

ELM13413CA-S-VB Datasheet

P-Channel 20-V (D-S) MOSFET

MOSFET	PRODUCT SUMM	ARY	
V _{DS} (V)	$R_{DS(on)}(\Omega)$	I _D (A) ^a	Q _g (Typ.)
	0.060 at V _{GS} = - 10 V	- 4.0	
- 20	0.065 at V _{GS} = - 4.5 V	- 3.5	10 nC
	0.080 at V _{GS} = - 2.5 V	- 2.0	

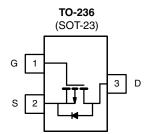
FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFET
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC



APPLICATIONS

- · Load Switch
- PA Switch
- DC/DC Converters



ABSOLUTE MAXIMUM RATINGS $(T_A =$	25 C, unless ou				
Parameter		Symbol	Limit	Unit	
Drain-Source Voltage		V_{DS}	- 20	V	
Gate-Source Voltage		V_{GS}	± 12		
	T _C = 25 °C		- 4 ^e		
Continuous Drain Current (T _{.1} = 150 °C)	T _C = 70 °C	I _D	-3.2		
Continuous Diain Current (1j = 130 °C)	T _A = 25 °C	'U	- 3 .5 ^{D, C}		
	T _A = 70 °C	- 2 .5 ^{b, c}	A		
Pulsed Drain Current		I _{DM}	- 10		
Continuous Source-Drain Diode Current	T _C = 25 °C	l _a	- 2.1		
Continuous Source-Drain Diode Current	T _A = 25 °C	I _S	- 1.0 ^{b, c}		
	T _C = 25 °C		2.5		
Mayimum Dayyar Dissipation	T _C = 70 °C	В.	1.6	w	
Maximum Power Dissipation	T _A = 25 °C	P _D	1.25 ^{b, c}	vv	
	T _A = 70 °C		0.8 ^{b, c}		
Operating Junction and Storage Temperature Range		T _J , T _{stq}	- 55 to 150	°C	

THERMAL RESISTANCE RATINGS								
Parameter		Symbol	Typical	Maximum	Unit			
Maximum Junction-to-Ambient ^{b, d}	≤5 s	R _{thJA}	75	100	°C/W			
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	40	50	O/ VV			

Notes:

- a. Based on T_C = 25 °C.
- b. Surface mounted on 1" x 1" FR4 board.
- c. t = 5 s.
- d. Maximum under steady state conditions is 166 °C/W.
- e. Package limited.



