

QS6M4TR-VB Datasheet

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

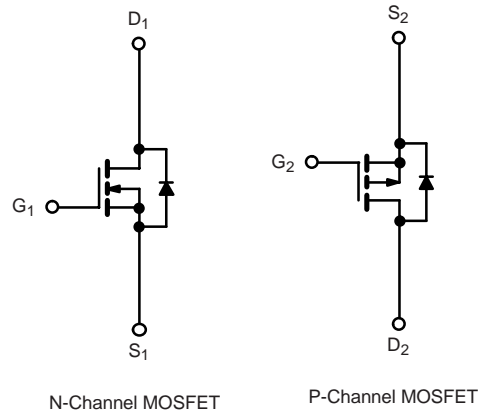
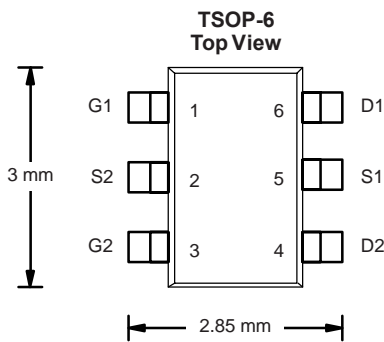
PRODUCT SUMMARY			
	V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A)
N-Channel	20	0.022 at V _{GS} = 10 V	5.5
		0.030 at V _{GS} = 4.5 V	4.2
P-Channel	- 20	0.055 at V _{GS} = - 10 V	- 3.4
		0.079 at V _{GS} = - 4.5 V	- 2.5

FEATURES

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



RoHS
COMPLIANT
HALOGEN
FREE
Available



ABSOLUTE MAXIMUM RATINGS T _A = 25 °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}	I _D	T _A = 25 °C	5.5	A	
		T _A = 70 °C	4.0		
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}	P _D	T _A = 25 °C	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	t ≤ 5 s	R _{thJA}	93	110	°C/W
	Steady State		130	150	
Maximum Junction-to-Lead	Steady State	R _{thJL}	75	90	

Notes:

a. Surface Mounted on FR4 board.

b. t ≤ 5 s.

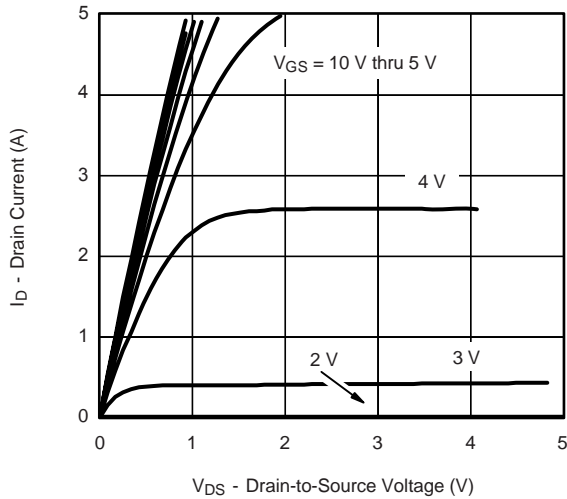
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted							
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit	
Static							
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	N-Ch	0.5	0.8	1.5	V
		$V_{DS} = V_{GS}, I_D = -250\ \mu\text{A}$	P-Ch	-0.5	-0.8	-1.5	
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\ \text{V}, V_{GS} = \pm 8\ \text{V}$	N-Ch P-Ch			± 100 ± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 16\ \text{V}, V_{GS} = 0\ \text{V}$	N-Ch			1	μA
		$V_{DS} = -16\ \text{V}, V_{GS} = 0\ \text{V}$	P-Ch			-1	
		$V_{DS} = 16\ \text{V}, V_{GS} = 0\ \text{V}, T_J = 55\text{ }^\circ\text{C}$	N-Ch			5	
		$V_{DS} = -16\ \text{V}, V_{GS} = 0\ \text{V}, T_J = 55\text{ }^\circ\text{C}$	P-Ch			-5	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} = 5\ \text{V}, V_{GS} = 10\ \text{V}$	N-Ch	3.7			A
		$V_{DS} = -5\ \text{V}, V_{GS} = -10\ \text{V}$	P-Ch	-3			
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\ \text{V}, I_D = 2.5\ \text{A}$	N-Ch		0.022		Ω
		$V_{GS} = -10\ \text{V}, I_D = -1.8\ \text{A}$	P-Ch		0.055		
		$V_{GS} = 4.5\ \text{V}, I_D = 2.0\ \text{A}$	N-Ch		0.030		
		$V_{GS} = -4.5\ \text{V}, I_D = -1.2\ \text{A}$	P-Ch		0.079		
Forward Transconductance ^a	g_{fs}	$V_{DS} = 10\ \text{V}, I_D = 2.5\ \text{A}$	N-Ch		4.3		S
		$V_{DS} = -15\ \text{V}, I_D = -1.8\ \text{A}$	P-Ch		2.4		
Diode Forward Voltage ^a	V_{SD}	$I_S = 1.05\ \text{A}, V_{GS} = 0\ \text{V}$	N-Ch		0.81	1.10	V
		$I_S = -1.05\ \text{A}, V_{GS} = 0\ \text{V}$	P-Ch		-0.83	-1.10	
Dynamic^b							
Total Gate Charge	Q_g	N-Channel $V_{DS} = 15\ \text{V}, V_{GS} = 5\ \text{V}, I_D = 1.8\ \text{A}$	N-Ch		2.1	3.2	nC
Gate-Source Charge	Q_{gs}		P-Ch		2.4	3.6	
Gate-Drain Charge	Q_{gd}	P-Channel $V_{DS} = -15\ \text{V}, V_{GS} = -5\ \text{V}, I_D = -1.8\ \text{A}$	N-Ch		0.7		
			P-Ch		0.9		
Gate Resistance	R_g		N-Ch	0.5		2.4	Ω
			P-Ch	3		11	
Turn-On Delay Time	$t_{d(on)}$	N-Channel $V_{DD} = 15\ \text{V}, R_L = 15\ \Omega$ $I_D \cong 1\ \text{A}, V_{GEN} = 10\ \text{V}, R_g = 6\ \Omega$	N-Ch		7	11	ns
Rise Time	t_r		P-Ch		8	12	
Turn-Off Delay Time	$t_{d(off)}$	P-Channel $V_{DD} = -15\ \text{V}, R_L = 15\ \Omega$ $I_D \cong -1\ \text{A}, V_{GEN} = -10\ \text{V}, R_g = 6\ \Omega$	N-Ch		13	20	
			P-Ch		12	18	
Fall Time	t_f		N-Ch		5	8	
			P-Ch		7	11	
Source-Drain Reverse Recovery Time	t_{rr}	$I_F = 1.05\ \text{A}, dI/dt = 100\ \text{A}/\mu\text{s}$	N-Ch		35	60	
		$I_F = -1.05\ \text{A}, dI/dt = 100\ \text{A}/\mu\text{s}$	P-Ch		30	60	

