

QS6K21TR-VB Datasheet Dual N-Channel 40 V (D-S) MOSFET

PRODUCT SUMMARY

V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A) ^a	Q _g (Typ.)
40	0.058 at V _{GS} = 10 V	3.6	4.0
	0.072 at V _{GS} = 4.5 V	3.0	

FEATURES

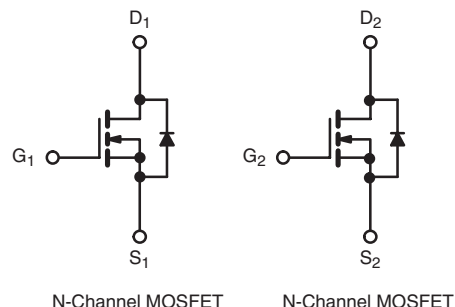
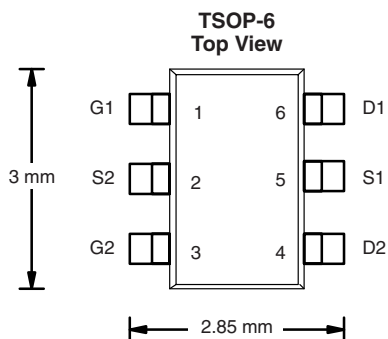
- Halogen-free According to IEC 61249-2-21 Definition
- Trench Power MOSFET
- 100 % R_g and UIS Tested
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT

APPLICATIONS

- CCFL Inverter
- DC/DC Converter
- HDD



ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise noted)

ABSOLUTE MAXIMUM RATINGS (T _A = 25 °C, unless otherwise noted)				
Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V _{DS}	40	V
Gate-Source Voltage		V _{GS}	± 20	
Continuous Drain Current (T _J = 150 °C)	T _C = 25 °C	I _D	3.6	A
	T _C = 70 °C		2.5	
	T _A = 25 °C		3.0 ^{b, c}	
	T _A = 70 °C		2.0 ^{b, c}	
Pulsed Drain Current (10 μs Pulse Width)		I _{DM}	20	
Source-Drain Current Diode Current	T _C = 25 °C	I _S	2.0	
	T _A = 25 °C		1.4 ^{b, c}	
Pulsed Source-Drain Current		I _{SM}	20	
Single Pulse Avalanche Current	L = 0.1 mH	I _{AS}	10	
Single Pulse Avalanche Energy		E _{AS}	5	
Maximum Power Dissipation	T _C = 25 °C	P _D	1.3	W
	T _C = 70 °C		0.9	
	T _A = 25 °C		1.0 ^{b, c}	
	T _A = 70 °C		0.75 ^{b, c}	
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 ^{b, d}	R _{thJA}	49	62.5	°C/W
Maximum Junction-to-Foot (Drain)	R _{thJF}	30	40	

Notes:

a. Based on T_C = 25 °C.

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

c. t = 10 s.

d. Maximum under steady state conditions is 120 °C/W.

SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ. ^a	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	40			V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = 250 μA		49		mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J			- 5.2		
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	1.0		2.0	V
Gate-Body Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V			100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 40 V, V _{GS} = 0 V			1	μA
		V _{DS} = 40 V, V _{GS} = 0 V, T _J = 55 °C			10	
On-State Drain Current ^b	I _{D(on)}	V _{DS} = 5 V, V _{GS} = 10 V	20			A
Drain-Source On-State Resistance ^b	R _{DS(on)}	V _{GS} = 10 V, I _D = 7.0A		0.058		Ω
		V _{GS} = 4.5 V, I _D = 6.0A		0.072		
Forward Transconductance ^b	g _{fs}	V _{DS} = 15 V, I _D = 7.0A		35		S
Dynamic ^a						
Input Capacitance	C _{iss}	V _{DS} = 20 V, V _{GS} = 0 V, I _D = 1 MHz		280		pF
Output Capacitance	C _{oss}			50		
Reverse Transfer Capacitance	C _{rss}			22		
Total Gate Charge	Q _g	V _{DS} = 20 V, V _{GS} = 10 V, I _D = 7.0 A		9.0		nC
		V _{DS} = 20 V, V _{GS} = 4.5 V, I _D = 7.0 A		4.5		
Gate-Source Charge	Q _{gs}			1.5		
Gate-Drain Charge	Q _{gd}			1.5		
Gate Resistance	R _g	f = 1 MHz	0.6	2.7	5.4	Ω
Turn-On Delay Time	t _{d(on)}	V _{DD} = 20 V, R _L = 2 Ω I _D ≅ 7.0 A, V _{GEN} = 10 V, R _g = 1 Ω		7	14	ns
Rise Time	t _r			9	18	
Turn-Off Delay Time	t _{d(off)}			16	32	
Fall Time	t _f			8	16	
Turn-On Delay Time	t _{d(on)}	V _{DD} = 20 V, R _L = 2 Ω I _D ≅ 7.0 A, V _{GEN} = 4.5 V, R _g = 1 Ω		12	24	
Rise Time	t _r			10	20	
Turn-Off Delay Time	t _{d(off)}			13	26	
Fall Time	t _f			8	16	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C		2.6		A
Pulse Diode Forward Current ^a	I _{SM}			20		
Body Diode Voltage	V _{SD}	I _S = 3 A		0.77	1.2	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = 5 A, dI/dt = 100 A/μs, T _J = 25 °C		15	30	ns
Body Diode Reverse Recovery Charge	Q _{rr}			7.5	15	nC
Reverse Recovery Fall Time	t _a			9		ns
Reverse Recovery Rise Time	t _b			6		

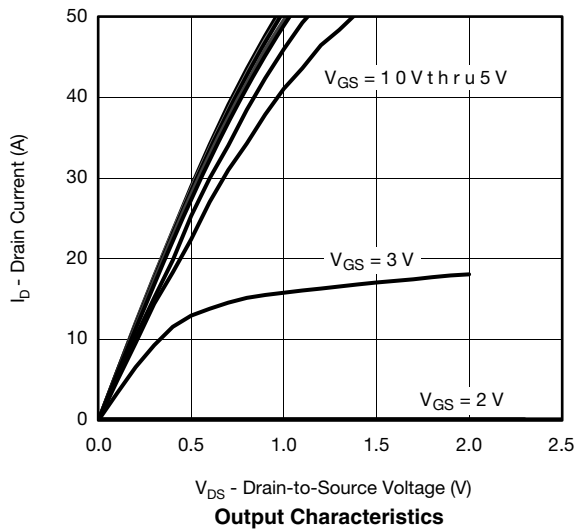
Notes:

a. Guaranteed by design, not subject to production testing.

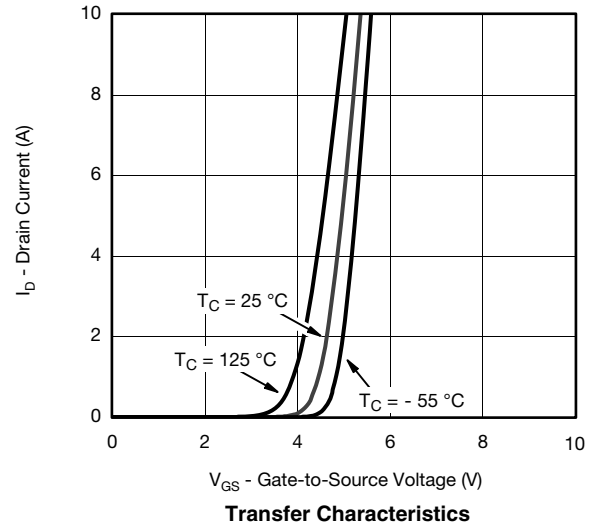
b. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

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.

