P-Channel Enhancement Mode Field Effect Transistor with Schottky

■ General Description

The LN4703 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. A Schottky diode is provided to facilitate the implementation of a bidirectional blocking switch, or for DC-DC conversion applications. Standard Product LN4703 is Pb-free (meets ROHS & Sony 259 specifications). LN4703 is a Green Product ordering option.

■ Features

- V_{DS}(V) = -20V
- I_D = -3.4A (V_{GS} = -4.5V)
- $R_{DS(ON)}$ < 90mΩ (V_{GS} = -4.5V)
- $R_{DS(ON)}$ < 120mΩ (V_{GS} = -2.5V)
- $R_{DS(ON)}$ < 160mΩ (V_{GS} = -1.8V)
- Schottky：V_{KA} (V) = 20V, I_F = 1A, V_F<0.5V@0.5A

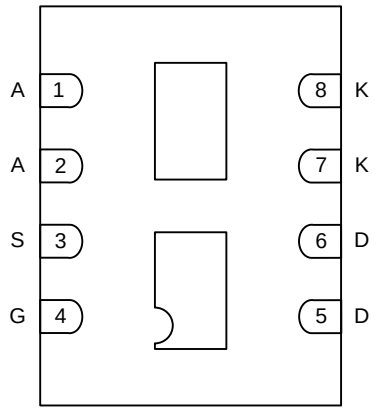
■ Applications

- Charging circuit in portable devices

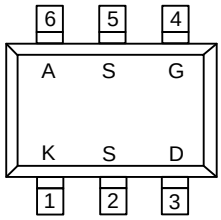
■ Package

- DFN3×2-8
- SOT-23-6

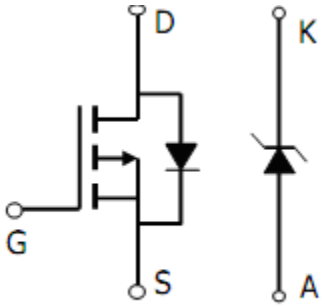
■ Pin Configuration



DFN3×2-8L
(Top View)



SOT-23-6
(Top View)



■ Marking Rule

LN4703①②

Number	Symbol	Function Description
①	D	DFN3X2-8L
	M	SOT-23-6
②	R	Embossed Tape :Standard Feed
	L	Embossed Tape :Reverse Feed

■ Absolute Maximum Ratings

(TA=25℃ unless otherwise noted)

Item		Symbol	MOSFET	Schottky	Unit
Drain-Source Voltage		V_{DS}	-20		V
Gate-Source Voltage		V_{GS}	±8		V
Continuous Drain Current[A]	T_A=25°C	I_D	-3.4		A
	T_A=70°C		-2.7		
Pulsed Drain Current[B]		I_{DM}	-15		
Schottky reverse voltage		V_{KA}		20	V
Continuous Forward Current[A]	T_A=25°C	I_F		1.9	A
	T_A=70°C			1.2	
Pulsed Forward Current[B]		I_{FM}		7	
Power Dissipation	T_A=25°C	P_D	1.7	0.96	W
	T_A=70°C		1.1	0.62	
Junction and Storage Temperature Range		T_J,T_{STG}	-55 to 150	-55 to 150	°C
Thermal Characteristics MOSFET					
Maximum Junction-to-Ambient[A]	t ≤ 10s	$R_{\theta JA}$	51	75	°C/W
Maximum Junction-to-Ambient[A]	Steady-State		88	110	
Maximum Junction-to-Lead[C]	Steady-State	$R_{\theta JL}$	28	35	
Thermal Characteristics Schottky					
Maximum Junction-to-Ambient[A]	t ≤ 10s	$R_{\theta JA}$	51	75	°C/W
Maximum Junction-to-Ambient[A]	Steady-State		88	110	
Maximum Junction-to-Lead[C]	Steady-State	$R_{\theta JL}$	28	35	

■ Electrical Characteristics

(T_J=25℃ unless otherwise noted)

