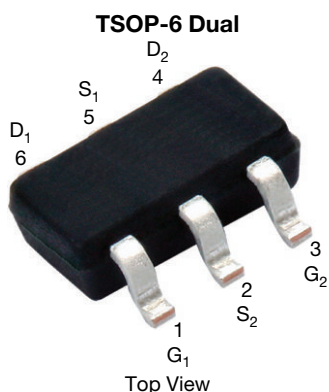


Automotive N- and P-Channel 20 V (D-S) MOSFET

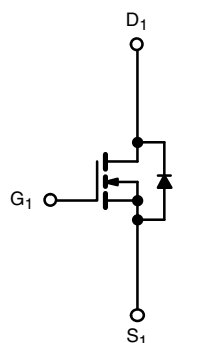


FEATURES

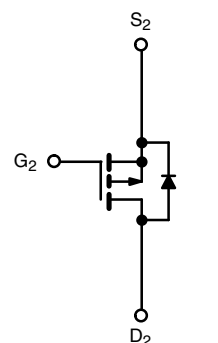
- TrenchFET® power MOSFET
- AEC-Q101 qualified
- 100 % R_g and UIS tested
- Material categorization:
for definitions of compliance please see
www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE



N-Channel MOSFET



P-Channel MOSFET

PRODUCT SUMMARY

	N-CHANNEL	P-CHANNEL
V _{DS} (V)	20	-20
R _{DS(on)} (Ω) at V _{GS} = 4.5 V	0.077	0.166
R _{DS(on)} (Ω) at V _{GS} = ± 2.5 V	0.120	0.318
I _D (A)	3.57	-2.5
Configuration	Dual	
Package	TSOP-6	

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}	± 12	± 12	
Continuous Drain Current (T _J = 150 °C) ^a	I _D	3.57	-2.5	A
		2	-1.45	
Pulsed Drain Current	I _{DM}	12	-10	
Continuous Source Current (Diode Conduction) ^a	I _S	2.1	-2.1	
Maximum Power Dissipation ^a	P _D	1.67	1.67	W
		0.56	0.56	
Unclamped Inductive Surge UIS	I _{AV}	3.3	3	A
Operating Junction and Storage Temperature Range	T _J , T _{stg}	-55 to +175		°C

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	N-CHANNEL	P-CHANNEL	UNIT
		MAX.	MAX.	
Maximum Junction-to-Ambient ^a	R _{thJA}	150	150	°C/W
Maximum Junction-to-Foot (Drain)	R _{thJF}	90	90	

Note

a. Surface mounted on 1" x 1" FR4 board.

