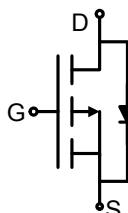
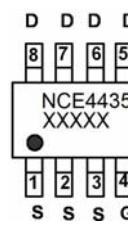
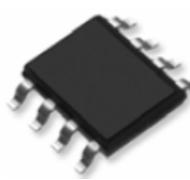


NCE P-Channel Enhancement Mode Power MOSFET

<p>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.</p> <p>General Features</p> <ul style="list-style-type: none"> ● $V_{DS} = -30V, I_D = -9.1A$ ● $R_{DS(ON)} < 35m\Omega @ V_{GS}=-4.5V$ ● $R_{DS(ON)} < 20m\Omega @ V_{GS}=-10V$ ● High power and current handing capability ● Lead free product is acquired ● Surface mount package <p>Application</p> <ul style="list-style-type: none"> ● Battery Switch ● Load switch ● Power management 	 <p>Schematic diagram</p>  <p>Marking and pin assignment</p>  <p>SOP-8 top view</p>
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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 ($T_A=25^\circ C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	-30	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ($T_J=150^\circ C$)	I_D	-11	A
		-9	
		-9.1	
		-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	°C

Thermal Characteristic

Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	40	°C/W
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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}	$\text{V}_{\text{GS}}=0\text{V}, \text{I}_{\text{D}}=-250\mu\text{A}$	-30	-33	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$\text{V}_{\text{DS}}=-30\text{V}, \text{V}_{\text{GS}}=0\text{V}$	-	-	-1	μA
Gate-Body Leakage Current	I_{GSS}	$\text{V}_{\text{GS}}=\pm 20\text{V}, \text{V}_{\text{DS}}=0\text{V}$	-	-	± 100	nA
On Characteristics <small>(Note 3)</small>						
Gate Threshold Voltage	$\text{V}_{\text{GS}(\text{th})}$	$\text{V}_{\text{DS}}=\text{V}_{\text{GS}}, \text{I}_{\text{D}}=-250\mu\text{A}$	-1	-1.5	-3	V
Drain-Source On-State Resistance	$\text{R}_{\text{DS}(\text{ON})}$	$\text{V}_{\text{GS}}=-10\text{V}, \text{I}_{\text{D}}=-9.1\text{A}$	-	16	20	$\text{m}\Omega$
		$\text{V}_{\text{GS}}=-4.5\text{V}, \text{I}_{\text{D}}=-6.9\text{A}$	-	21	35	$\text{m}\Omega$
Forward Transconductance	g_{FS}	$\text{V}_{\text{DS}}=-15\text{V}, \text{I}_{\text{D}}=-9.1\text{A}$	10	-	-	S
Dynamic Characteristics <small>(Note 4)</small>						
Input Capacitance	C_{iss}	$\text{V}_{\text{DS}}=-15\text{V}, \text{V}_{\text{GS}}=0\text{V}, \text{F}=1.0\text{MHz}$	-	1600	-	PF
Output Capacitance	C_{oss}		-	350	-	PF
Reverse Transfer Capacitance	C_{rss}		-	300	-	PF
Switching Characteristics <small>(Note 4)</small>						
Turn-on Delay Time	$\text{t}_{\text{d}(\text{on})}$	$\text{V}_{\text{DD}}=-15\text{V}, \text{ID}=-1\text{A}, \text{V}_{\text{GS}}=-10\text{V}, \text{R}_{\text{GEN}}=6\Omega$	-	10	-	nS
Turn-on Rise Time	t_r		-	15	-	nS
Turn-Off Delay Time	$\text{t}_{\text{d}(\text{off})}$		-	110	-	nS
Turn-Off Fall Time	t_f		-	70	-	nS
Total Gate Charge	Q_{g}	$\text{V}_{\text{DS}}=-15\text{V}, \text{I}_{\text{D}}=-9.1\text{A}$ $\text{V}_{\text{GS}}=-10\text{V}$	-	30	-	nC
Gate-Source Charge	Q_{gs}		-	5.5	-	nC
Gate-Drain Charge	Q_{gd}		-	8	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage <small>(Note 3)</small>	V_{SD}	$\text{V}_{\text{GS}}=0\text{V}, \text{I}_{\text{S}}=-9.1\text{A}$	-	-	-1.2	V

