

## Dual N-Channel 20-V (D-S) MOSFET

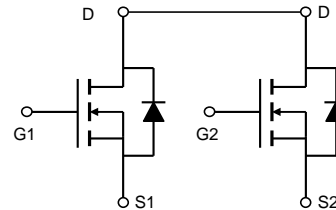
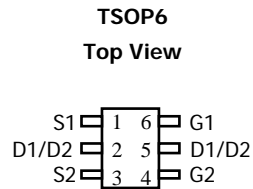
PRODUCT SUMMARY		
$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
20	0.024 at $V_{GS} = 4.5$ V	6.0
	0.028 at $V_{GS} = 2.5$ V	5.0

### FEATURES

- Halogen-free Option Available
- TrenchFET<sup>®</sup> Power MOSFETs
- 100 %  $R_g$  Tested
- Compliant to RoHS Directive 2002/95/EC



RoHS\*  
COMPLIANT



ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted					
Parameter	Symbol	10 s	Steady State	Unit	
Drain-Source Voltage	$V_{DS}$	20		V	
Gate-Source Voltage	$V_{GS}$	$\pm 12$			
Continuous Drain Current ( $T_J = 150$ °C) <sup>a</sup>	$I_D$	$T_A = 25$ °C	6.0	5.2	A
		$T_A = 70$ °C	4.8	4.2	
Pulsed Drain Current	$I_{DM}$	30			
Continuous Source Current (Diode Conduction) <sup>a</sup>	$I_S$	1.5	1.0		
Maximum Power Dissipation <sup>a</sup>	$P_D$	$T_A = 25$ °C	1.5	1.0	W
		$T_A = 70$ °C	0.96	0.64	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 150		°C	

THERMAL RESISTANCE RATINGS					
Parameter	Symbol	Typ.	Max.	Unit	
Maximum Junction-to-Ambient <sup>a</sup>	$R_{thJA}$	$t \leq 10$ s	72	83	°C/W
		Steady State	100	120	
Maximum Junction-to-Foot (Drain)	$R_{thJF}$	55	70		

Notes:

a. Surface Mounted on FR4 board,  $t \leq 10$  s.

\* Pb containing terminations are not RoHS compliant, exemptions may apply.