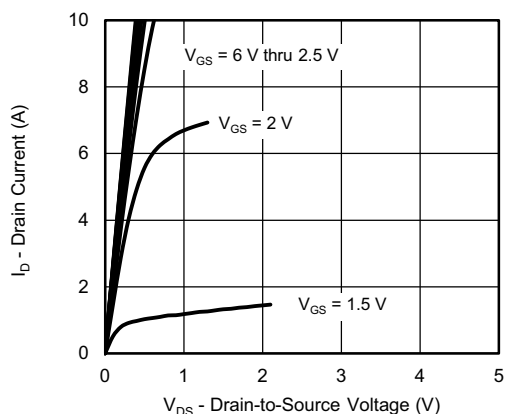
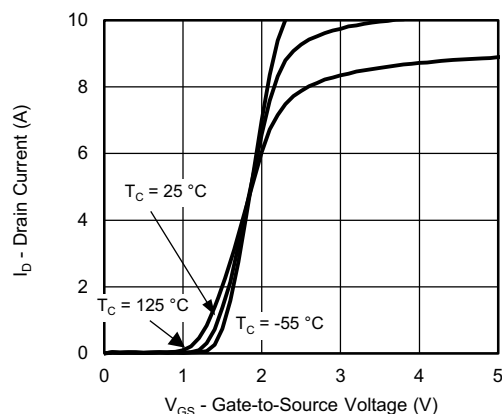
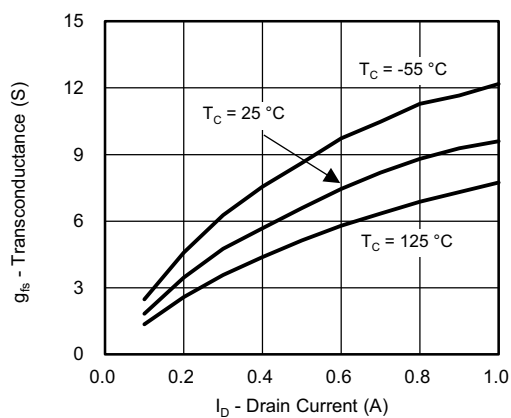
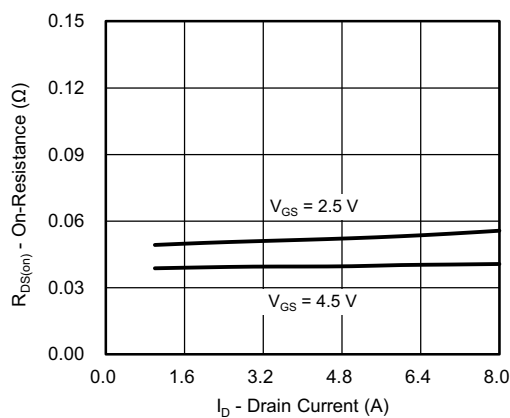
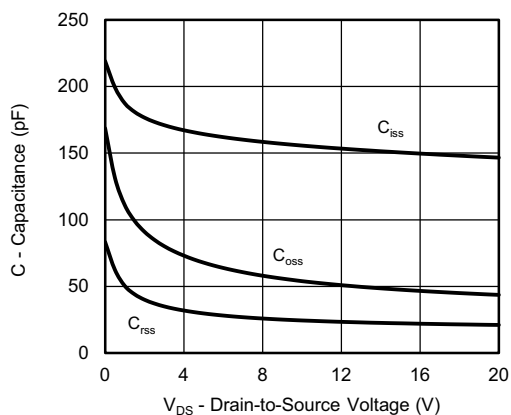
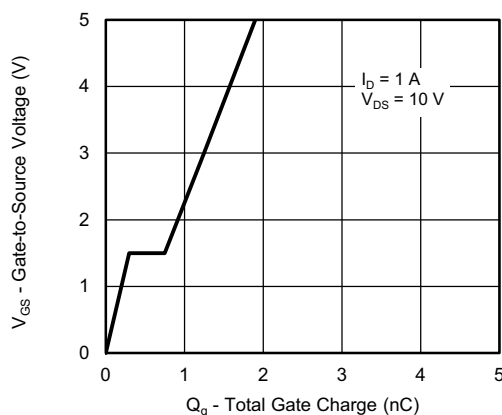


SPECIFICATIONS (T _J = 25°C, unless otherwise noted)									
PARAMETER		SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT	
Static									
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA		N-Ch	0.6	-	1.5	V	
		V _{DS} = V _{GS} , I _D = -250 μA		P-Ch	-0.6	-	-1.5		
Gate-Body Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 12 V		N-Ch	-	-	± 100	nA	
				P-Ch	-	-	± 100		
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V	V _{DS} = 30 V	N-Ch	-	-	1	μA	
		V _{GS} = 0 V	V _{DS} = -30 V	P-Ch	-	-	-1		
		V _{GS} = 0 V	V _{DS} = 30 V, T _J = 55 °C	N-Ch	-	-	5		
		V _{GS} = 0 V	V _{DS} = -30 V, T _J = 55 °C	P-Ch	-	-	-5		
On-State Drain Current ^a	I _{D(on)}	V _{GS} = 4.5 V	V _{DS} ≥ 5 V	N-Ch	5	-	-	A	
		V _{GS} = -4.5 V	V _{DS} ≤ -5 V	P-Ch	-5	-	-		
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 4.5 V	I _D = 1 A	N-Ch	-	0.049	0.077	Ω	
		V _{GS} = -4.5 V	I _D = -1 A	P-Ch	-	0.140	0.166		
		V _{GS} = 2.5 V	I _D = 1 A	N-Ch	-	0.066	0.120		
		V _{GS} = -2.5 V	I _D = -1 A	P-Ch	-	0.265	0.318		
Forward Transconductance ^a	g _{fs}	V _{DS} = 5 V, I _D = 1 A		N-Ch	-	10	-	S	
		V _{DS} = -5 V, I _D = -1 A		P-Ch	-	3	-		
Diode Forward Voltage ^a	V _{SD}	I _S = 1.05 A, V _{GS} = 0 V		N-Ch	-	0.80	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	V _{GS} = 4.5 V	V _{DS} = 10 V, I _D = 1 A	N-Ch	-	1.8	2.5	nC	
		V _{GS} = -4.5 V	V _{DS} = -10 V, I _D = -1 A	P-Ch	-	2.4	3.5		
Gate-Source Charge	Q _{gs}	V _{GS} = 4.5 V	V _{DS} = 10 V, I _D = 1 A	N-Ch	-	0.3	-		
		V _{GS} = -4.5 V	V _{DS} = -10 V, I _D = -1 A	P-Ch	-	0.4	-		
Gate-Drain Charge	Q _{gd}	V _{GS} = 4.5 V	V _{DS} = 10 V, I _D = 1 A	N-Ch	-	0.4	-		
		V _{GS} = -4.5 V	V _{DS} = -10 V, I _D = -1 A	P-Ch	-	0.7	-		
Gate Resistance	R _g	f = 1 MHz		N-Ch	3.4	-	9.1	Ω	
				P-Ch	3.4	-	9.1		
Turn-On Delay Time	t _{d(on)}	N-Channel V _{DD} = 10 V, R _L = 10 Ω I _D ≅ 1 A, V _{GEN} = 10 V, R _g = 1 kΩ		N-Ch	-	9	12	ns	
Rise Time	t _r			P-Ch	-	7	11		
				N-Ch	-	15	19		
				P-Ch	-	16	22		
Turn-Off Delay Time	t _{d(off)}	P-Channel V _{DD} = -10 V, R _L = 10 Ω I _D ≅ -1 A, V _{GEN} = -10 V, R _g = 1 kΩ		N-Ch	-	22	28		
				P-Ch	-	29	40		
Fall Time	t _f			N-Ch	-	8	12		
				P-Ch	-	14	24		

