

TSM210N02CX

20V N-Channel Power MOSFET

SOT-23



Pin Definition:

1. Gate
2. Source
3. Drain

Key Parameter Performance

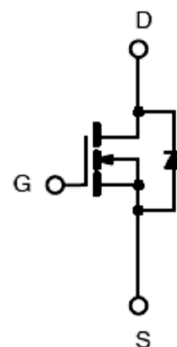
| Parameter | Value | Unit |
|--------------------|-----------------|------|
| V_{DS} | 20 | V |
| $R_{DS(on)}$ (max) | $V_{GS} = 4.5V$ | 21 |
| | $V_{GS} = 2.5V$ | 25 |
| | $V_{GS} = 1.8V$ | 32 |
| Q_g | 5.8 | nC |

Ordering Information

| Part No. | Package | Packing |
|-----------------|---------|----------------|
| TSM210N02CX RFG | SOT-23 | 3kpcs / 7+Reel |

Note: %G+denotes for Halogen- and Antimony-free as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds

Block Diagram



N-Channel MOSFET

Absolute Maximum Ratings ($T_C = 25^\circ C$ unless otherwise noted)

| Parameter | Symbol | Limit | Unit |
|------------------------------------------|-----------|---------------------|------------|
| Drain-Source Voltage | V_{DS} | 20 | V |
| Gate-Source Voltage | V_{GS} | ± 10 | V |
| Continuous Drain Current | I_D | $T_C = 25^\circ C$ | 6.7 |
| | | $T_C = 100^\circ C$ | 4.2 |
| Pulsed Drain Current ^(Note 1) | I_{DM} | 26.8 | A |
| Power Dissipation @ $T_C = 25^\circ C$ | P_D | 1.56 | W |
| Operating Junction Temperature | T_J | 150 | $^\circ C$ |
| Storage Temperature Range | T_{STG} | -55 to +150 | $^\circ C$ |

Thermal Performance

| Parameter | Symbol | Limit | Unit |
|------------------------------------------|----------|-------|--------------|
| Thermal Resistance - Junction to Ambient | R_{JA} | 80 | $^\circ C/W$ |

