

## ELM33404CA-VB Datasheet

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

PRODUCT SUMMARY						
V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω)	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			
30	0.033 at V <sub>GS</sub> = 4.5 V	6.0	4.5 110			

## FEATURES

- Halogen-free According to IEC 61249-2-21
  Definition
- TrenchFET<sup>®</sup> Power MOSFET

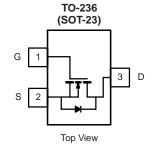
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- 100 % Rg Tested
- Compliant to RoHS Directive 2002/95/EC

## **APPLICATIONS**

DC/DC Converter





## S N-Channel MOSFET

Parameter		Symbol	Limit	Unit	
Drain-Source Voltage		V <sub>DS</sub>	30	V	
Gate-Source Voltage		V <sub>GS</sub>	± 20	v	
	T <sub>C</sub> = 25 °C		6.5 <sup>a</sup>		
Continuous Drain Current ( $T_1 = 150 \ ^{\circ}C$ )	T <sub>C</sub> = 70 °C		6.0		
	T <sub>A</sub> = 25 °C	ן טי ן	5.3		
	T <sub>A</sub> = 70 °C	1 1	5.0	A	
Pulsed Drain Current		I <sub>DM</sub>	25		
Continuous Source-Drain Diode Current	T <sub>C</sub> = 25 °C		1.4		
	T <sub>A</sub> = 25 °C	۱ <sub>S</sub>	0.9 <sup>b, c</sup>		
	T <sub>C</sub> = 25 °C		1.7		
Maximum Power Dissipation	T <sub>C</sub> = 70 °C	P <sub>D</sub>	1.1	w	
	T <sub>A</sub> = 25 °C	טי ן	1.1 <sup>b, c</sup>	vv	
	T <sub>A</sub> = 70 °C	1 1	0.7 <sup>b, c</sup>		
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>stg</sub>	- 55 to 150		
Soldering Recommendations (Peak Temperature) <sup>d, e</sup>			260	- °C	

THERMAL RESISTANCE RATINGS						
Parameter		Symbol	Typical	Maximum	Unit	
Maximum Junction-to-Ambient <sup>b, d</sup>	t ≤ 5 s	R <sub>thJA</sub>	90	115	°C/W	
Maximum Junction-to-Foot (Drain)	Steady State	R <sub>thJF</sub>	60	75	- 0/10	

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  $^{\circ}\text{C/W}.$ 

<b>SPECIFICATIONS</b> T <sub>J</sub> = 25 °C, unless otherwise noted							
Parameter	Symbol	Test Conditions	Min.	Тур.	Max.	Unit	
Static	1			T	r	1	
Drain-Source Breakdown Voltage	V <sub>DS</sub>	$V_{GS} = 0 \text{ V}, \text{ I}_{D} = 250 \mu\text{A}$	30			V	
V <sub>DS</sub> Temperature Coefficient کا		I <sub>D</sub> = 250 μA		31		mV/°C	
V <sub>GS(th)</sub> Temperature Coefficient	$\Delta V_{GS(th)}/T_J$	10 - 200 μΑ		- 5		11107 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>	$V_{DS} = 0 V, V_{GS} = \pm 20 V$			± 100	nA	
Zero Gate Voltage Drain Current	laaa	$V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}$			1	μA	
Zero Gale voltage Drain Current	IDSS	$V_{DS}$ = 30 V, $V_{GS}$ = 0 V, $T_{J}$ = 55 °C			10		
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	$V_{DS} \ge 5 \text{ V}, \text{ V}_{GS} = 10 \text{ V}$	10			А	
	Б	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 3.2 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 <sub>DS</sub> = 15 V, I <sub>D</sub> = 4.8 A		11		S	
Dynamic <sup>b</sup>				<u>1</u>	I		
Input Capacitance	C <sub>iss</sub>			335			
Output Capacitance	C <sub>oss</sub>	V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 0 V, f = 1 MHz		45		pF	
Reverse Transfer Capacitance	C <sub>rss</sub>			17			
Total Gate Charge		V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 3.4 A		4.5	6.7		
	Qg			2.1	3.2	nC	
Gate-Source Charge	Q <sub>gs</sub>	$V_{DS}$ = 15 V, $V_{GS}$ = 4.5 V, $I_{D}$ = 3.4 A		0.85			
Gate-Drain Charge	Q <sub>gd</sub>			0.65			
Gate Resistance	Rg	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>	$I_D \cong 2.7 \text{ A}, V_{GEN} = 4.5 \text{ V}, R_g = 1 \Omega$		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>	$V_{DD} = 15 \text{ V}, \text{ R}_{1} = 5.6 \Omega$		12	20	-	
Turn-Off Delay Time	t <sub>d(off)</sub>	$I_D \cong 2.7 \text{ A}, V_{GEN} = 10 \text{ V}, \text{ R}_g = 1 \Omega$		10	15		
Fall Time	t <sub>f</sub>			5	10		
Drain-Source Body Diode Characteristic	s			<u> </u>			
Continuous Source-Drain Diode Current	ا <sub>S</sub>	T <sub>C</sub> = 25 °C			1.4		
Pulse Diode Forward Current	I <sub>SM</sub>				15	A	
Body Diode Voltage	V <sub>SD</sub>	I <sub>S</sub> = 2.7 A, V <sub>GS</sub> = 0 V		0.8	1.2	V	
Body Diode Reverse Recovery Time	t <sub>rr</sub>			10	20	ns	
Body Diode Reverse Recovery Charge				5	10	nC	
Reverse Recovery Fall Time	t <sub>a</sub>	$I_F = 2.7 \text{ A}, \text{ dI/dt} = 100 \text{ A/}\mu\text{s}, \text{ T}_J = 25 ^\circ\text{C}$		6		1	
Reverse Recovery Rise Time	t <sub>b</sub>			4		ns	

