

## 1. Product Information

### 1.1 Features

- Surface-mounted package
- Advanced trench cell design
- Extremely low threshold voltage

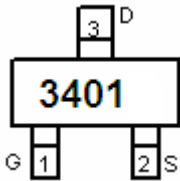

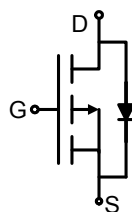
### 1.2 Applications

- Portable appliances
- Battery management

### 1.3 Quick reference

- $BV \geq -30\text{ V}$
- $P_{tot} \cong 1.3\text{ W}$
- $I_D \cong -4.2\text{ A}$
- $R_{DS(ON)} = 42\text{ m}\Omega @ V_{GS} = -10\text{ V}$
- $R_{DS(ON)} = 48\text{ m}\Omega @ V_{GS} = -4.5\text{ V}$
- $R_{DS(ON)} = 68\text{ m}\Omega @ V_{GS} = -2.5\text{ V}$

## 2. Pin Description

| Pin | Description   | Simplified Outline  | Symbol  |
|-----|---|---|---|
|     |  |  <p>SOT-23 top view</p> |  |


### 3. Values

| Symbol            | Parameter                               | Conditions  | Min  | Max      | Unit                        |
|-------------------|---|---|------|----------|-----------------------------|
| $V_{DS}$          | Drain-Source Voltage                    | $T_A = 25\text{ }^\circ\text{C}$                        | -    | -30      | V                           |
| $V_{GS}$          | Gate-Source Voltage                     | $T_A = 25\text{ }^\circ\text{C}$                        | -    | $\pm 20$ | V                           |
| $I_D^*$           | Drain Current                           | $T_A = 25\text{ }^\circ\text{C}, V_{GS} = 4.5\text{ V}$ | -    | -4.7     | A                           |
| $I_{DM}^{***}$    | Pulsed Drain Current                    | $T_A = 25\text{ }^\circ\text{C}, V_{GS} = 4.5\text{ V}$ | -    | -20      | A                           |
| $P_{tot}^*$       | Total Power Dissipation                 | $T_A = 25\text{ }^\circ\text{C}$                        | -    | 1.3      | W                           |
|                   |   | $T_A = 100\text{ }^\circ\text{C}$                       | -    | 0.8      |                             |
| $T_{stg}$         | Storage Temperature                     |   | - 55 | 150      | $^\circ\text{C}$            |
| $T_J$             | Junction Temperature                    |   | -    | 150      | $^\circ\text{C}$            |
| $I_S^*$           | Diode Forward Current                   | $T_A = 25\text{ }^\circ\text{C}$                        | -    | -4.7     | A                           |
| $R_{\theta JA}^*$ | Thermal Resistance- Junction to Ambient |   | -    | 150      | $^\circ\text{C} / \text{W}$ |

Notes :

- \* Surface Mounted on 1 in<sup>2</sup> pad area,  $t \leq 10\text{ sec}$
- \*\* Pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$

### 4. Marking Information

| Product Name | Marking   |
|--------------|---|
| WTM3401      |  |

### 5. Ordering Code

| Product Name | Package | Reel Size | Tape width | Quantity | Note |
|--------------|---------|-----------|------------|----------|------|
| WTM3401      | SOT23   |           |            |          |      |

Note: NHCX defines "Green" as lead-free (RoHS compliant) and halogen free (Br or Cl does not exceed 900 ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500 ppm by weight; Follow IEC 61249-2-21 and IPC / JEDEC J-STD-020C)