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production

Typical Electrical and Thermal Characteristics

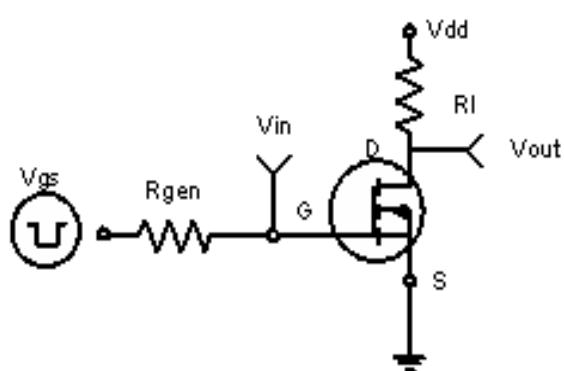


Figure 1: Switching Test Circuit

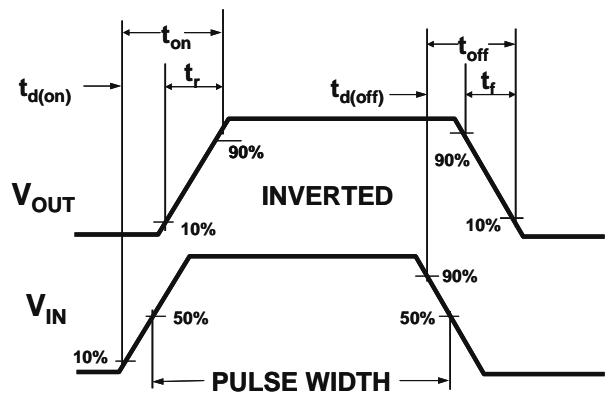


Figure 2: Switching Waveforms

