

ELM16604EA-S-VB Datasheet

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

PRODUCT SUMMARY

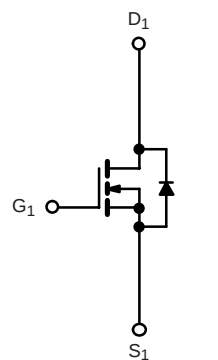
	V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)
N-Channel	20	0.022 at $V_{GS} = 10$ V	5.5
		0.030 at $V_{GS} = 4.5$ V	4.2
P-Channel	- 20	0.055 at $V_{GS} = - 10$ V	- 3.4
		0.079 at $V_{GS} = - 4.5$ V	- 2.5

FEATURES

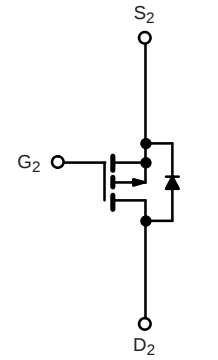
- Halogen-free According to IEC 61249-2-21 Definition
- Trench Power MOSFET
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE
Available



N-Channel MOSFET



P-Channel MOSFET

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

Parameter		Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage		V _{DS}	20	- 20	V
Gate-Source Voltage		V _{GS}	± 20	± 20	
Continuous Drain Current (T _J = 150 °C) ^{a, b}	T _A = 25 °C	I _D	5.5	- 3.4	A
	T _A = 70 °C		4.0	- 2.3	
Pulsed Drain Current		I _{DM}	15	10	
Continuous Source Current (Diode Conduction) ^{a, b}		I _S	1.05	- 1.05	
Maximum Power Dissipation ^{a, b}	T _A = 25 °C	P _D	1.15		W
	T _A = 70 °C		0.73		
Operating Junction and Storage Temperature Range		T _J , T _{stg}	- 55 to 150		°C

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^a	R_{thJA}	93	110	$^\circ\text{C/W}$
		130	150	
Maximum Junction-to-Lead	R_{thJL}	75	90	

Notes:

a. Surface Mounted on FR4 board.

b. $t \leq 5$ s.

SPECIFICATIONS T _J = 25 °C, unless otherwise noted							
Parameter	Symbol	Test Conditions		Min.	Typ.	Max.	Unit
Static							
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	N-Ch	0.5	0.8	1.5	V
		V _{DS} = V _{GS} , I _D = - 250 μA	P-Ch	- 0.5	-0.8	-1.5	
Gate-Body Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 8 V	N-Ch P-Ch			± 100 ± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 16 V, V _{GS} = 0 V	N-Ch			1	μA
		V _{DS} = - 16 V, V _{GS} = 0 V	P-Ch			- 1	
		V _{DS} = 16 V, V _{GS} = 0 V, T _J = 55 °C	N-Ch			5	
		V _{DS} = - 16 V, V _{GS} = 0 V, T _J = 55 °C	P-Ch			- 5	
On-State Drain Current ^a	I _{D(on)}	V _{DS} = 5 V, V _{GS} = 10 V	N-Ch	3.7			A
		V _{DS} = - 5 V, V _{GS} = - 10 V	P-Ch	- 3			
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 10 V, I _D = 2.5 A	N-Ch		0.022		Ω
		V _{GS} = - 10 V, I _D = - 1.8 A	P-Ch		0.055		
		V _{GS} = 4.5 V, I _D = 2.0 A	N-Ch		0.030		
		V _{GS} = - 4.5 V, I _D = - 1.2 A	P-Ch		0.079		
Forward Transconductance ^a	g _{fs}	V _{DS} = 10 V, I _D = 2.5 A	N-Ch		4.3		S
		V _{DS} = - 15 V, I _D = - 1.8 A	P-Ch		2.4		
Diode Forward Voltage ^a	V _{SD}	I _S = 1.05 A, V _{GS} = 0 V	N-Ch		0.81	1.10	V
		I _S = - 1.05 A, V _{GS} = 0 V	P-Ch		- 0.83	- 1.10	
Dynamic ^b							
Total Gate Charge	Q _g	N-Channel V _{DS} = 15 V, V _{GS} = 5 V, I _D = 1.8 A	N-Ch P-Ch		2.1 2.4	3.2 3.6	nC
Gate-Source Charge	Q _{gs}		N-Ch P-Ch		0.7 0.9		
Gate-Drain Charge	Q _{gd}	P-Channel V _{DS} = - 15 V, V _{GS} = - 5 V, I _D = - 1.8 A	N-Ch P-Ch		0.7 0.8		
Gate Resistance	R _g		N-Ch P-Ch	0.5 3		2.4 11	Ω
Turn-On Delay Time	t _{d(on)}	N-Channel V _{DD} = 15 V, R _L = 15 Ω I _D ≅ 1 A, V _{GEN} = 10 V, R _g = 6 Ω	N-Ch P-Ch		7 8	11 12	ns
Rise Time	t _r		N-Ch P-Ch		9 12	14 18	
Turn-Off Delay Time	t _{d(off)}	P-Channel V _{DD} = - 15 V, R _L = 15 Ω I _D ≅ - 1 A, V _{GEN} = - 10 V, R _g = 6 Ω	N-Ch P-Ch		13 12	20 18	
			N-Ch P-Ch		5 7	8 11	
Fall Time	t _f						
Source-Drain Reverse Recovery Time	t _{rr}	I _F = 1.05 A, dI/dt = 100 A/μs	N-Ch		35	60	
		I _F = - 1.05 A, dI/dt = 100 A/μs	P-Ch		30	60	

