

SI3993DV-T1-E3-VB Datasheet

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

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^a	Q_g (Typ.)
- 20	0.075 at $V_{GS} = -4.5V$	- 4.0	2.7 nC
	0.100 at $V_{GS} = -2.5V$	- 3.2	

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

APPLICATIONS

- Load Switch for Portable Applications
- Battery Switch for Portable Devices
- Computers
 - Bus Switch
 - Load Switch



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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	- 20	V
Gate-Source Voltage	V_{GS}	± 12	
Continuous Drain Current ($T_J = 150^\circ\text{C}$)	I_D	$T_C = 25^\circ\text{C}$	A
		$T_C = 70^\circ\text{C}$	
		$T_A = 25^\circ\text{C}$	
		$T_A = 70^\circ\text{C}$	
Pulsed Drain Current	I_{DM}	- 12	A
Continuous Source-Drain Diode Current	I_S	$T_C = 25^\circ\text{C}$	
		$T_A = 25^\circ\text{C}$	
Maximum Power Dissipation	P_D	$T_C = 25^\circ\text{C}$	W
		$T_C = 70^\circ\text{C}$	
		$T_A = 25^\circ\text{C}$	
		$T_A = 70^\circ\text{C}$	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150	$^\circ\text{C}$

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{b, d}	R_{thJA}	93	110	$^\circ\text{C/W}$
Maximum Junction-to-Foot	R_{thJF}	75	90	

Notes:

- $T_C = 25^\circ\text{C}$.
- Surface mounted on 1" x 1" FR4 board.
- $t = 5$ s.
- Maximum under steady state conditions is 150°C/W .

