

## N-Channel Power MOSFET

30V, 5.5A, 32mΩ

### FEATURES

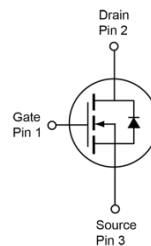
- Low  $R_{DS(on)}$  to minimize conductive losses
- Low gate charge for fast power switching
- Compliant to RoHS directive 2011/65/EU and in accordance to WEEE 2002/96/EC
- Halogen-free according to IEC 61249-2-21

### KEY PERFORMANCE PARAMETERS

PARAMETER	VALUE	UNIT
$V_{DS}$	30	V
$R_{DS(on)}$ (max)	$V_{GS} = 4.5V$	32
	$V_{GS} = 2.5V$	40
$Q_g$	8.9	nC

### APPLICATIONS

- Battery Power Management
- ORing FET/Load Switch



**Note:** MSL 1 (Moisture Sensitivity Level) per J-STD-020

### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	$V_{DS}$	30	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Continuous Drain Current (Note 1)	$I_D$	$T_C = 25^\circ\text{C}$	5.5
		$T_A = 25^\circ\text{C}$	4
Pulsed Drain Current	$I_{DM}$	22	A
Total Power Dissipation	$P_D$	$T_C = 25^\circ\text{C}$	1.8
		$T_C = 125^\circ\text{C}$	0.4
Total Power Dissipation	$P_D$	$T_A = 25^\circ\text{C}$	1
		$T_A = 125^\circ\text{C}$	0.2
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	- 55 to +150	$^\circ\text{C}$

### THERMAL PERFORMANCE

PARAMETER	SYMBOL	LIMIT	UNIT
Junction to Case Thermal Resistance	$R_{\theta JC}$	70	$^\circ\text{C/W}$
Junction to Ambient Thermal Resistance	$R_{\theta JA}$	124	$^\circ\text{C/W}$

**Thermal Performance Note:**  $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient thermal resistances. The case-thermal reference is defined at the solder mounting surface of the drain pins.  $R_{\theta JA}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.

<b>ELECTRICAL SPECIFICATIONS</b> ( $T_A = 25^\circ\text{C}$ unless otherwise noted)						
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{GS} = 0\text{V}, I_D = 250\mu\text{A}$	$BV_{DSS}$	30	--	--	V
Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	$V_{GS(TH)}$	0.4	0.75	0.9	V
Gate-Source Leakage Current	$V_{GS} = \pm 12\text{V}, V_{DS} = 0\text{V}$	$I_{GSS}$	--	--	$\pm 100$	nA
Drain-Source Leakage Current	$V_{GS} = 0\text{V}, V_{DS} = 30\text{V}$	$I_{DSS}$	--	--	1	$\mu\text{A}$
	$V_{GS} = 0\text{V}, V_{DS} = 30\text{V}$ $T_J = 125^\circ\text{C}$		--	--	100	
Drain-Source On-State Resistance (Note 2)	$V_{GS} = 4.5\text{V}, I_D = 4\text{A}$	$R_{DS(on)}$	--	27	32	m $\Omega$
	$V_{GS} = 2.5\text{V}, I_D = 4\text{A}$		--	32	40	
Forward Transconductance (Note 2)	$V_{DS} = 5\text{V}, I_D = 4\text{A}$	$g_{fs}$	--	9.5	--	S
<b>Dynamic</b> (Note 3)						
Total Gate Charge	$V_{GS} = 4.5\text{V}, V_{DS} = 15\text{V},$ $I_D = 4\text{A}$	$Q_g$	--	8.9	--	nC
Total Gate Charge	$V_{GS} = 2.5\text{V}, V_{DS} = 15\text{V},$ $I_D = 4\text{A}$	$Q_g$	--	5.1	--	
Gate-Source Charge		$Q_{gs}$	--	1.5	--	
Gate-Drain Charge		$Q_{gd}$	--	2	--	
Input Capacitance	$V_{GS} = 0\text{V}, V_{DS} = 15\text{V}$ $f = 1.0\text{MHz}$	$C_{iss}$	--	792	--	pF
Output Capacitance		$C_{oss}$	--	53	--	
Reverse Transfer Capacitance		$C_{rss}$	--	21	--	
Gate Resistance	$f = 1.0\text{MHz}$	$R_g$	--	1	--	$\Omega$
<b>Switching</b> (Note 3)						
Turn-On Delay Time	$V_{GS} = 10\text{V}, V_{DS} = 15\text{V},$ $I_D = 4\text{A}, R_G = 2\Omega,$	$t_{d(on)}$	--	5.8	--	ns
Turn-On Rise Time		$t_r$	--	32	--	
Turn-Off Delay Time		$t_{d(off)}$	--	19	--	
Turn-Off Fall Time		$t_f$	--	28	--	
<b>Source-Drain Diode</b>						
Forward Voltage (Note 2)	$V_{GS} = 0\text{V}, I_S = 4\text{A}$	$V_{SD}$	--	--	1	V
Reverse Recovery Time	$I_S = 4\text{A},$ $di/dt = 100\text{A}/\mu\text{s}$	$t_{rr}$	--	8	--	ns
Reverse Recovery Charge		$Q_{rr}$	--	3.3	--	nC