Notes:

a. Pulse test; pulse width $\leq 300\ \mu\text{s}$, 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.

N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

Output Characteristics

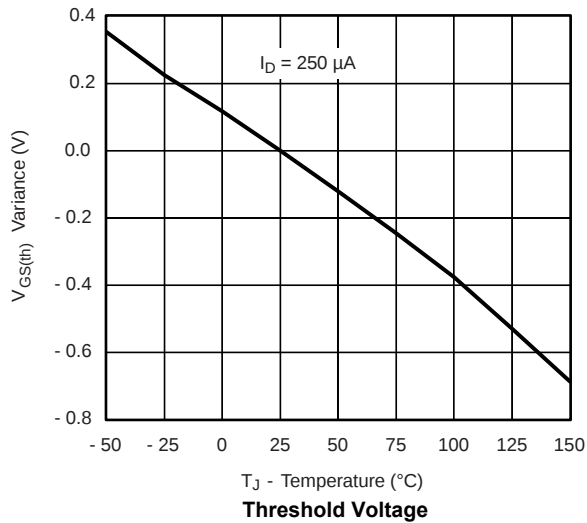
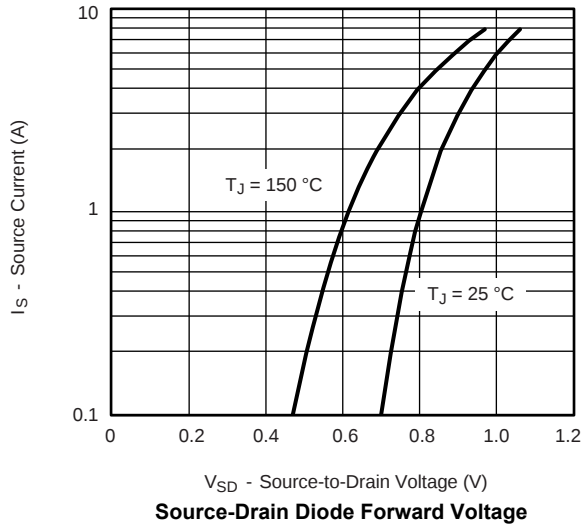
Transfer Characteristics