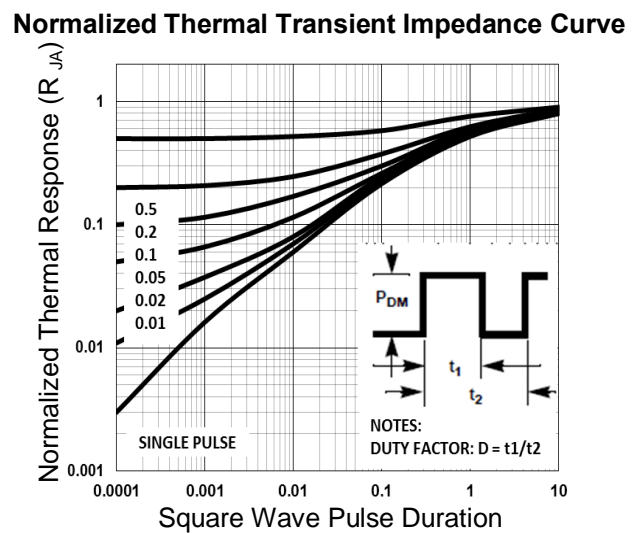
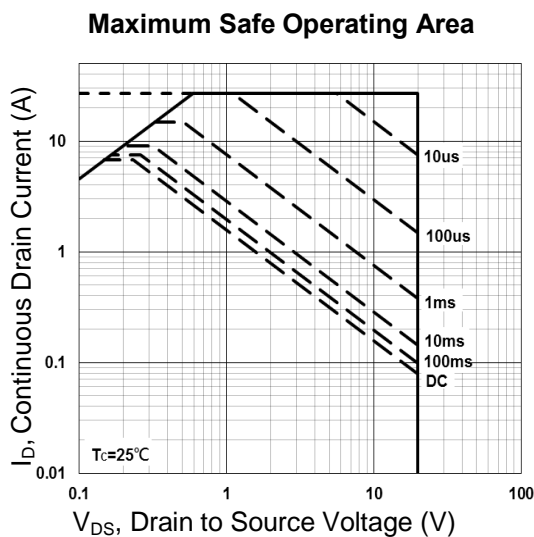
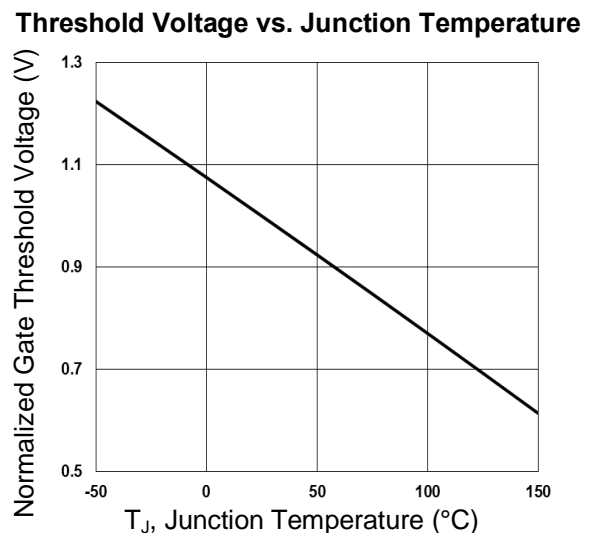
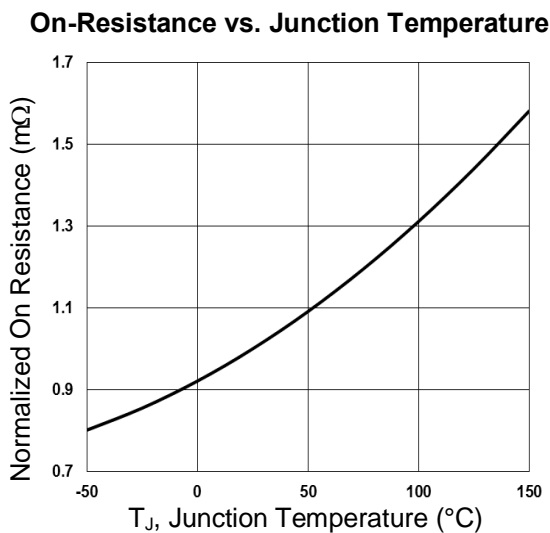
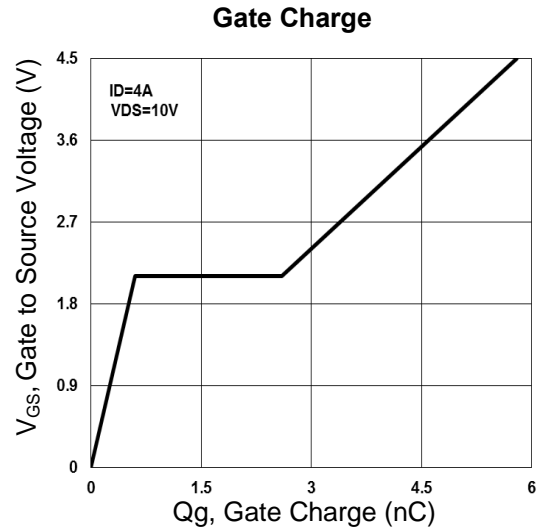
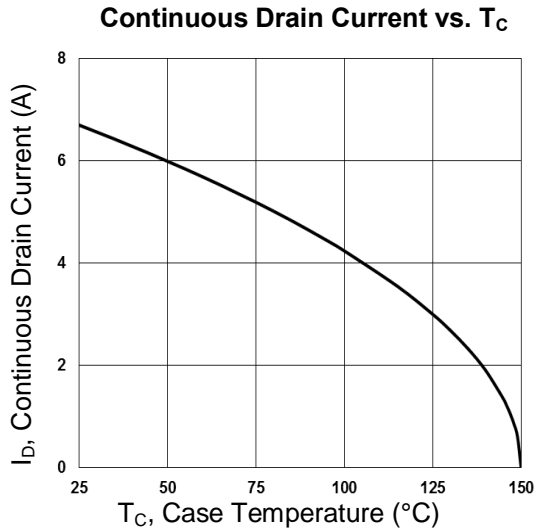
Electrical Specifications ($T_C = 25^\circ\text{C}$ unless otherwise noted)