Item	Parameter	Condition	Min	Typ	Max	Unit
Static Parameters						
BV_{DSS}	Drain-Source Breakdown Voltage	I_D=-250A, V_{GS}=0V	-20			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=-16V, V_{GS}=0V			-1	μA
		V_{DS}=-16V, V_{GS}=0V,T_J=55°C			-5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±8V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} ,I_D=-250μA	-0.3	-0.63	-1	V
$I_{D(ON)}$	On state drain current	V_{GS}=-4.5V, V_{DS}=-5V	-15			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-4.5V, I_D=-3.4A		73	90	mΩ
		V_{GS}=-4.5V,I_D=-3.4A,T_J=125°C		110	135	
		V_{GS}=-2.5V, I_D=-2.5A		99	120	
		V_{GS}=-1.8V, I_D=-1.5A		133	160	
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-3.4A	4		7	S
V_{SD}	Diode Forward Voltage	I_S=-1A,V_{GS}=0V		-0.83	-1	V
I_S	Maximum Body-Diode Continuous Current				-2	A
Dynamic Parameters						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-10V, f=1MHz		540		pF
C_{oss}	Output Capacitance			72		pF
C_{rss}	Reverse Transfer Capacitance			49		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		12		Ω
Switching Parameters						
Q_g	Total Gate Charge	V_{GS}=-4.5V,V_{DS}=-10V,I_D=-3.4A			6.1	nC
Q_{gs}	Gate Source Charge				0.6	nC
Q_{gd}	Gate Drain Charge				1.6	nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-4.5V,V_{DS}=-10V, R_L=2.9Ω, R_{GEN}=3Ω			10	ns
t_r	Turn-On Rise Time				12	ns
$t_{D(off)}$	Turn-Off DelayTime				44	ns
t_f	Turn-Off Fall Time				22	ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-3.4A, dI/dt=100A/μs			21	ns
Q_{rr}	Body Diode Reverse Recovery	I_F=-3.4A, dI/dt=100A/μs			7.5	nC

Schottky Parameters						
V_F	Forward Voltage Drop	I_F=0.5A		0.39	0.5	V
I_{rm}	Maximum reverse leakage current	V_R=16V			0.1	mA
		V_R=16V,T_J=125°C			20	
C_T	Junction Capacitance	V_R=10V		34		pF
t_{rr}	SchottkyReverse Recovery Time	I_F=1A, dI/dt=100A/μs		5.2	10	ns
Q_{rr}	Schottky Reverse Recovery Charge	I_F=1A, dI/dt=100A/μs		0.8		nC

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A =25°C.The value in any a given application depends on the user's specific board design. The current rating is based on the t ≤ 10s thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.