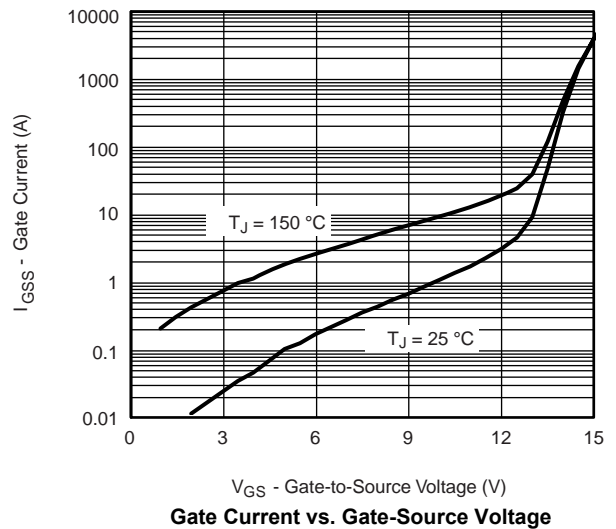
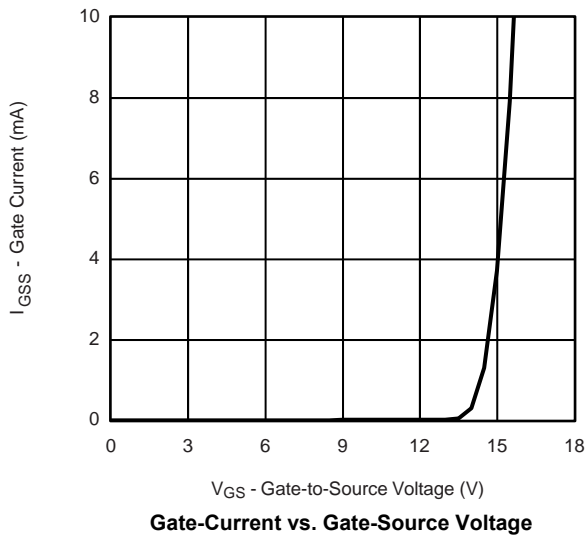
<b>SPECIFICATIONS</b> $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ. <sup>a</sup>	Max.	Unit
<b>Static</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	0.5		1.5	V
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\ \text{V}, V_{GS} = \pm 4.5\ \text{V}$			$\pm 200$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 20\ \text{V}, V_{GS} = 0\ \text{V}$			1	$\mu\text{A}$
		$V_{DS} = 20\ \text{V}, V_{GS} = 0\ \text{V}, T_J = 70\text{ }^\circ\text{C}$			25	
On-State Drain Current <sup>b</sup>	$I_{D(on)}$	$V_{DS} \leq 5\ \text{V}, V_{GS} = 4.5\ \text{V}$	30			A
Drain-Source On-State Resistance <sup>b</sup>	$R_{DS(on)}$	$V_{GS} = 4.5\ \text{V}, I_D = 5.5\ \text{A}$		0.024		$\Omega$
		$V_{GS} = 2.5\ \text{V}, I_D = 3.5\ \text{A}$		0.028		
Forward Transconductance <sup>b</sup>	$g_{fs}$	$V_{DS} = 10\ \text{V}, I_D = 5.5\ \text{A}$		30		S
Diode Forward Voltage <sup>b</sup>	$V_{SD}$	$I_S = 1.5\ \text{A}, V_{GS} = 0\ \text{V}$		0.71	1.2	V
<b>Dynamic<sup>a</sup></b>						
Total Gate Charge	$Q_g$	$V_{DS} = 10\ \text{V}, V_{GS} = 4.5\ \text{V}, I_D = 5.5\ \text{A}$		12		nC
Gate-Source Charge	$Q_{gs}$			2.2		
Gate-Drain Charge	$Q_{gd}$			3.6		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10\ \text{V}, R_L = 10\ \Omega$ $I_D \cong 1\ \text{A}, V_{GEN} = 4.5\ \text{V}, R_G = 6\ \Omega$		245	365	ns
Rise Time	$t_r$			330	495	
Turn-Off Delay Time	$t_{d(off)}$			860	1300	
Fall Time	$t_f$			510	765	

Notes:

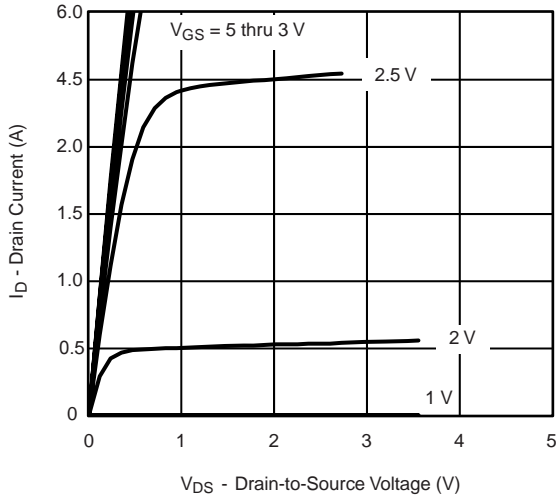
- a. For design aid only; not subject to production testing.
- b. Pulse test; pulse width  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$ .

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.

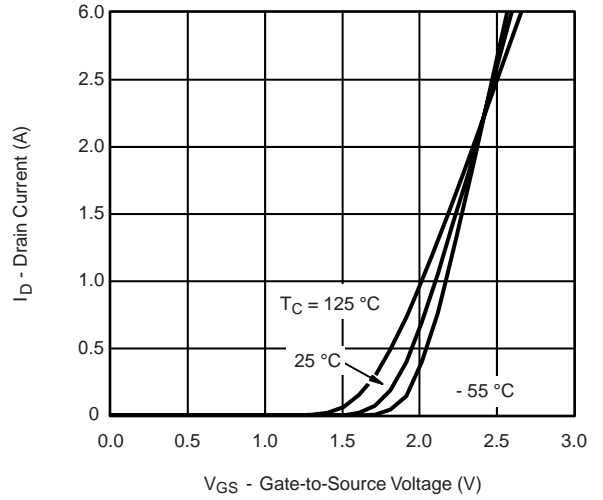
**TYPICAL CHARACTERISTICS**  $25\text{ }^\circ\text{C}$ , unless otherwise noted