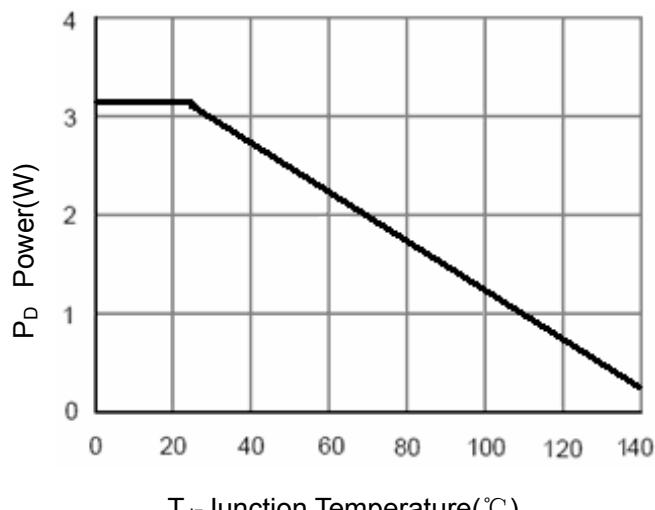


Figure 3 Power Dissipation

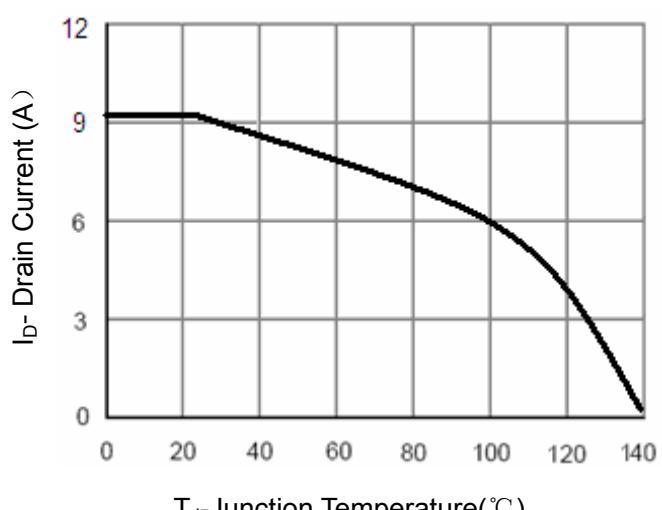


Figure 4 Drain Current

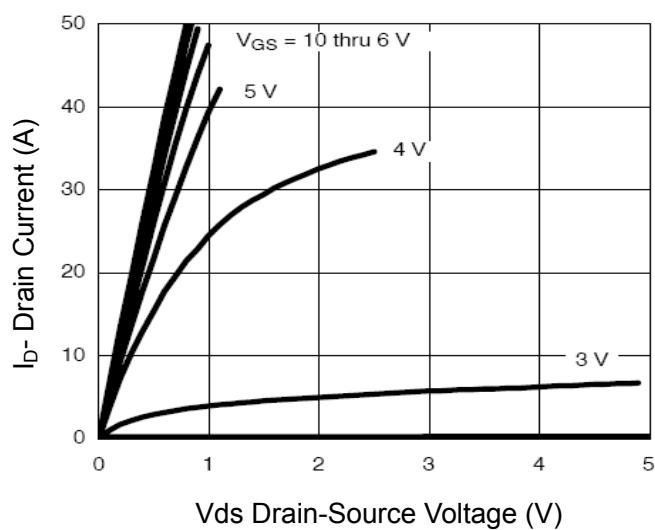


Figure 5 Output Characteristics

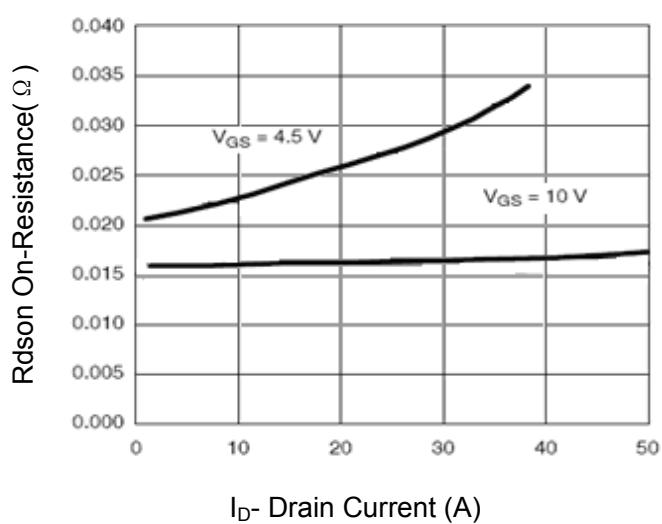