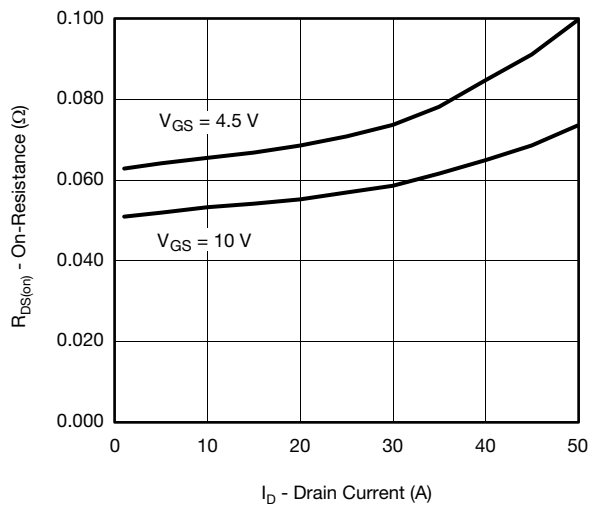
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



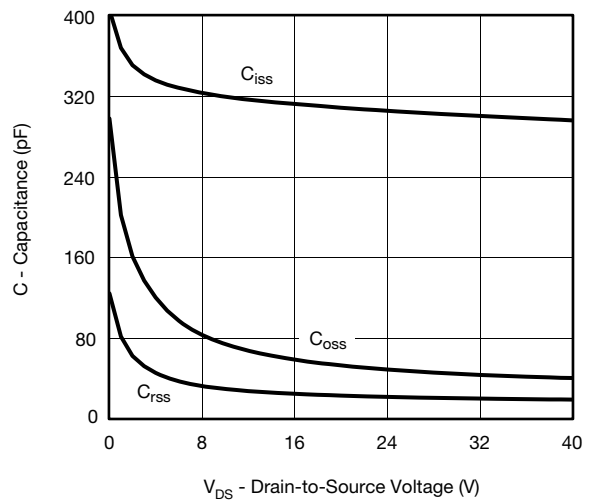
Output Characteristics



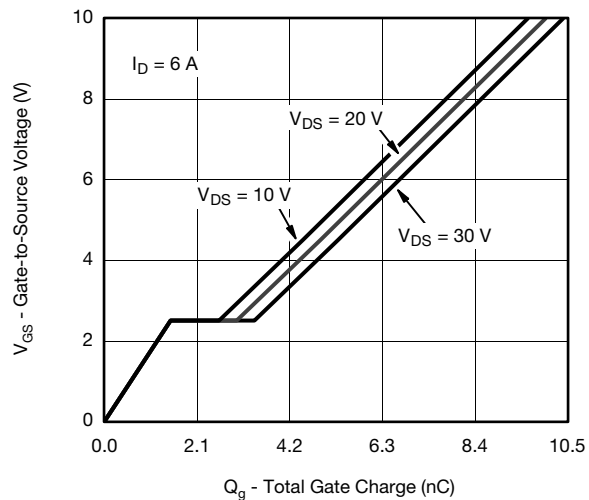
Transfer Characteristics



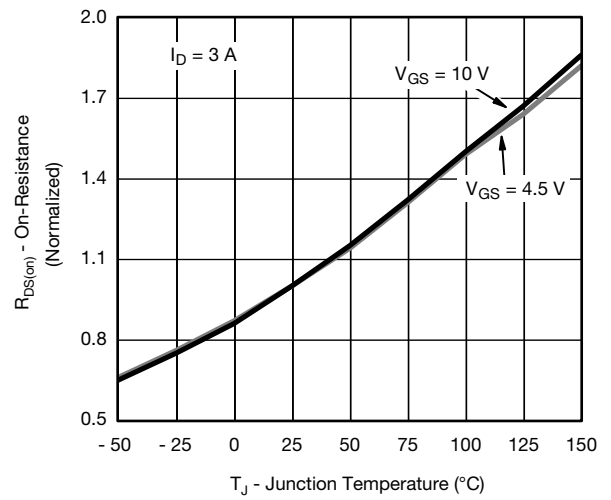