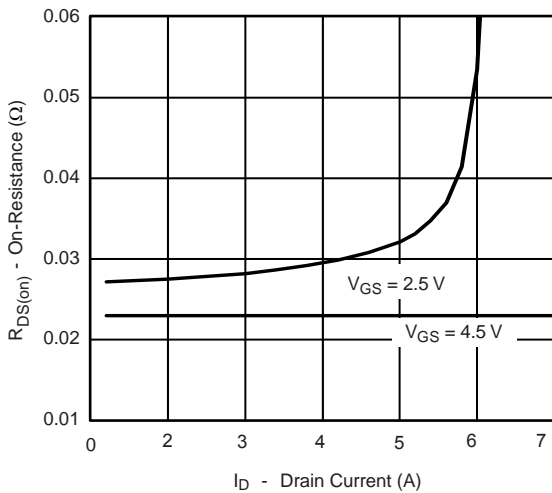
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



**Output Characteristics**



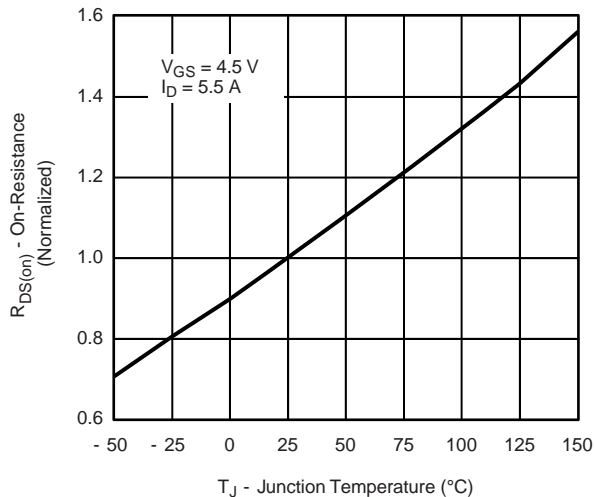
**Transfer Characteristics**



**On-Resistance vs. Drain Current**



**Gate Charge**

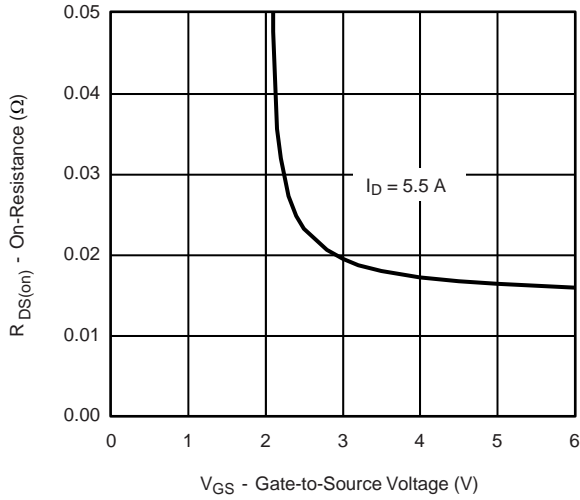


**On-Resistance vs. Junction Temperature**



**Source-Drain Diode Forward Voltage**

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



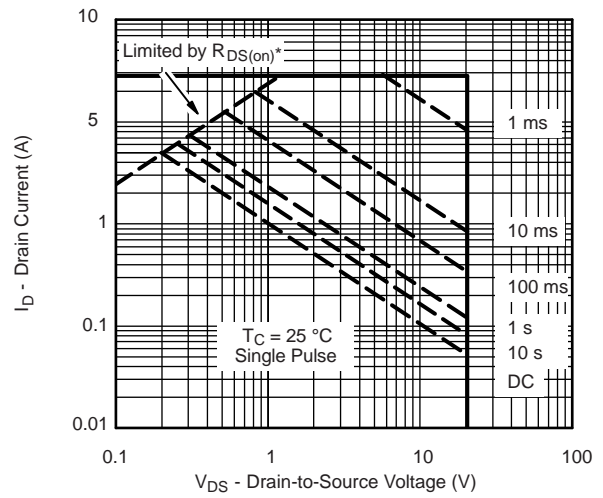
**On-Resistance vs. Gate-to-Source Voltage**



