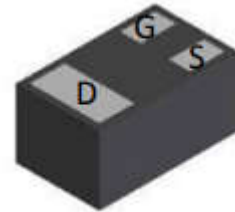
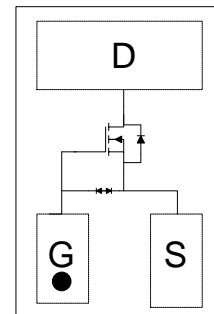


WNM2046E
Single N-Channel, 20V, 0.8A, Power MOSFET
[Http://www.sh-willsemi.com](http://www.sh-willsemi.com)

| V_{DS} (V) | Max. $R_{DS(on)}$ (m Ω) |
|-----------------------|---------------------------------|
| 20 | 500 @ $V_{GS}=4.5V$ |
| | 570 @ $V_{GS}=3.1V$ |
| | 700 @ $V_{GS}=2.5V$ |
| | 1500 @ $V_{GS}=1.8V$ |
| ESD Rating: 2000V HBM | |


DFN1006-3L
Description

The WNM2046E 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 WNM2046E is Pb-free.


Pin configuration (Top view)
Features

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



6 = 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 |
|---------------|------------|---------------|
| WNM2046E-3/TR | DFN1006-3L | 10K/Tape&Reel |

Absolute Maximum ratings

| Parameter | Symbol | Maximum | Unit | |
|---------------------------------------|-----------|------------------------|------------------|----|
| Drain-Source Voltage | V_{DS} | 20 | V | |
| Gate-Source Voltage | V_{GS} | ± 10 | | |
| Continuous Drain Current ^d | I_D | $T_A=25^\circ\text{C}$ | 800 | mA |
| | | $T_A=70^\circ\text{C}$ | 640 | |
| Pulsed Drain Current ^c | I_{DM} | 3000 | mA | |
| Power Dissipation ^a | P_D | $T_A=25^\circ\text{C}$ | 480 | mW |
| | | $T_A=70^\circ\text{C}$ | 305 | |
| Operating Junction Temperature | T_J | -55 to 150 | $^\circ\text{C}$ | |
| Storage Temperature Range | T_{STG} | -55 to 150 | $^\circ\text{C}$ | |

