

# TSM210N02CX

## 20V N-Channel Power MOSFET

SOT-23



Pin Definition:

1. Gate
2. Source
3. Drain

### Key Parameter Performance

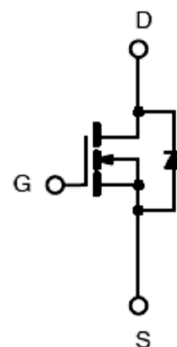
Parameter	Value	Unit
$V_{DS}$	20	V
$R_{DS(on)}$ (max)	$V_{GS} = 4.5V$	21
	$V_{GS} = 2.5V$	25
	$V_{GS} = 1.8V$	32
$Q_g$	5.8	nC

### 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	$V_{GS}$	$\pm 10$	V
Continuous Drain Current	$I_D$	$T_C = 25^\circ C$	6.7
		$T_C = 100^\circ C$	4.2
Pulsed Drain Current <sup>(Note 1)</sup>	$I_{DM}$	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	$^\circ C/W$

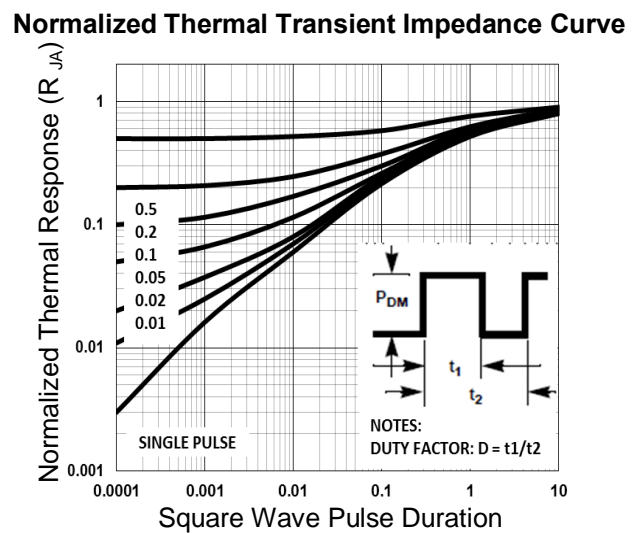
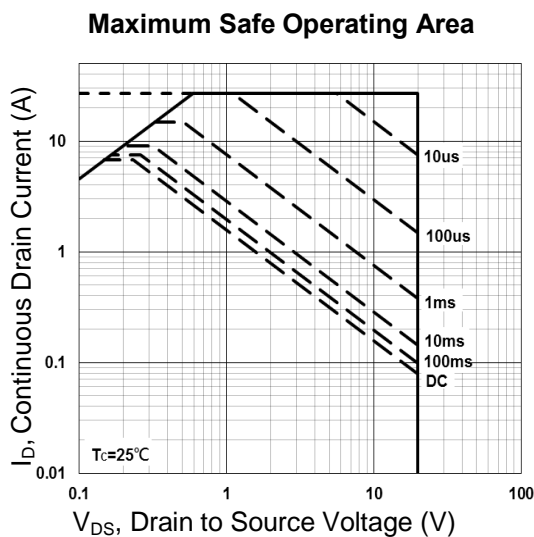
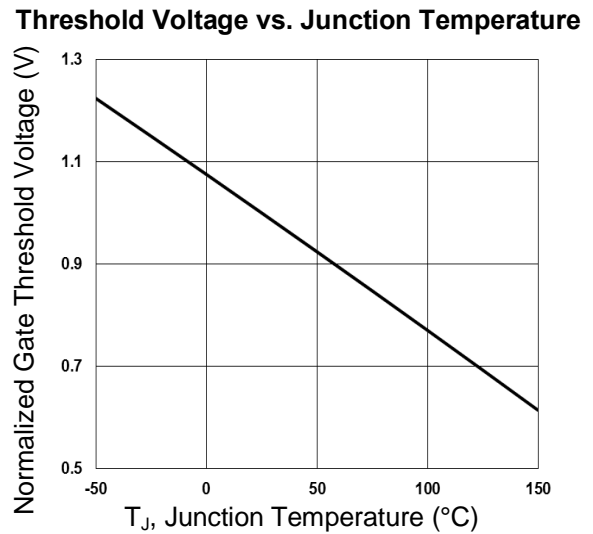
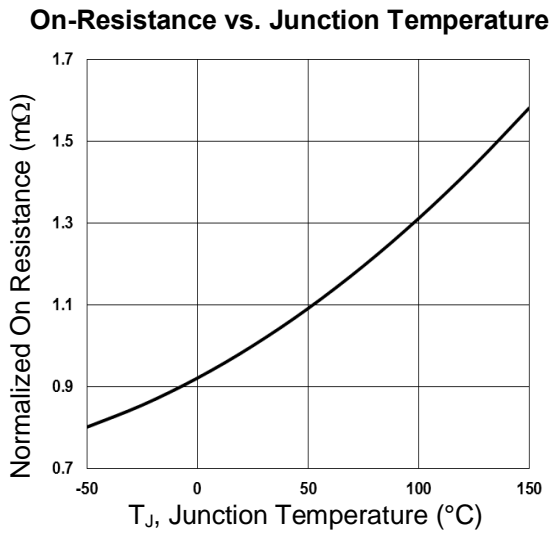
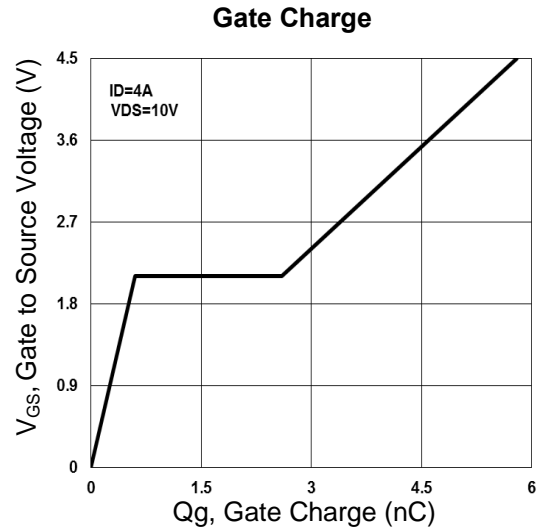
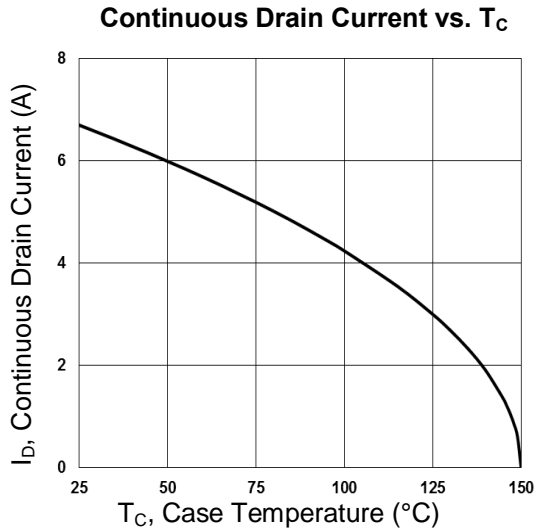
### Electrical Specifications ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