Notes

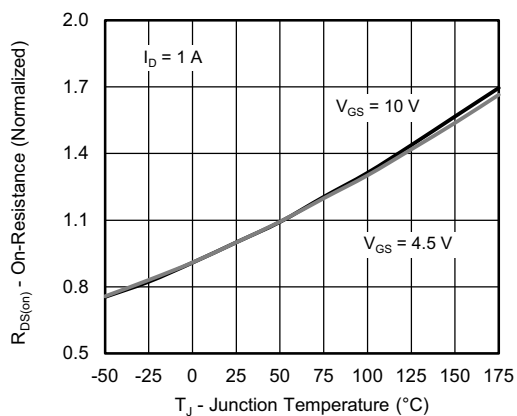
- a. Pulse test; pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\ \%$.
b. Guaranteed by design, not subject to production testing.

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.

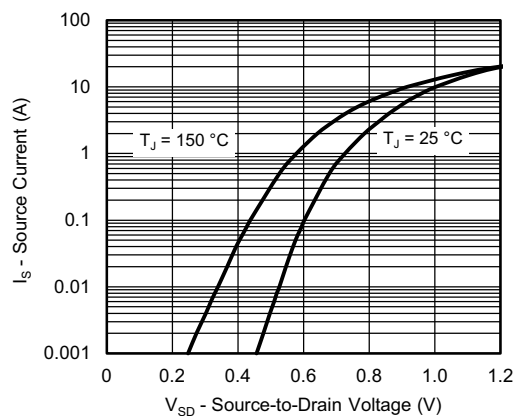
N-CHANNEL TYPICAL CHARACTERISTICS (25 °C unless otherwise noted)

Output Characteristics

Transfer Characteristics

Transconductance

On-Resistance vs. Drain Current

Capacitance

Gate Charge



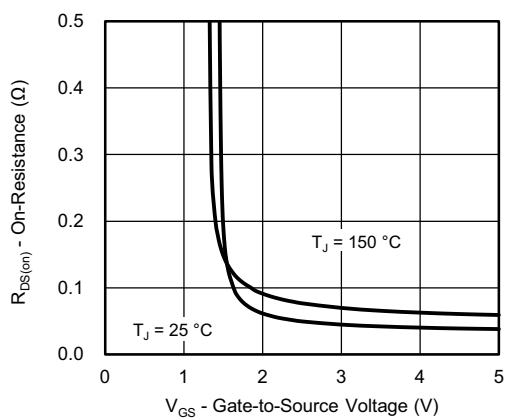
N-CHANNEL TYPICAL CHARACTERISTICS (25 °C unless otherwise noted)