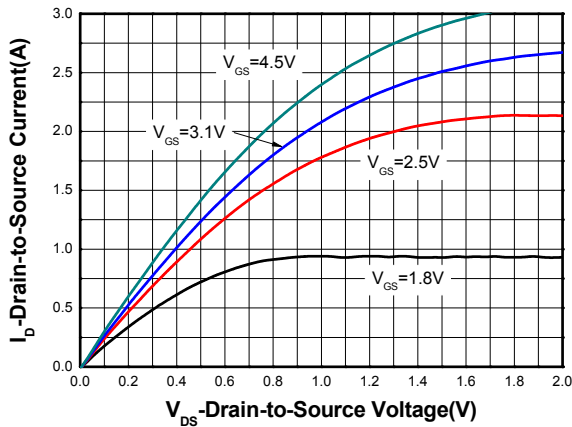
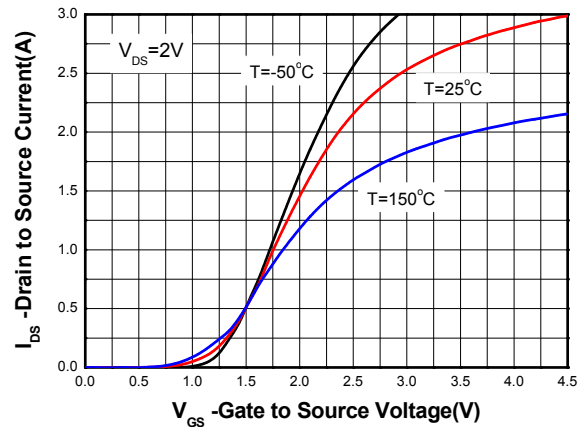
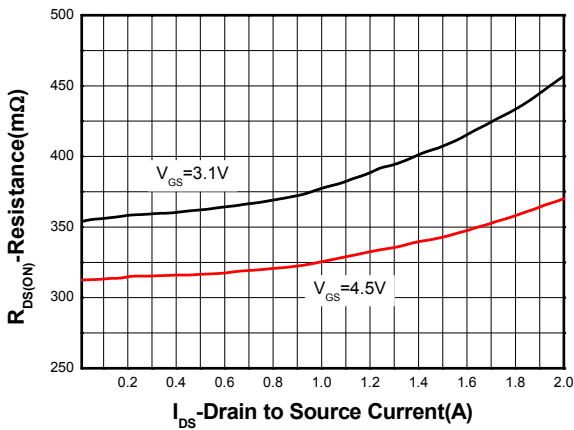
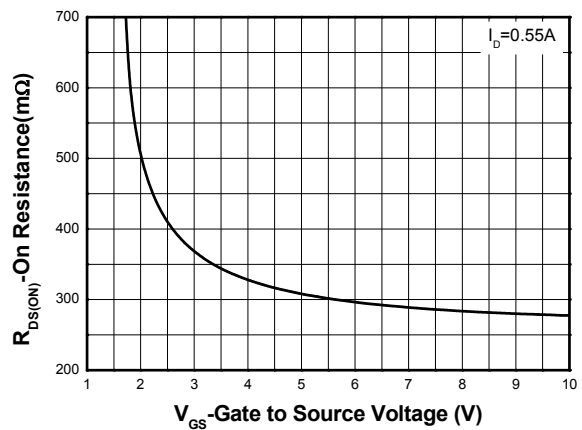
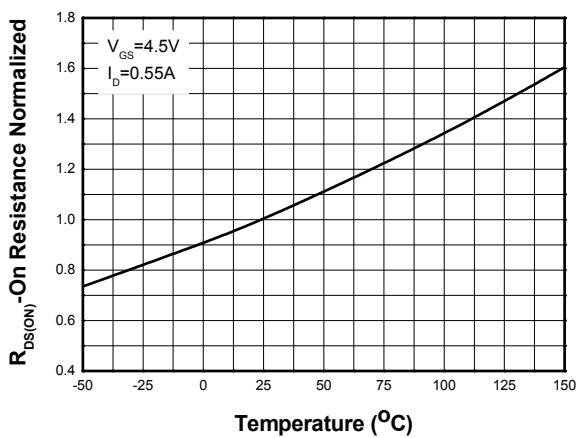
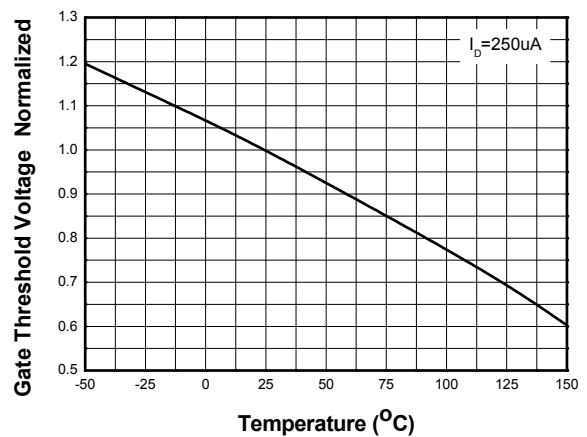
Thermal resistance ratings

