

NTK3139PT5G-VB Datasheet

P-Channel 20 V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)	Q_g (TYP.) (nC)
-20	0.450 at $V_{GS} = -4.5$ V	-0.55	1
	0.500 at $V_{GS} = -2.5$ V	-0.50	
	0.600 at $V_{GS} = -1.8$ V	-0.38	

FEATURES

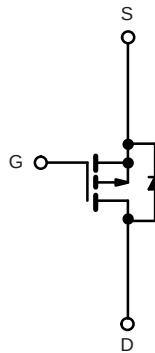
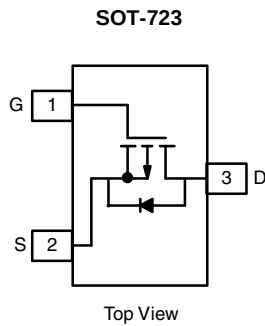
- Trench power MOSFET
- 100 % R tested
- Fast switching speed



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Load / power switch for portable devices
- Drivers: relays, solenoids, displays
- Battery operated systems



P-Channel MOSFET

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}	± 8	
Continuous Drain Current ($T_J = 150^\circ\text{C}$)	$T_A = 25^\circ\text{C}$	I_D	-0.55 ^{b, c}	A
	$T_A = 70^\circ\text{C}$		-0.45 ^{b, c}	
Pulsed Drain Current ($t = 300\ \mu\text{s}$)		I_{DM}	-1.8	
Continuous Source-Drain Diode Current	$T_A = 25^\circ\text{C}$	I_S	-0.16 ^{b, c}	
Maximum Power Dissipation	$T_A = 25^\circ\text{C}$	P_D	0.19 ^{b, c}	W
	$T_A = 70^\circ\text{C}$		0.12 ^{b, 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 ^{a, b}	$t \leq 5$ s	R_{thJA}	440	530	$^\circ\text{C/W}$
	Steady State		540	650	

Notes

- a. Maximum under steady state conditions is 650°C/W .
 b. Surface mounted on 1" x 1" FR4 board.
 c. $t = 5$ s.

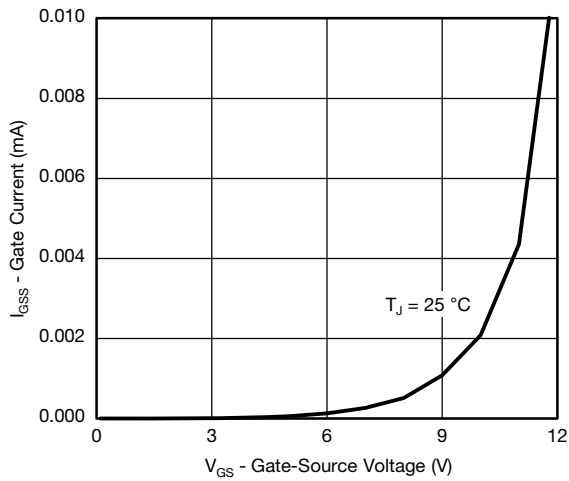
SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0, I _D = -250 μA	-20	-	-	V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = -250 μA	-	-12	-	mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J		-	1.8	-	
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = -250 μA	-0.4	-	-1	V
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 8 V	-	-	± 30	μA
		V _{DS} = 0 V, V _{GS} = ± 4.5 V	-	-	± 1	
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = -20 V, V _{GS} = 0 V	-	-	-1	
		V _{DS} = -20 V, V _{GS} = 0 V, T _J = 85 °C	-	-	-10	
On-State Drain Current ^a	I _{D(on)}	V _{DS} = ≥ 5 V, V _{GS} = -4.5 V	-1.5	-	-	A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = -4.5 V, I _D = -0.4 A	-	0.450	-	Ω
		V _{GS} = -2.5 V, I _D = -0.2 A	-	0.500	-	
		V _{GS} = -1.8 V, I _D = -0.1 A	-	0.600	-	
Forward Transconductance	g _{fs}	V _{DS} = -10 V, I _D = 0.4 A	-	1	-	S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{DS} = -10 V, V _{GS} = 0 V, f = 1 MHz	-	45	-	pF
Output Capacitance	C _{oss}		-	15	-	
Reverse Transfer Capacitance	C _{rss}		-	10	-	
Total Gate Charge	Q _g	V _{DS} = -10 V, V _{GS} = -4.5 V, I _D = -0.4 A	-	1.65	2.50	nC
		V _{DS} = -0 V, V _{GS} = -2.5 V, I _D = -0.4	-	1	2	
Gate-Source Charge	Q _{gs}		-	0.2	-	
Gate-Drain Charge	Q _{gd}		-	0.26	-	
Gate Resistance	R _g	f = 1 MHz	2.4	12	24	Ω
Turn-On Delay Time	t _{d(on)}	V _{DD} = -10 V, R _L = 33.3 Ω I _D ≅ -0.3 A, V _{GEN} = -4.5 V, R _g = 1 Ω	-	9	18	ns
Rise Time	t _r		-	10	20	
Turn-Off DelayTime	t _{d(off)}		-	10	20	
Fall Time	t _f		-	8	16	
Turn-On Delay Time	t _{d(on)}	V _{DD} = -10 V, R _L = 33.3 Ω I _D ≅ -0.3 A, V _{GEN} = -8 V, R _g = 1 Ω	-	1	2	
Rise Time	t _r		-	8	16	
Turn-Off DelayTime	t _{d(off)}		-	9	18	
Fall Time	t _f		-	5	10	
Drain-Source Body Diode Characteristics						
Pulse Diode Forward Current ^a	I _{SM}		-	-	-1.5	A
Body Diode Voltage	V _{SD}	I _S = -0.3 A	-	-0.8	-1.2	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = -0.3 A, dI/dt = 100 A/μs	-	16	24	ns
Body Diode Reverse Recovery Charge	Q _{rr}		-	8	16	nC
Reverse Recovery Fall Time	t _a		-	11	-	ns
Reverse Recovery Rise Time	t _b		-	5	-	