Notes:

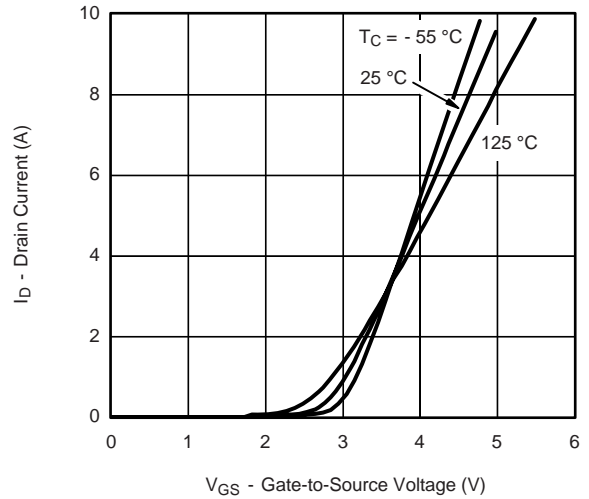
- a. Pulse test; pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.
- b. Guaranteed by design, not subject to production testing.

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.

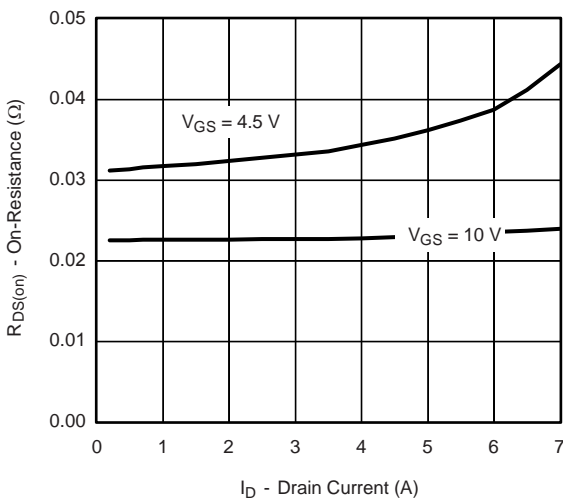
N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