Parameter	Symbol	Test Conditions	Min.	Тур.	Max.	Unit	
Static						1	
Drain-Source Breakdown Voltage	V_{DS}	$V_{DS} = 0 \text{ V}, I_D = -250 \mu\text{A}$	- 20			V	
V _{DS} Temperature Coefficient	$\Delta V_{DS}/T_{J}$	J 050 vA		- 13.4		m\//°C	
V _{GS(th)} Temperature Coefficient	$\Delta V_{GS(th)}/T_J$	I _D = - 250 μA		2.9		mV/°C	
Gate-Source Threshold Voltage	V _{GS(th)}	$V_{DS} = V_{GS}, I_{D} = -250 \mu A$	- 0.5		- 1.5	V	
Gate-Source Leakage	I _{GSS}	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 12 \text{ V}$			± 100	nA	
Zava Cata Valtaga Drain Current		$V_{DS} = -20 \text{ V}, V_{GS} = 0 \text{ V}$			- 1		
Zero Gate Voltage Drain Current	I _{DSS}	$V_{DS} = -20 \text{ V}, V_{GS} = 0 \text{ V}, T_{J} = 55 ^{\circ}\text{C}$		- 10		μΑ	
On-State Drain Current ^a	I _{D(on)}	$V_{DS} \le -5 \text{ V}, V_{GS} = -4.5 \text{ V}$	- 10			Α	
		V _{GS} = - 10 V, I _D = - 3 A		0.060			
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = - 4.5 V, I _D = - 2.5 A		0.065		Ω	
		V _{GS} = - 2.5 V, I _D = - 2 A		0.080		V nA μA	
Forward Transconductance ^a	9 _{fs}	V _{DS} = - 5 V, I _D = - 3 A		15		S	
Dynamic ^b							
Input Capacitance	C _{iss}			835		pF	
Output Capacitance	C _{oss}	V _{DS} = - 10 V, V _{GS} = 0 V, f = 1 MHz		180			
Reverse Transfer Capacitance	C _{rss}			155			
Total Oats Observe	0	V _{DS} = - 10 V, V _{GS} = - 4.5 V, I _D = - 3.1 A		10			
Total Gate Charge	Q_g	20 20		6.4		1	
Gate-Source Charge	Q_{gs}	V _{DS} = - 10 V, V _{GS} = - 2.5 V, I _D = - 3.1 A		1.7		nC	
Gate-Drain Charge	Q_{gd}			3.4		1	
Gate Resistance	R_g	f = 1 MHz	0.9	4.4	8.8	Ω	
Turn-On Delay Time	t _{d(on)}			22	33		
Rise Time	t _r	$V_{DD} = -10 \text{ V}, R_{L} = 2.4 \Omega$		20	30	ns	
Turn-Off Delay Time	t _{d(off)}	$I_D = -3.1 \text{ A}, V_{GEN} = -4.5 \text{ V}, R_g = 1 \Omega$		28	42		
Fall Time	t _f			9	18		
Drain-Source Body Diode Characteristi	cs						
Continuous Source-Drain Diode Current	I _S	$T_C = 25 ^{\circ}C$			- 2.1	A	
Pulse Diode Forward Current ^a	I _{SM}				- 1 0	1 ^	
Body Diode Voltage	V_{SD}	I _S = - 3.1 A		- 0.8	- 1.2	٧	
Body Diode Reverse Recovery Time	t _{rr}			23	35	ns	
Body Diode Reverse Recovery Charge	Q _{rr}	1 04 A 41/44 400 A / - T 05 00		12	20	nC	
Reverse Recovery Fall Time	t _a	$I_F = -3.1 \text{ A, dI/dt} = 100 \text{ A/}\mu\text{s, T}_J = 25 ^{\circ}\text{C}$		15			
Reverse Recovery Rise Time t _b				8		ns	

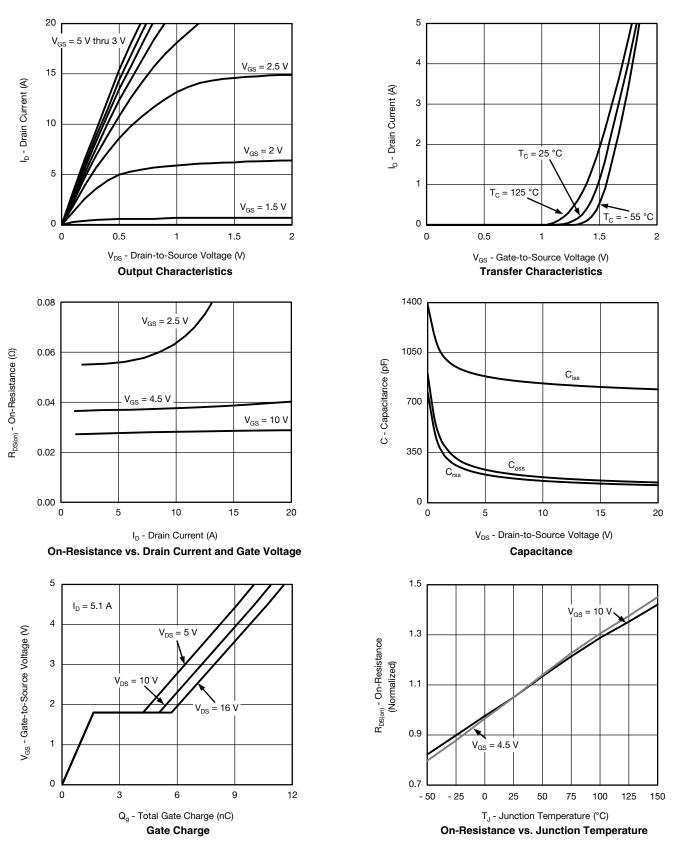
Notes:

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.

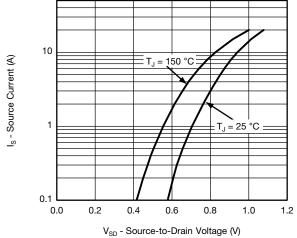
a. Pulse test; pulse width \leq 300 $\mu s,$ duty cycle \leq 2 %.