On-Resistance vs. Drain Current



Capacitance

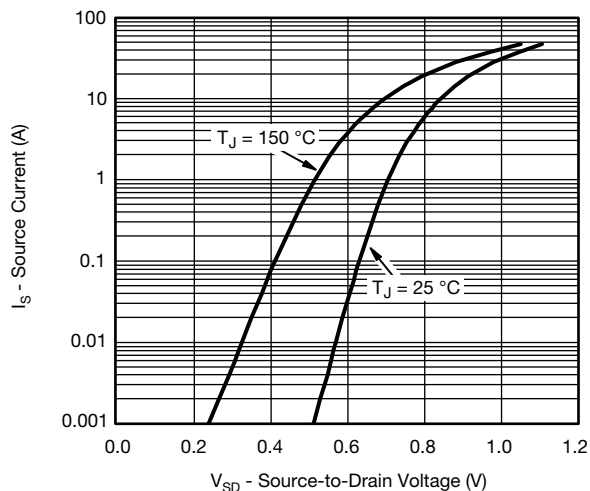


Gate Charge

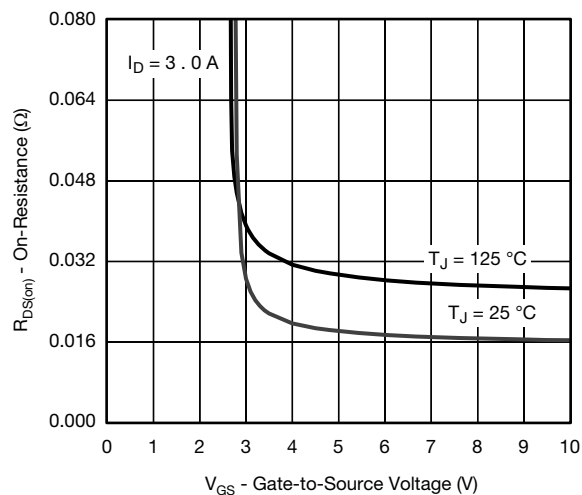


On-Resistance vs. Junction Temperature

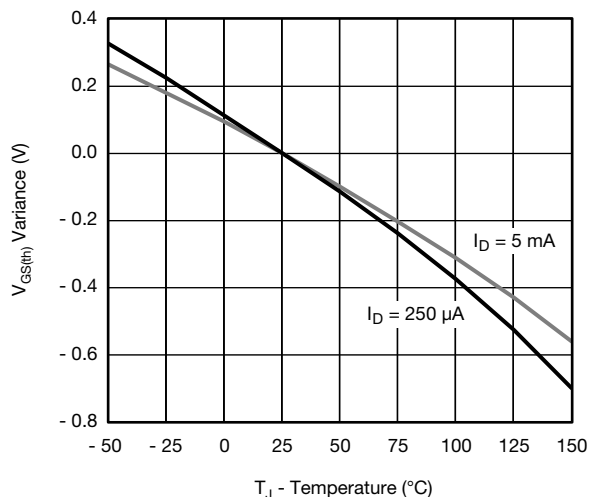
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