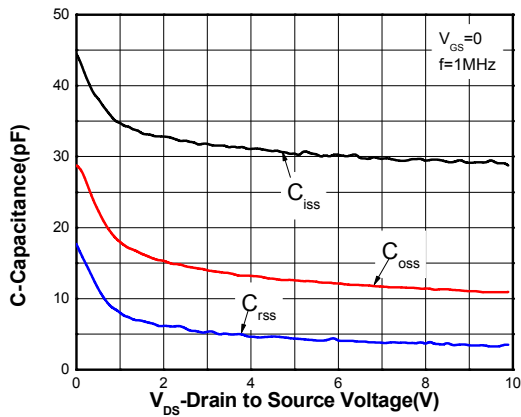
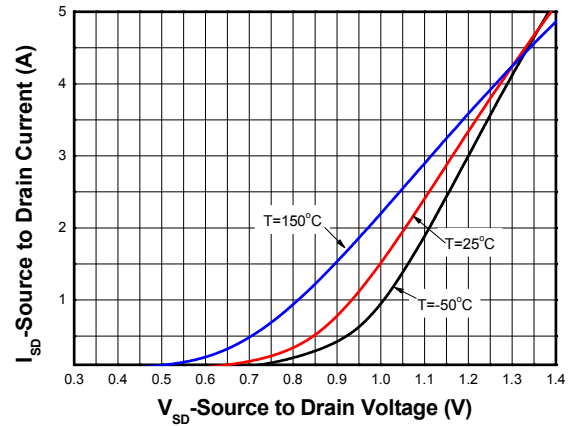
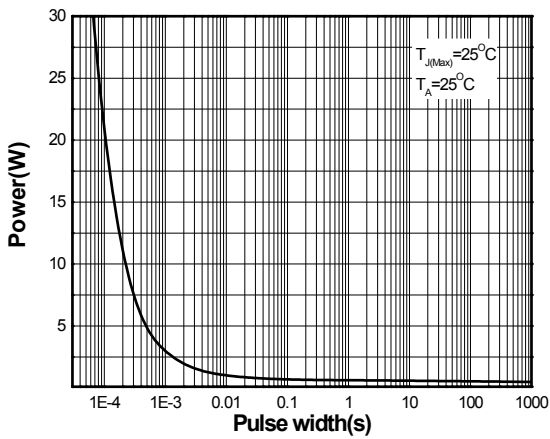
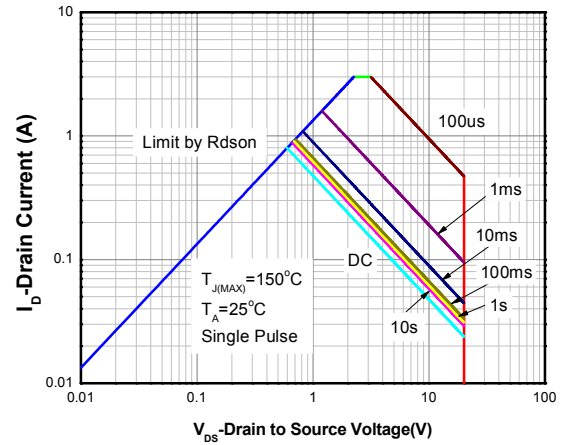
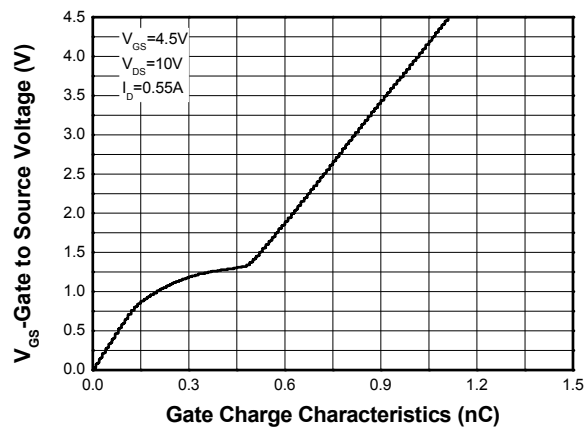
| Single Operation | | | | |
|---|-----------------------|-----------------|---------|--------------------|
| Parameter | | Symbol | Maximum | Unit |
| Junction-to-Ambient Thermal Resistance ^a | $t \leq 10 \text{ s}$ | $R_{\theta JA}$ | 216 | $^\circ\text{C/W}$ |
| | Steady State | | 262 | |
| Junction-to-Ambient Thermal Resistance ^b | $t \leq 10 \text{ s}$ | $R_{\theta JA}$ | 464 | |
| | Steady State | | 580 | |

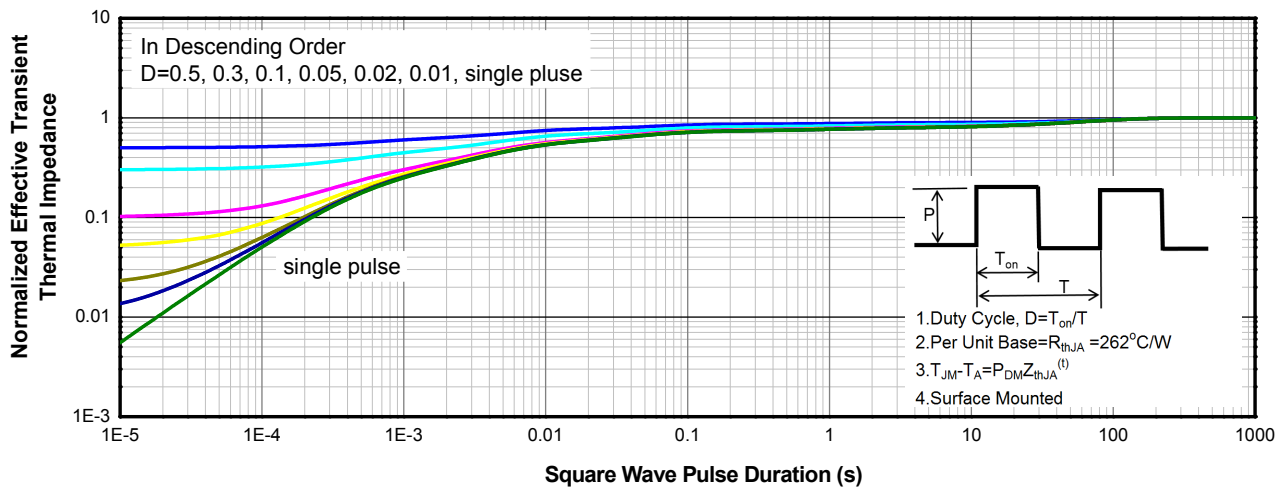
- a The value of $R_{\theta JA}$ is measured with the device mounted on 1-inch² (6.45cm²) with 2oz.(0.071mm thick) Copper pad on a 1.5*1.5 inch², 0.06-inch thick FR4 PCB, in a still air environment with $T_A = 25^\circ\text{C}$. The power dissipation P_D is based on $R_{\theta JA}$ value and the $T_{J(MAX)}=150^\circ\text{C}$. The value in any given application is determined by the user's specific board design, and the maximum temperature of 150°C may be used if the PCB allows it to.
- b The value of $R_{\theta JA}$ is measured with the device mounted on FR-4 minimum pad board, in a still air environment with $T_A = 25^\circ\text{C}$. The power dissipation P_D is based on $R_{\theta JA}$ value and the $T_{J(MAX)}=150^\circ\text{C}$. The value in any given application is determined by the user's specific board design, and the maximum temperature of 150°C may be used if the PCB allows it to.
- c Repetitive rating, ~10us pulse width, duty cycle ~1%, keep initial $T_J = 25^\circ\text{C}$, the maximum allowed junction temperature of 150°C .
- d The maximum current rating by source bonding technology.
- e The static characteristics are obtained using ~380us pulses, duty cycle ~1%.