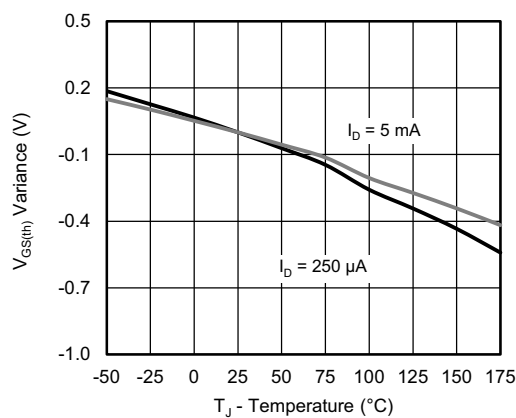
On-Resistance vs. Junction Temperature



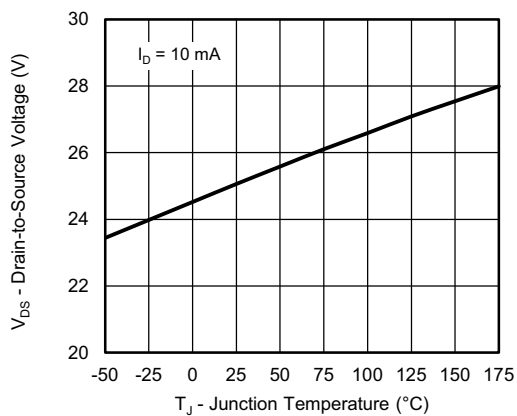
Source-Drain Diode Forward Voltage



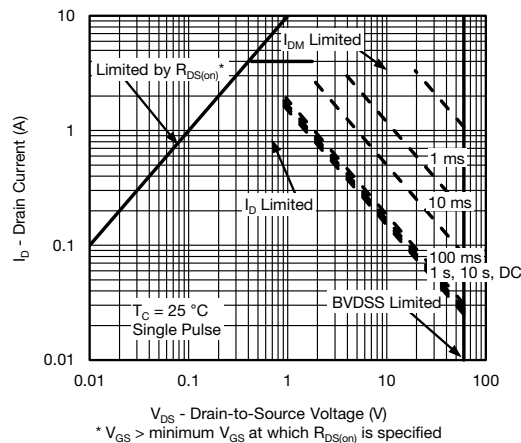
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



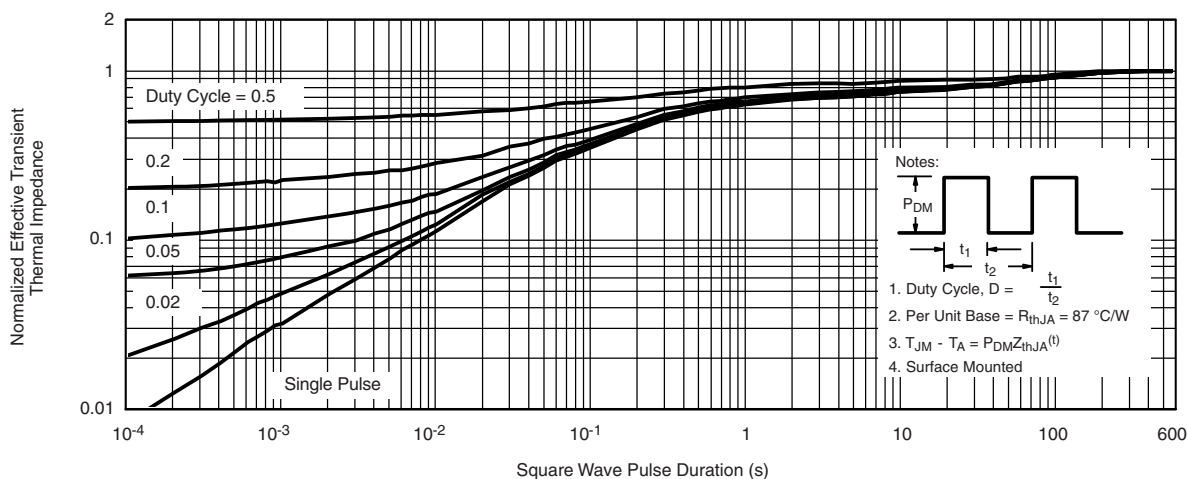
Drain Source Breakdown vs. Junction Temperature