D. The static characteristics in Figures 1 to 6,12,14 are obtained using 80μs pulses, duty cycle 0.5% max.

E. These tests are performed with the device mounted on 1 in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C.

■ Typical Performance Characteristics

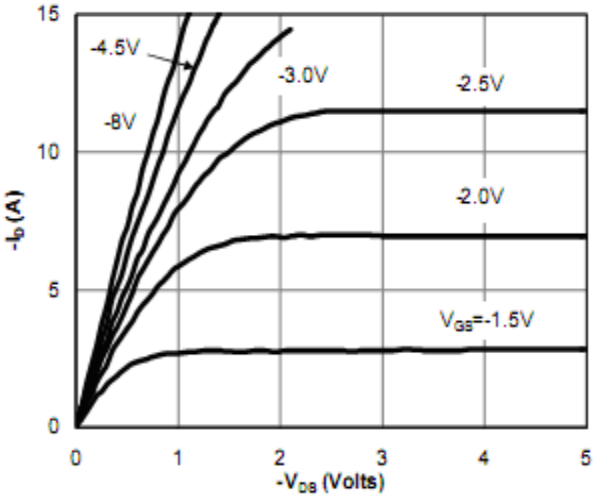


Fig 1: On-Region Characteristics

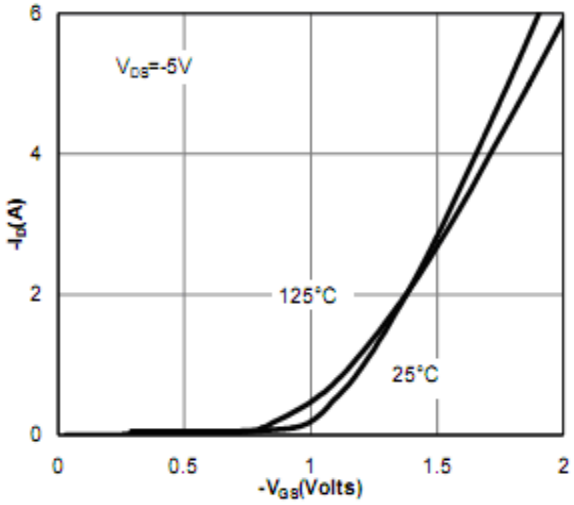