| Parameter | Conditions | Symbol | Min | Typ | Max | Unit |
|-------------------------------------------------------|------------------------------------------------------------|--------------|-----|------|-----------|---------|
| Static | | | | | | |
| Drain-Source Breakdown Voltage | $V_{GS} = 0V, I_D = 250\mu A$ | BV_{DSS} | 20 | -- | -- | V |
| Drain-Source On-State Resistance | $V_{GS} = 4.5V, I_D = 4A$ | $R_{DS(ON)}$ | -- | 19 | 21 | m |
| | $V_{GS} = 2.5V, I_D = 3A$ | | -- | 22 | 25 | |
| | $V_{GS} = 1.8V, I_D = 2A$ | | -- | 26 | 32 | |
| Gate Threshold Voltage | $V_{DS} = V_{GS}, I_D = 250\mu A$ | $V_{GS(TH)}$ | 0.3 | 0.6 | 0.8 | V |
| Zero Gate Voltage Drain Current | $V_{DS} = 20V, V_{GS} = 0V$ | I_{DSS} | -- | -- | 1 | μA |
| | $V_{DS} = 16V, T_J = 125^\circ\text{C}$ | | -- | -- | 10 | |
| Gate Body Leakage | $V_{GS} = \pm 10V, V_{DS} = 0V$ | I_{GSS} | -- | -- | ± 100 | nA |
| Forward Transconductance ^(Note 2) | $V_{DS} = 10V, I_S = 4A$ | g_{fs} | -- | 9.5 | -- | S |
| Dynamic | | | | | | |
| Total Gate Charge ^(Note 2,3) | $V_{DS} = 10V, I_D = 4A,$ $V_{GS} = 4.5V$ | Q_g | -- | 5.8 | -- | nC |
| Gate-Source Charge ^(Note 2,3) | | Q_{gs} | -- | 0.6 | -- | |
| Gate-Drain Charge ^(Note 2,3) | | Q_{gd} | -- | 2 | -- | |
| Input Capacitance | $V_{DS} = 10V, V_{GS} = 0V,$ $f = 1.0\text{MHz}$ | C_{iss} | -- | 600 | -- | pF |
| Output Capacitance | | C_{oss} | -- | 70 | -- | |
| Reverse Transfer Capacitance | | C_{rss} | -- | 45 | -- | |
| Switching | | | | | | |
| Turn-On Delay Time ^(Note 2,3) | $V_{DD} = 10V, I_D = 1A,$ $V_{GS} = 4.5V, R_{GEN} = 25$ | $t_{d(on)}$ | -- | 5.0 | -- | ns |
| Turn-On Rise Time ^(Note 2,3) | | t_r | -- | 14.4 | -- | |
| Turn-Off Delay Time ^(Note 2,3) | | $t_{d(off)}$ | -- | 30.0 | -- | |
| Turn-Off Fall Time ^(Note 2,3) | | t_f | -- | 9.2 | -- | |
| Source-Drain Diode Ratings and Characteristic | | | | | | |
| Maximum Continuous Drain-Source Diode Forward Current | Integral reverse diode in the MOSFET | I_S | -- | -- | 6.7 | A |
| Maximum Pulse Drain-Source Diode Forward Current | | I_{SM} | -- | -- | 26.8 | A |
| Diode-Source Forward Voltage | $V_{GS} = 0V, I_S = 1A$ | V_{SD} | -- | -- | 1 | V |

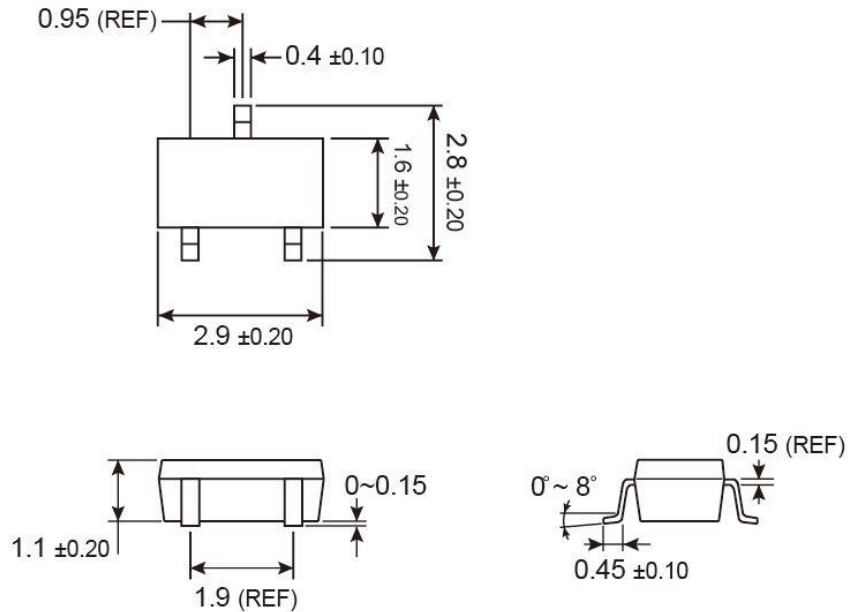
Note:

1. Pulse width limited by safe operating area
2. Pulse test: pulse width $m300\mu s$, duty cycle $m2\%$
3. Switching time is essentially independent of operating temperature.

Electrical Characteristics Curve

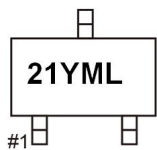


SOT-23 Mechanical Drawing



Unit: Millimeters

Marking Diagram



- 21** = Device Code
- Y** = Year Code
- M** = Month Code for Halogen Free Product
(**O**=Jan, **P**=Feb, **Q**=Mar, **R**=Apr, **S**=May, **T**=Jun, **U**=Jul, **V**=Aug, **W**=Sep, **X**=Oct, **Y**=Nov, **Z**=Dec)
- L** = Lot Code

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