**Threshold Voltage**



**Single Pulse Power**



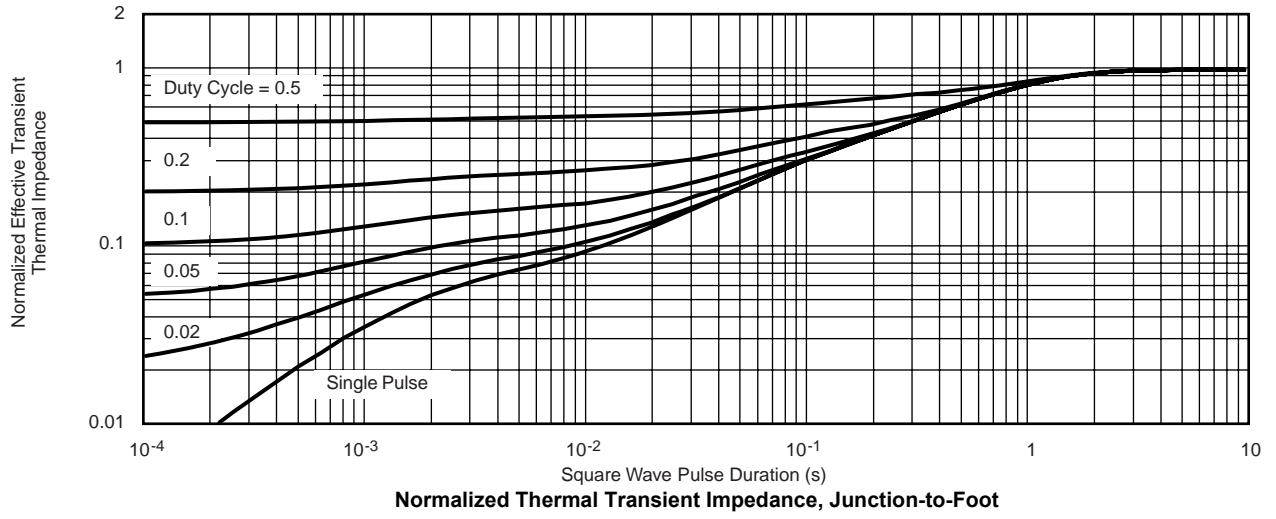
**Safe Operating Area, Junction-to-Case**  
\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified



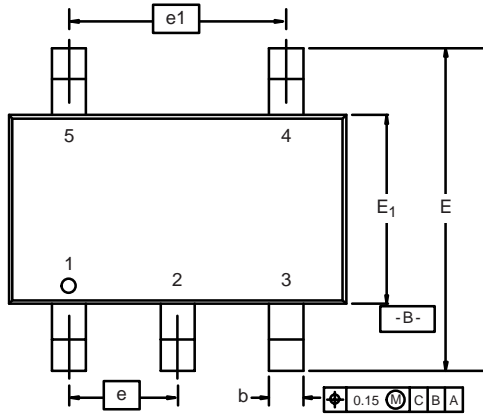
- Notes:
- Duty Cycle,  $D = \frac{t_1}{t_2}$
  - Per Unit Base =  $R_{thJA} = 115 \text{ } ^\circ\text{C/W}$
  - $T_{JM} - T_A = P_{DM}Z_{thJA}(t)$
  - Surface Mounted