On-Resistance vs. Drain Current

Capacitance

Gate Charge

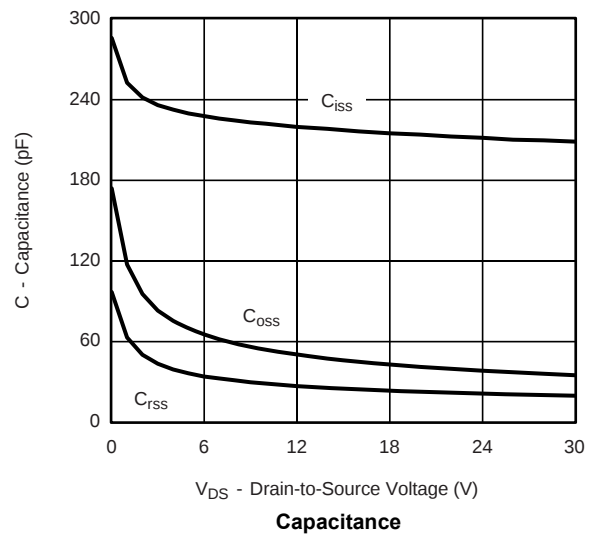
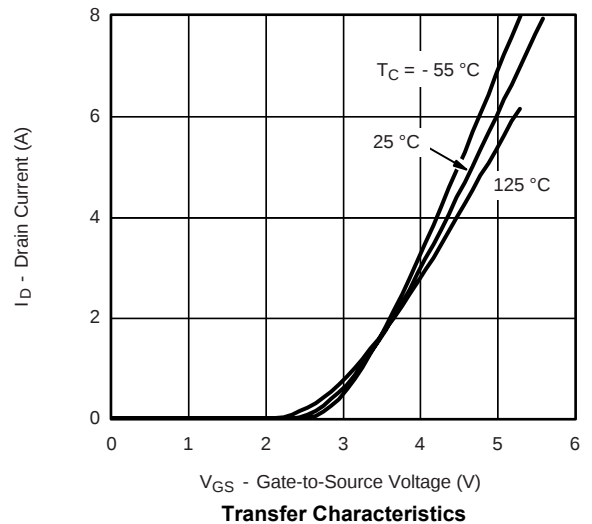
On-Resistance vs. Junction Temperature

N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


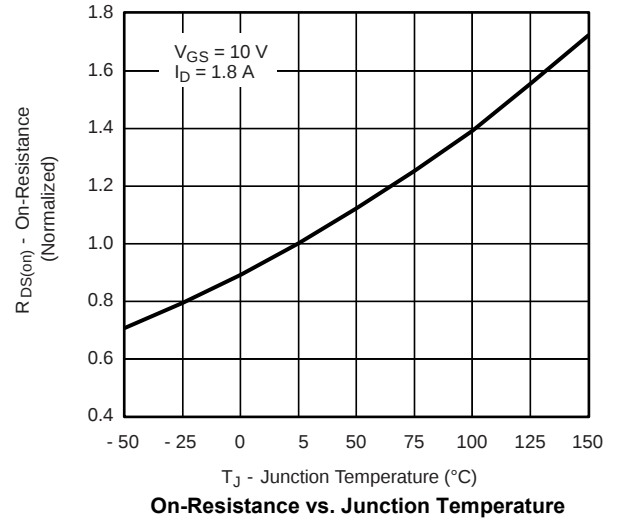
N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



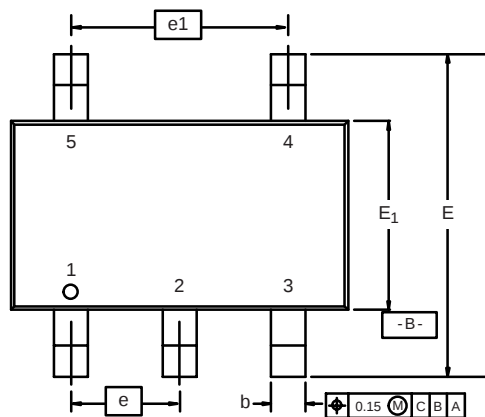
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