Notes

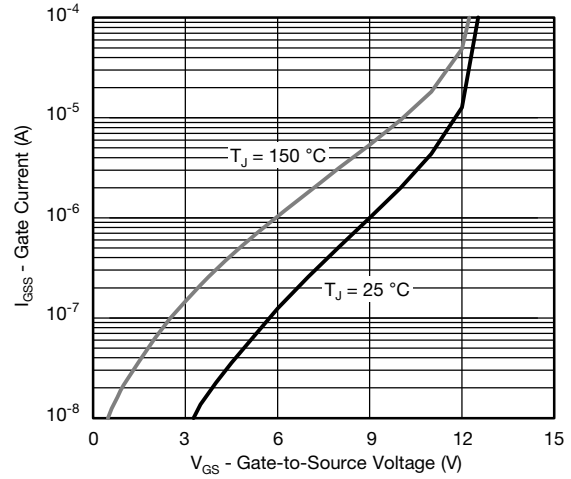
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
 b. Guaranteed by design, not subject to production testing.

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.

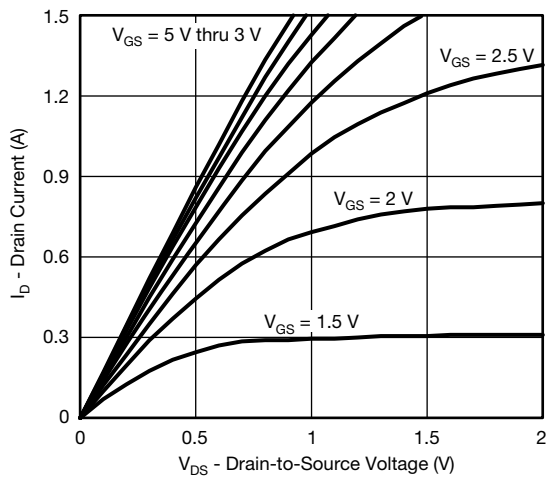
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



