



# TSM2320

## 20V N-Channel Enhancement Mode MOSFET

SOT-23



Pin assignment:

1. Gate
2. Source
3. Drain

$V_{DS} = 20V$

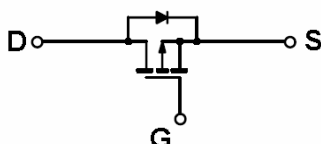
$R_{DS(on)}, V_{GS} @ 4.5V, I_{DS} @ 3.0A = 45m\Omega$

$R_{DS(on)}, V_{GS} @ 2.5V, I_{DS} @ 2.0A = 65m\Omega$

### Features

- ◇ Advanced trench process technology
- ◇ High density cell design for ultra low on-resistance
- ◇ Excellent thermal and electrical capabilities
- ◇ Compact and low profile SOT-23 package

### Block Diagram



### Ordering Information

Part No.	Packing	Package
TSM2320CX	Tape & Reel	SOT-23

### Absolute Maximum Rating (Ta = 25 °C unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	20V	V
Gate-Source Voltage	$V_{GS}$	±10	V
Continuous Drain Current	$I_D$	3.6	A
Pulsed Drain Current	$I_{DM}$	14	A
Maximum Power Dissipation	$P_D$	Ta = 25 °C	1.25
		Ta = 75 °C	0.8
Operating Junction Temperature	$T_J$	+150	°C
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	°C

### Thermal Performance

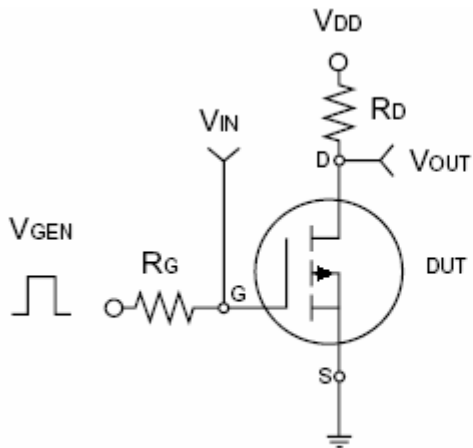
Parameter	Symbol	Limit	Unit
Lead Temperature (1/8" from case)	$T_L$	5	S
Junction to Ambient Thermal Resistance (PCB mounted)	$R_{\theta ja}$	100	°C/W

Note: Surface mounted on FR4 board  $t \leq 5\text{sec}$ .