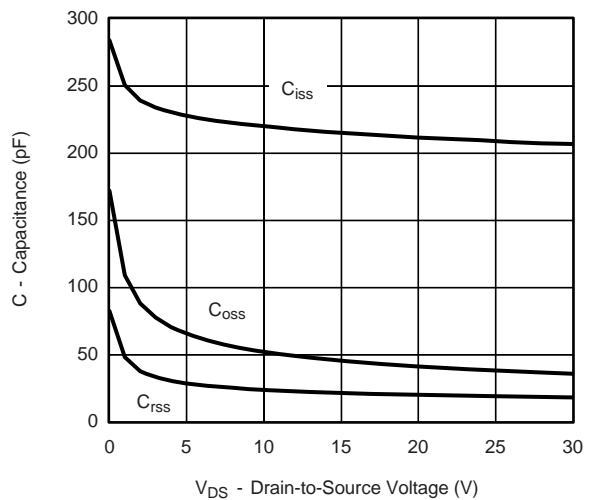
Output Characteristics



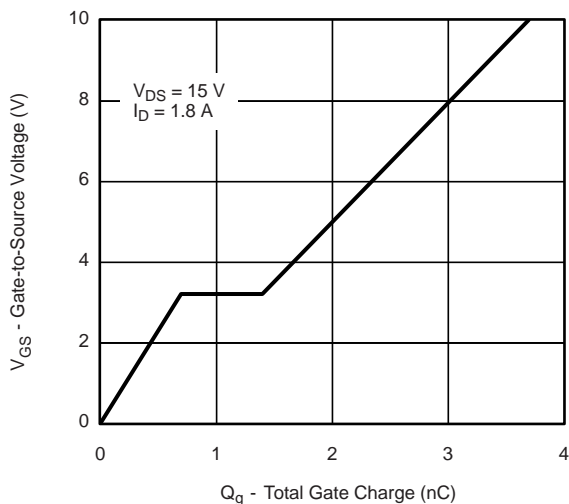
Transfer Characteristics



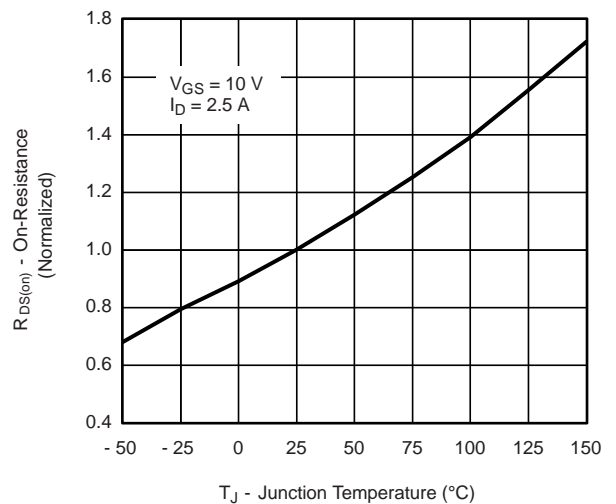
On-Resistance vs. Drain Current