**Notes:**

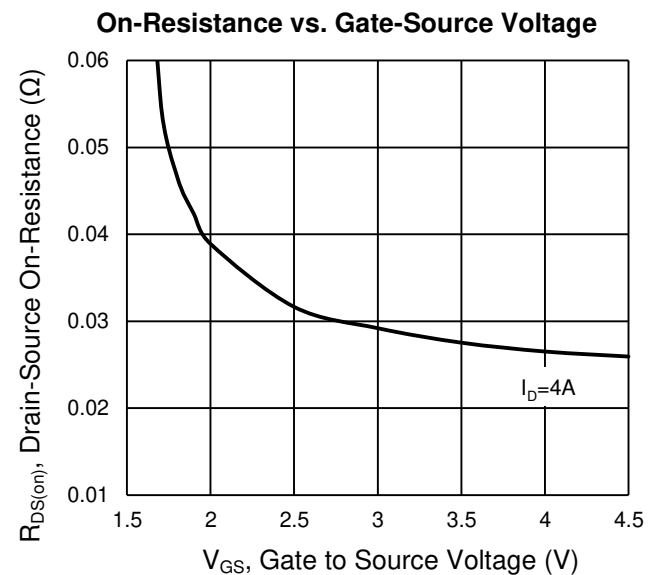
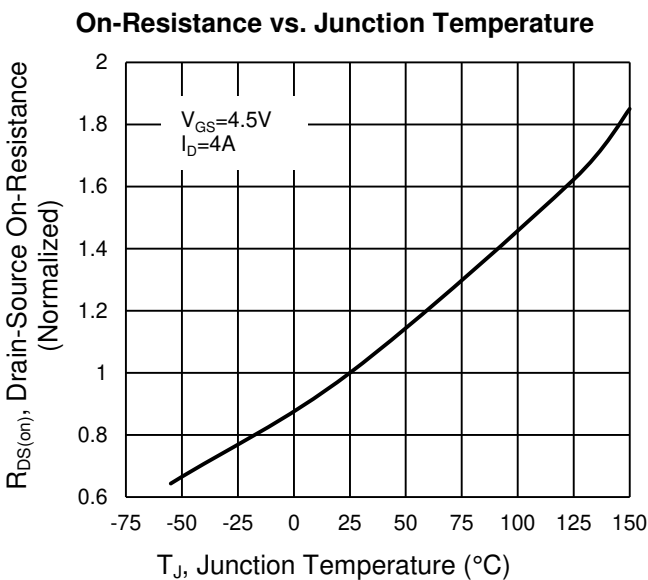
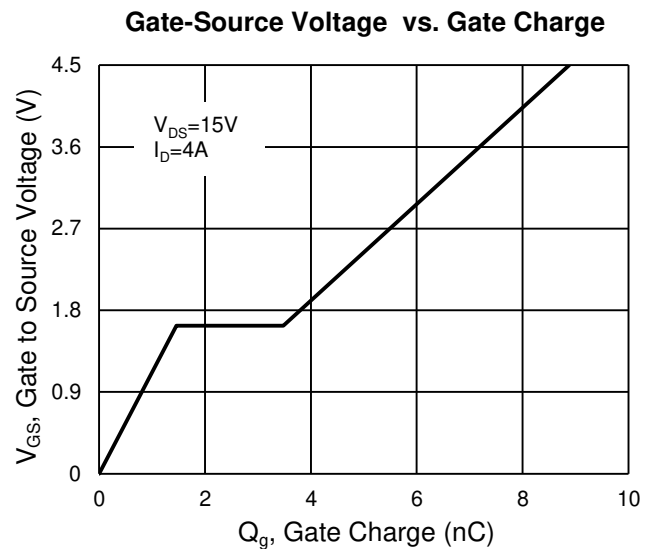
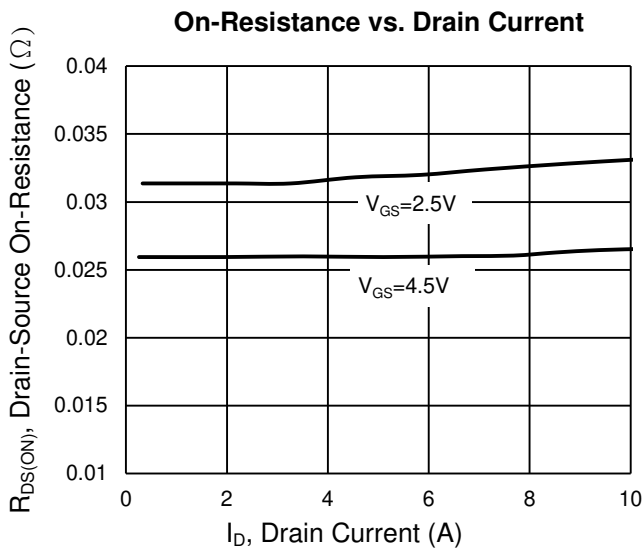
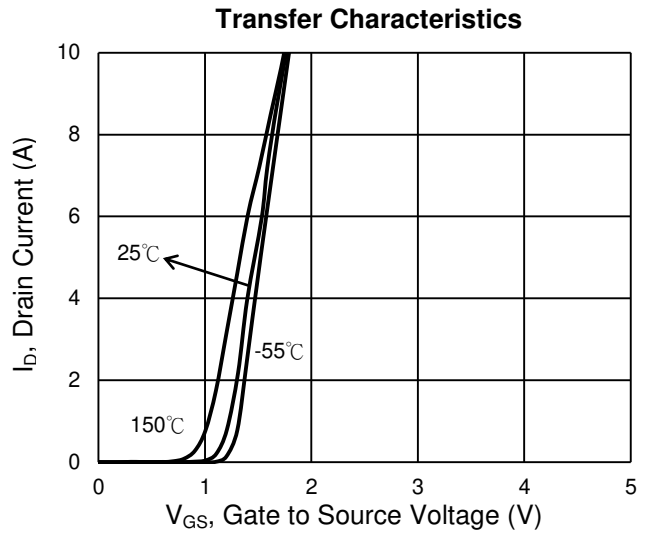
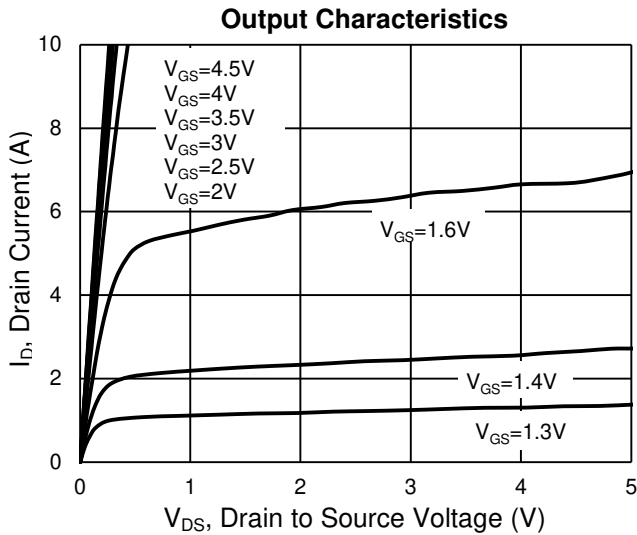
- Silicon limited current only.
- Pulse test: Pulse Width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- Switching time is essentially independent of operating temperature.