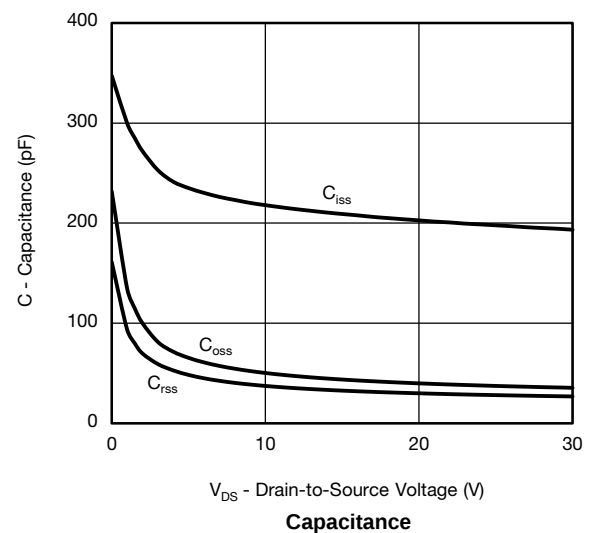
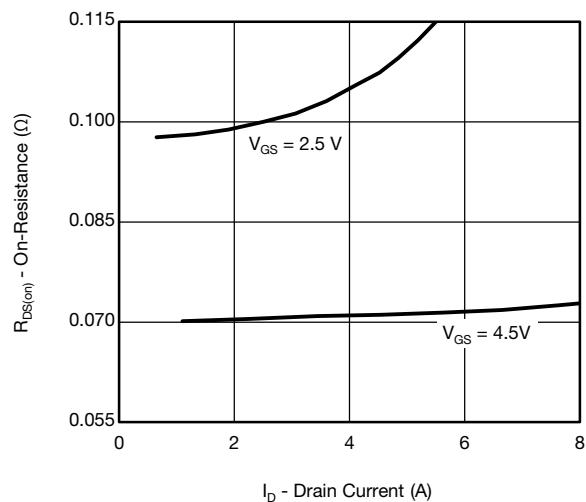
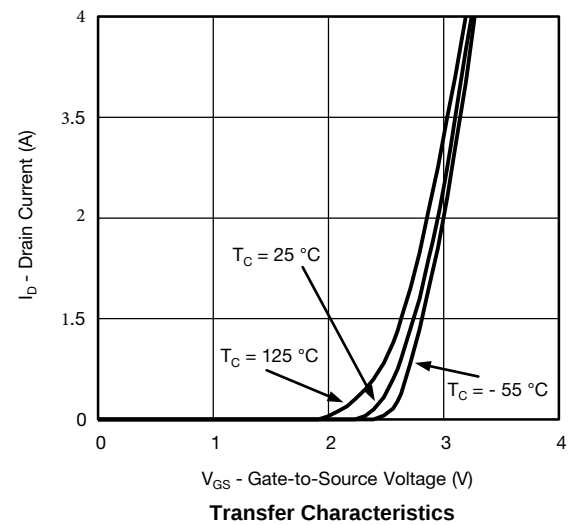
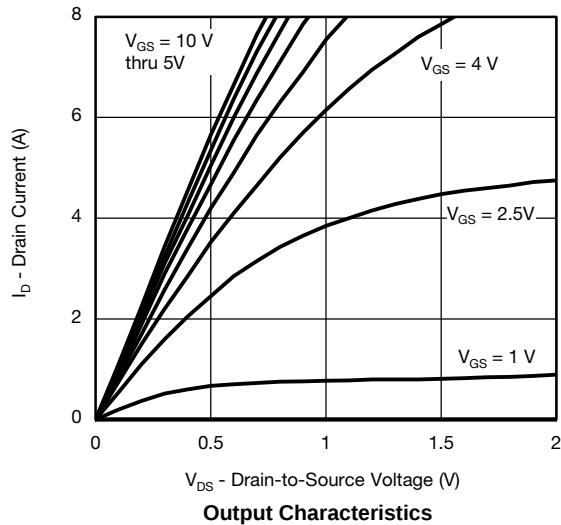
SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = - 250 μA	- 20			V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = - 250 μA		- 17		mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J			3.5		
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = - 250 μA	- 0.5		- 2.0	V
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 12 V			± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = - 20 V, V _{GS} = 0 V			1	μA
		V _{DS} = - 20 V, V _{GS} = 0 V, T _J = 55 °C			10	
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≤ - 5 V, V _{GS} = - 4.5V	- 8			A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = - 4.5V, I _D = - 2.5 A		0.075		Ω
		V _{GS} = - 2.5 V, I _D = - 1 A		0.100		
Forward Transconductance ^a	g _{fs}	V _{DS} = - 10 V, I _D = - 2.6 A		5		S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{DS} = - 10 V, V _{GS} = 0 V, f = 1 MHz		210		pF
Output Capacitance	C _{oss}			45		
Reverse Transfer Capacitance	C _{rss}			33		
Total Gate Charge	Q _g	V _{DS} = - 10 V, V _{GS} = - 4.5 V, I _D = - 2.6 A		5.2	8	nC
				2.7	4	
Gate-Source Charge	Q _{gs}	V _{DS} = - 10 V, V _{GS} = - 4.5 V, I _D = - 2.6 A		0.94		
Gate-Drain Charge	Q _{gd}			1.3		
Gate Resistance	R _g	f = 1 MHz	2	7	14	Ω
Turn-On Delay Time	t _{d(on)}	V _{DD} = - 10 V, R _L = 7.1 Ω I _D ≅ - 2.1 A, V _{GEN} = - 4.5 V, R _g = 1 Ω		39	59	ns
Rise Time	t _r			25	38	
Turn-Off Delay Time	t _{d(off)}			13	20	
Fall Time	t _f			9	18	
Turn-On Delay Time	t _{d(on)}	V _{DD} = - 10 V, R _L = 7.1 Ω I _D ≅ - 2.1 A, V _{GEN} = - 4.5 V, R _g = 1 Ω		5	10	
Rise Time	t _r			10	20	
Turn-Off Delay Time	t _{d(off)}			14	21	
Fall Time	t _f			7	14	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C			1.17	A
Pulse Diode Forward Current	I _{SM}				8	
Body Diode Voltage	V _{SD}	I _S = - 2.1 A, V _{GS} = 0 V		0.85	1.2	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = - 2.1 A, dI/dt = 100 A/μs, T _J = 25 °C		13	20	ns
Body Diode Reverse Recovery Charge	Q _{rr}			6	12	nC
Reverse Recovery Fall Time	t _a			9		ns
Reverse Recovery Rise Time	t _b			4		