Capacitance

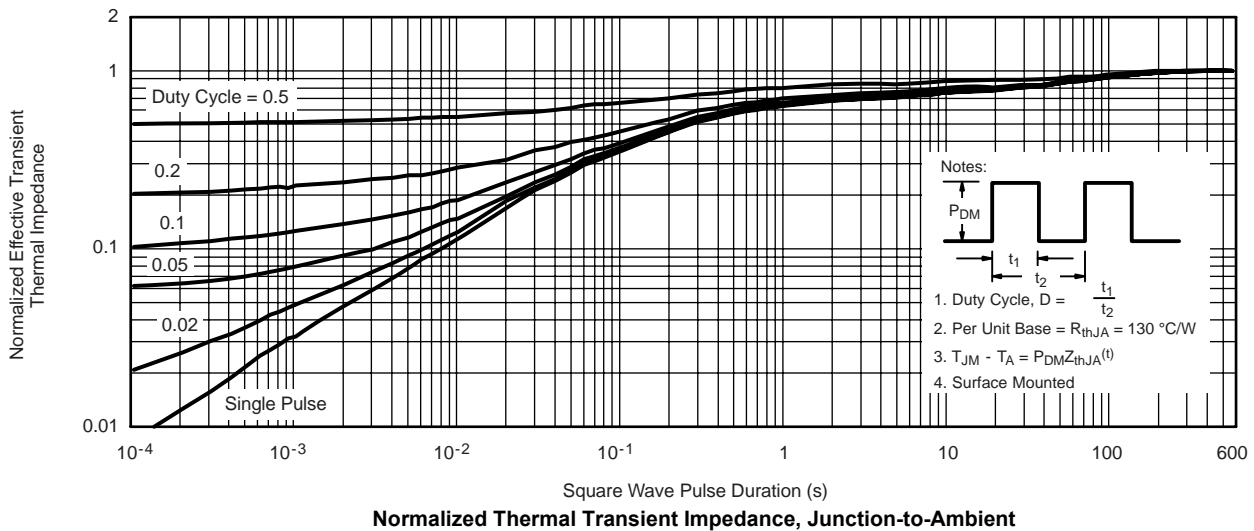
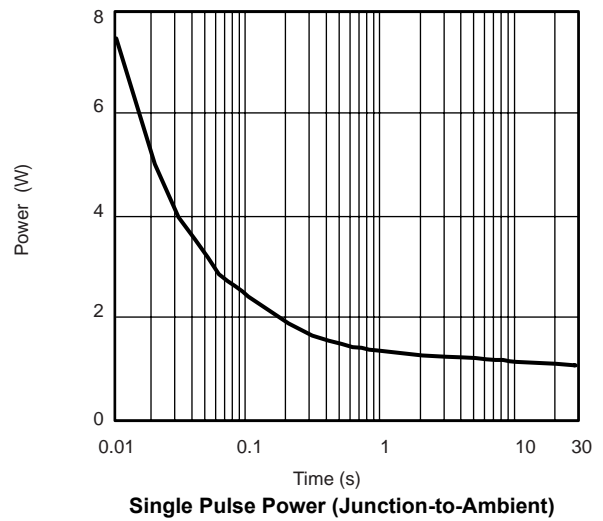
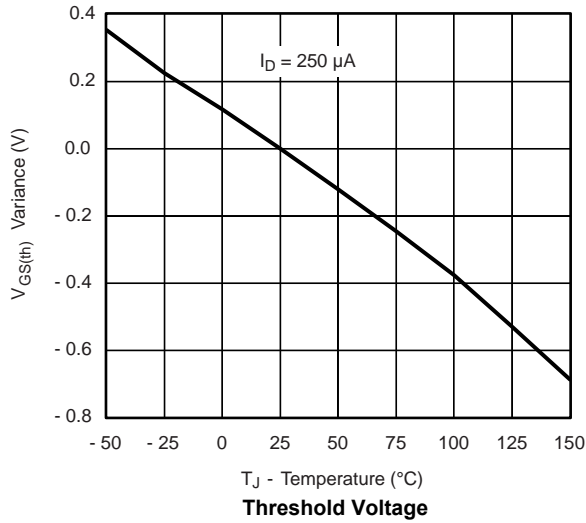
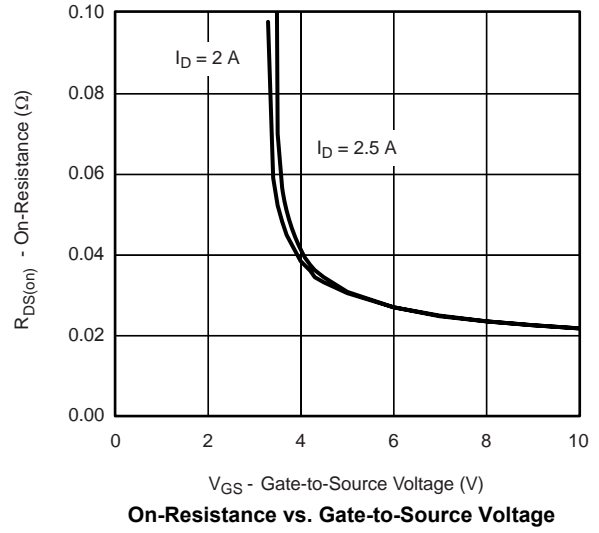
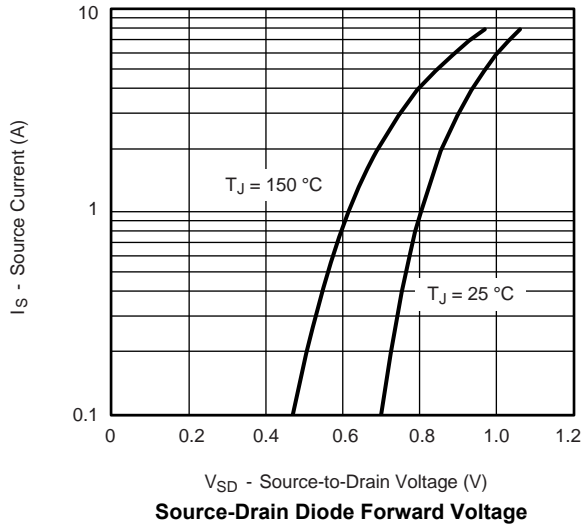