**Normalized Thermal Transient Impedance, Junction-to-Ambient**

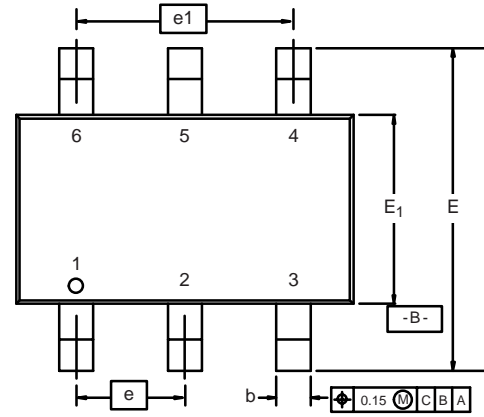
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



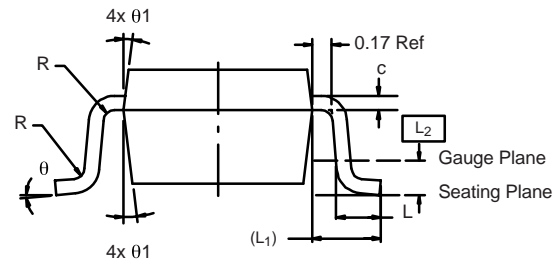
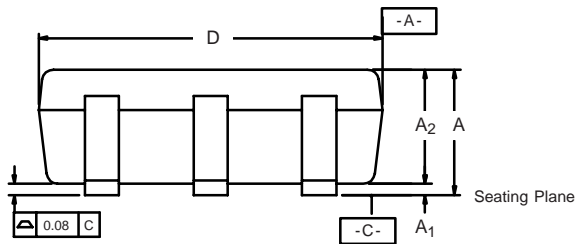
TSOP: 5/6-LEAD  
JEDEC Part Number: MO-193C



5-LEAD TSOP

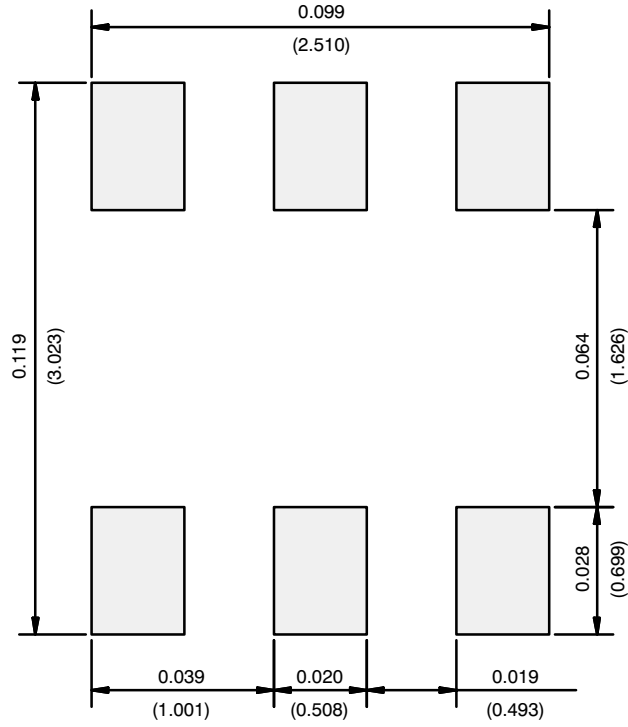


6-LEAD TSOP



Dim	MILLIMETERS			INCHES		
	Min	Nom	Max	Min	Nom	Max
A	0.91	-	1.10	0.036	-	0.043
A <sub>1</sub>	0.01	-	0.10	0.0004	-	0.004
A <sub>2</sub>	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 <sub>1</sub>	1.55	1.65	1.70	0.061	0.065	0.067
e	0.95 BSC			0.0374 BSC		
e <sub>1</sub>	1.80	1.90	2.00	0.071	0.075	0.079
L	0.32	-	0.50	0.012	-	0.020
L <sub>1</sub>	0.60 Ref			0.024 Ref		
L <sub>2</sub>	0.25 BSC			0.010 BSC		
R	0.10	-	-	0.004	-	-
θ	0°	4°	8°	0°	4°	8°
θ <sub>1</sub>	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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