Figure 2: Transfer Characteristics

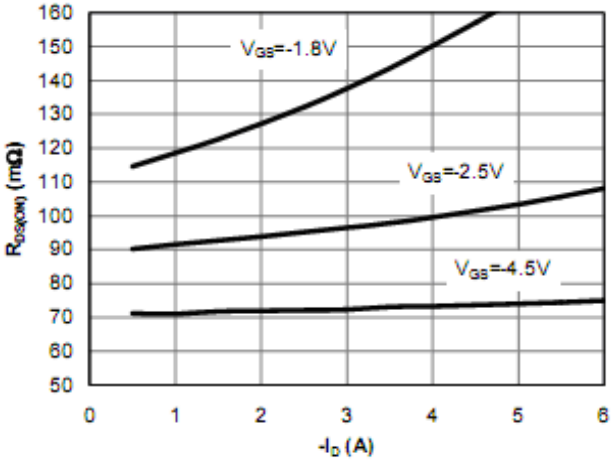


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

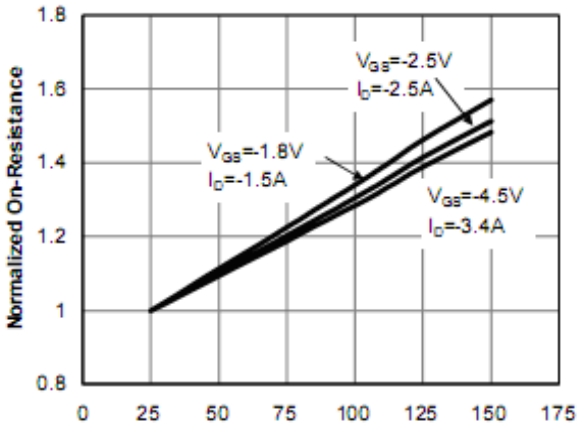


Figure 4: On-Resistance vs. Junction Temperature

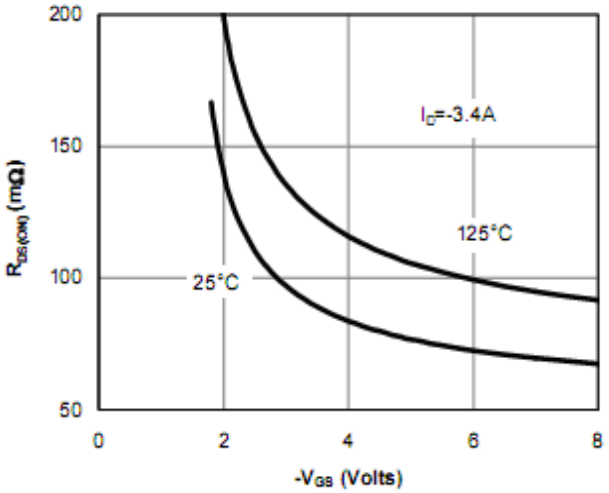


Figure 5: On-Resistance vs. Gate-Source Voltage

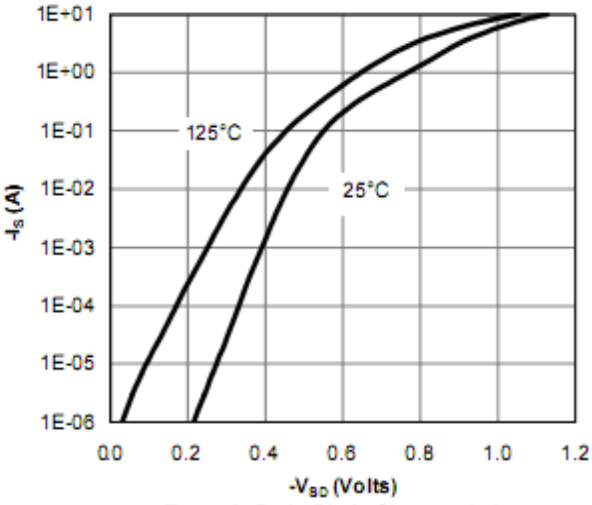