Figure 6 Drain-Source On-Resistance

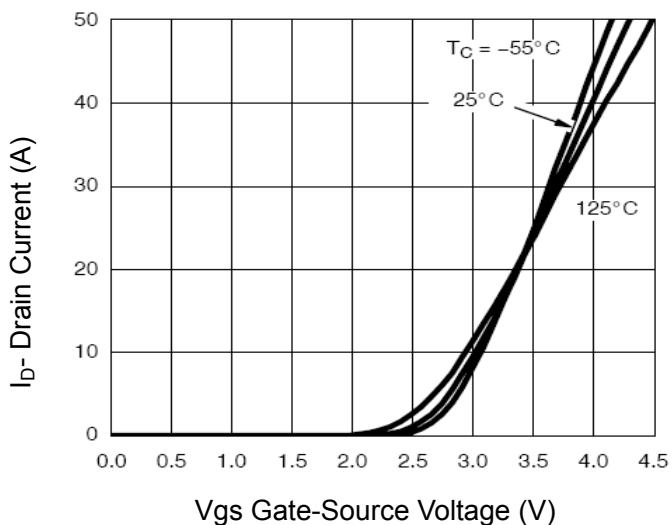


Figure 7 Transfer Characteristics

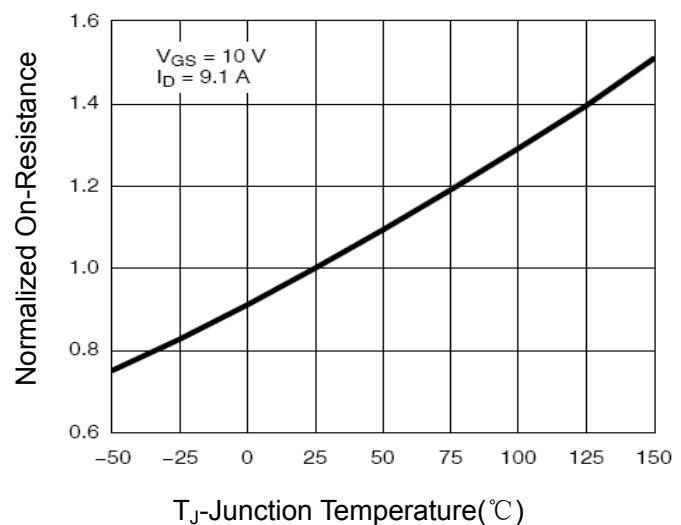


Figure 8 Drain-Source On-Resistance

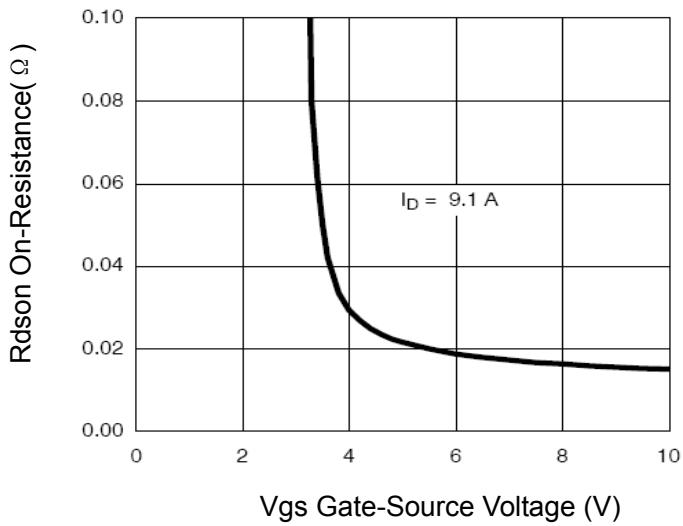


Figure 9 R_{DSON} vs V_{GS}

