

NCE P-Channel Enhancement Mode Power MOSFET

Description

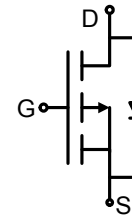
The NCE4435 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V.

General Features

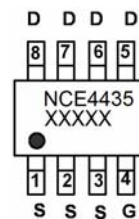
- $V_{DS} = -30V, I_D = -9.1A$
 $R_{DS(ON)} < 35m\Omega @ V_{GS} = -4.5V$
 $R_{DS(ON)} < 20m\Omega @ V_{GS} = -10V$
- High power and current handling capability
- Lead free product is acquired
- Surface mount package

Application

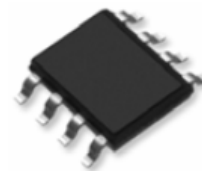
- Battery Switch
- Load switch
- Power management



Schematic diagram



Marking and pin assignment



SOP-8 top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCE4435	NCE4435	SOP-8	Ø330mm	12mm	4000 units

Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	-30	V
Gate-Source Voltage		V_{GS}	± 20	V
Continuous Drain Current ($T_J = 150^\circ\text{C}$)	$T_C = 25^\circ\text{C}$	I_D	-11	A
	$T_C = 70^\circ\text{C}$		-9	
	$T_A = 25^\circ\text{C}$		-9.1	
	$T_A = 70^\circ\text{C}$		-7.2	
Drain Current-Pulsed (Note 1)		I_{DM}	-50	A
Maximum Power Dissipation		P_D	3.1	W
Operating Junction and Storage Temperature Range		T_J, T_{STG}	-55 To 150	$^\circ\text{C}$

Thermal Characteristic

Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	40	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Lead (Note 2)	$R_{\theta JL}$	24	$^\circ\text{C/W}$

Electrical Characteristics ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=-250\mu A$	-30	-33	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=-30V, V_{GS}=0V$	-	-	-1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1	-1.5	-3	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-9.1A$	-	16	20	m Ω
		$V_{GS}=-4.5V, I_D=-6.9A$	-	21	35	m Ω
Forward Transconductance	g_{FS}	$V_{DS}=-15V, I_D=-9.1A$	10	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{ISS}	$V_{DS}=-15V, V_{GS}=0V,$ $F=1.0MHz$	-	1600	-	PF
Output Capacitance	C_{OSS}		-	350	-	PF
Reverse Transfer Capacitance	C_{RSS}		-	300	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-15V, I_D=-1A,$ $V_{GS}=-10V, R_{GEN}=6\Omega$	-	10	-	nS
Turn-on Rise Time	t_r		-	15	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	110	-	nS
Turn-Off Fall Time	t_f			70	-	nS
Total Gate Charge	Q_g	$V_{DS}=-15V, I_D=-9.1A$ $V_{GS}=-10V$	-	30	-	nC
Gate-Source Charge	Q_{gs}		-	5.5	-	nC
Gate-Drain Charge	Q_{gd}		-	8	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	$V_{GS}=0V, I_S=-9.1A$	-	-	-1.2	V

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. The value of $R_{\theta JA}$ is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with $T_A = 25^{\circ}\text{C}$. The value in any given application depends on the user's specific board design. The current rating is based on the $t \leq 10s$ thermal resistance rating. The $R_{\theta JA}$ is the sum of the thermal impedance from junction to lead $R_{\theta JL}$ and lead to ambient.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production