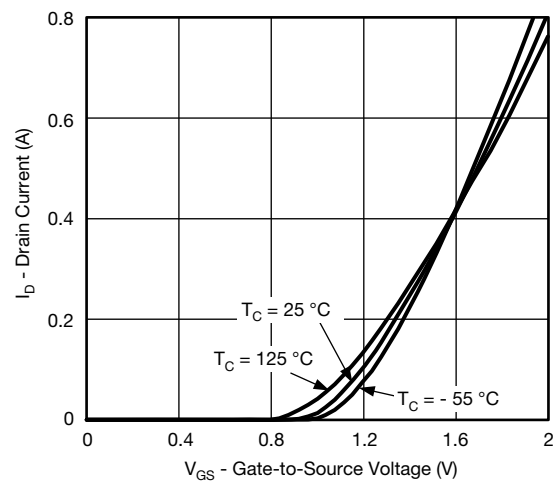
Gate Current vs. Gate-Source Voltage



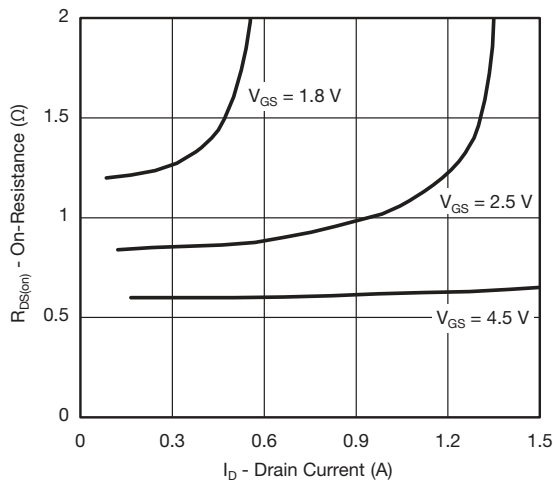
Gate Current vs. Gate-Source Voltage



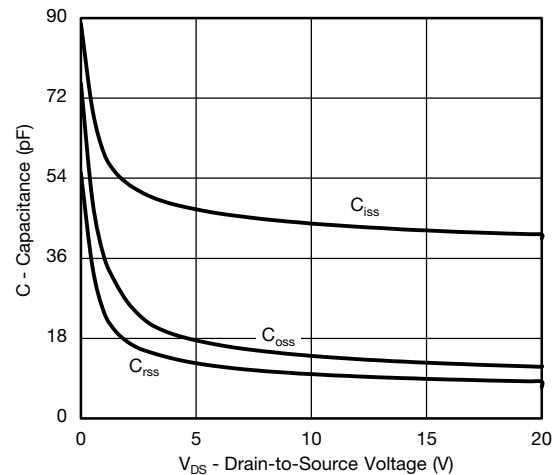
Output Characteristics



Transfer Characteristics

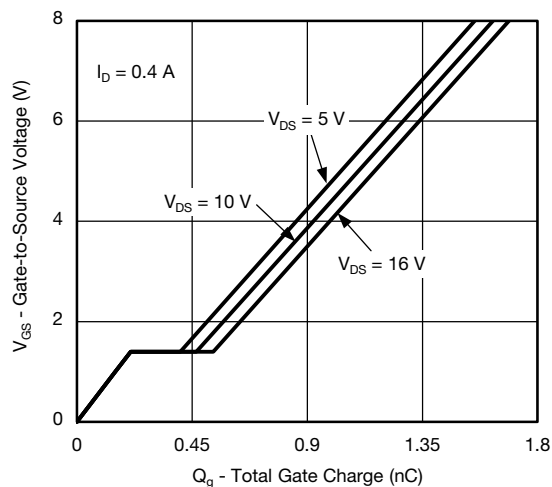


On-Resistance vs. Drain Current

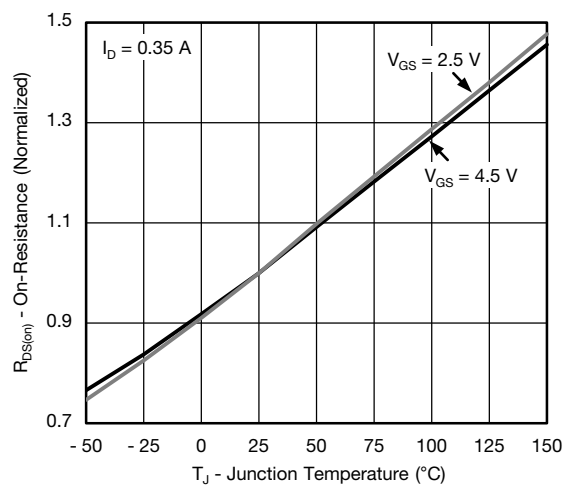