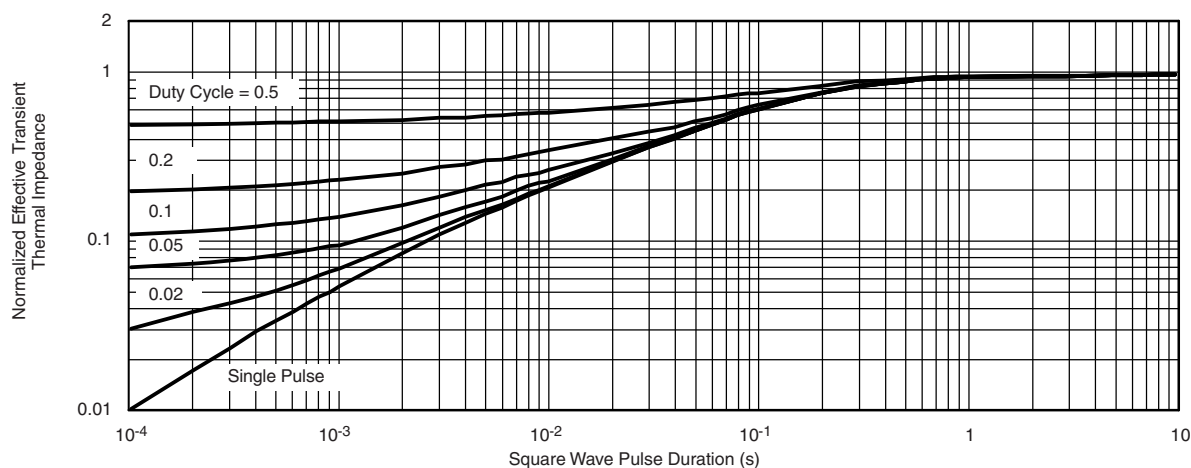
Safe Operating Area, Junction-to-Case



N-CHANNEL TYPICAL CHARACTERISTICS (25 °C unless otherwise noted)



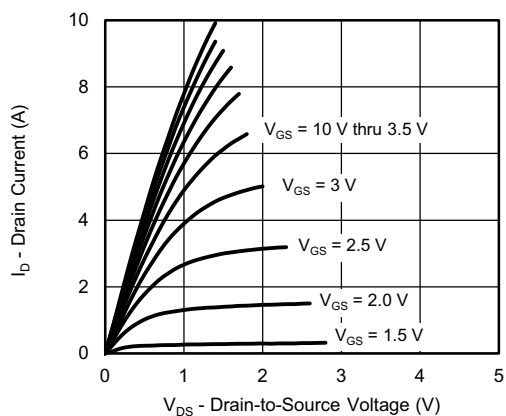
Normalized Thermal Transient Impedance, Junction-to-Ambient



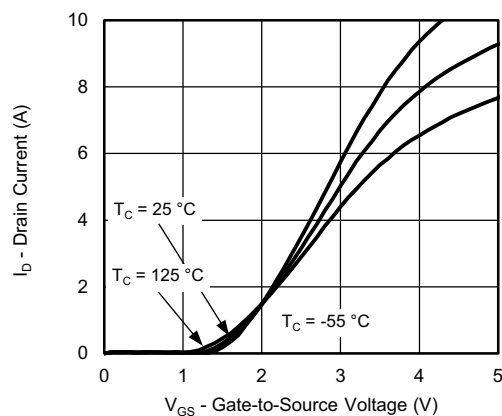
Normalized Thermal Transient Impedance, Junction-to-Foot



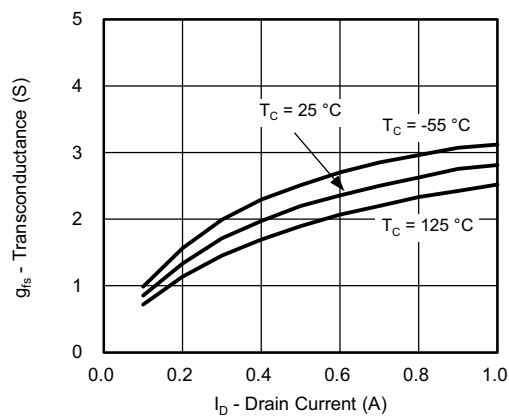
P-CHANNEL TYPICAL CHARACTERISTICS (25 °C unless otherwise noted)