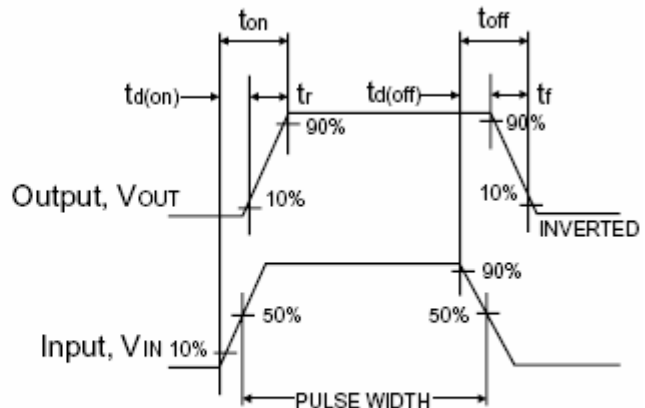


Electrical Characteristics						
Ta = 25 °C, unless otherwise noted						
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> = -250uA	BV <sub>DSS</sub>	20	--	--	V
Drain-Source On-State Resistance	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 3A	R <sub>DS(ON)</sub>	--	32	45	mΩ
Drain-Source On-State Resistance	V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 2A	R <sub>DS(ON)</sub>	--	50	65	
Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250uA	V <sub>GS(TH)</sub>	0.6	0.9	1.5	V
Zero Gate Voltage Drain Current	V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V	I <sub>DSS</sub>	--	--	1.0	uA
Gate Body Leakage	V <sub>GS</sub> = ±10V, V <sub>DS</sub> = 0V	I <sub>GSS</sub>	--	--	±100	nA
On-State Drain Current	V <sub>DS</sub> = 5V, V <sub>GS</sub> = 4.5V	I <sub>D(ON)</sub>	10	--	--	A
Forward Transconductance	V <sub>DS</sub> = 5V, I <sub>D</sub> = 3A	g <sub>fs</sub>	--	8	--	S
<b>Dynamic</b>						
Total Gate Charge	V <sub>DS</sub> = 10V, I <sub>D</sub> = 3.5A, V <sub>GS</sub> = 4.5V	Q <sub>g</sub>	--	9.1	--	nC
Gate-Source Charge		Q <sub>gs</sub>	--	1.4	--	
Gate-Drain Charge		Q <sub>gd</sub>	--	3.2	--	
Turn-On Delay Time	V <sub>DD</sub> = 10V, R <sub>L</sub> = 10Ω, I <sub>D</sub> = 1A, V <sub>GEN</sub> = 4.5V, R <sub>G</sub> = 6Ω	t <sub>d(on)</sub>	--	19.6		nS
Turn-On Rise Time		t <sub>r</sub>	--	4		
Turn-Off Delay Time		t <sub>d(off)</sub>	--	26		
Turn-Off Fall Time		t <sub>f</sub>	--	15.7		
Input Capacitance	V <sub>DS</sub> = 15V, V <sub>GS</sub> = 0V, f = 1.0MHz	C <sub>iss</sub>	--	641	--	pF
Output Capacitance		C <sub>oss</sub>	--	135	--	
Reverse Transfer Capacitance		C <sub>rss</sub>	--	101	--	
<b>Source-Drain Diode</b>						
Max. Diode Forward Current		I <sub>S</sub>	--	--	1.6	A
Diode Forward Voltage	I <sub>S</sub> = 1.6A, V <sub>GS</sub> = 0V	V <sub>SD</sub>	--	0.81	1.2	V