Capacitance

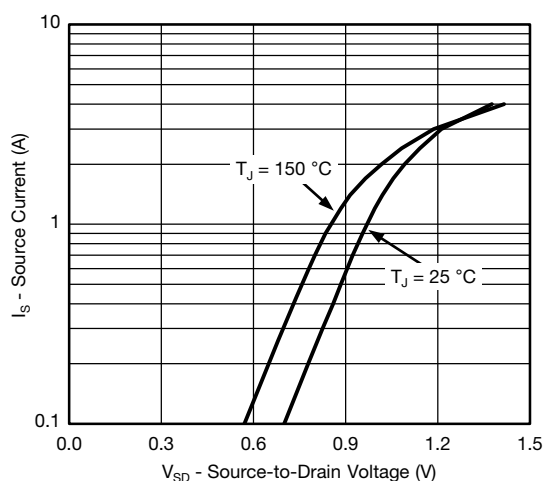
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



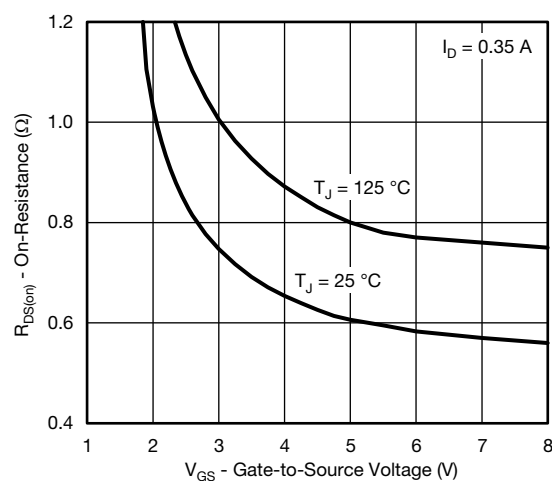
Gate Charge



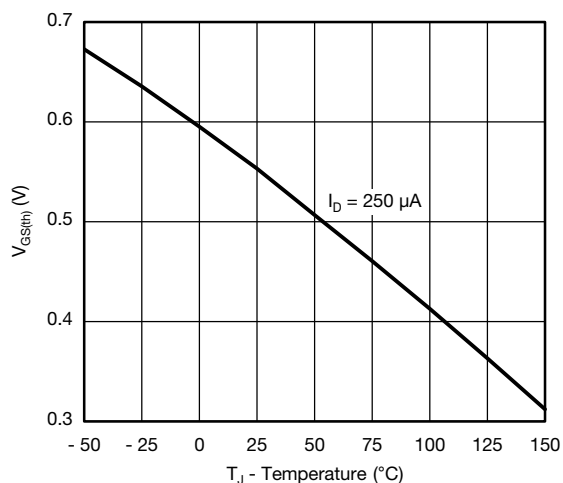
On-Resistance vs. Junction Temperature



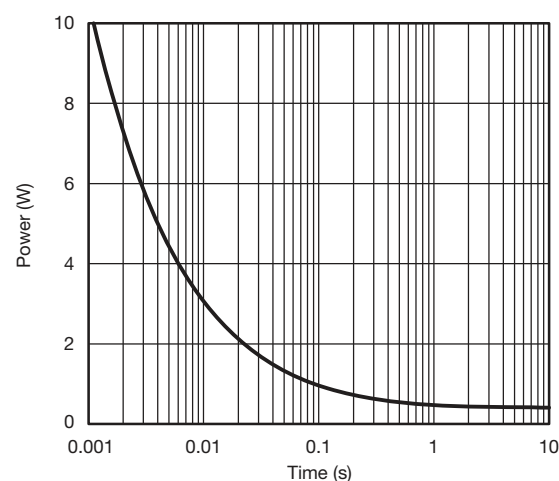
Source-Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