Figure 6: Body-Diode Characteristics

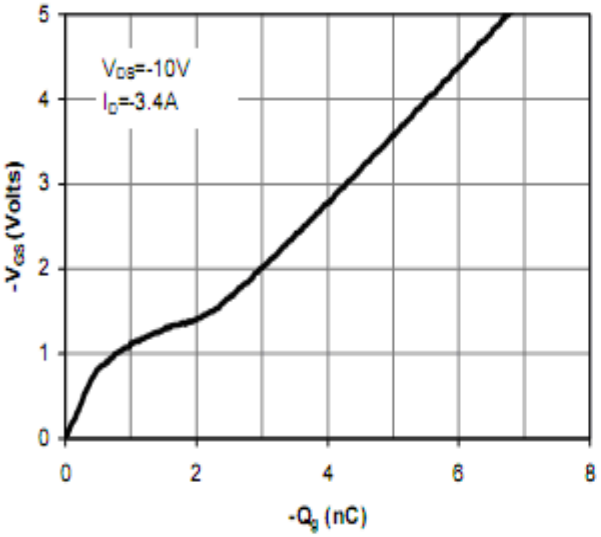


Figure 7: Gate-Charge Characteristics

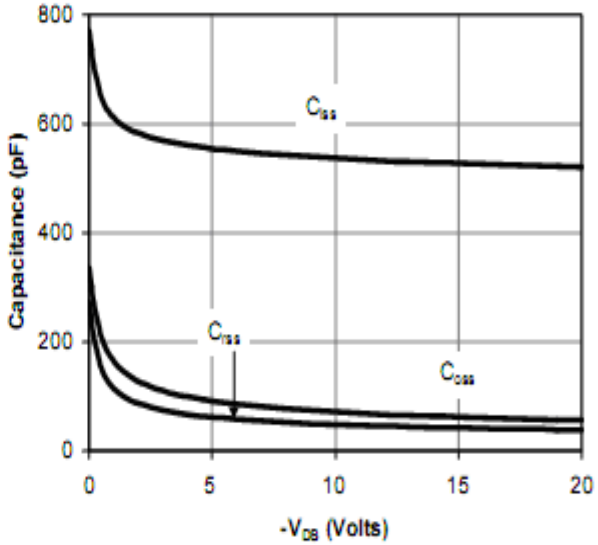


Figure 8: Capacitance Characteristics

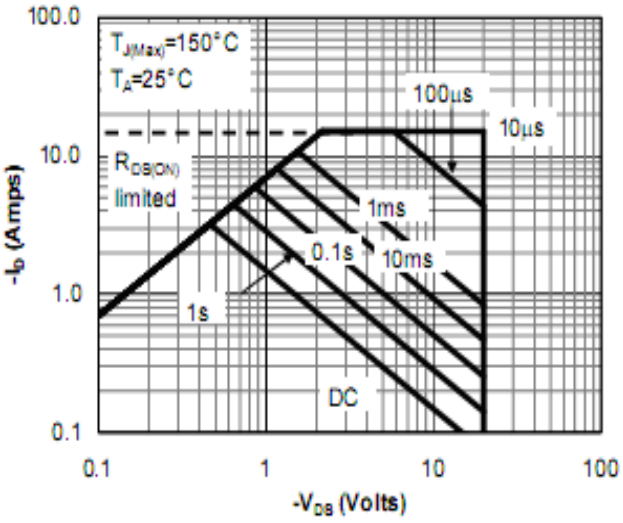


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

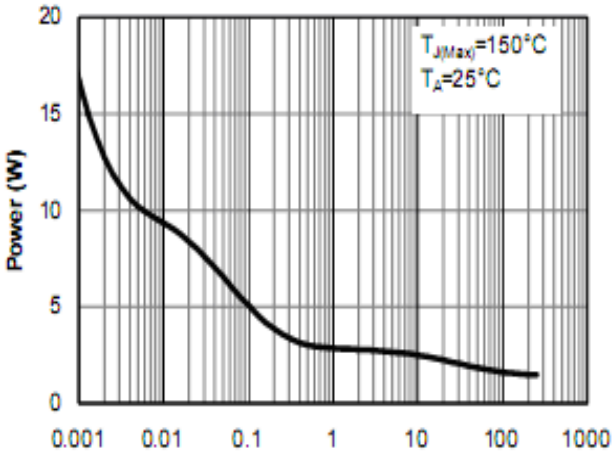


