SI4401

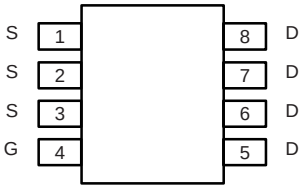
P-Channel MOSFET

PRODUCT SUMMARY

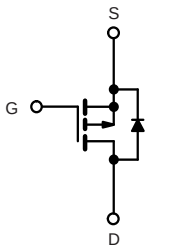
- $V_{DS\,(V)}$ =-40V
- $R_{DS(ON)}$ < 18mΩ (V_{GS} = -10V)
- $R_{DS(ON)}$ < 29mΩ (V_{GS} = -4.5V)

APPLICATIONS

- Load Switch
- POL



SOP-8



P-Channel MOSFET

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	- 16.1	A
	T_C = 70 °C		- 12.9	
	T_A = 25 °C		- 10.2[b, c]	
	T_A = 70 °C		- 8.2[b, c]	
Pulsed Drain Current		I_{DM}	- 50	
Continous Source-Drain Diode Current	T_C = 25 °C	I_S	- 5.3	
	T_A = 25 °C		- 2.1[b, c]	
Single Pulse Avalanche Current	L = 0.1 mH	I_{AS}	- 28	
Single Pulse Avalanche Energy		E_{AS}	39	mJ
Maximum Power Dissipation	T_C = 25 °C	P_D	6.3	W
	T_C = 70 °C		4	
	T_A = 25 °C		2.5[b, c]	
	T_A = 70 °C		1.6[b, c]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150	°C

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient[b, d]	t ≤ 10 s	R_{thJA}	37	50	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	16	20	

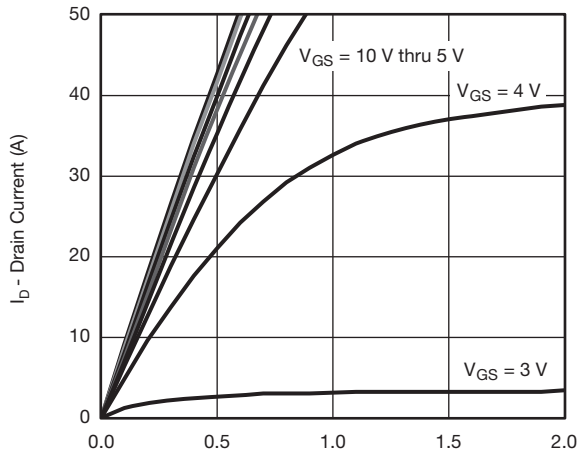
Notes:
a. Based on T_C = 25 °C.
b. Surface mounted on 1" x 1" FR4 board.
c. t = 10 s.
d. Maximum under steady state conditions is 85 °C/W.