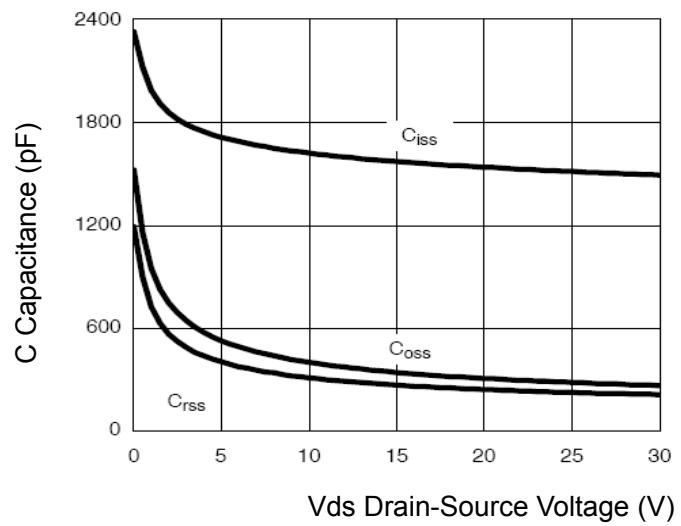


Figure 10 Capacitance vs V_{DS}

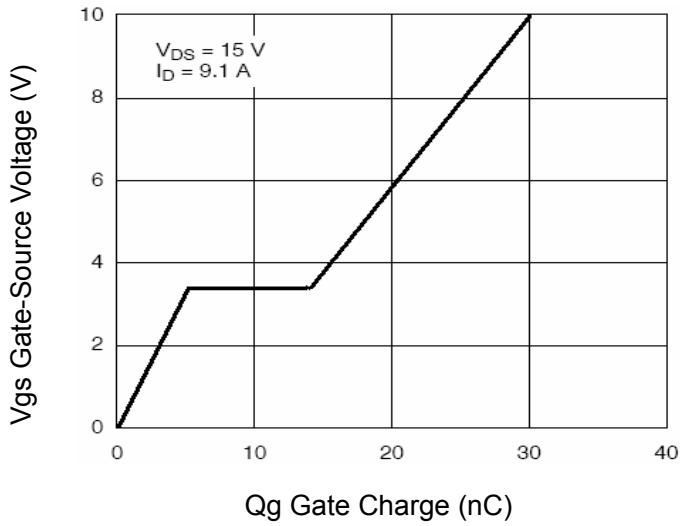


Figure 11 Gate Charge

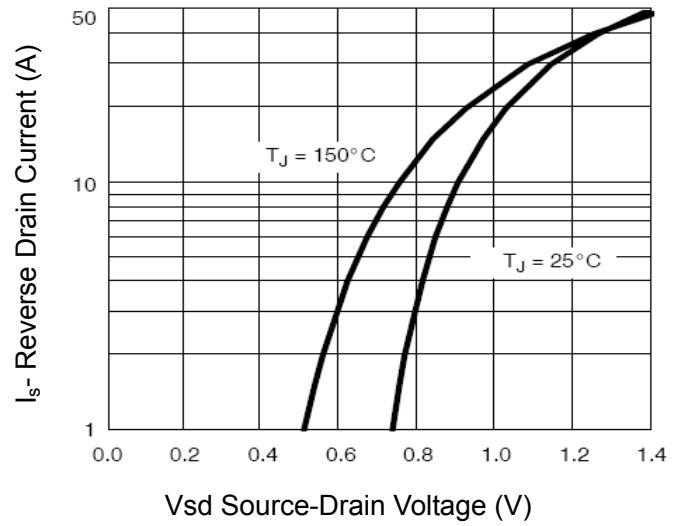


Figure 12 Source-Drain Diode Forward

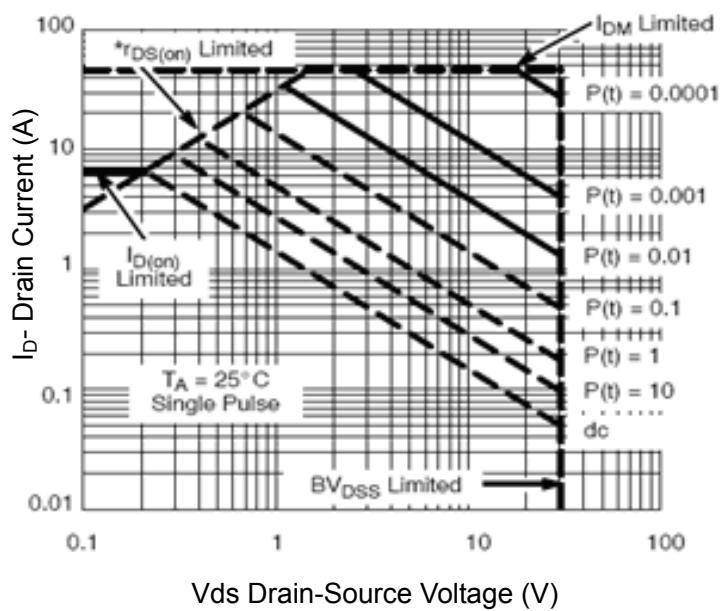