Gate Charge

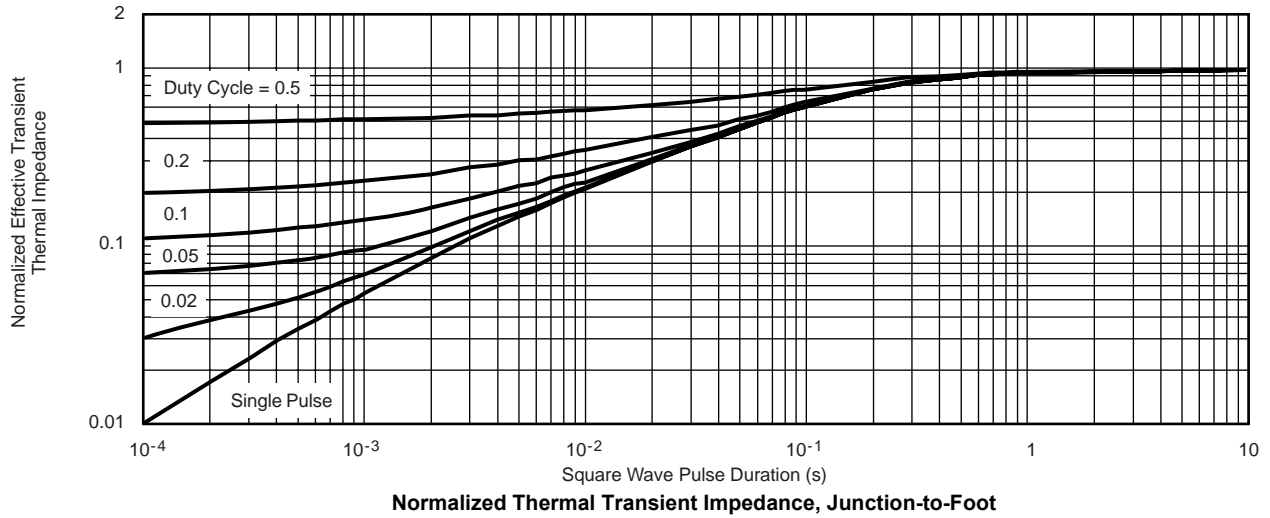


On-Resistance vs. Junction Temperature

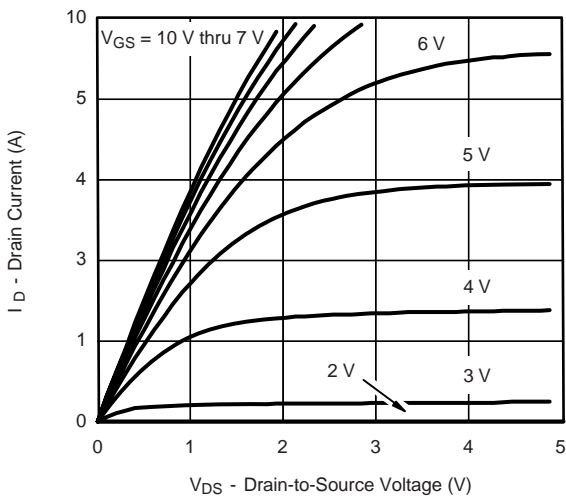
N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



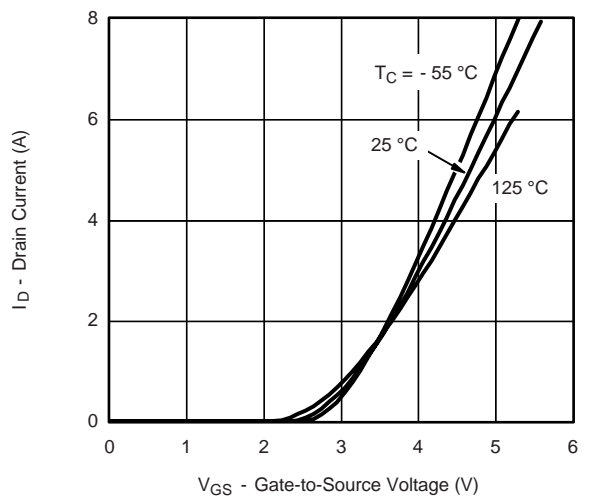
N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



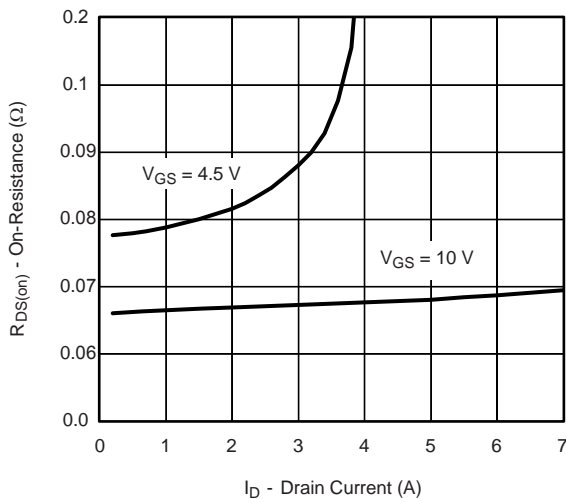
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