SPECIFICATIONS T_J = 25 °C, unless otherwise noted

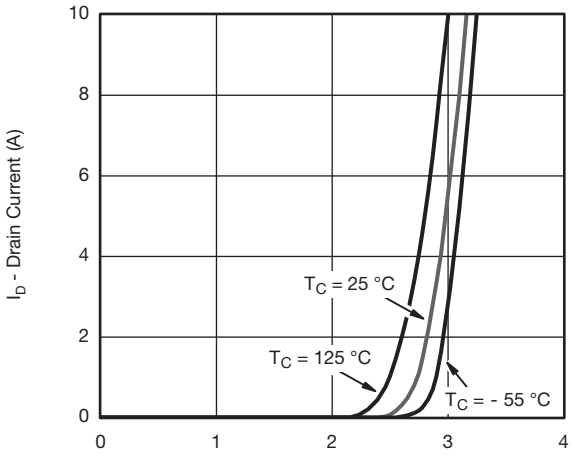
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = - 250 µA	- 40			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	µA		- 36		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$	µA		5		mV/°C
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS} , I_D = - 250 µA	- 1.2		- 2.5	V
Gate-Source 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			- 5	µA
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \leq$ - 5 V, V_{GS} = - 10 V	- 25			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = - 10 V, I_D = - 10.2 A			18	mΩ
		V_{GS} = - 4.5 V, I_D = - 8.4 A			29	mΩ
Forward Transconductance[a]	g_{fs}	V_{DS} = - 15 V, I_D = - 10.2 A		37		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = - 20 V, V_{GS} = 0 V, f = 1 MHz		3007		pF
Output Capacitance	C_{oss}			335		pF
Reverse Transfer Capacitance	C_{rss}			291		pF
Total Gate Charge	Q_g	V_{DS} = - 20 V, V_{GS} = - 10 V, I_D = - 10.2 A		64	95	nC
		V_{DS} = - 20 V, V_{GS} = - 4.5 V, I_D = - 10.2 A		33	50	nC
Gate-Source Charge	Q_{gs}			9.8		nC
Gate-Drain Charge	Q_{gd}			15.7		nC
Gate Resistance	R_g	f = 1 MHz	0.4	2	4	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 20 V, R_L = 2.4 Ω $I_D \cong$ - 8.2 A, V_{GEN} = - 4.5 V, R_g = 1 Ω		57	86	ns
Rise Time	t_r			50	75	ns
Turn-Off Delay Time	$t_{d(off)}$			40	60	ns
Fall Time	t_f			17	26	ns
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 20 V, R_L = 2.4 Ω $I_D \cong$ - 8.2 A, V_{GEN} = - 10 V, R_g = 1 Ω		13	20	ns
Rise Time	t_r			11	20	ns
Turn-Off Delay Time	$t_{d(off)}$			45	68	ns
Fall Time	t_f			9	18	ns
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			- 5.3	A
Pulse Diode Forward Current	I_{SM}				- 50	A
Body Diode Voltage	V_{SD}	I_S = - 8.2 A, V_{GS} = 0 V		- 0.8	- 1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = - 8.2 A, dI/dt = 100 A/µs, T_J = 25 °C		36	54	ns
Body Diode Reverse Recovery Charge	Q_{rr}			41	62	nC
Reverse Recovery Fall Time	t_a			20		ns
Reverse Recovery Rise Time	t_b			16		ns

Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

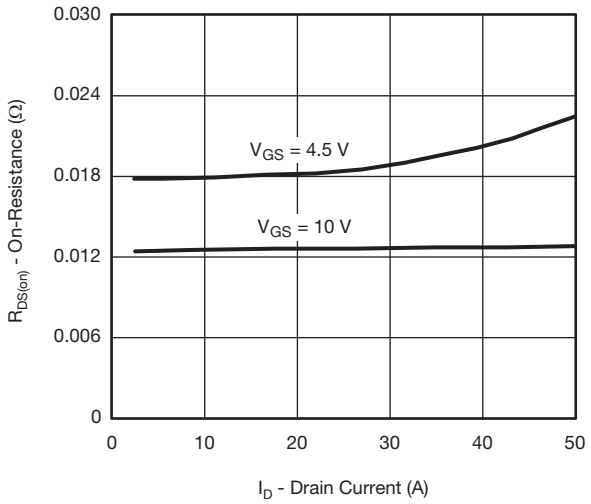
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



