

## MSI3400-VB Datasheet

## N-Channel 30-V (D-S) MOSFET

PRODUCT SUMMARY						
V <sub>DS</sub> (V)	$R_{DS(on)}(\Omega)$	I <sub>D</sub> (A) <sup>a</sup>	Q <sub>g</sub> (Typ.)			
30	0.030 at V <sub>GS</sub> = 10 V	6.5	4.5 nC			
	$0.033$ at $V_{GS} = 4.5 \text{ V}$	6.0	4.5 110			

#### **FEATURES**

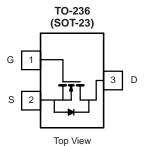
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET<sup>®</sup> Power MOSFET
- 100 % R<sub>g</sub> Tested
- Compliant to RoHS Directive 2002/95/EC

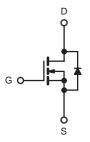


ROHS COMPLIANT HALOGEN FREE

#### **APPLICATIONS**

DC/DC Converter





N-Channel MOSFET

<b>ABSOLUTE MAXIMUM RATINGS</b> T <sub>A</sub> = 25 °C, unless otherwise noted						
Parameter		Symbol	Limit	Unit		
Drain-Source Voltage		$V_{DS}$	30	V		
Gate-Source Voltage		$V_{GS}$	± 20			
	T <sub>C</sub> = 25 °C		6.5 <sup>a</sup>			
Continuous Drain Current (T <sub>J</sub> = 150 °C)	T <sub>C</sub> = 70 °C	I <sub>D</sub>	6.0			
	T <sub>A</sub> = 25 °C		5.3			
	T <sub>A</sub> = 70 °C		5.0	Α		
Pulsed Drain Current		I <sub>DM</sub>	25			
	T <sub>C</sub> = 25 °C		1.4			
Continuous Source-Drain Diode Current	T <sub>A</sub> = 25 °C	I <sub>S</sub>	0.9 <sup>b, c</sup>			
	T <sub>C</sub> = 25 °C		1.7			
Maximum Power Dissipation	$T_C = 70  ^{\circ}C$	P <sub>D</sub>	1.1	w		
Maximum Fower Dissipation	$T_A = 25  ^{\circ}C$		1.1 <sup>b, c</sup>	T **		
	T <sub>A</sub> = 70 °C		0.7 <sup>b, c</sup>			
Operating Junction and Storage Temperature	Range	T <sub>J</sub> , T <sub>stg</sub>	- 55 to 150	°C		
Soldering Recommendations (Peak Tempera	ture) <sup>d, e</sup>		260			

THERMAL RESISTANCE RATINGS							
Parameter		Symbol	Typical	Maximum	Unit		
Maximum Junction-to-Ambient <sup>b, d</sup>	t ≤ 5 s	$R_{thJA}$	90	115	°C/W		
Maximum Junction-to-Foot (Drain)	Steady State	$R_{thJF}$	60	75	0/11		

#### Notes:

- a. Package limited
- b. Surface Mounted on 1" x 1" FR4 board.
- c. t = 5 s.
- d. Maximum under steady state conditions is 130 °C/W.