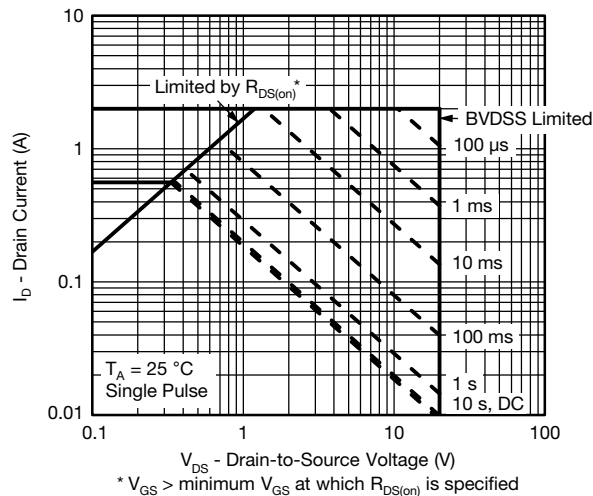


Threshold Voltage

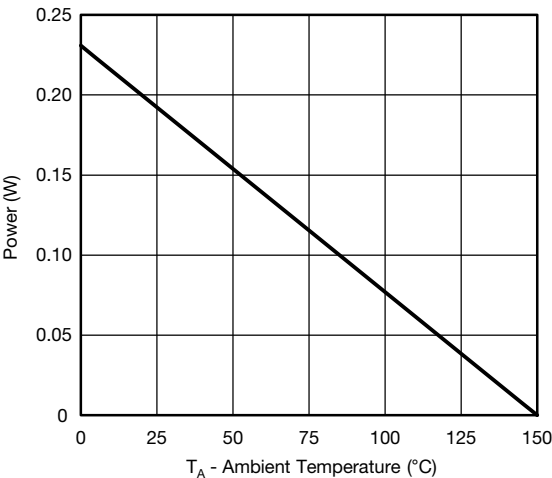


Single Pulse Power, Junction-to-Ambient

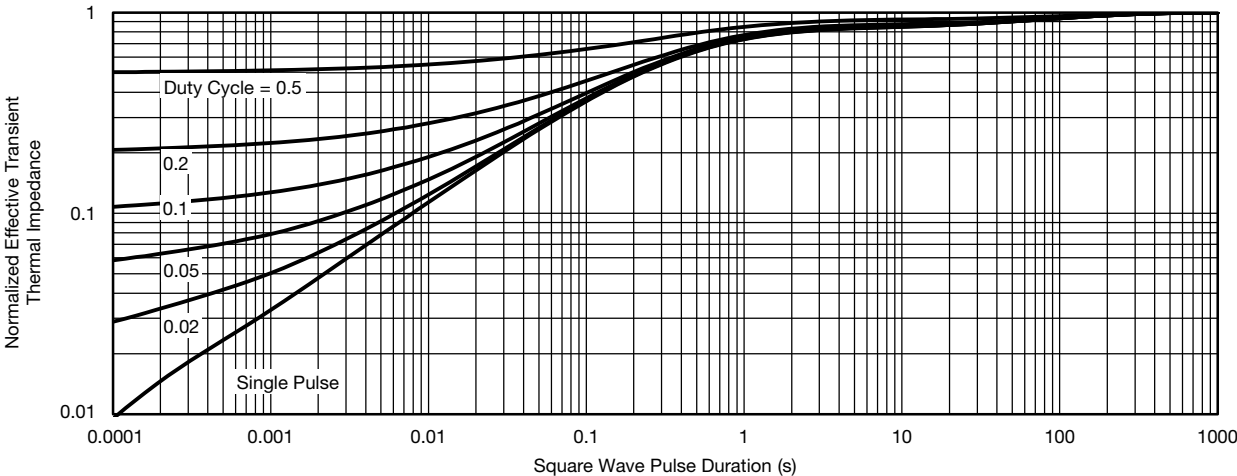
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Safe Operating Area, Junction-to-Ambient