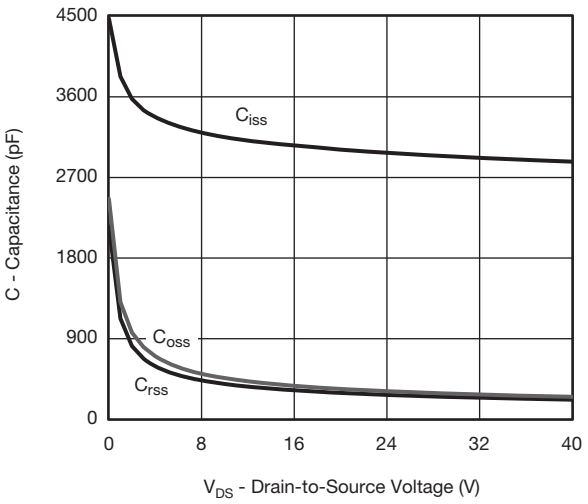
Output Characteristics



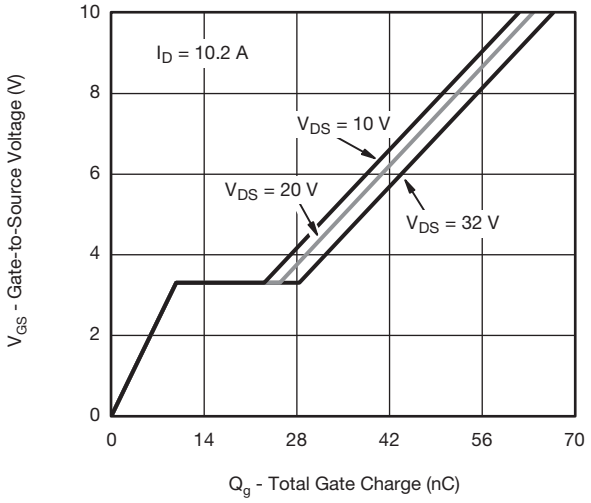
Transfer Characteristics



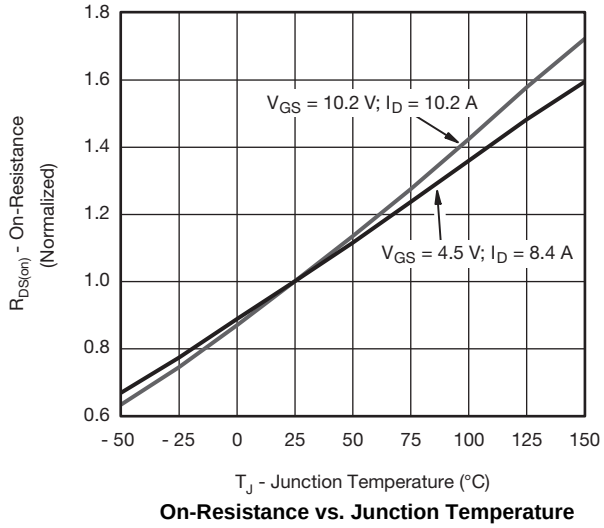
On-Resistance vs. Drain Current



Capacitance

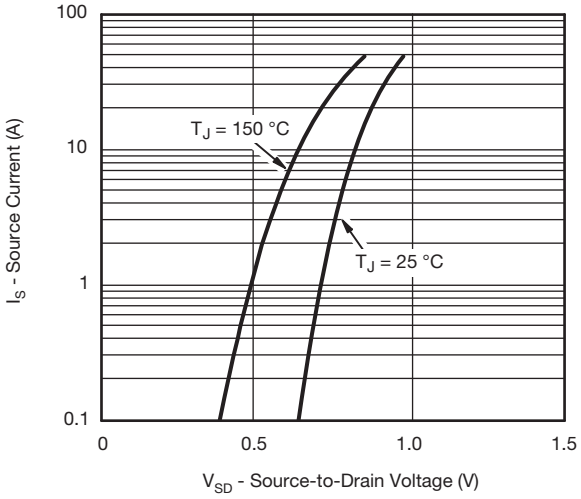


Gate Charge

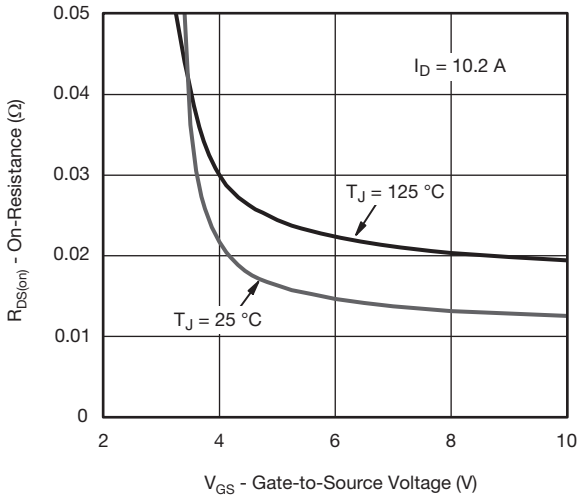


On-Resistance vs. Junction Temperature

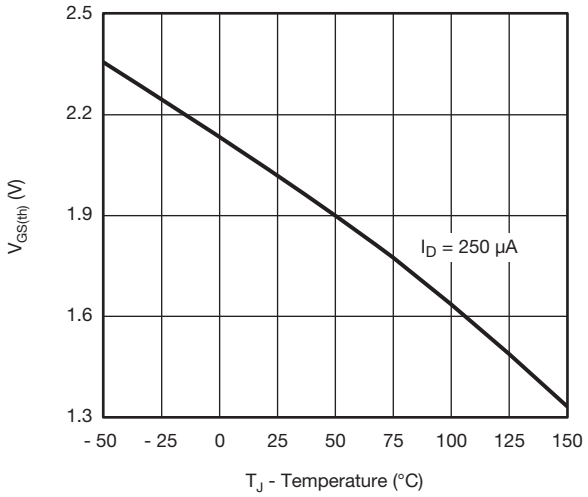
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