Typical Electrical and Thermal Characteristics

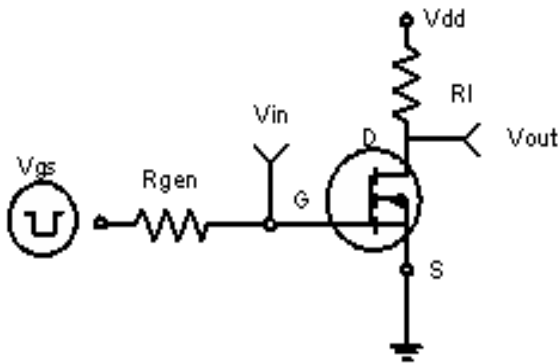


Figure 1: Switching Test Circuit

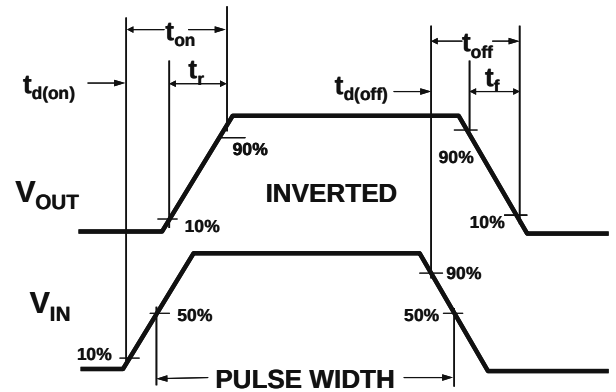


Figure 2: Switching Waveforms

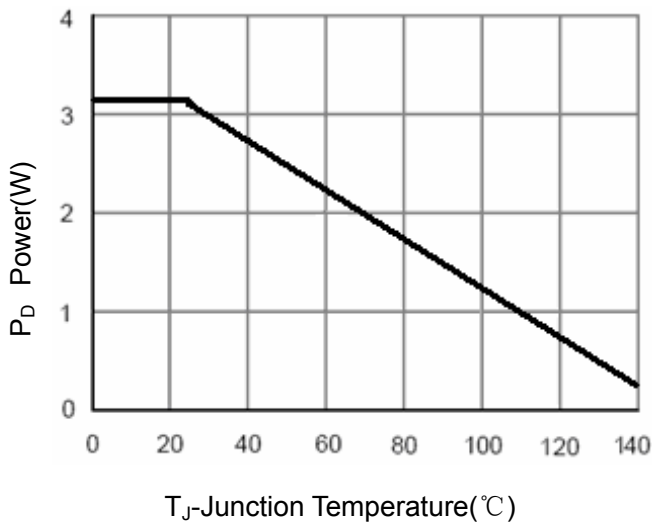


Figure 3: Power Dissipation