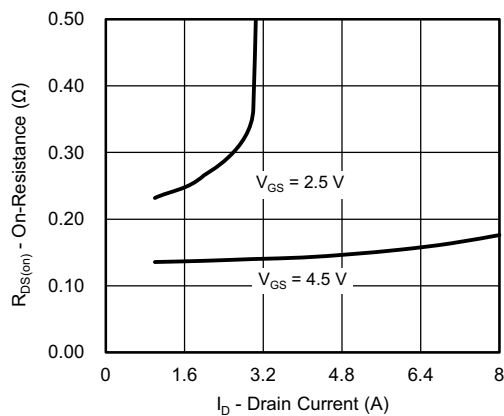
Output Characteristics



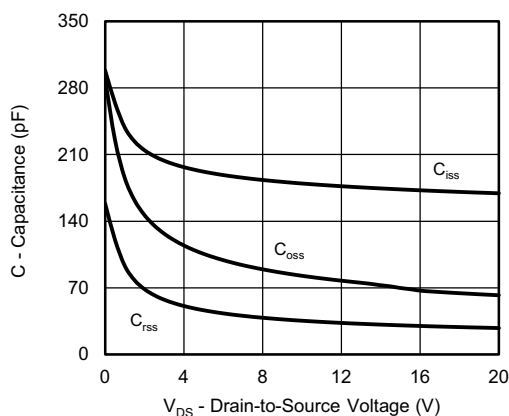
Transfer Characteristics



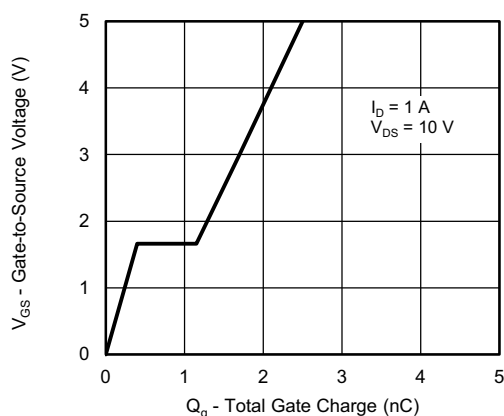
Transconductance



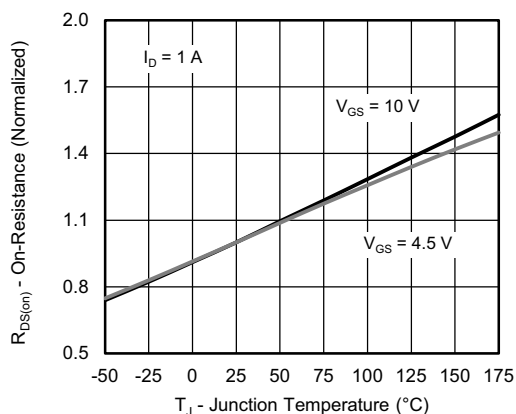
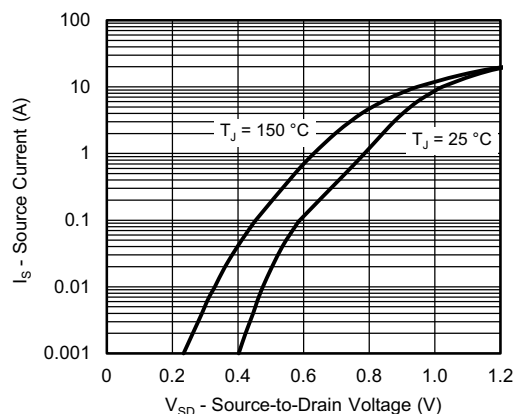
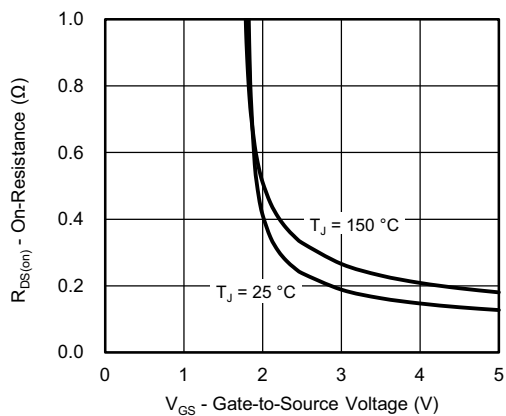
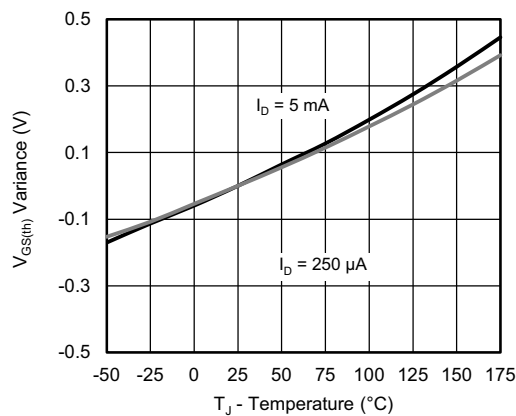
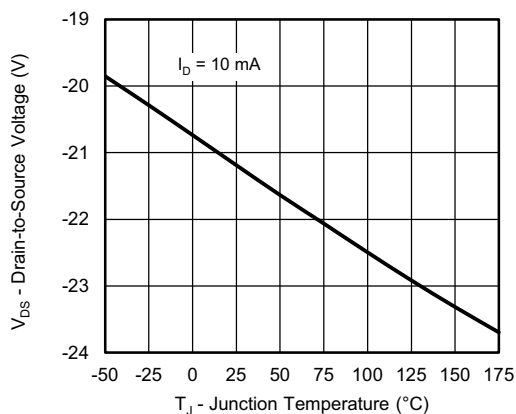
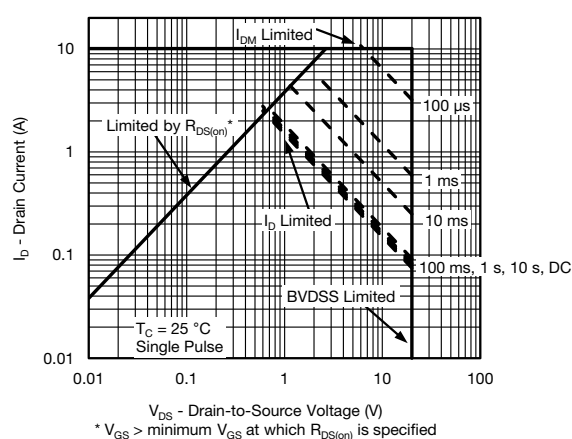
On-Resistance vs. Drain Current