**ORDERING INFORMATION**

ORDERING CODE	PACKAGE	PACKING
TSM320N03CX RFG	SOT-23	3,000pcs / 7" Reel

**CHARACTERISTICS CURVES**

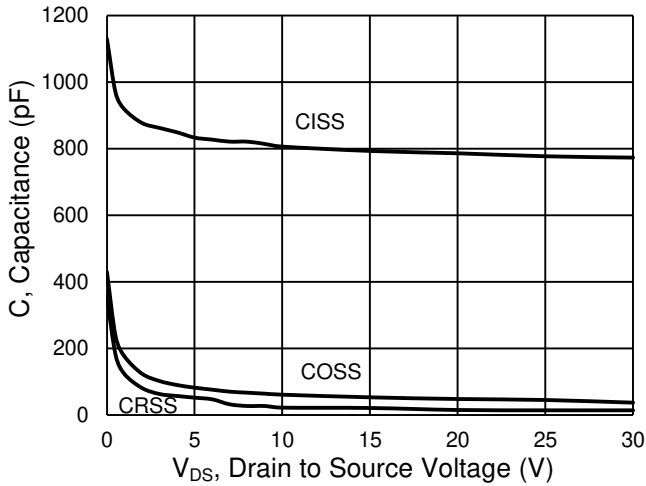
( $T_A = 25^\circ\text{C}$  unless otherwise noted)