Notes:

a. Pulse test; pulse width  $\leq$  300  $\mu s,$  duty cycle  $\leq$  2 %

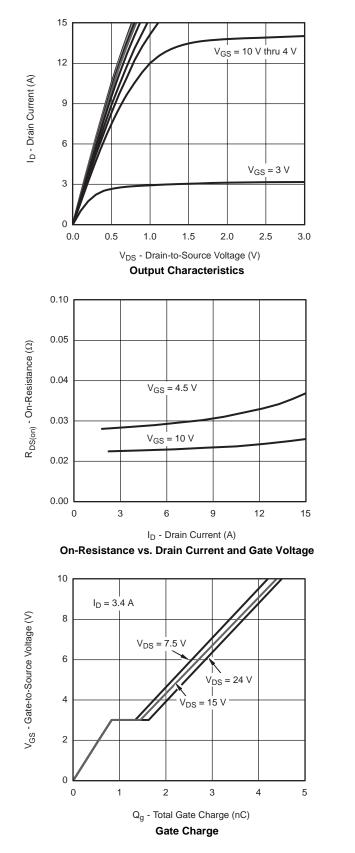
b. Guaranteed by design, not subject to production testing.

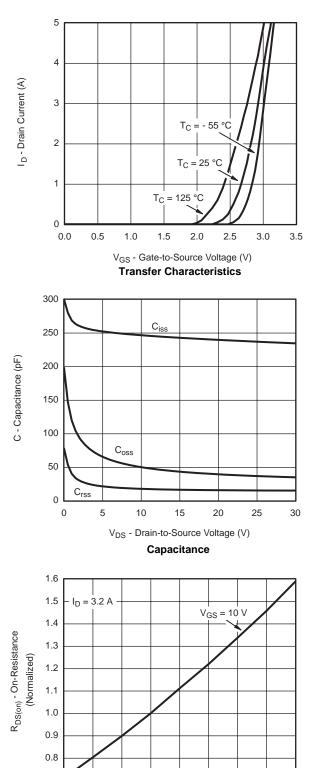
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

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## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted





0.7

- 50

- 25

0

25

50

T<sub>J</sub> - Junction Temperature (°C) On-Resistance vs. Junction Temperature

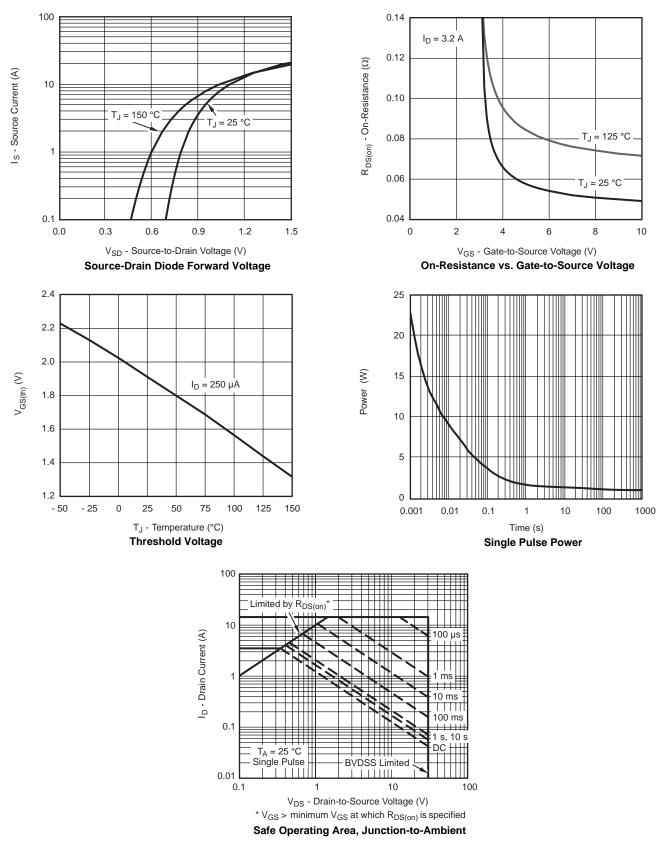
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100

125 150



## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted





#### 6 2.0 5 1.5 I<sub>D</sub> - Drain Current (A) Package Limited 4 Power (W 1.0 3 0.5 2 0 0.0 25 75 150 50 75 150 0 50 100 125 25 100 125 T<sub>C</sub> - Case Temperature (°C) T<sub>C</sub> - Case Temperature (°C) **Current Derating\* Power Derating**

### TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

\* 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.



## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Normalized Thermal Transient Impedance, Junction-to-Foot



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







Dim	MILLIN	IETERS	INCHES		
	Min	Max	Min	Мах	
Α	0.89	1.12	0.035	0.044	
A <sub>1</sub>	0.01	0.10	0.0004	0.004	
A <sub>2</sub>	0.88	1.02	0.0346	0.040	
b	0.35	0.50	0.014	0.020	
С	0.085	0.18	0.003	0.007	
D	2.80	3.04	0.110	0.120	
E	2.10	2.64	0.083	0.104	
E <sub>1</sub>	1.20	1.40	0.047	0.055	
е	0.95 BSC		0.0374 Ref		
e <sub>1</sub>	1.90 BSC		0.0748 Ref		
L	0.40	0.60	0.016	0.024	
L <sub>1</sub>	0.64 Ref		0.025 Ref		
S	0.50 Ref		0.020 Ref		
q	3°	8°	3°	8°	



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



Recommended Minimum Pads Dimensions in Inches/(mm)

Return to Index



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