V, I <sub>D</sub> = 0.20A		500	700	
		V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 0.20A		580	800	
		V <sub>GS</sub> = 1.8V, I <sub>D</sub> = 0.20A		840	1300	
		V <sub>GS</sub> = 1.5V, I <sub>D</sub> = 0.04A		1100	1600	
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 0.35A		0.85		S
<b>CHARGES, CAPACITANCES AND GATE RESISTANCE</b>						
Input Capacitance	C <sub>ISS</sub>	V <sub>GS</sub> = 0 V, f = 1.0MHz, V <sub>DS</sub> = 10 V		30		pF
Output Capacitance	C <sub>OSS</sub>			7		
Reverse Transfer Capacitance	C <sub>RSS</sub>			5		
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = 4.5 V, V <sub>DS</sub> = 10 V, I <sub>D</sub> = 0.54 A		1.07		nC
Threshold Gate Charge	Q <sub>G(TH)</sub>			0.12		
Gate-to-Source Charge	Q <sub>GS</sub>			0.32		
Gate-to-Drain Charge	Q <sub>GD</sub>			0.14		
<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Delay Time	td(ON)	V <sub>GS</sub> = 4.5 V, V <sub>DS</sub> = 10 V, I <sub>D</sub> = 0.54A, R <sub>G</sub> = 6Ω		7.2		ns
Rise Time	tr			9.5		
Turn-Off Delay Time	td(OFF)			19.6		
Fall Time	tf			4.6		
<b>BODY DIODE CHARACTERISTICS</b>						
Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 0.3A		0.85	1.5	V

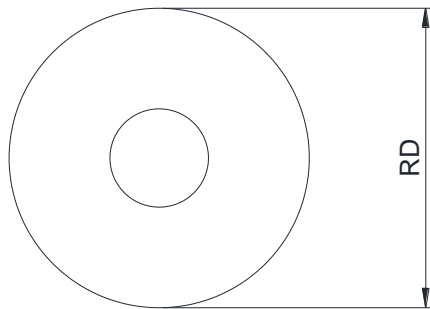
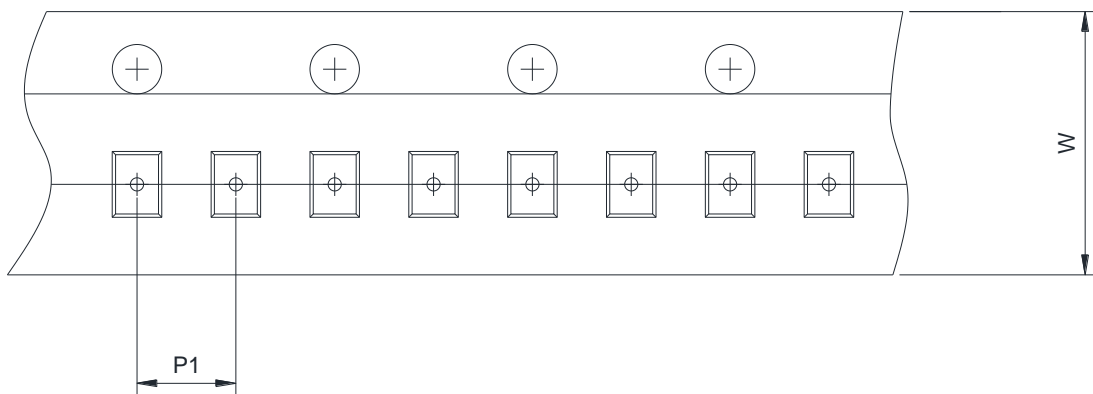
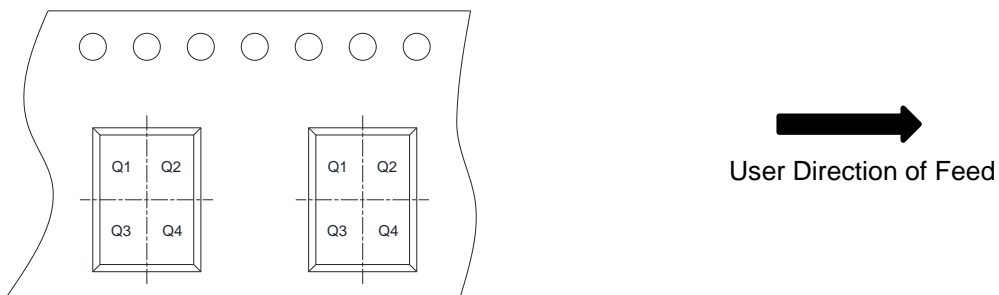
**Typical Characteristics (Ta=25°C, unless otherwise noted)**

**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**

**Single pulse power**

**Safe operating power**

**Gate Charge Characteristics**

**Transient thermal response (Junction-to-Ambient)**


**Package outline dimensions**
**DFN1006-3L**

**TOP VIEW**

**BOTTOM VIEW**

**SIDE VIEW**

Symbol	Dimensions in Millimeters		
	Min.	Typ.	Max.
A	0.36	-	0.50
A1	0.00	-	0.05
D	0.95	1.00	1.05
E	0.55	0.60	0.65
b1	0.10	0.15	0.20
b2	0.40	0.50	0.60
L	0.20	0.25	0.30
L1	0.20	0.30	0.40
e1	0.35 BSC		
e2	0.65 BSC		

**Package outline dimensions**
**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 checked="" type="checkbox"/> Q4