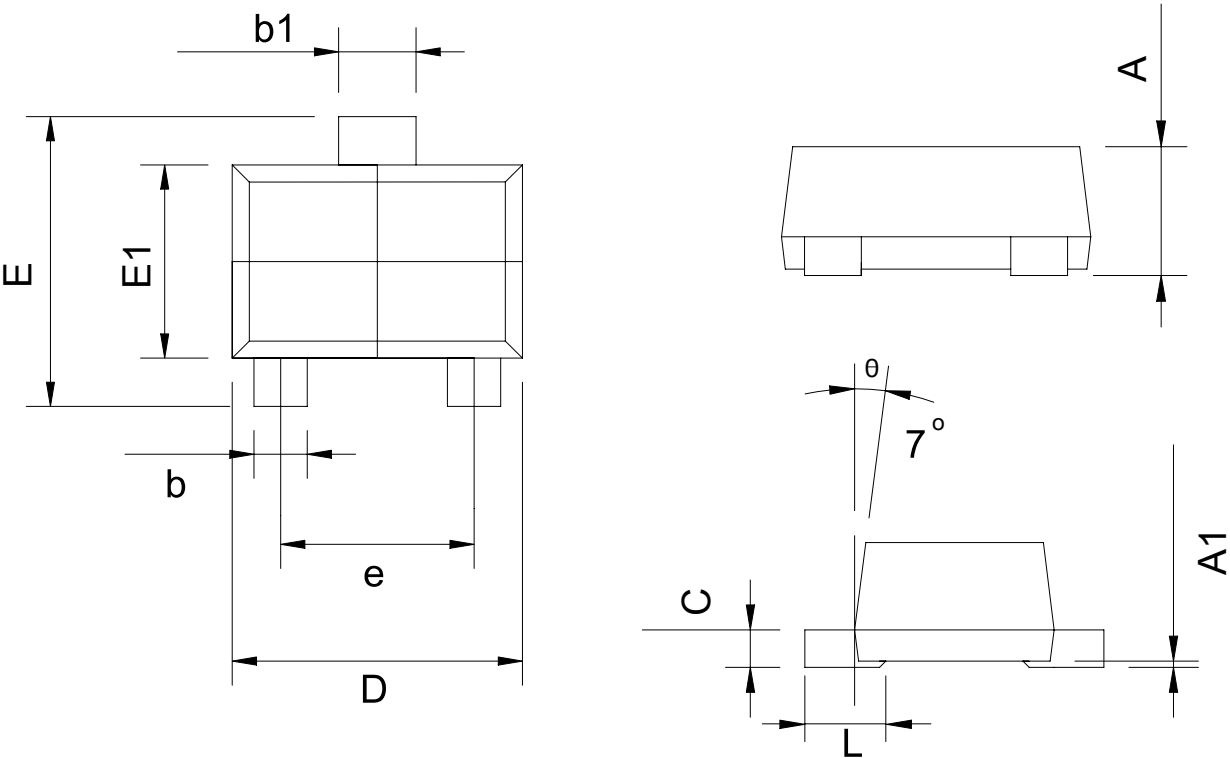


Power Derating, Junction-to-Ambient



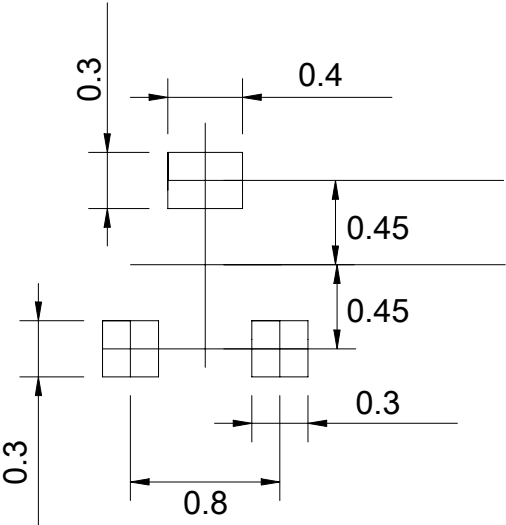
Normalized Thermal Transient Impedance, Junction-to-Ambient

SOT-723: 3 Leads



SYMBOL	SOT-723			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	-	0.500	-	0.020
A1	0.000	0.050	0.000	0.002
b	0.170	0.270	0.007	0.011
b1	0.270	0.370	0.011	0.015
c	-	0.150	-	0.006
D	1.150	1.250	0.045	0.049
E	1.150	1.250	0.045	0.049
E1	0.750	0.850	0.030	0.033
e	0.800 TYP.		0.031 TYP.	
L	0.32 BSC		0.013 BSC	
-	° REF.		° REF.	

RECOMMENDED LAND PATTERN



UNIT: mm

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