## 6. Electrical Characteristics (T<sub>A</sub> = 25 °C Unless Otherwise Noted)

| Symbol   | Parameter                      | Conditions  | Min  | Typ | Max   | Unit |
|--|--------------------------------|---|------|-----|-------|------|
| <b>Static Characteristics</b>                  |                                |   |      |     |       |      |
| BV <sub>DSS</sub>                              | Drain-Source Breakdown Voltage | V <sub>GS</sub> = 0 V, I <sub>DS</sub> = 250 μA   | -30  | -   | -     | V    |
| V <sub>GS(th)</sub>                            | Gate Threshold Voltage         | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>DS</sub> = 250 μA  | -0.5 | -   | -1.3  | V    |
| I <sub>DSS</sub>                               | Drain Leakage Current          | V <sub>DS</sub> = -30 V, V <sub>GS</sub> = 0 V  | -    | -   | -1    | μA   |
|  |                                | T <sub>J</sub> = 85 °C  | -    | -   | -30   | μA   |
| I <sub>GSS</sub>                               | Gate Leakage Current           | V <sub>GS</sub> = ± 10 V, V <sub>DS</sub> = 0 V   | -    | -   | ± 100 | nA   |
| R <sub>DS(ON)</sub> <sup>a</sup>               | On-State Resistance            | V <sub>GS</sub> = -10 V, I <sub>DS</sub> = -4 A   | -    | 42  | 52    | mΩ   |
|  |                                | V <sub>GS</sub> = -4.5 V, I <sub>DS</sub> = -2 A  | -    | 48  | 65    |      |
|  |                                | V <sub>GS</sub> = -2.5 V, I <sub>DS</sub> = -1 A  |      | 68  | 85    |      |
| <b>Diode Characteristics</b>                   |                                |   |      |     |       |      |
| V <sub>SD</sub> <sup>a</sup>                   | Diode Forward Voltage          | I <sub>SD</sub> = -4.4 A, V <sub>GS</sub> = 0 V   | -    | -   | -1.2  | V    |
| t <sub>rr</sub>                                | Reverse Recovery Time          | I <sub>SD</sub> = -4.4 A, dI <sub>SD</sub> /dt = 100 A/μs   | -    | 38  | -     | nS   |
| Q <sub>rr</sub>                                | Reverse Recovery Charge        |   | -    | 17  | -     | nC   |
| <b>Dynamic Characteristics<sup>b</sup></b>     |                                |   |      |     |       |      |
| C <sub>iss</sub>                               | Input Capacitance              | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = -15 V<br>Frequency = 1 MHz   | -    | 950 | -     | pF   |
| C <sub>oss</sub>                               | Output Capacitance             |   | -    | 115 | -     |      |
| C <sub>rss</sub>                               | Reverse Transfer Capacitance   |   | -    | 75  | -     |      |
| t <sub>d(on)</sub>                             | Turn-on Delay Time             | V <sub>DS</sub> = -15 V, V <sub>GEN</sub> = -10 V,<br>R <sub>G</sub> = 6 Ω, R <sub>L</sub> = 6 Ω,<br>I <sub>DS</sub> = -4 A | -    | 7   | -     | nS   |
| t <sub>r</sub>                                 | Turn-on Rise Time              |   | -    | 3   | -     |      |
| t <sub>d(off)</sub>                            | Turn-off Delay Time            |   | -    | 30  | -     |      |
| t <sub>f</sub>                                 | Turn-off Fall Time             |   | -    | 12  | -     |      |
| <b>Gate Charge Characteristics<sup>b</sup></b> |                                |   |      |     |       |      |
| Q <sub>g</sub>                                 | Total Gate Charge              | V <sub>DS</sub> = -15 V, V <sub>GS</sub> = -4.5 V,<br>I <sub>DS</sub> = -4 A  | -    | 9.5 | -     | nC   |
| Q <sub>gs</sub>                                | Gate-Source Charge             |   | -    | 2   | -     |      |
| Q <sub>gd</sub>                                | Gate-Drain Charge              |   | -    | 3   | -     |      |