Notes:

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

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)


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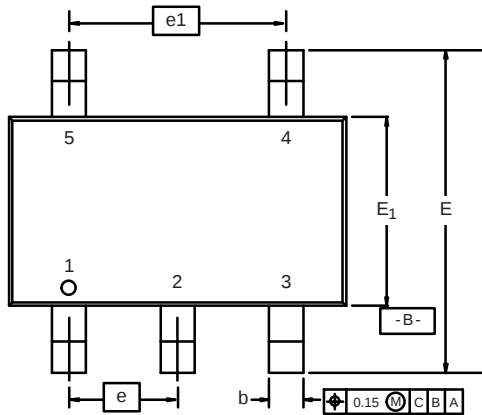

* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

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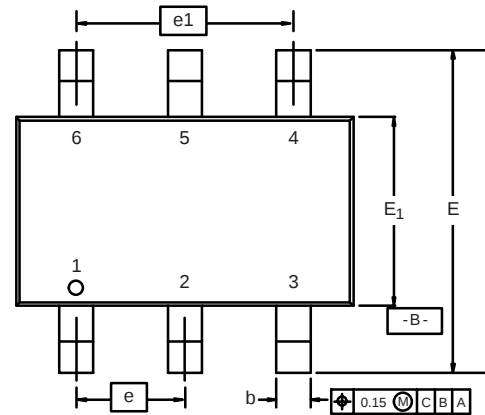


TSOP: 5/6-LEAD

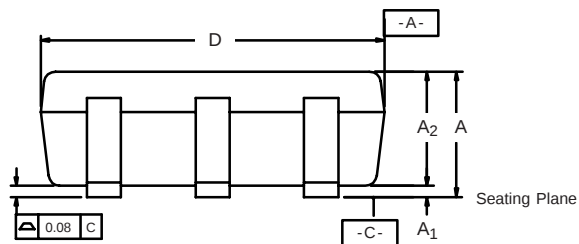
JEDEC Part Number: MO-193C



5-LEAD TSOP

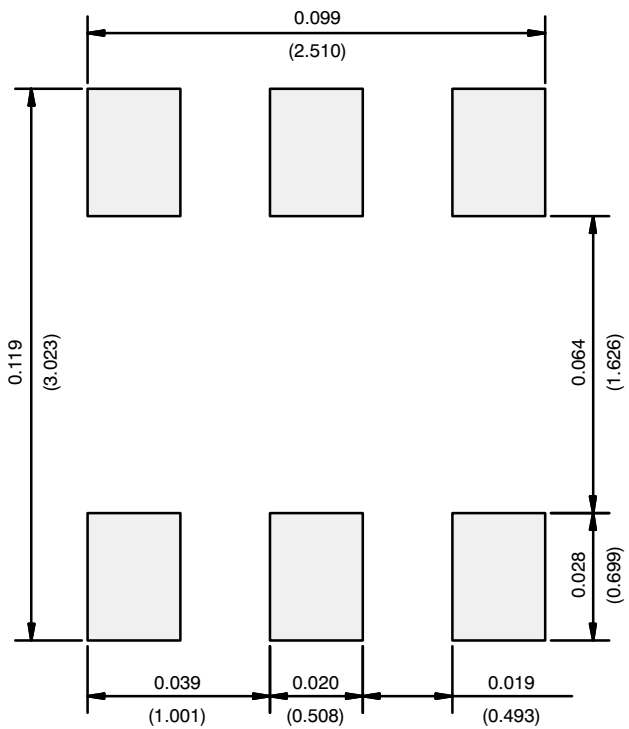


6-LEAD TSOP



	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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