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

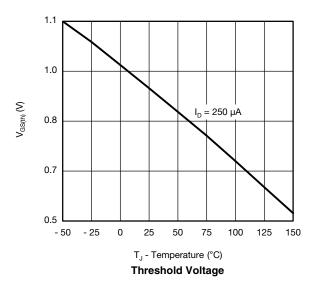


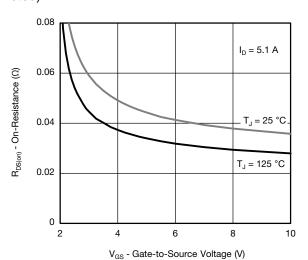




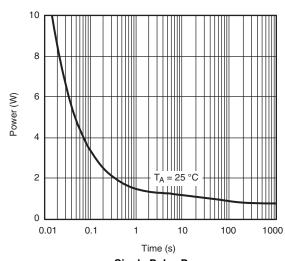


Source-Drain Diode Forward Voltage

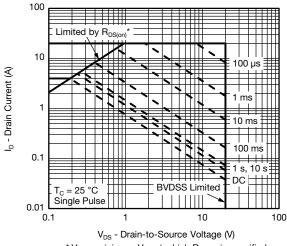




On-Resistance vs. Gate-to-Source Voltage



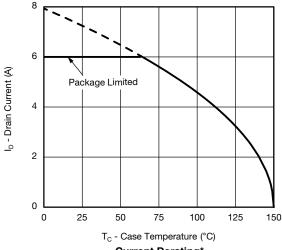
Single Pulse Power



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

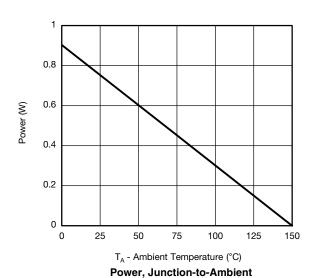
Safe Operating Area





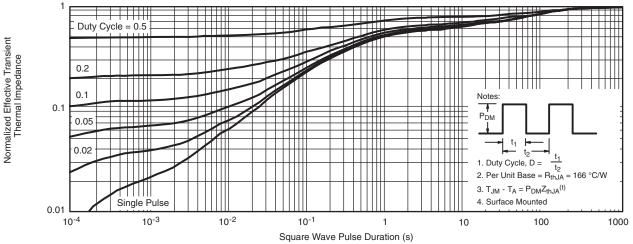




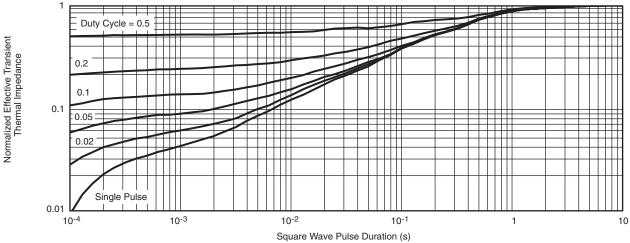


^{*} The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package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





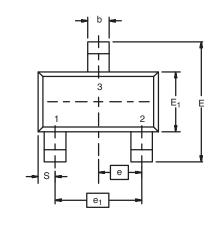


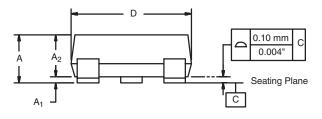


Normalized Thermal Transient Impedance, Junction-to-Foot



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







Dim	MILLIMETERS		INCHES		
	Min	Max	Min	Max	
Α	0.89	1.12	0.035	0.044	
A ₁	0.01	0.10	0.0004	0.004	
A ₂	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 ₁	1.20	1.40	0.047	0.055	
е	0.95 BSC		0.0374 Ref		
e ₁	1.90	1.90 BSC		0.0748 Ref	
L	0.40	0.60	0.016	0.024	
L ₁	0.64 Ref		0.025	i Ref	
S	0.50 Ref		0.020) Ref	
q	3°	8°	3°	8°	

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DWG: 5479



RECOMMENDED MINIMUM PADS FOR SOT-23



Recommended Minimum Pads Dimensions in Inches/(mm)

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