Notes :

a : Pulse test ; pulse width ≤ 300 μs, duty cycle ≤ 2 %

b : Guaranteed by design, not subject to production testing

## 7. Typical Characteristics

### Typical Electrical and Thermal Characteristics

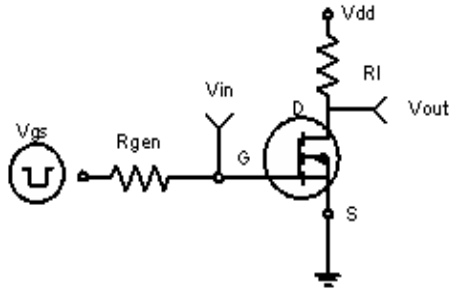


Figure 1: Switching Test Circuit

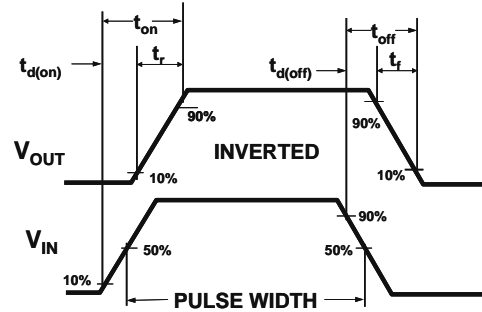


Figure 2: Switching Waveforms

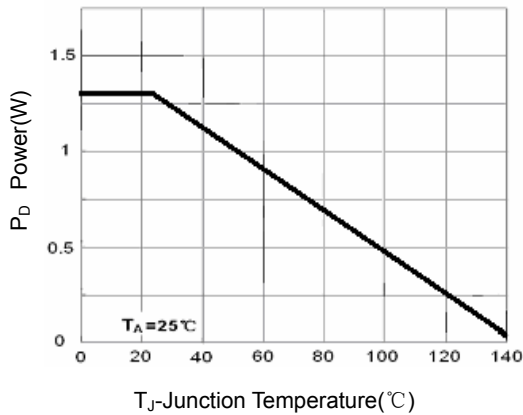


Figure 3 Power Dissipation

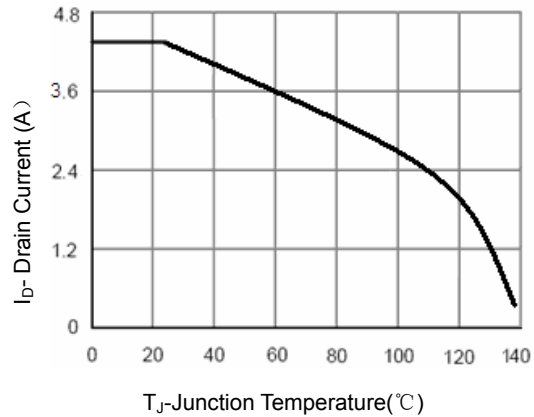


Figure 4 Drain Current

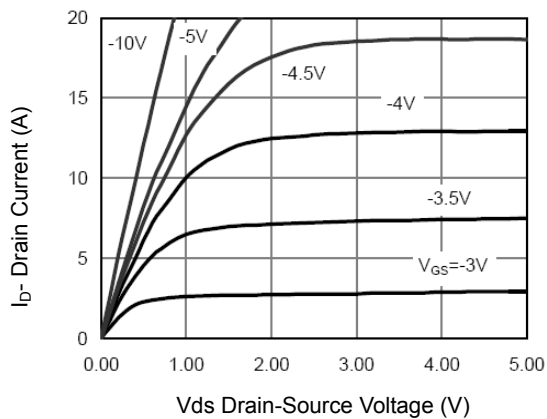


Figure 5 Output Characteristics

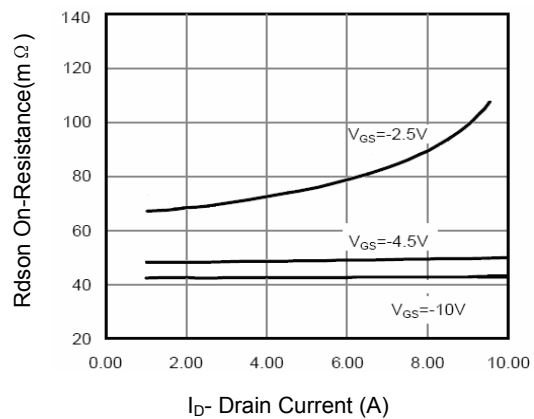


Figure 6 Drain-Source On-Resistance