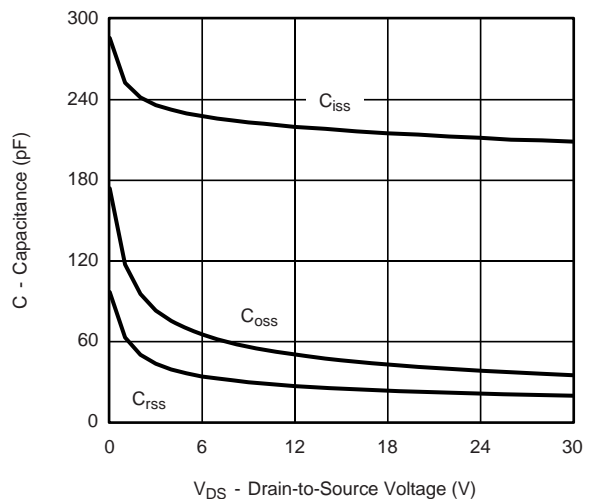
Output Characteristics



Transfer Characteristics

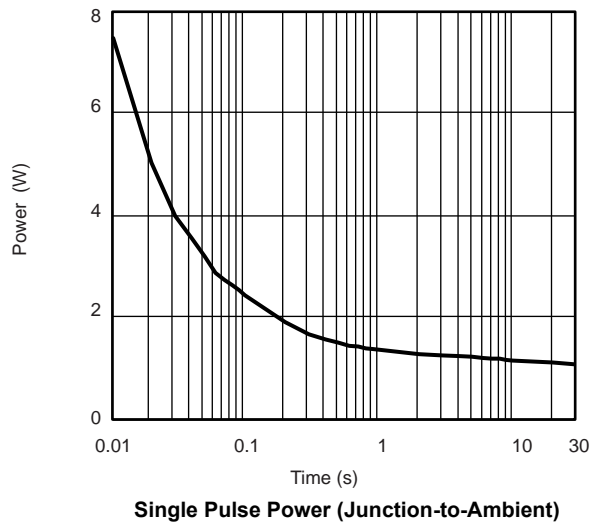
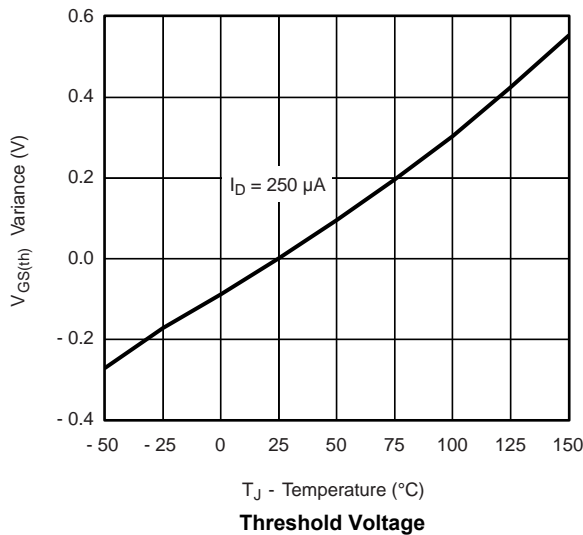
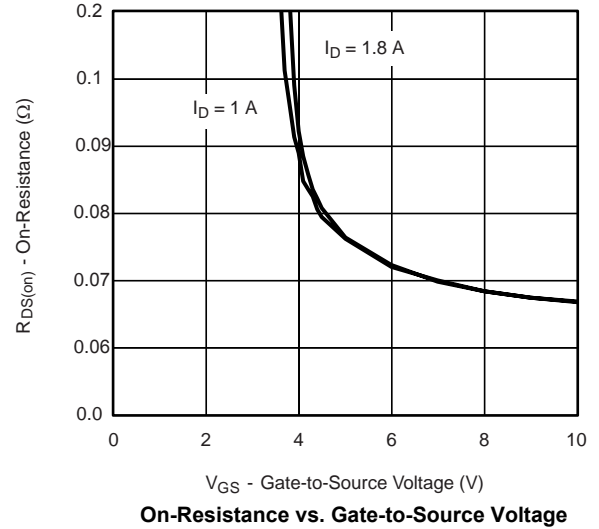
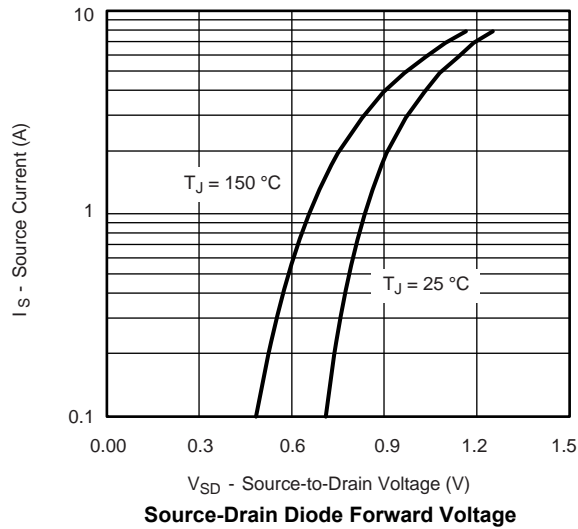
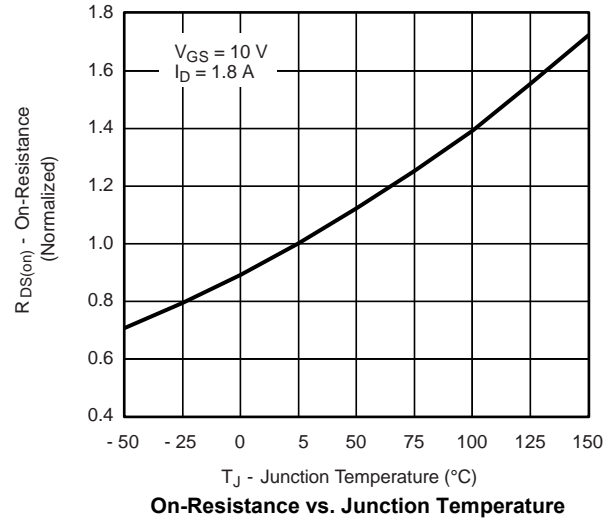
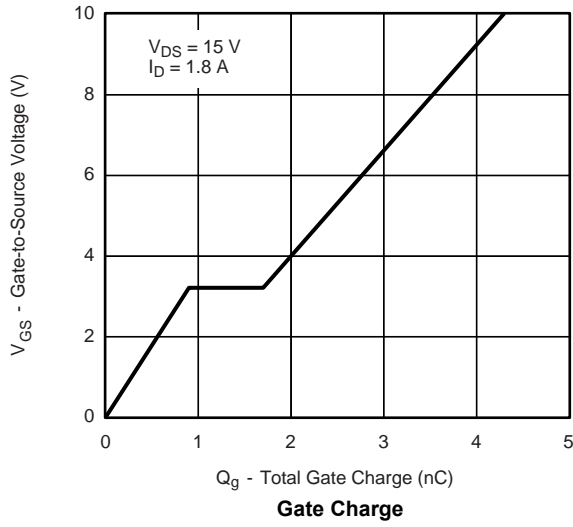