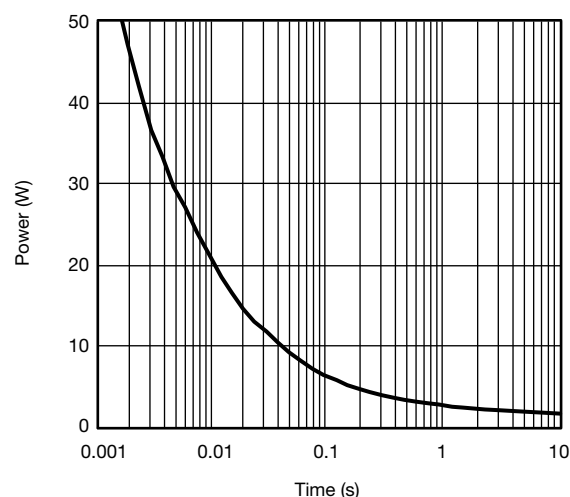
Source-Drain Diode Forward Voltage



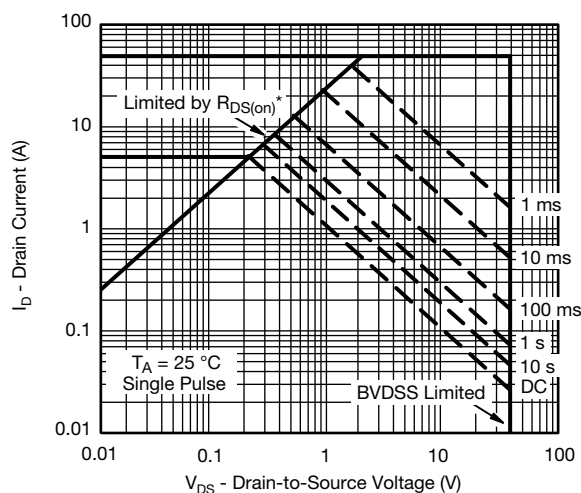
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



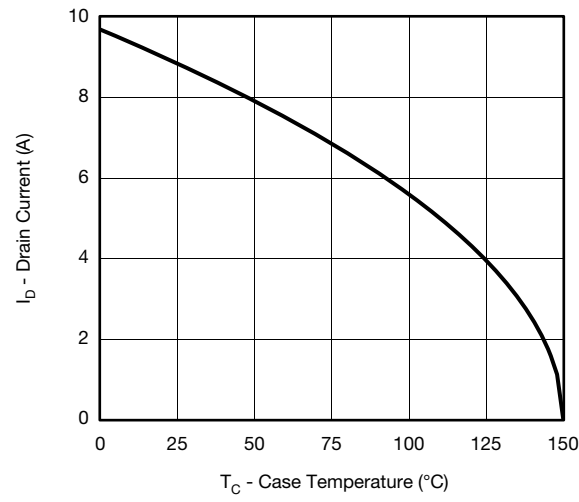
Single Pulse Power, Junction-to-Ambient



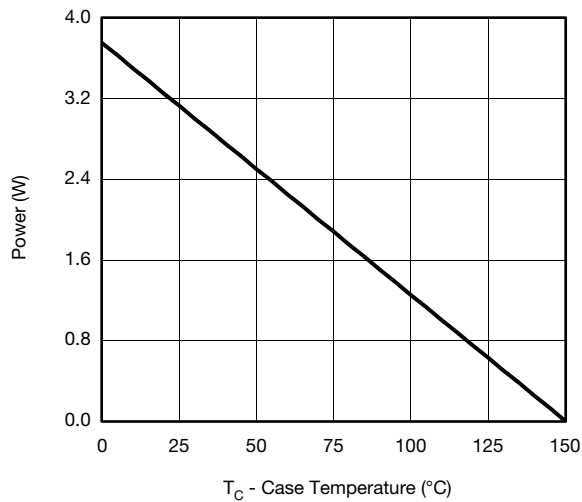
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area

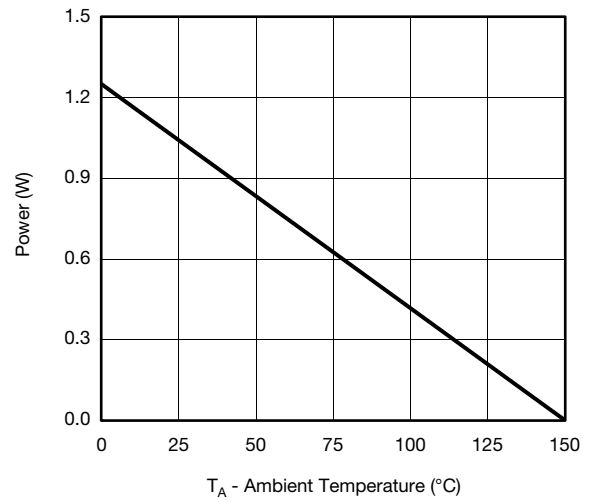
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating*