## 7. Typical Characteristics (cont.)

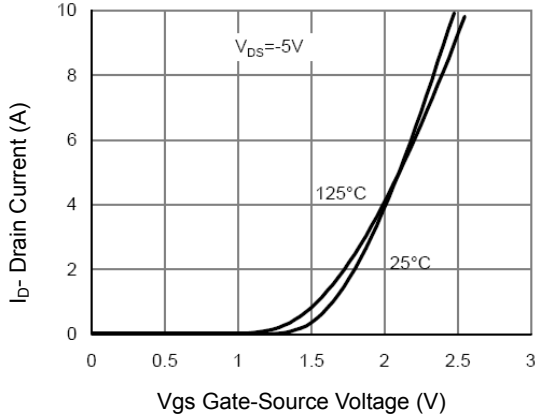


Figure 7 Transfer Characteristics

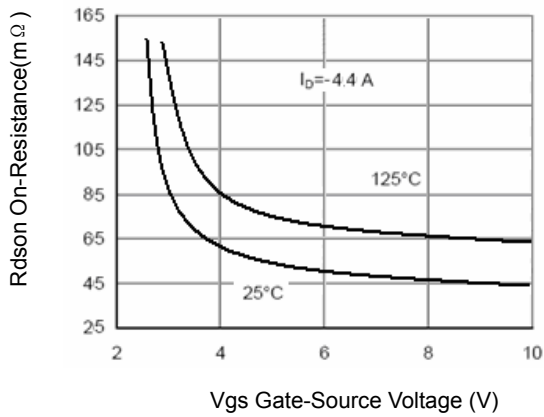


Figure 9 Rdson vs Vgs

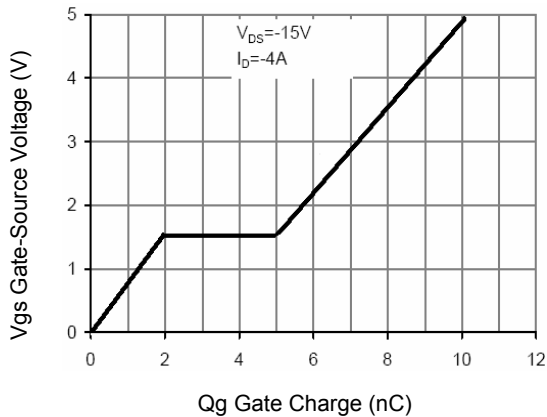


Figure 11 Gate Charge

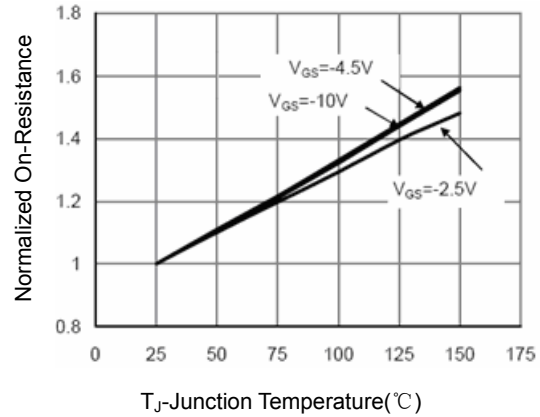


Figure 8 Drain-Source On-Resistance

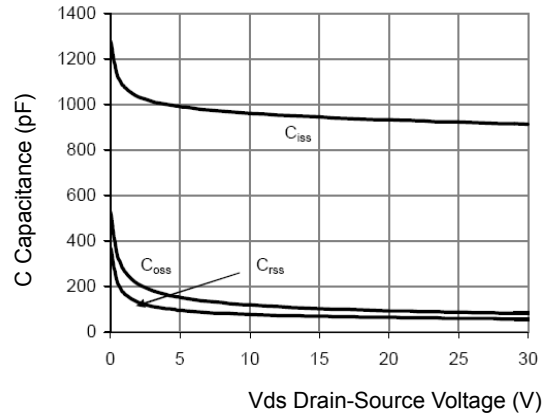


Figure 10 Capacitance vs Vds

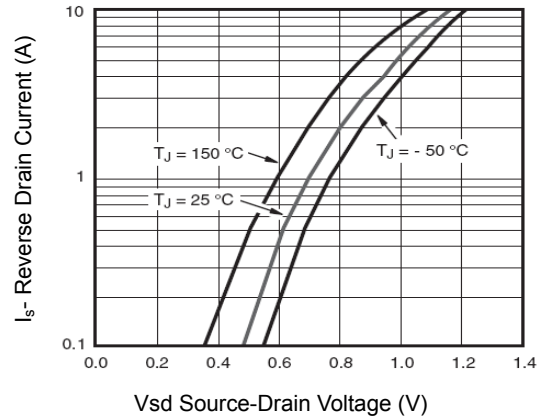
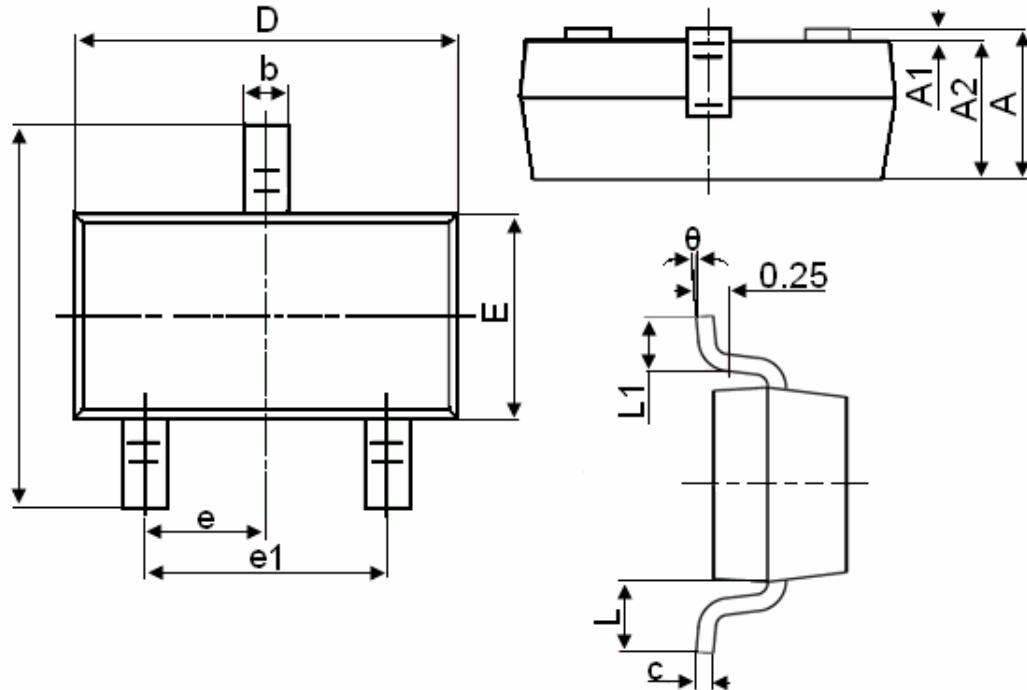


Figure 12 Source- Drain Diode Forward

## 8. Package Dimensions

SOT23



| Symbol | Dimensions in Millimeters |       |
|--------|---------------------------|-------|
|        | MIN.                      | MAX.  |
| A      | 0.900                     | 1.150 |
| A1     | 0.000                     | 0.100 |
| A2     | 0.900                     | 1.050 |
| b      | 0.300                     | 0.500 |
| c      | 0.080                     | 0.150 |
| D      | 2.800                     | 3.000 |
| E      | 1.200                     | 1.400 |
| E1     | 2.250                     | 2.550 |
| e      | 0.950TYP                  |       |
| e1     | 1.800                     | 2.000 |
| L      | 0.550REF                  |       |
| L1     | 0.300                     | 0.500 |
| theta  | 0°                        | 8°    |