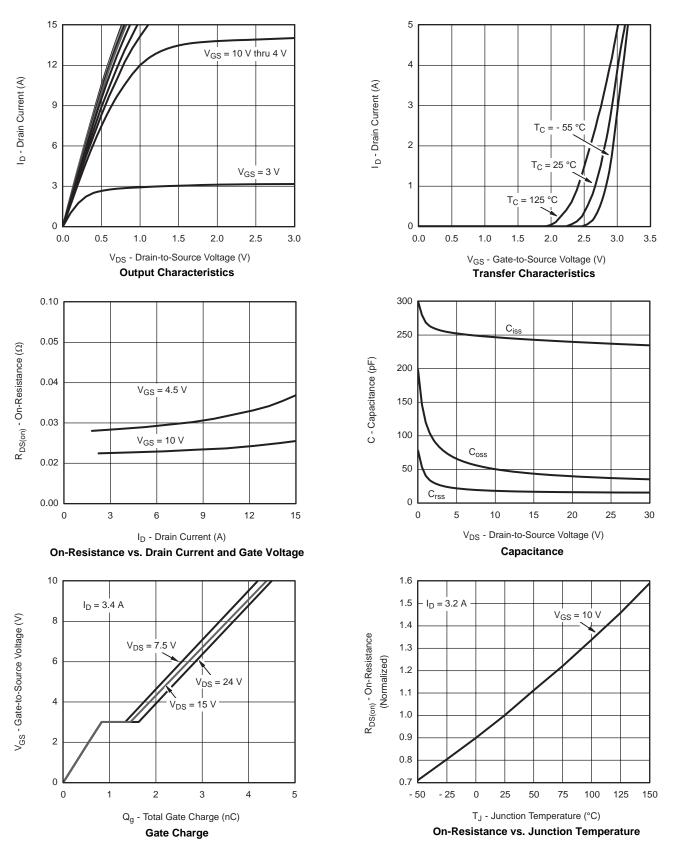
Parameter	Symbol	Test Conditions	Min.	Тур.	Max.	Unit	
Static							
Drain-Source Breakdown Voltage	V <sub>DS</sub>	$V_{GS} = 0 \text{ V, I}_{D} = 250 \mu\text{A}$	30			V	
V <sub>DS</sub> Temperature Coefficient	ΔV <sub>DS</sub> /T <sub>J</sub>	$V_{DS}/T_{J}$ $I_{D} = 250 \mu A$		31		>//00	
V <sub>GS(th)</sub> Temperature Coefficient	$\Delta V_{GS(th)}/T_{J}$	I <sub>D</sub> = 250 μA		- 5		mV/°C	
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	$V_{DS} = V_{GS}$ , $I_D = 250 \mu A$	0.7	1.1	2.0	V	
Gate-Source Leakage	I <sub>GSS</sub>	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 20 \text{ V}$			± 100	nA	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V			1	μΑ	
		$V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}, T_{J} = 55 ^{\circ}\text{C}$			10		
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	$V_{DS} \ge 5 \text{ V}, V_{GS} = 10 \text{ V}$	10			Α	
	_	$V_{GS} = 10 \text{ V, I}_{D} = 3.2 \text{ A}$		0.030			
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	$V_{GS} = 4.5 \text{ V}, I_D = 2.8 \text{ A}$		0.033		Ω	
Forward Transconductance <sup>a</sup>	9 <sub>fs</sub>	$V_{DS} = 15 \text{ V}, I_D = 4.8 \text{ A}$		11		S	
Dynamic <sup>b</sup>					L		
Input Capacitance	C <sub>iss</sub>			335			
Output Capacitance	C <sub>oss</sub>	$V_{DS} = 15 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$		45		pF	
Reverse Transfer Capacitance	C <sub>rss</sub>			17			
Tatal Oata Ohaana	0	$V_{DS} = 15 \text{ V}, V_{GS} = 10 \text{ V}, I_{D} = 3.4 \text{ A}$		4.5	6.7		
Total Gate Charge	Qg			2.1	3.2		
Gate-Source Charge	$Q_{gs}$	$V_{DS} = 15 \text{ V}, V_{GS} = 4.5 \text{ V}, I_{D} = 3.4 \text{ A}$		0.85		nC	
Gate-Drain Charge	Q <sub>gd</sub>			0.65			
Gate Resistance	R <sub>g</sub>	f = 1 MHz	0.8	4.4	8.8	Ω	
Turn-On Delay Time	t <sub>d(on)</sub>			12	20		
Rise Time	t <sub>r</sub>	$V_{DD}$ = 15 V, $R_L$ = 5.6 $\Omega$		50	75		
Turn-Off Delay Time	t <sub>d(off)</sub>	$I_D\cong$ 2.7 A, $V_{GEN}$ = 4.5 V, $R_g$ = 1 $\Omega$		12	20		
Fall Time	t <sub>f</sub>			22	35		
Turn-On Delay Time	t <sub>d(on)</sub>			5	10	ns	
Rise Time	t <sub>r</sub>	$V_{DD}$ = 15 V, $R_L$ = 5.6 $\Omega$		12	20	1	
Turn-Off Delay Time	t <sub>d(off)</sub>	$I_D\cong$ 2.7 A, $V_{GEN}$ = 10 V, $R_g$ = 1 $\Omega$		10	15	•	
Fall Time	t <sub>f</sub>			5	10		
<b>Drain-Source Body Diode Characteristi</b>	cs				L		
Continuous Source-Drain Diode Current	I <sub>S</sub>	$T_C = 25  ^{\circ}C$			1.4	۸	
Pulse Diode Forward Current	I <sub>SM</sub>				15	A	
Body Diode Voltage	V <sub>SD</sub>	$I_S = 2.7 \text{ A}, V_{GS} = 0 \text{ V}$		0.8	1.2	V	
Body Diode Reverse Recovery Time	t <sub>rr</sub>			10	20	ns	
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	L = 2.7 A dl/dt = 100 A/vo T = 25.00		5	10	nC	
Reverse Recovery Fall Time	t <sub>a</sub>	$I_F = 2.7 \text{ A}, \text{ dI/dt} = 100 \text{ A/}\mu\text{s}, T_J = 25 ^{\circ}\text{C}$		6			
Reverse Recovery Rise Time	t <sub>b</sub>			4		ns	

#### Notes:

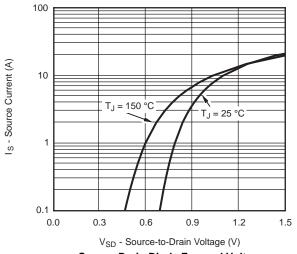
- a. Pulse test; pulse width  $\leq 300~\mu s,$  duty cycle  $\leq 2~\%$
- b. Guaranteed by design, not subject to production testing.