Note : pulse test: pulse width <=300uS, duty cycle <=2%



Switching Test Circuit



Switchin Waveforms



**Typical Characteristics Curve** ( $T_a = 25^\circ\text{C}$  unless otherwise noted)

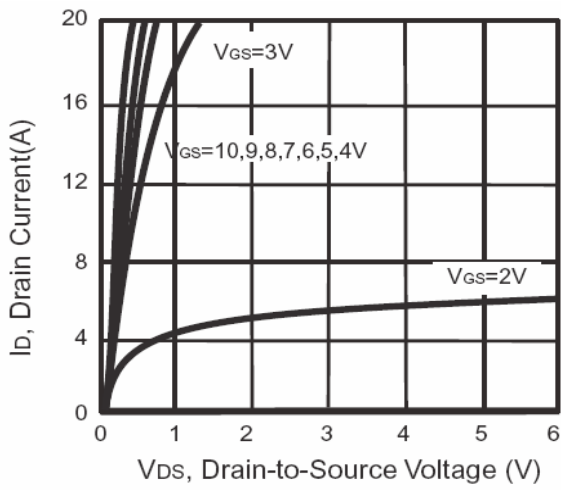


Figure 1. Output Characteristics

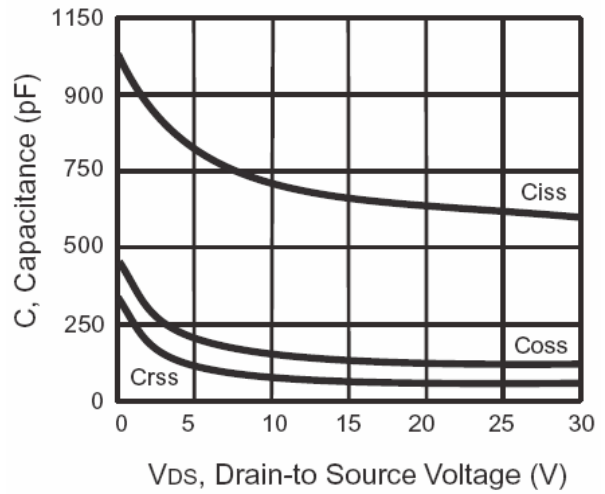


Figure 3. Capacitance

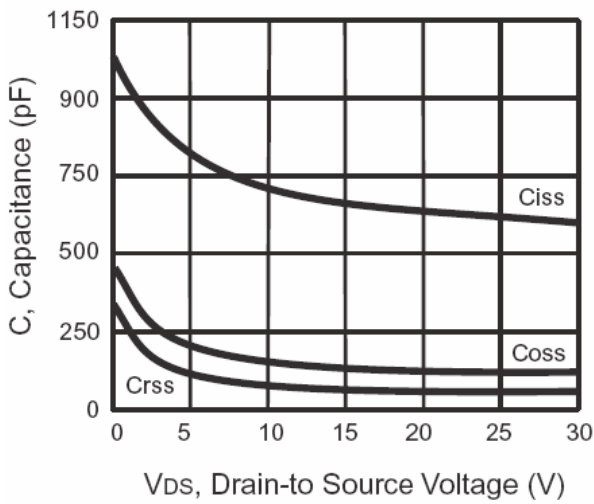


Figure 3. Capacitance

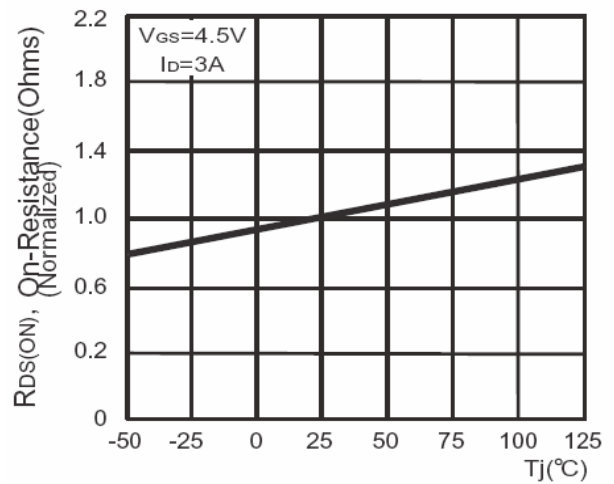


Figure 4. On-Resistance Variation with Temperature