Figure 13 Safe Operation Area

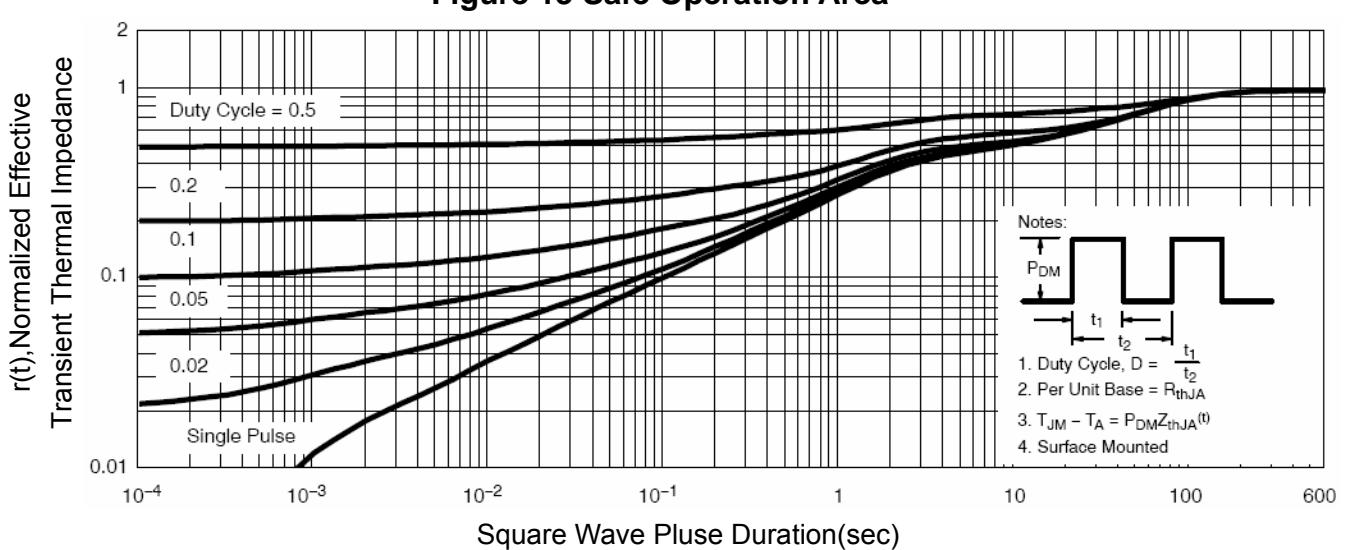
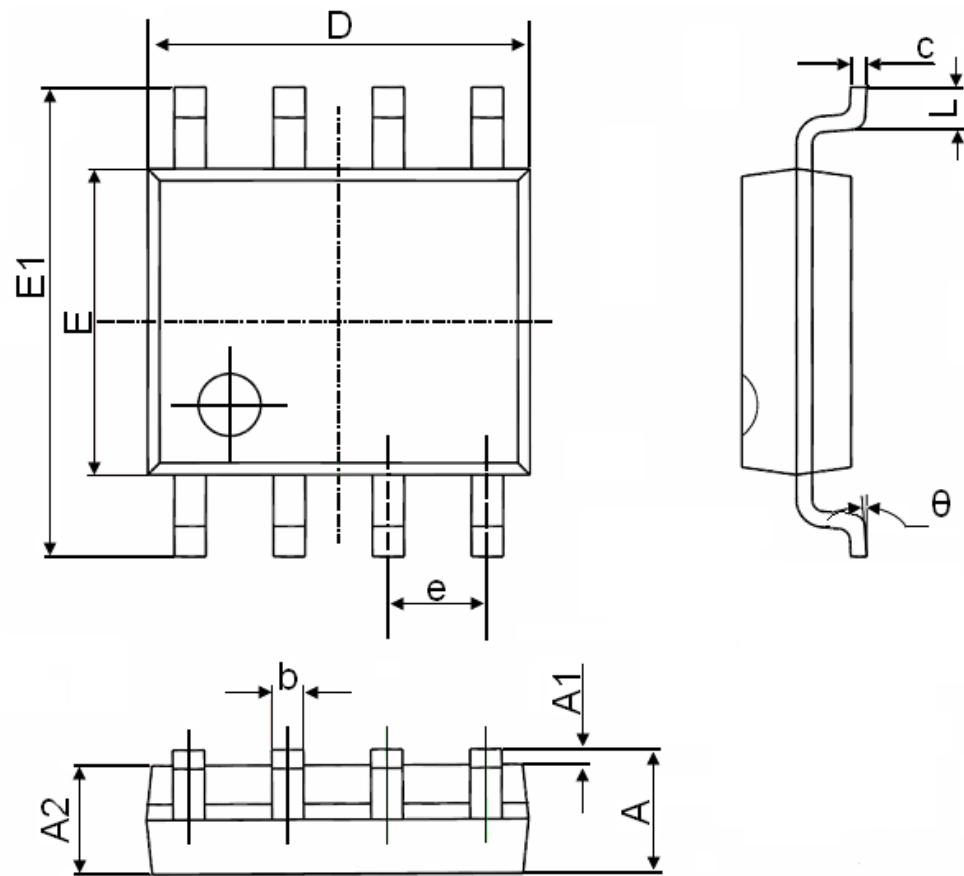


Figure 14 Normalized Maximum Transient Thermal Impedance

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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