On-Resistance vs. Drain Current

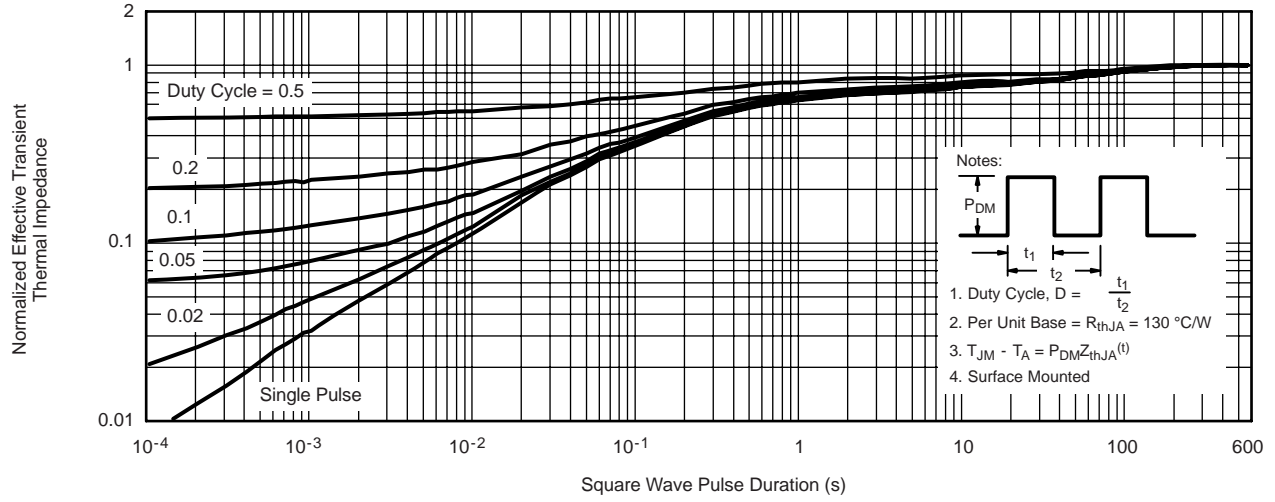


Capacitance

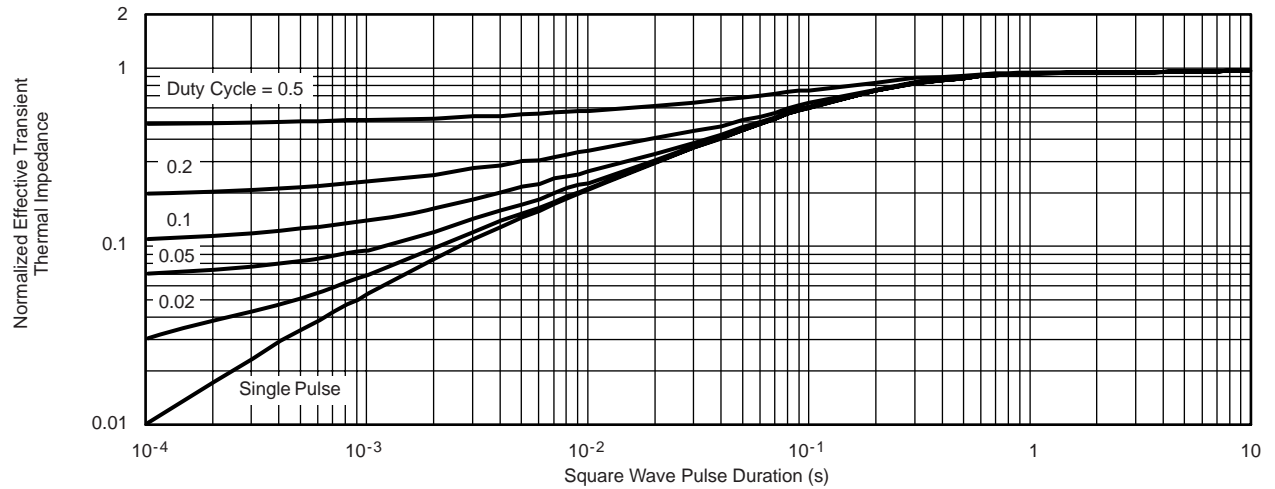
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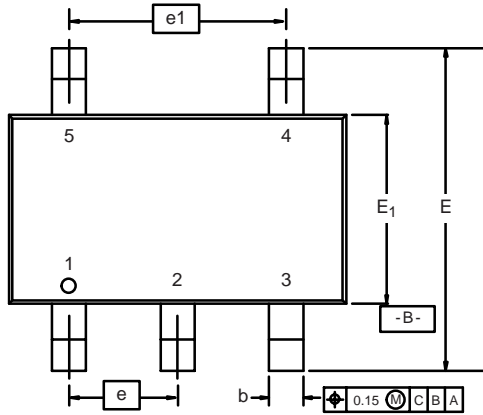


Normalized Thermal Transient Impedance, Junction-to-Ambient

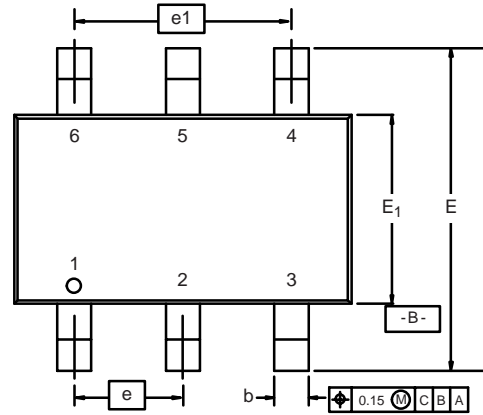


Normalized Thermal Transient Impedance, Junction-to-Foot