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

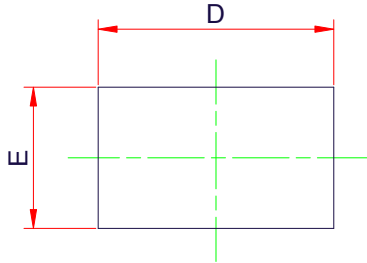
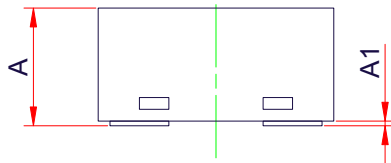
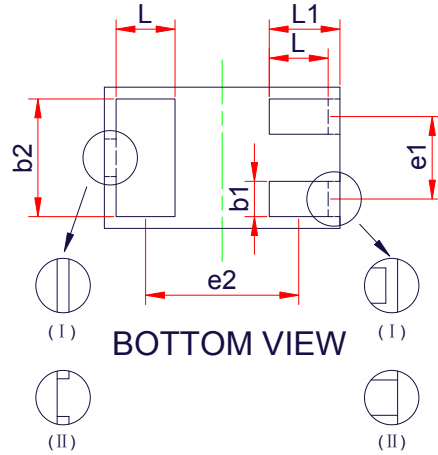
| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|--|--------------|--|-----|------|----------|---------------|
| OFF CHARACTERISTICS | | | | | | |
| Drain-to-Source Breakdown Voltage | BV_{DSS} | $V_{GS} = 0\text{ V}, I_D = 250\mu\text{A}$ | 20 | | | V |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = 16\text{V}, V_{GS} = 0\text{V}$ | | | 1 | μA |
| Gate-to-source Leakage Current | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = \pm 10\text{V}$ | | | ± 10 | μA |
| ON CHARACTERISTICS | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = 250\mu\text{A}$ | 0.4 | 0.7 | 1.0 | V |
| Drain-to-source On-resistance | $R_{DS(on)}$ | $V_{GS} = 4.5\text{V}, I_D = 0.55\text{A}$ | | 340 | 500 | m Ω |
| | | $V_{GS} = 3.1\text{V}, I_D = 0.35\text{A}$ | | 380 | 570 | |
| | | $V_{GS} = 2.5\text{V}, I_D = 0.25\text{A}$ | | 425 | 700 | |
| | | $V_{GS} = 1.8\text{V}, I_D = 0.15\text{A}$ | | 560 | 1500 | |
| CHARGES, CAPACITANCES AND GATE RESISTANCE | | | | | | |
| Input Capacitance | C_{ISS} | $V_{GS} = 0\text{ V}, f = 1.0\text{MHz}, V_{DS} = 10\text{ V}$ | | 29 | | pF |
| Output Capacitance | C_{OSS} | | | 11 | | |
| Reverse Transfer Capacitance | C_{RSS} | | | 4 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS} = 4.5\text{ V}, V_{DS} = 10\text{V}, I_D = 0.55\text{ A}$ | | 1.1 | | nC |
| Threshold Gate Charge | $Q_{G(TH)}$ | | | 0.11 | | |
| Gate-to-Source Charge | Q_{GS} | | | 0.15 | | |
| Gate-to-Drain Charge | Q_{GD} | | | 0.32 | | |
| SWITCHING CHARACTERISTICS | | | | | | |
| Turn-On Delay Time | $t_d(ON)$ | $V_{GS} = 4.5\text{ V}, V_{DS} = 10\text{ V}, I_D = 0.55\text{A}, R_G = 6\Omega$ | | 5 | | ns |
| Rise Time | t_r | | | 5.8 | | |
| Turn-Off Delay Time | $t_d(OFF)$ | | | 15.4 | | |
| Fall Time | t_f | | | 3.6 | | |
| BODY DIODE CHARACTERISTICS | | | | | | |
| Forward Voltage | V_{SD} | $V_{GS} = 0\text{ V}, I_S = 0.8\text{A}$ | | 0.9 | 1.5 | V |