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

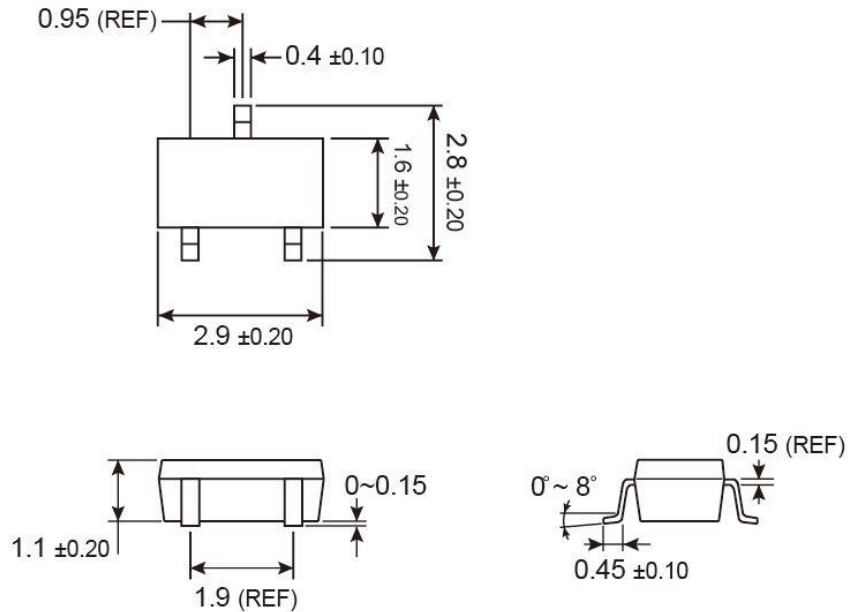
#### Note:

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

### Electrical Characteristics Curve

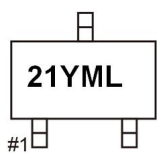


### SOT-23 Mechanical Drawing



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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