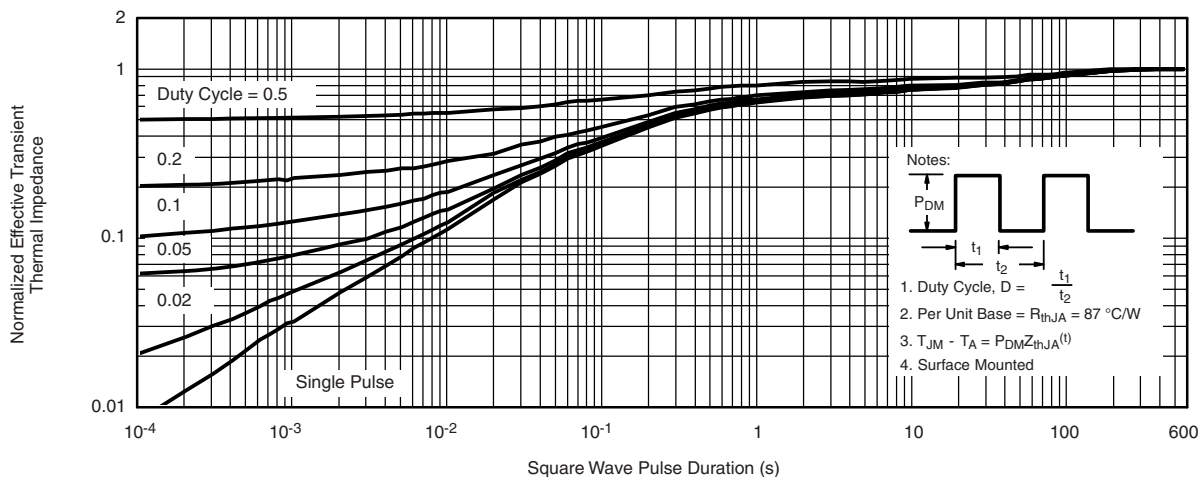
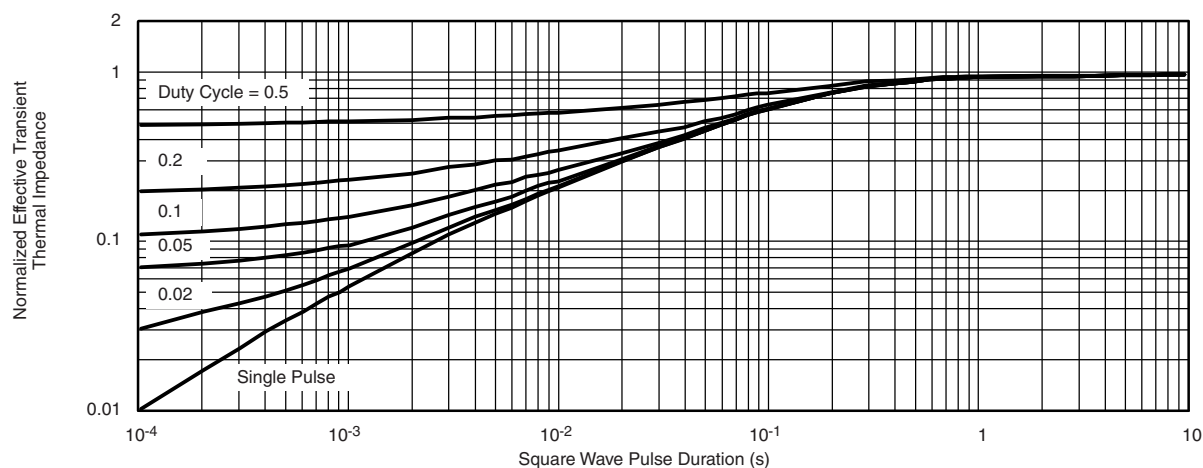