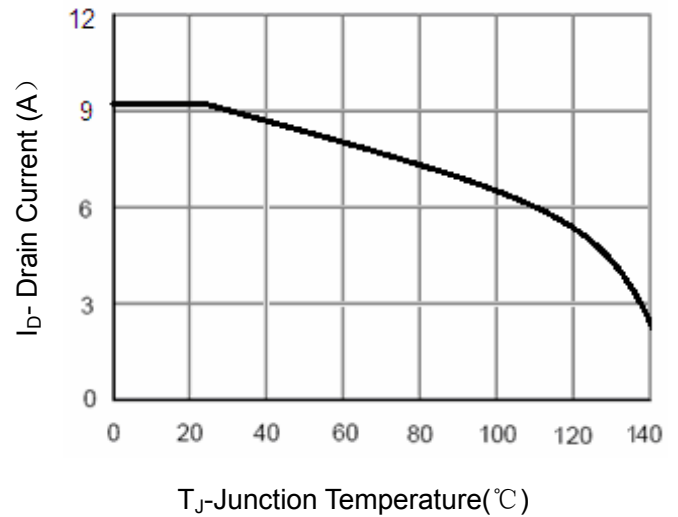


Figure 4: Drain Current

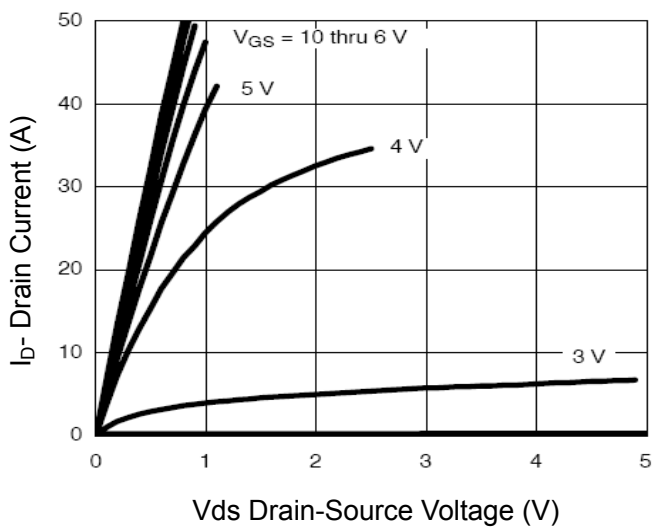


Figure 5: Output Characteristics

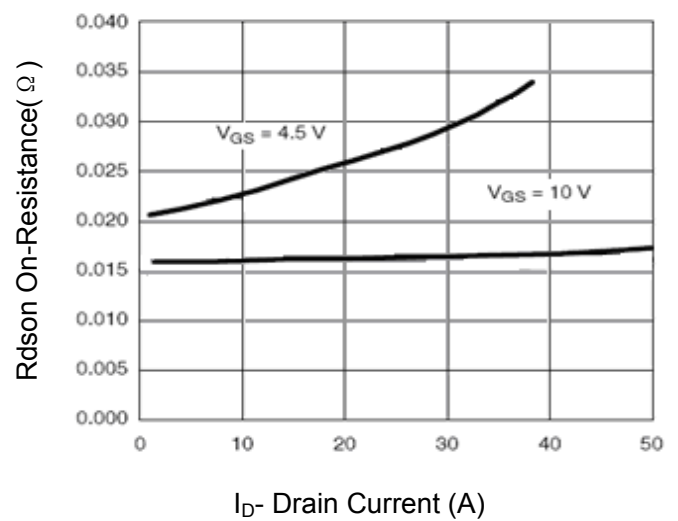


Figure 6: Drain-Source On-Resistance

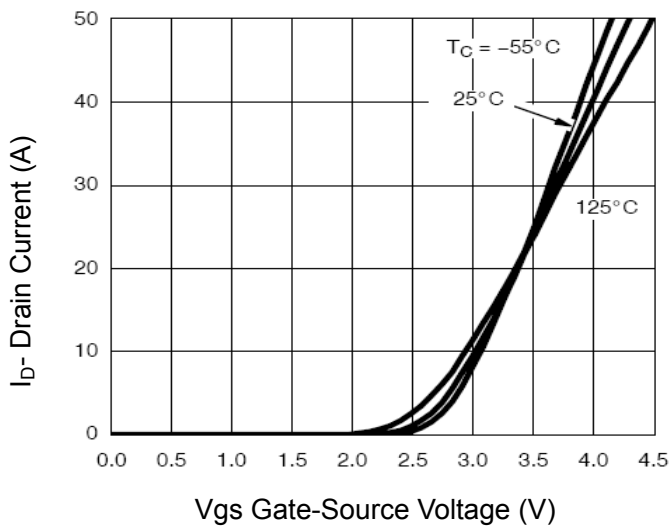