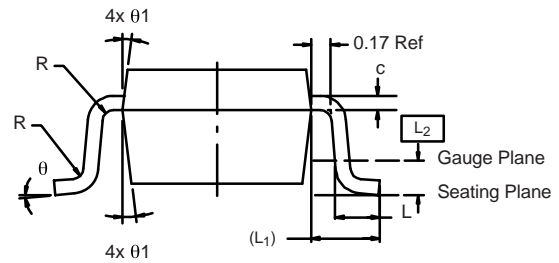
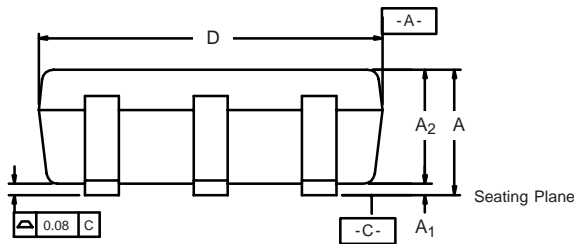
TSOP: 5/6-LEAD
JEDEC Part Number: MO-193C



5-LEAD TSOP

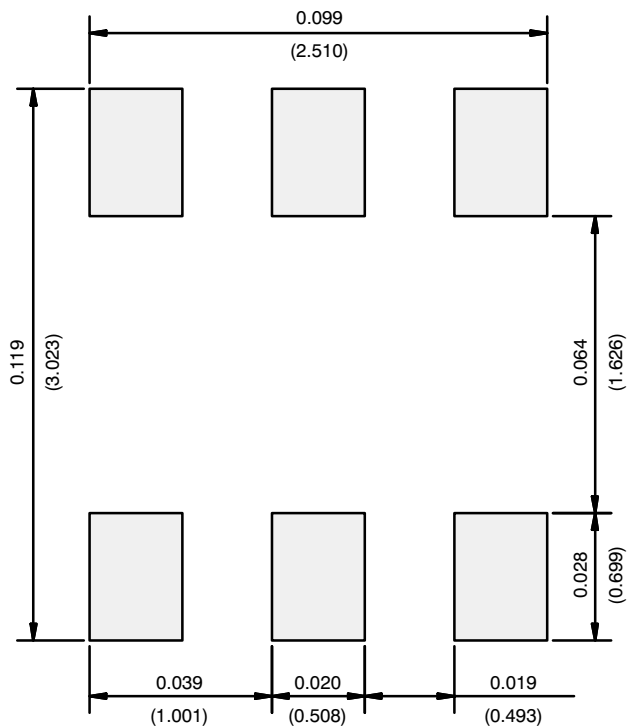


6-LEAD TSOP



Dim	MILLIMETERS			INCHES		
	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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