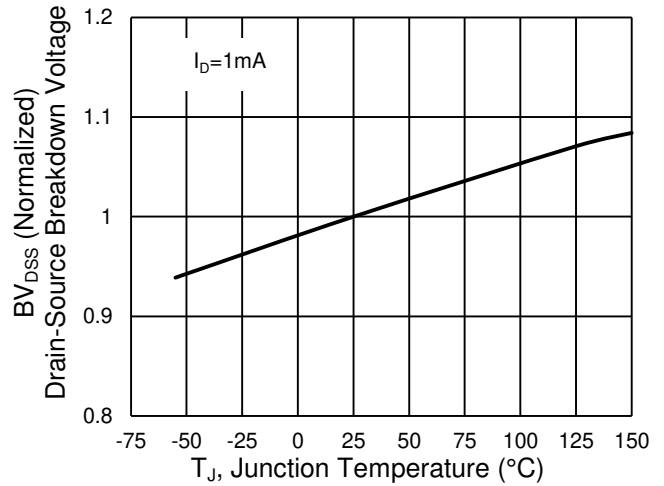
**CHARACTERISTICS CURVES**

( $T_A = 25^\circ\text{C}$  unless otherwise noted)

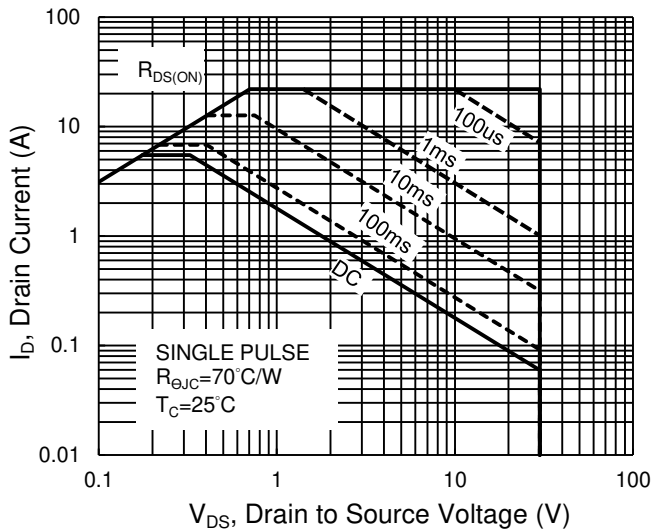
**Capacitance vs. Drain-Source Voltage**



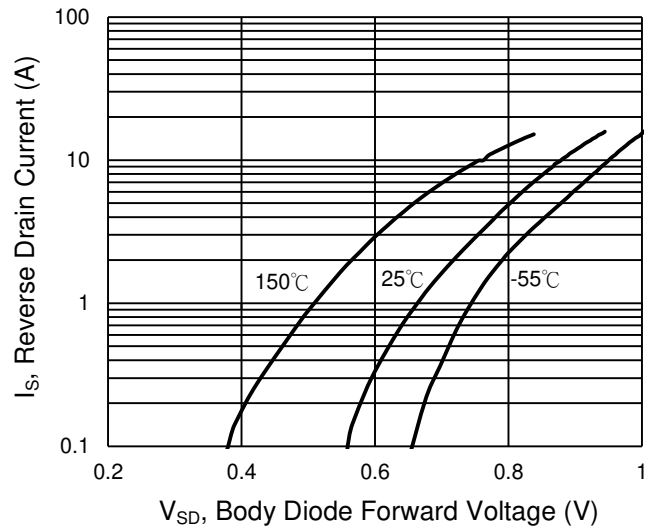
**$BV_{DSS}$  vs. Junction Temperature**