Capacitance



Gate Charge

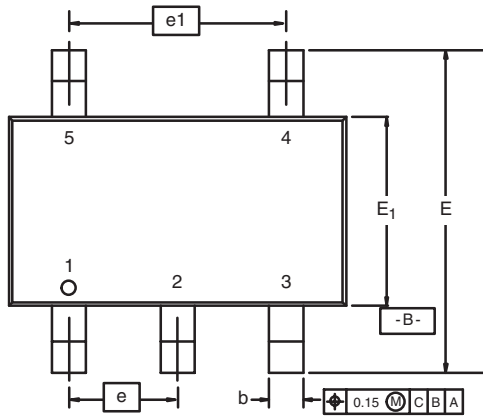
P-CHANNEL TYPICAL CHARACTERISTICS (25 °C unless otherwise noted)

On-Resistance vs. Junction Temperature

Source-Drain Diode Forward Voltage

On-Resistance vs. Gate-to-Source Voltage

Threshold Voltage

Drain Source Breakdown vs. Junction Temperature

Safe Operating Area, Junction-to-Case

P-CHANNEL TYPICAL CHARACTERISTICS (25 °C unless otherwise noted)

Normalized Thermal Transient Impedance, Junction-to-Ambient

Normalized Thermal Transient Impedance, Junction-to-Foot

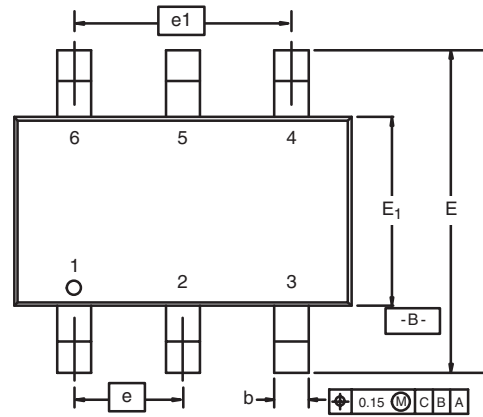
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TSOP: 5/6-LEAD

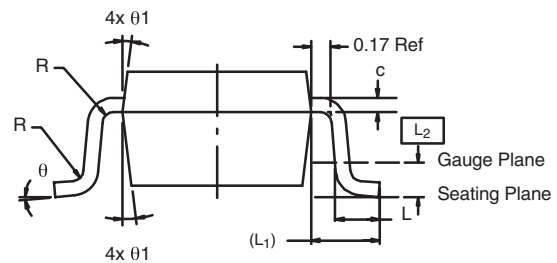
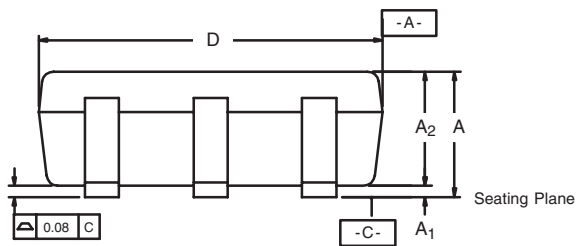
JEDEC Part Number: MO-193C



5-LEAD TSOP

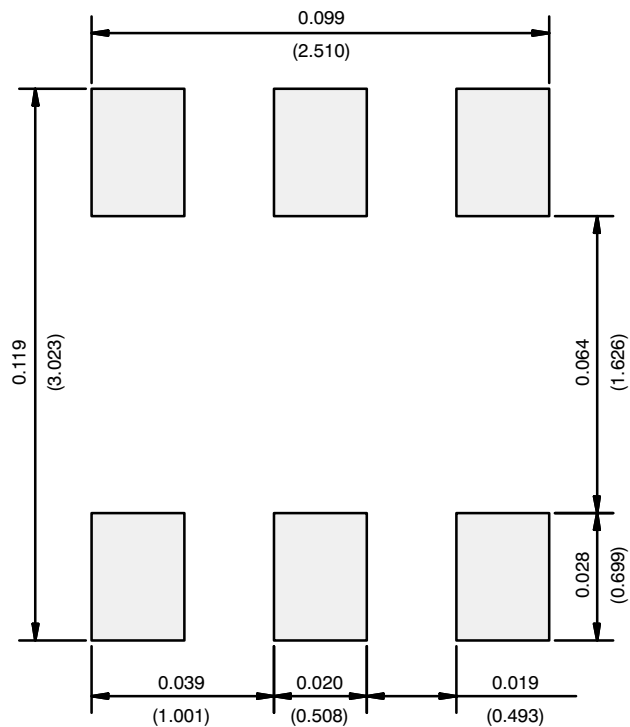


6-LEAD TSOP



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)

[Return to Index](#)



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