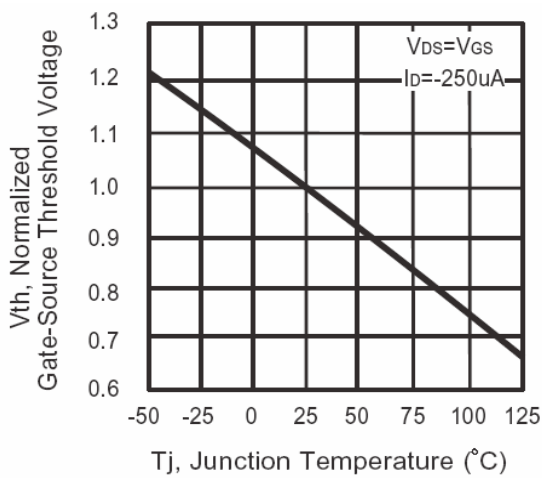


Figure 5. Threshold Voltage Variation with Temperature

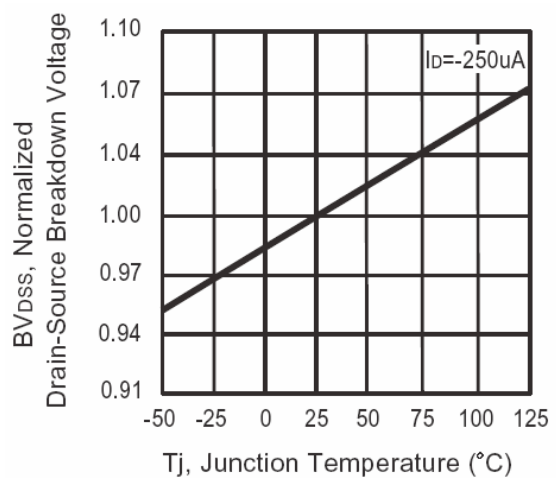


Figure 6. Breakdown Voltage Variation with Temperature

**Typical Characteristics Curve** ( $T_a = 25^\circ\text{C}$  unless otherwise noted)

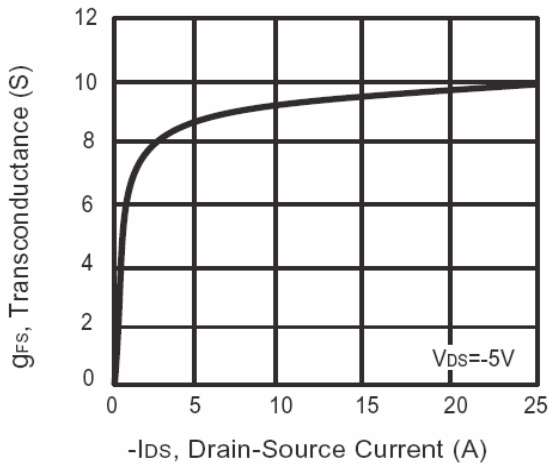


Figure 7. Transconductance Variation with Drain Current

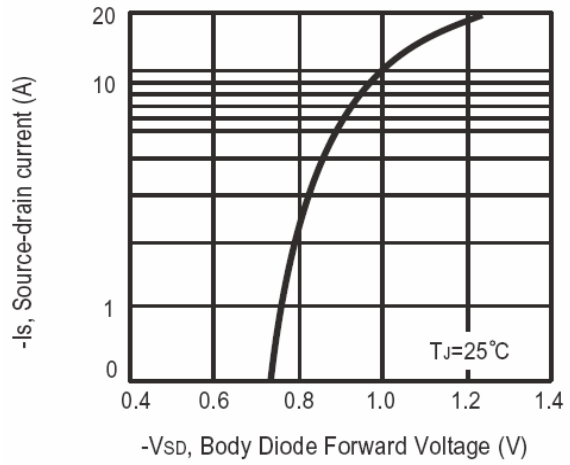


Figure 8. Body Diode Forward Voltage Variation with Source Current

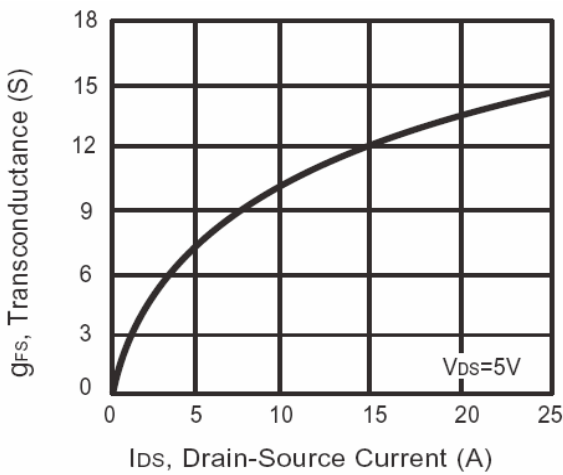