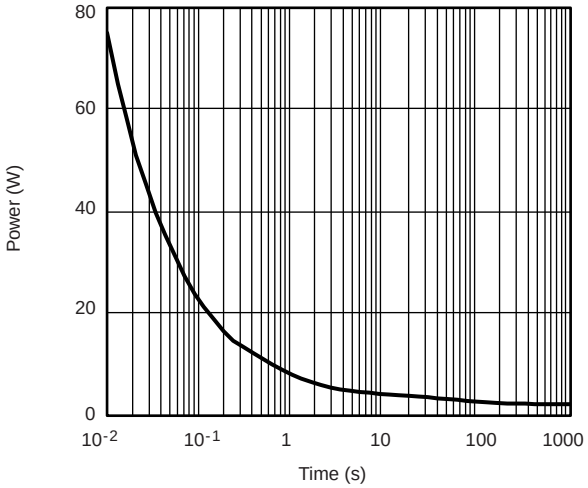
Source-Drain Diode Forward Voltage



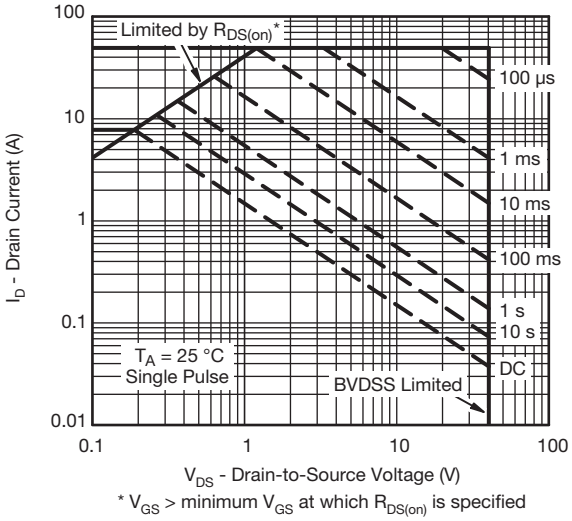
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



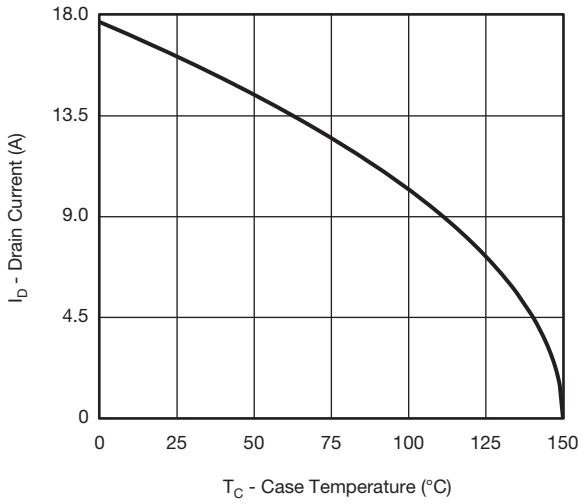
Single Pulse Power (Junction-to-Ambient)



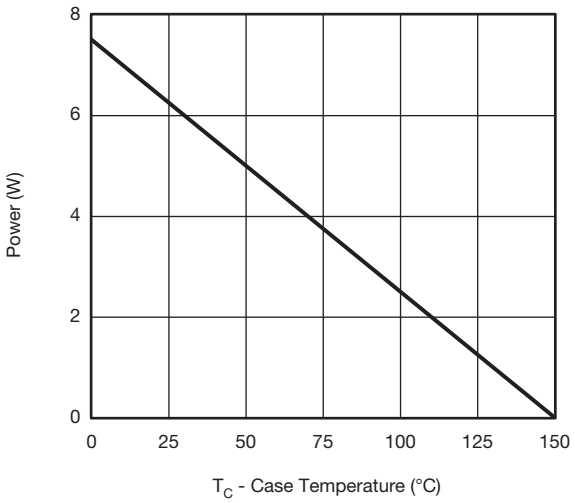
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