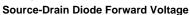
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

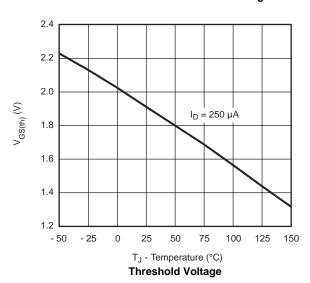






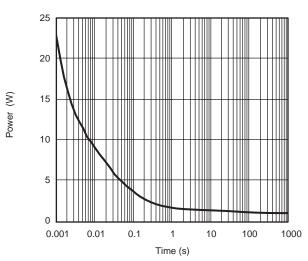




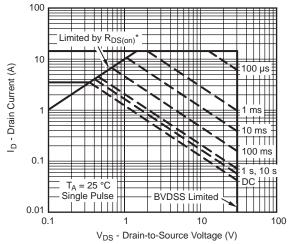


0.14  $I_D = 3.2 \text{ A}$ 0.12  $R_{DS(on)}$  - On-Resistance  $(\Omega)$ 0.10 T<sub>J</sub> = 125 °C 0.08 0.06 T<sub>J</sub> = 25 °C 0.04 0 2 4 10

V<sub>GS</sub> - Gate-to-Source Voltage (V) On-Resistance vs. Gate-to-Source Voltage



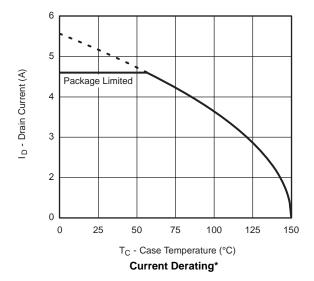
Single Pulse Power

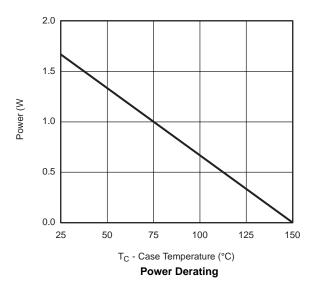


 $^*$   $V_{GS}$  > minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

Safe Operating Area, Junction-to-Ambient

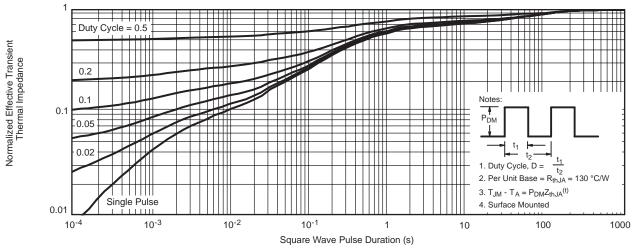






<sup>\*</sup> The power dissipation  $P_D$  is based on  $T_{J(max)} = 150$  °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.





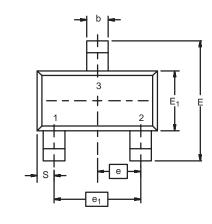
Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot



## SOT-23 (TO-236): 3-LEAD







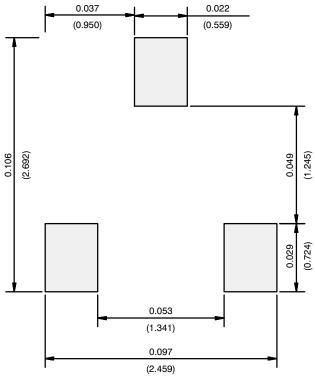
Min 0.89 0.01 0.88	<b>Max</b> 1.12 0.10	Min 0.035 0.0004	<b>Max</b> 0.044	
0.01	0.10			
		0.0004		
0.88		0.0001	0.004	
	1.02	0.0346	0.040	
0.35	0.50	0.014	0.020	
0.085	0.18	0.003	0.007	
2.80	3.04	0.110	0.120	
2.10	2.64	0.083	0.104	
1.20	1.40	0.047	0.055	
0.95 E	BSC	0.0374 Ref		
1.90 BSC		0.0748 Ref		
0.40	0.60	0.016	0.024	
0.64 Ref		0.64 Ref 0.025 Ref		
0.50 Ref		0.020 Ref		
3°	8°	3°	8°	
	0.35 0.085 2.80 2.10 1.20 0.95 E 1.90 E 0.40 0.64	0.35 0.50   0.085 0.18   2.80 3.04   2.10 2.64   1.20 1.40   0.95 BSC 1.90 BSC   0.40 0.60   0.64 Ref 0.50 Ref	0.35 0.50 0.014   0.085 0.18 0.003   2.80 3.04 0.110   2.10 2.64 0.083   1.20 1.40 0.047   0.95 BSC 0.0374   1.90 BSC 0.0748   0.40 0.60 0.016   0.64 Ref 0.025   0.50 Ref 0.020	

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DWG: 5479



#### **RECOMMENDED MINIMUM PADS FOR SOT-23**



Recommended Minimum Pads Dimensions in Inches/(mm)

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