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

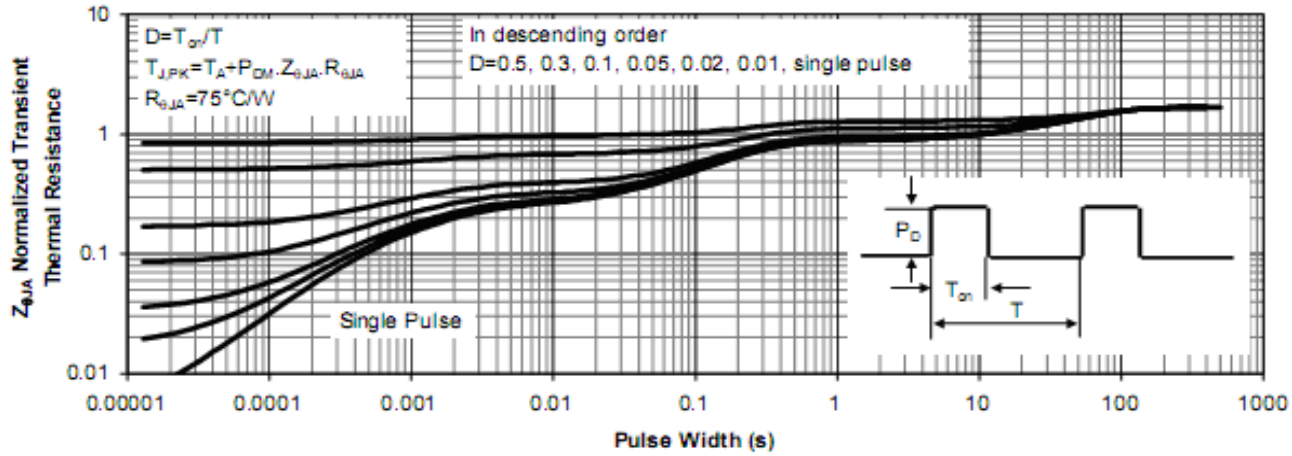


Figure 11: Normalized Maximum Transient Thermal Impedance

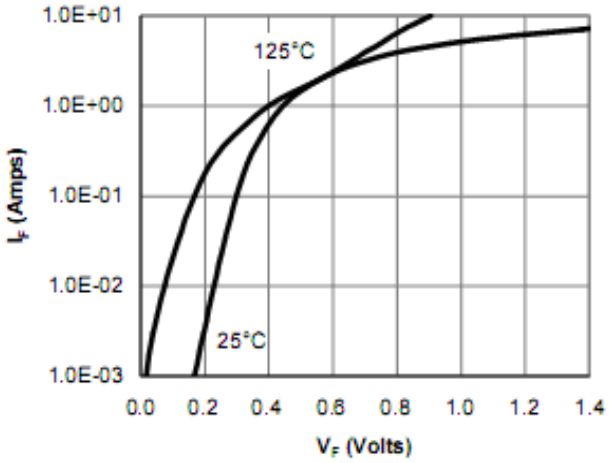


Figure 12: Schottky Forward Characteristics

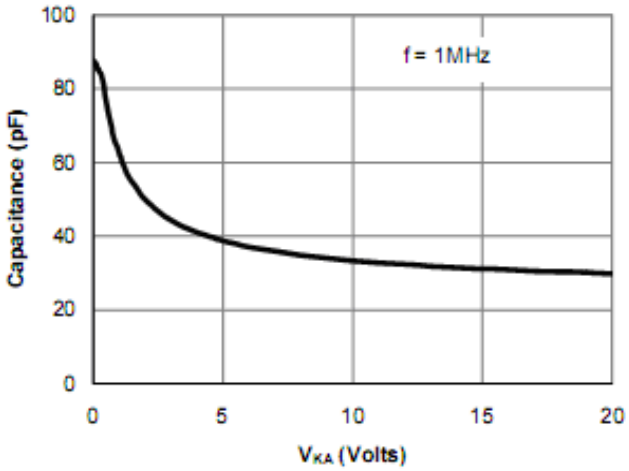


Figure 13: Schottky Capacitance Characteristics

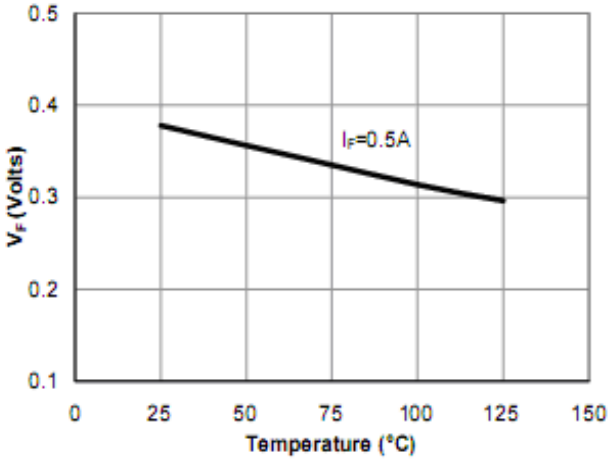