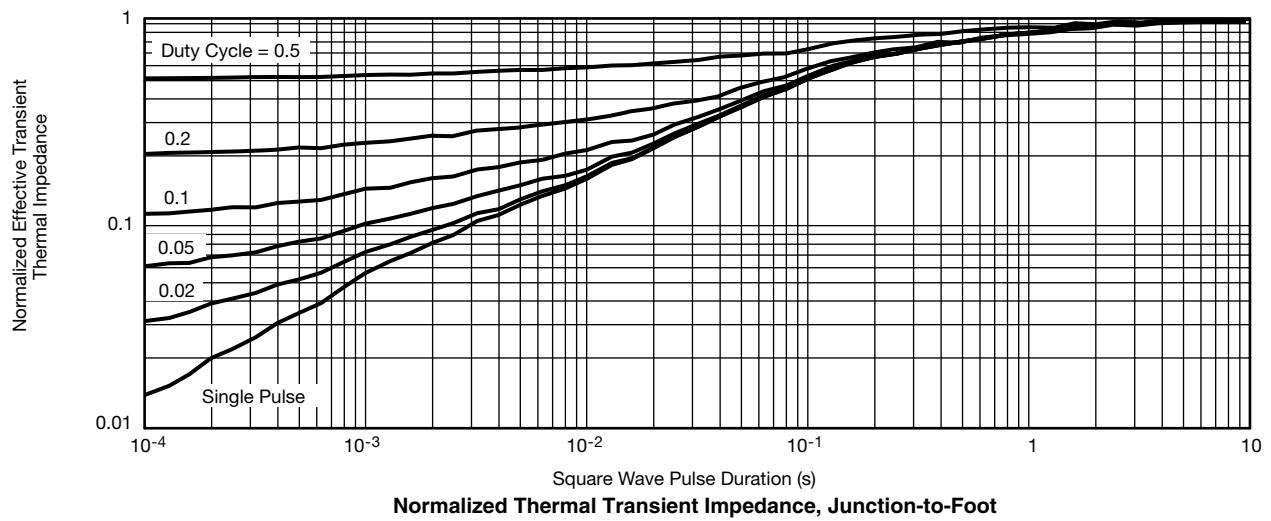
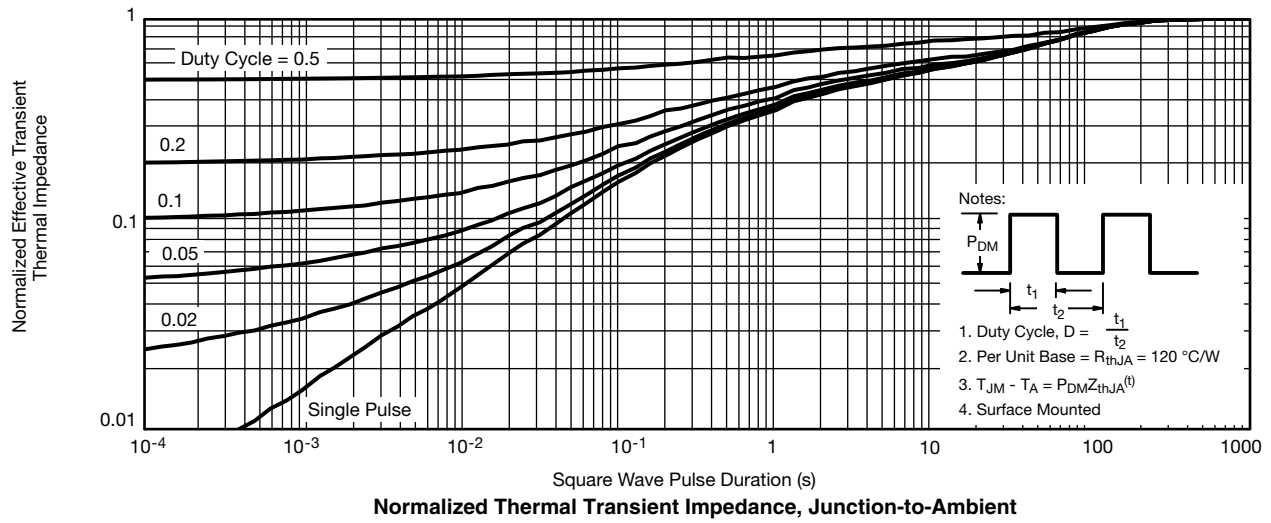
Power Derating, Junction-to-Foot