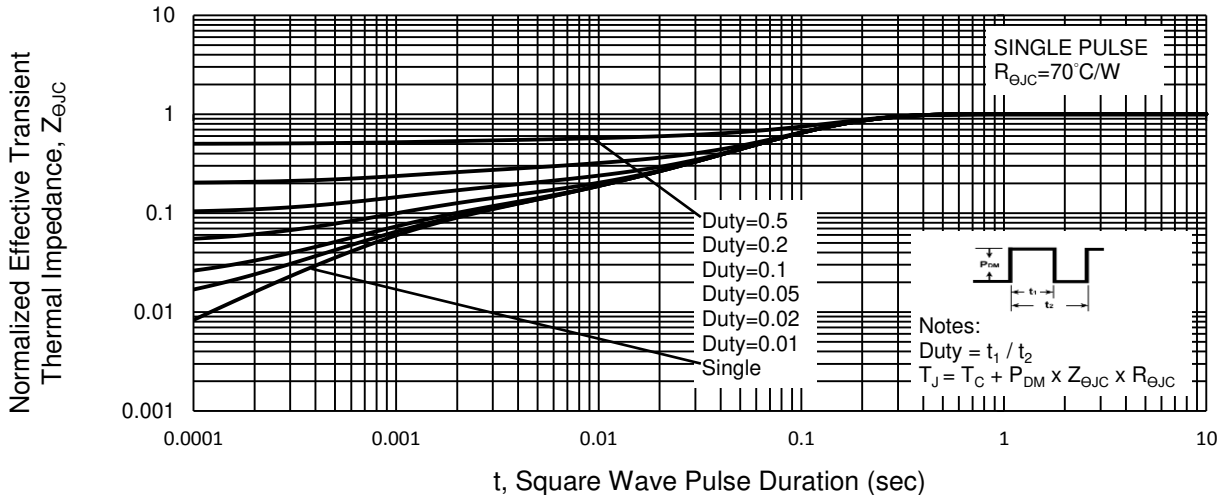
**Maximum Safe Operating Area, Junction-to-Case**



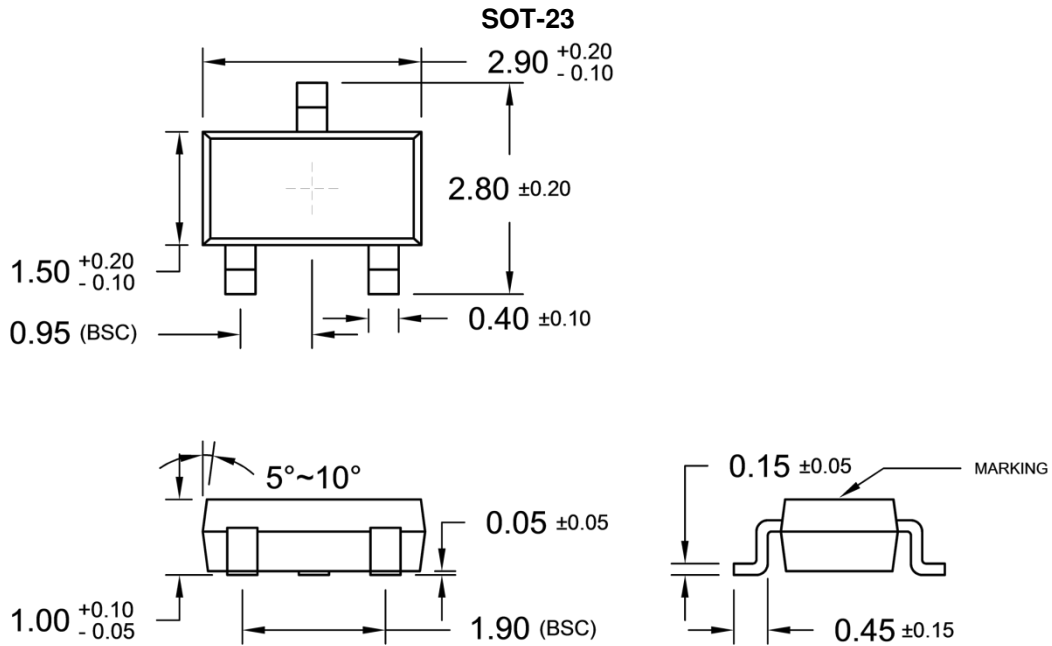
**Source-Drain Diode Forward Current vs. Voltage**



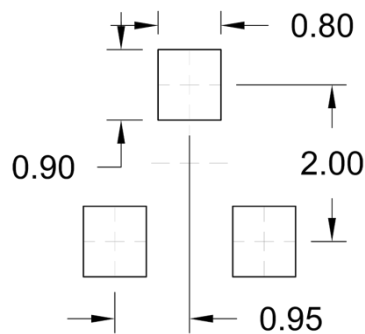
**Normalized Thermal Transient Impedance, Junction-to-Case**



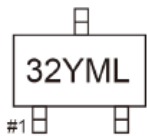
**PACKAGE OUTLINE DIMENSIONS** (Unit: Millimeters)



**SUGGESTED PAD LAYOUT** (Unit: Millimeters)



**MARKING DIAGRAM**



- 32** = Device Code
- Y** = Year Code
- M** = Month Code
- 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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