Figure 7 Transfer Characteristics

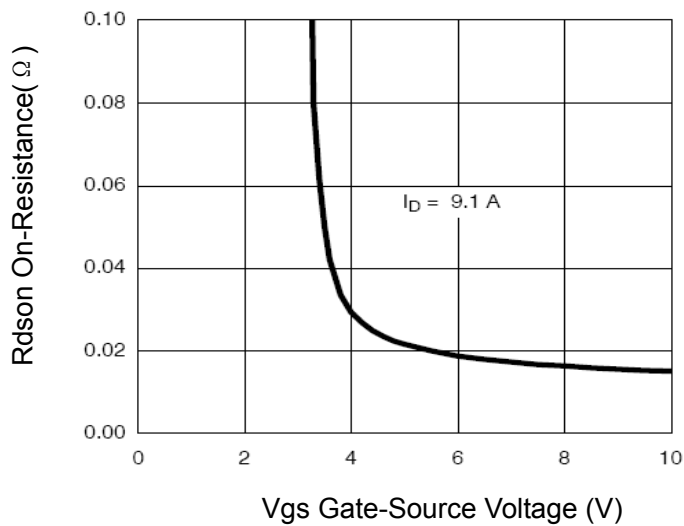


Figure 9 Rdson vs Vgs

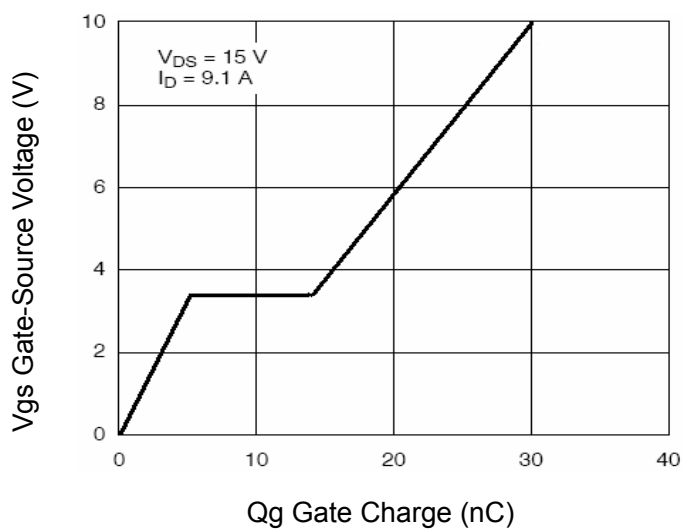


Figure 11 Gate Charge

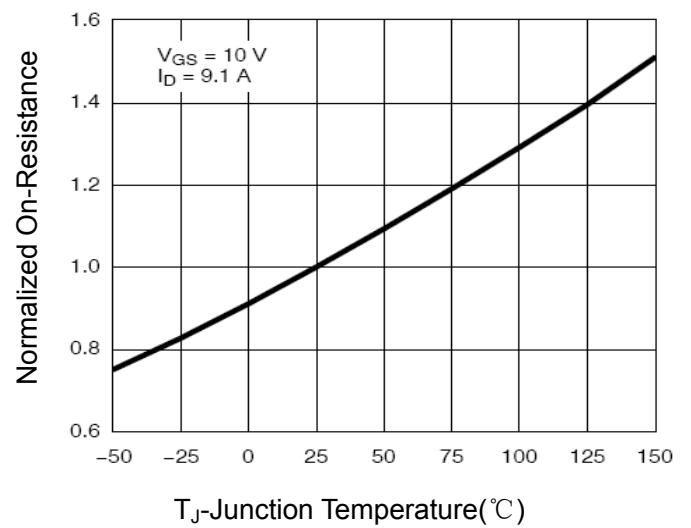


Figure 8 Drain-Source On-Resistance

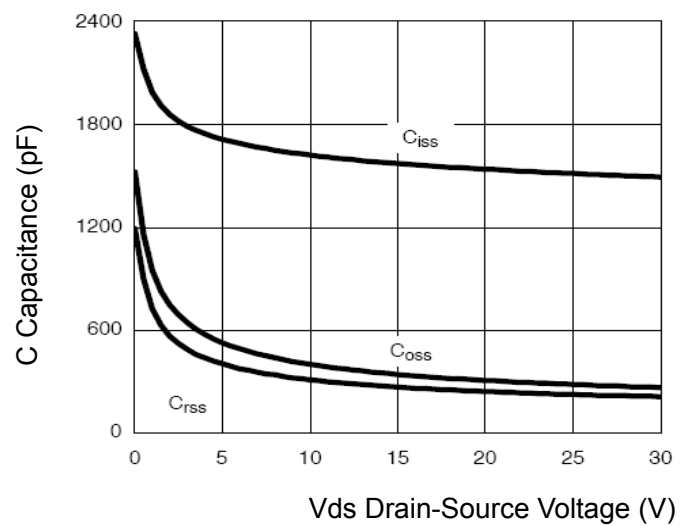