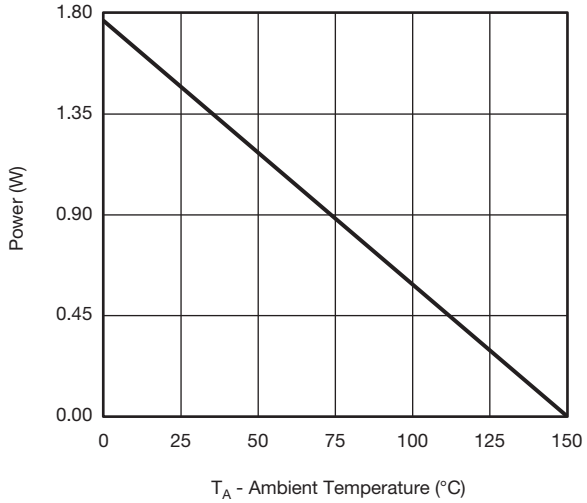
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Current Derating*



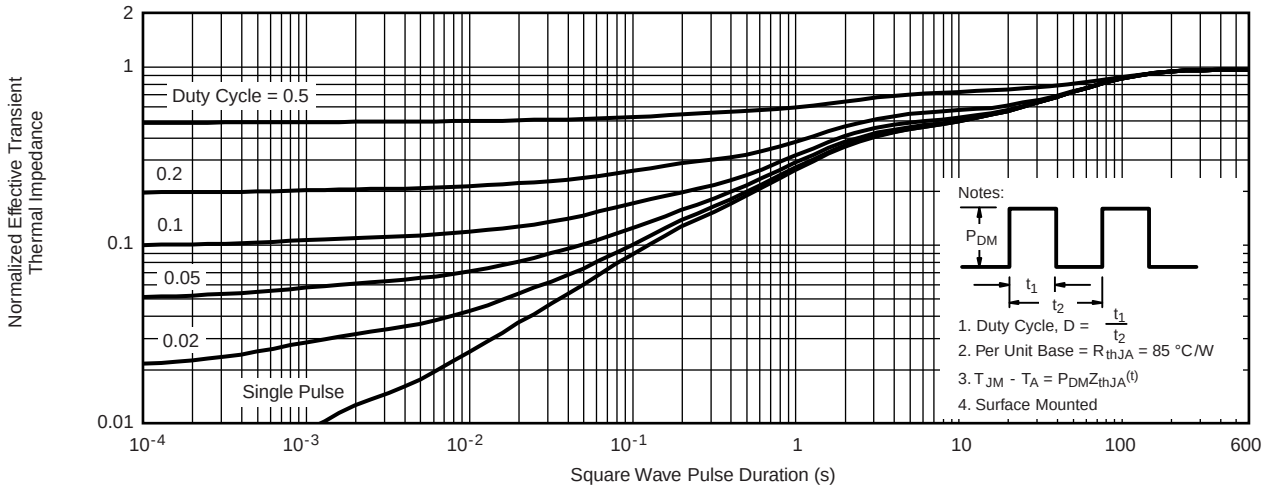
Power, Junction-to-Foot



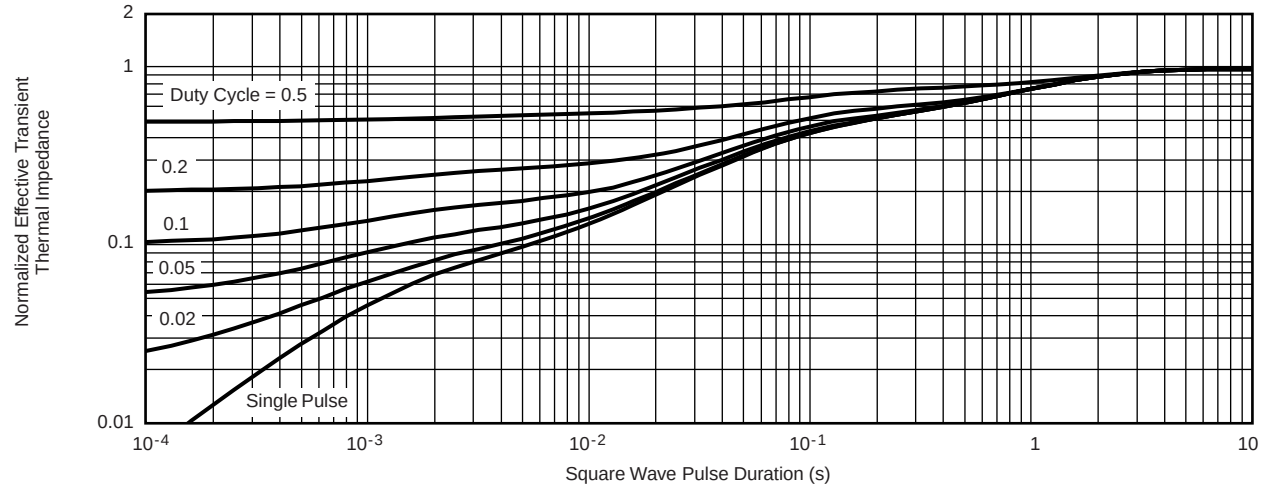
Power, Junction-to-Ambient

* 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

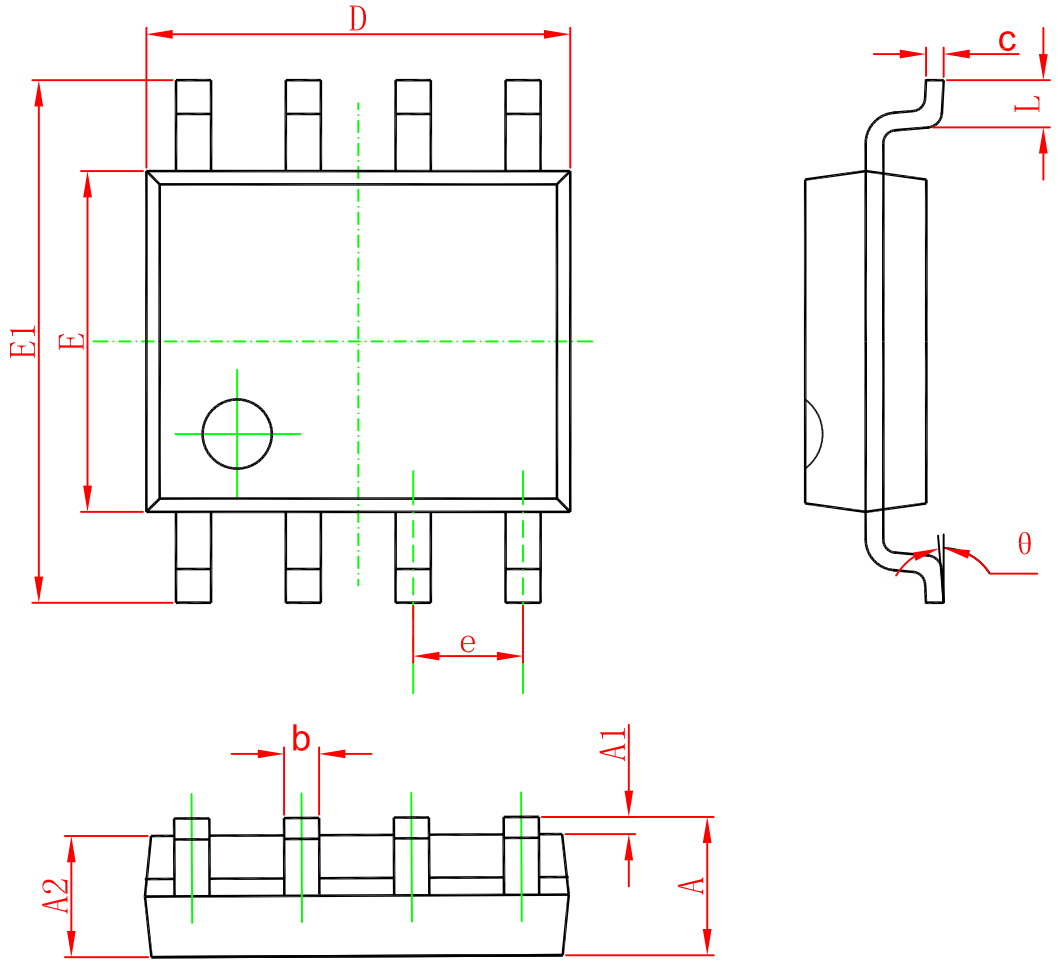


Normalized Thermal Transient Impedance, Junction-to-Ambient



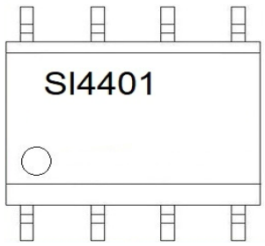
Normalized Thermal Transient Impedance, Junction-to-Foot

SOP-8



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°

Marking



Ordering information

Order code	Package	Baseqty	Deliverymode
SI4401BDY	SOP-8	3000	Tape and reel