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

Output Characteristics ^e

Transfer Characteristics ^e

On-Resistance vs. Drain Current ^e

On-Resistance vs. Gate-to-Source Voltage ^e

On-Resistance vs. Junction Temperature ^e

Threshold Voltage vs. Temperature

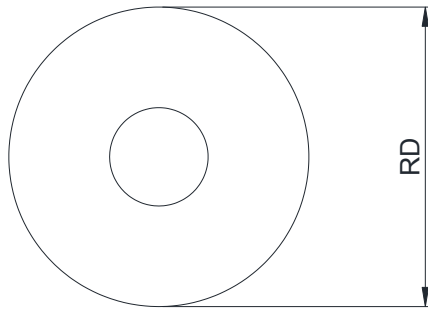
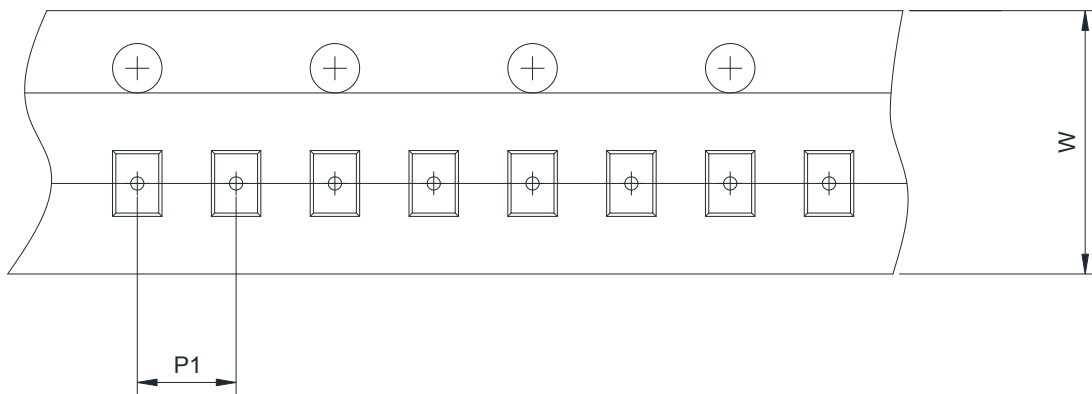
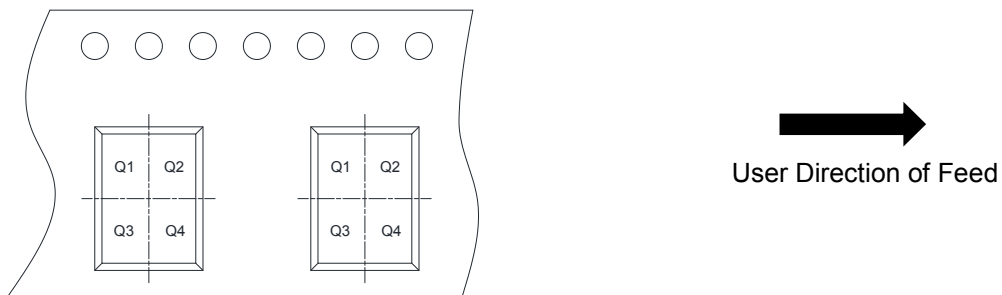

Capacitance

Body Diode Forward Voltage^e

Single Pulse power

Safe Operating Power

Gate Charge Characteristics



Transient Thermal Response (Junction-to-Ambient)

PACKAGE OUTLINE DIMENSIONS
DFN1006-3L

TOP VIEW

SIDE VIEW

BOTTOM 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 | 0.35Ref | | |
| e2 | 0.65Ref | | |

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 |