Power Derating, Junction-to-Ambient

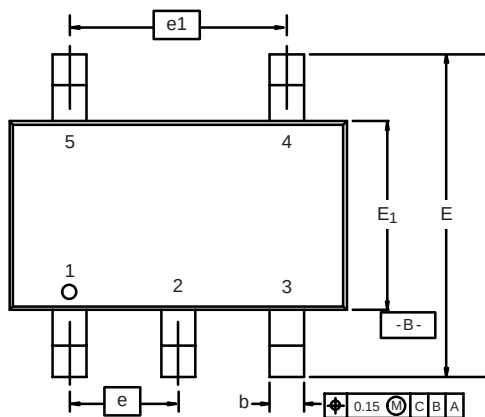
* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

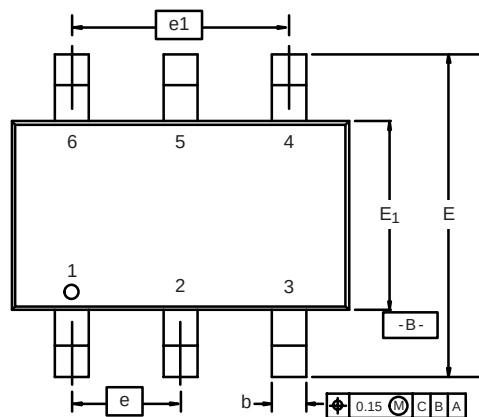


TSOP: 5/6-LEAD

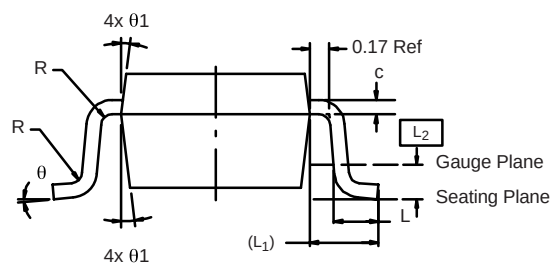
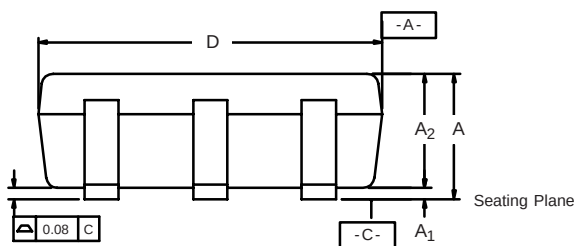
JEDEC Part Number: MO-193C



5-LEAD TSOP

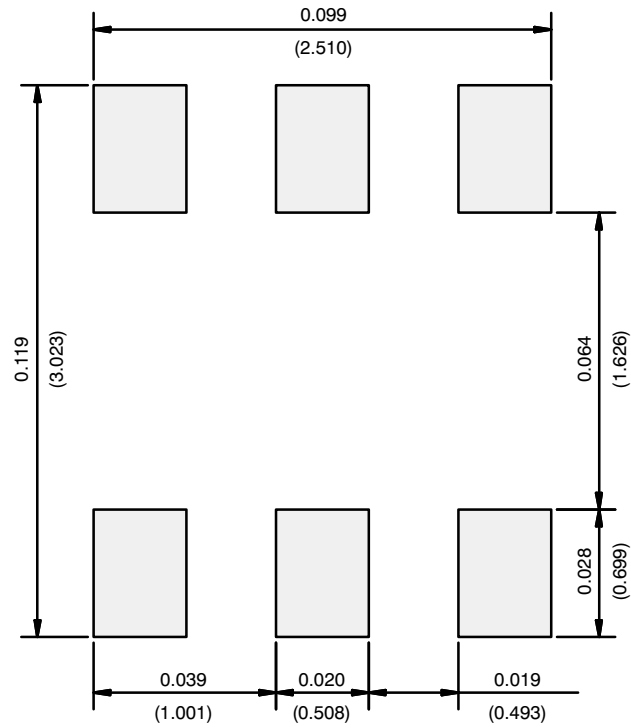


6-LEAD TSOP



	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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