Figure 14: Schottky Forward Drop vs. Junction Temperature

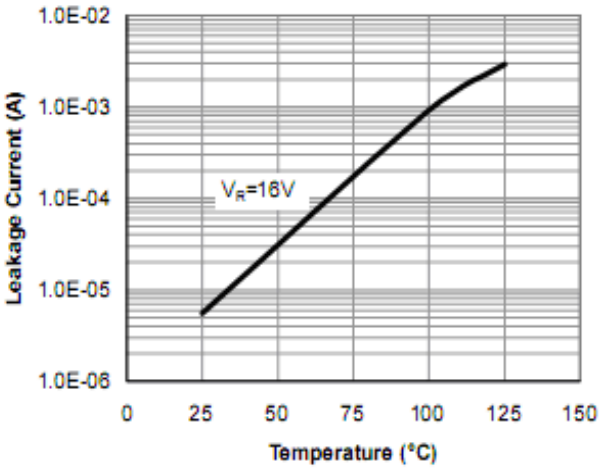


Figure 15: Schottky Leakage current vs. Junction Temperature

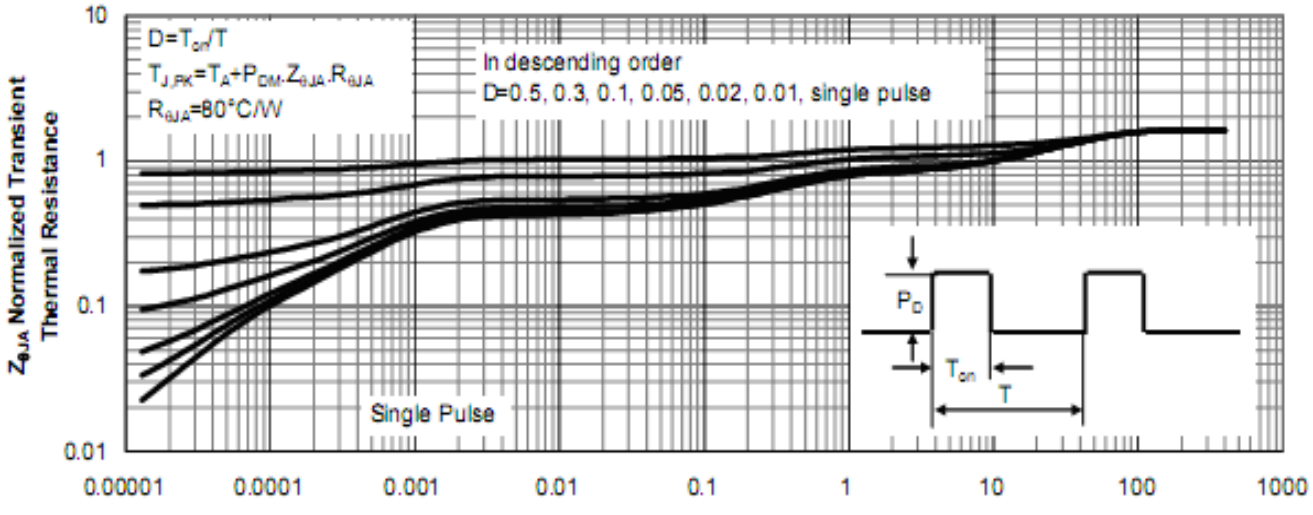
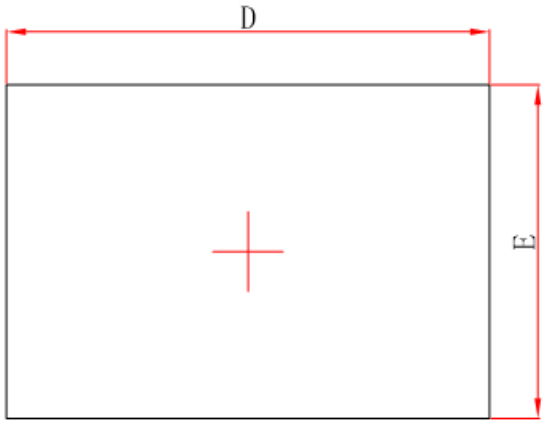


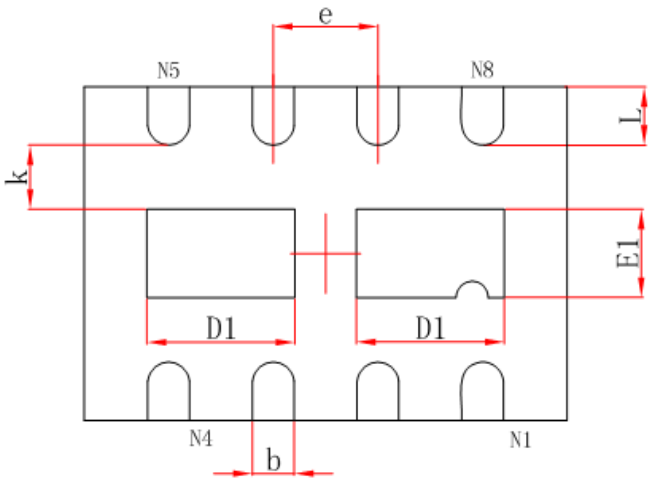
Figure 16: Schottky Normalized Maximum Transient Thermal Impedance