Figure 7. Transconductance Variation with Drain Current

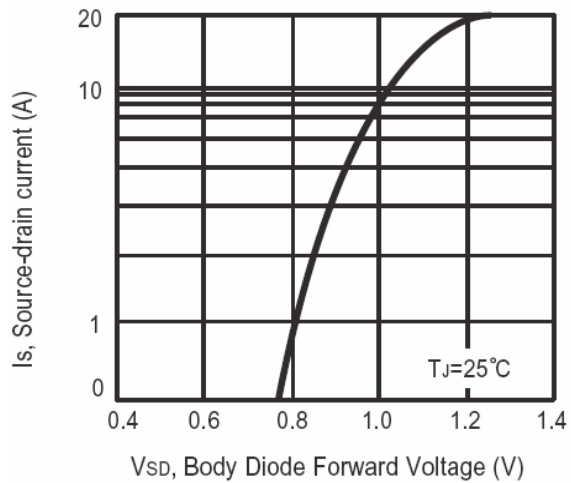
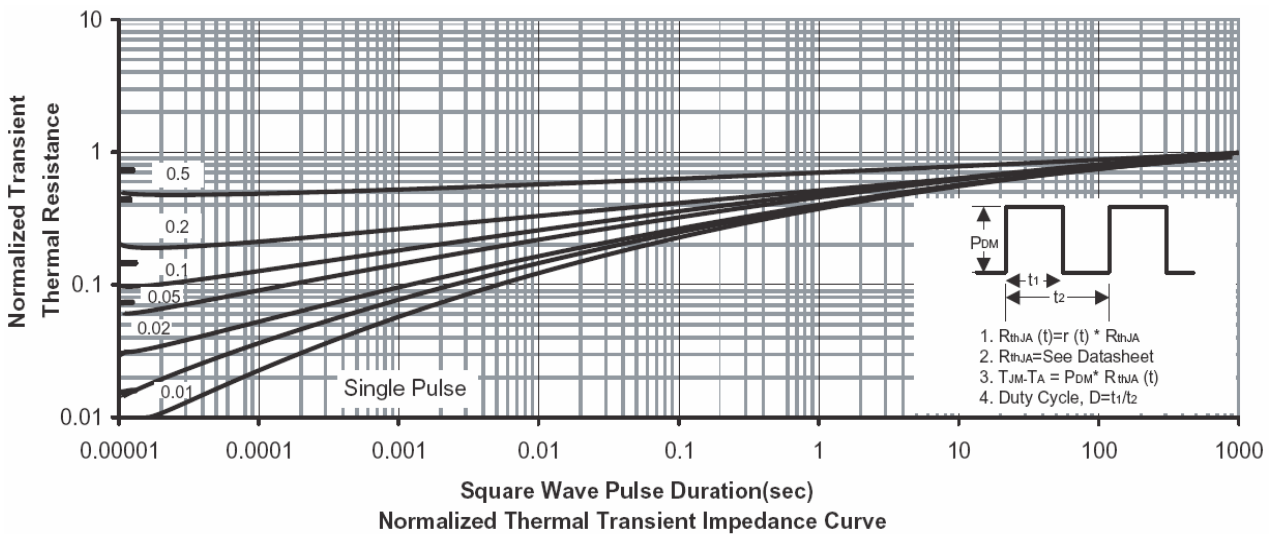
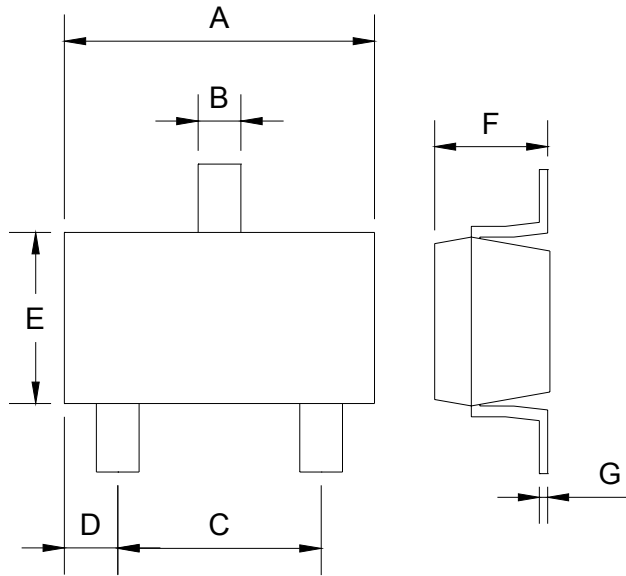


Figure 8. Body Diode Forward Voltage Variation with Source Current



### SOT-23 Mechanical Drawing



SOT-23 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.88	2.91	0.113	0.115
B	0.39	0.42	0.015	0.017
C	1.78	2.03	0.070	0.080
D	0.51	0.61	0.020	0.024
E	1.59	1.66	0.063	0.065
F	1.04	1.08	0.041	0.043
G	0.07	0.09	0.003	0.004