Figure 10 Capacitance vs Vds

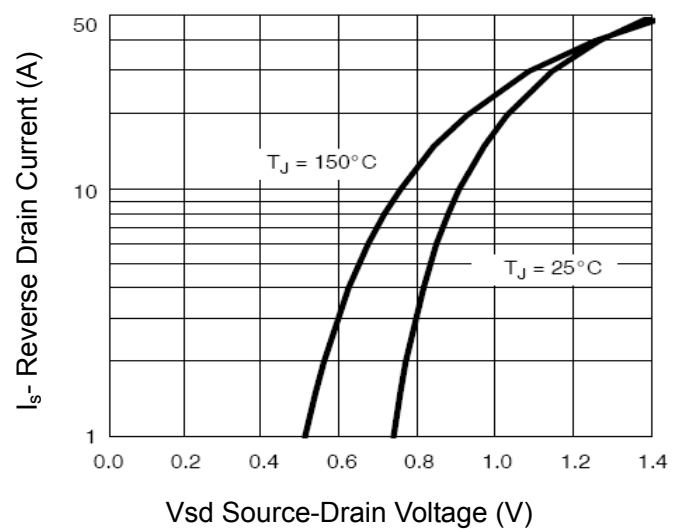


Figure 12 Source- Drain Diode Forward

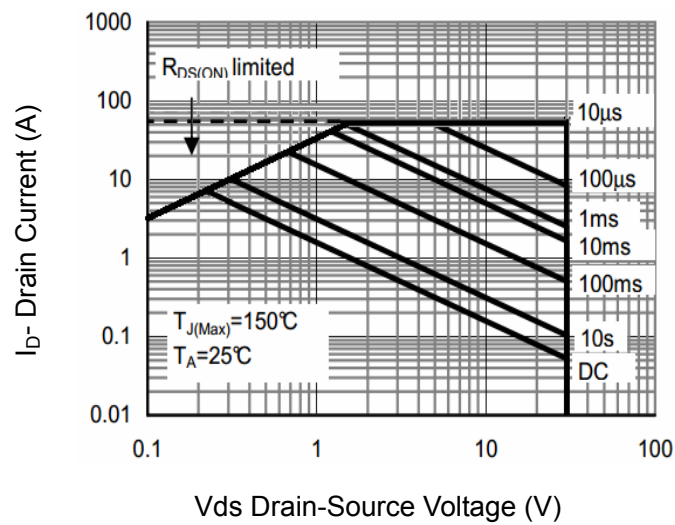


Figure 13 Safe Operation Area

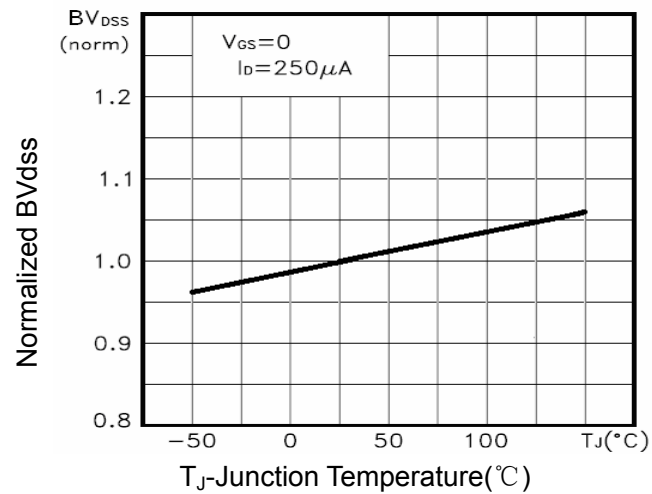


Figure 14 BV_{DS} vs Junction Temperature