■ Package Information

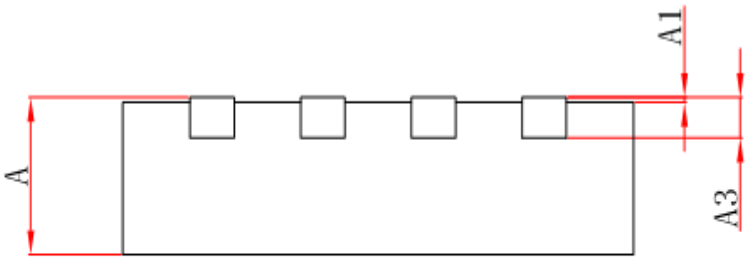
- DFN3×2-8



Top View



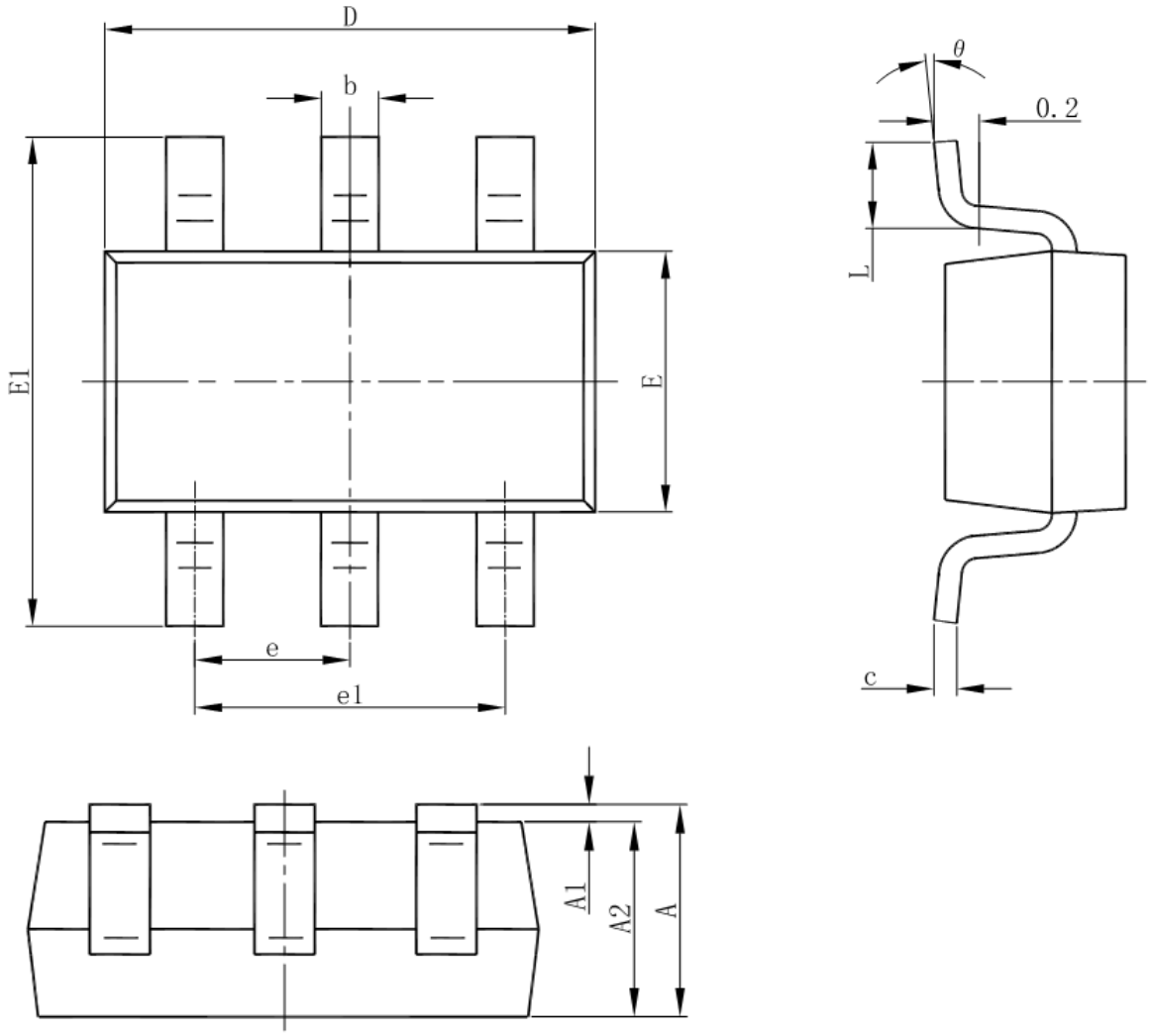
Bottom View



Side View

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.700/0.800	0.800/0.900	0.028/0.031	0.031/0.035
A1	0.000	0.050	0.000	0.002
A3	0.203REF.		0.008REF.	
D	2.900	3.100	0.114	0.122
E	1.900	2.100	0.075	0.083
D1	0.820	1.020	0.032	0.040
E1	0.430	0.630	0.017	0.025
k	0.200MIN.		0.008MIN.	
b	0.250	0.350	0.010	0.014
e	0.650TYP.		0.026TYP.	
L	0.250	0.450	0.010	0.018

- SOT-23-6



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°