Normalized Thermal Transient Impedance, Junction-to-Ambient

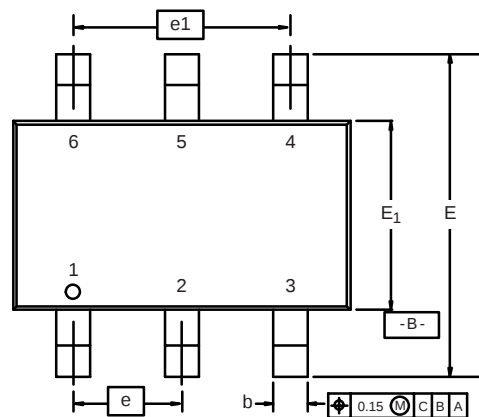
Normalized Thermal Transient Impedance, Junction-to-Foot

TSOP: 5/6-LEAD

JEDEC Part Number: MO-193C



5-LEAD TSOP

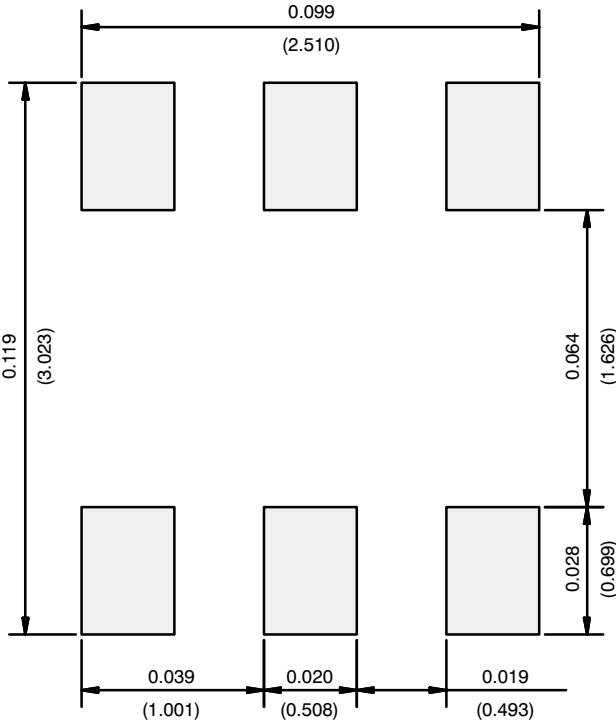


6-LEAD TSOP



	MILLIMETERS			INCHES		
Dim	Min	Nom	Max	Min	Nom	Max
A	0.91	-	1.10	0.036	-	0.043
A ₁	0.01	-	0.10	0.0004	-	0.004
A ₂	0.90	-	1.00	0.035	0.038	0.039
b	0.30	0.32	0.45	0.012	0.013	0.018
c	0.10	0.15	0.20	0.004	0.006	0.008
D	2.95	3.05	3.10	0.116	0.120	0.122
E	2.70	2.85	2.98	0.106	0.112	0.117
E ₁	1.55	1.65	1.70	0.061	0.065	0.067
e	0.95 BSC			0.0374 BSC		
e ₁	1.80	1.90	2.00	0.071	0.075	0.079
L	0.32	-	0.50	0.012	-	0.020
L ₁	0.60 Ref			0.024 Ref		
L ₂	0.25 BSC			0.010 BSC		
R	0.10	-	-	0.004	-	-
θ	0°	4°	8°	0°	4°	8°
θ ₁	7° Nom			7° Nom		
ECN: C-06593-Rev. I, 18-Dec-06						
DWG: 5540						

RECOMMENDED MINIMUM PADS FOR TSOP-6



Recommended Minimum Pads
Dimensions in Inches/(mm)

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