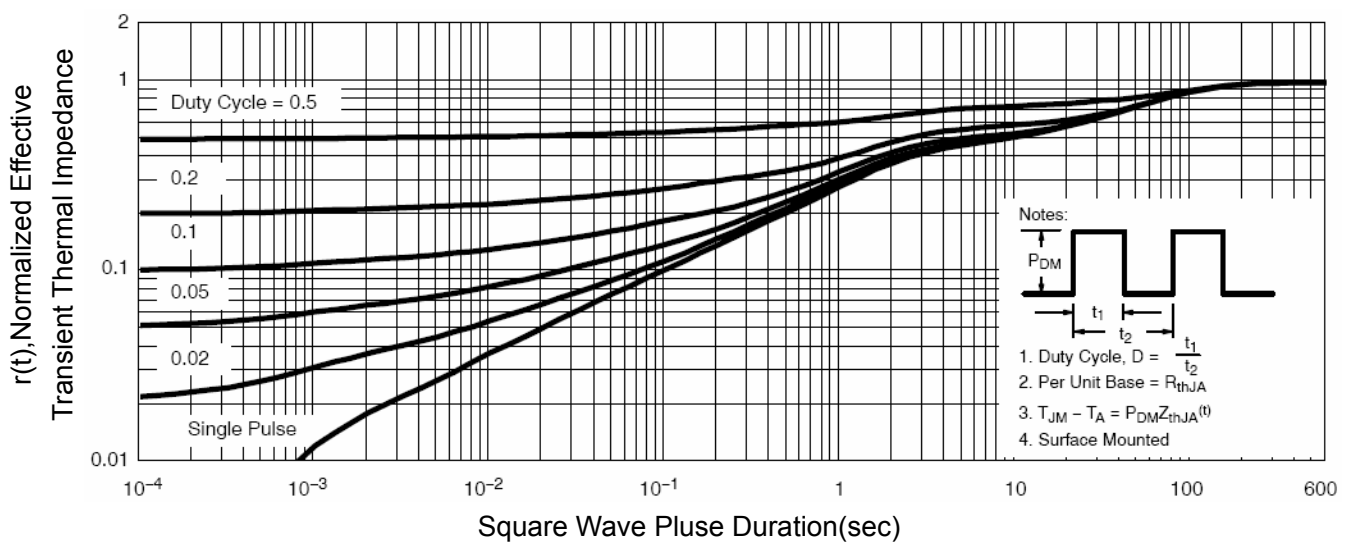
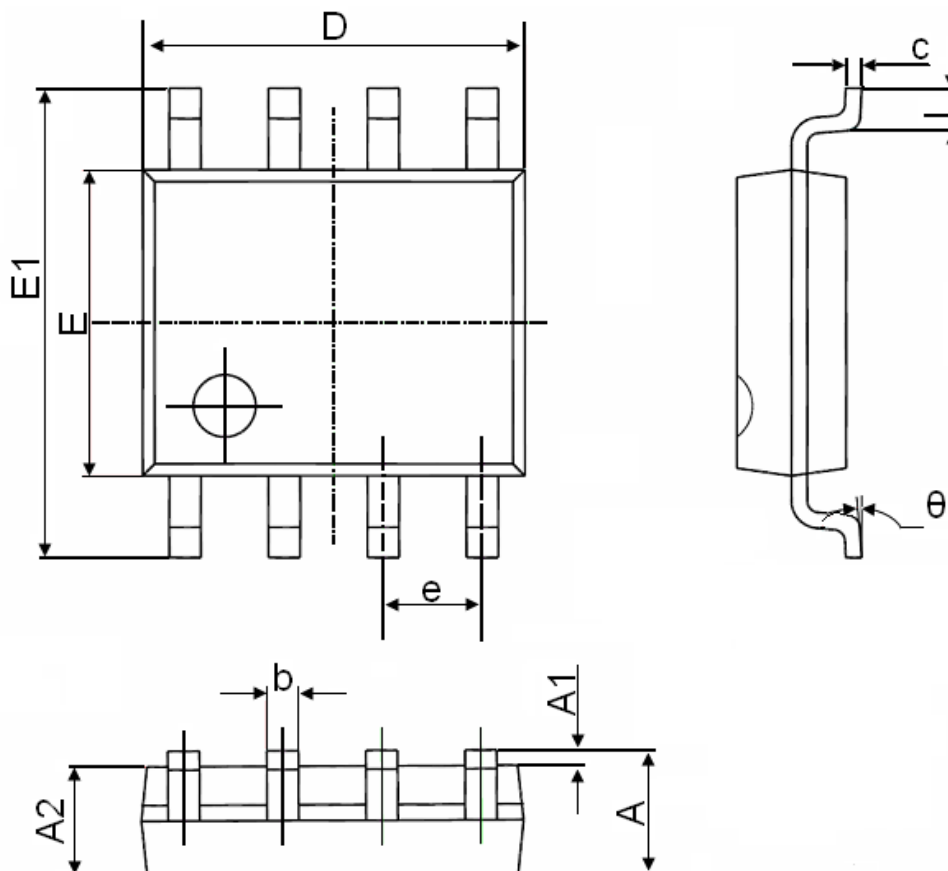


Figure 15 Normalized Maximum Transient Thermal Impedance

SOP-8 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

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