

## P & N-Channel 30-V (D-S) MOSFET

### ■ Features

- Low  $r_{DS(on)}$  Provides Higher Efficiency and Extends Battery Life
- Miniature SO-8 Surface Mount Package Saves Board Space
- High power and current handling capability
- Low side high current DC-DC Converter applications

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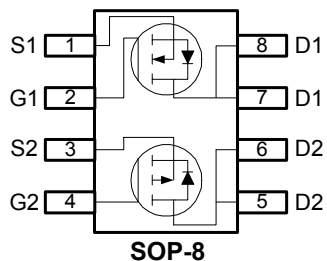
### ■ General Description

These miniature surface mount MOSFETs utilize High Cell Density process. Low  $r_{DS(on)}$  assures minimal power loss and conserves energy, making this device ideal for use in power management circuitry. Typical applications are PWMDC-DC converters, power management in portable and battery-powered products such as computers, printers, battery charger, telecommunication power system, and telephones power system.

### ■ Product Summary

$V_{DS}$ (V)	$r_{DS(on)}$ (m $\Omega$ )	$I_D$ (A)
30	20@ $V_{GS}=4.5V$	8.4
	13.5@ $V_{GS}=10V$	10.0
-30	30@ $V_{GS}=-4.5V$	-6.8
	19@ $V_{GS}=-10V$	-8.5

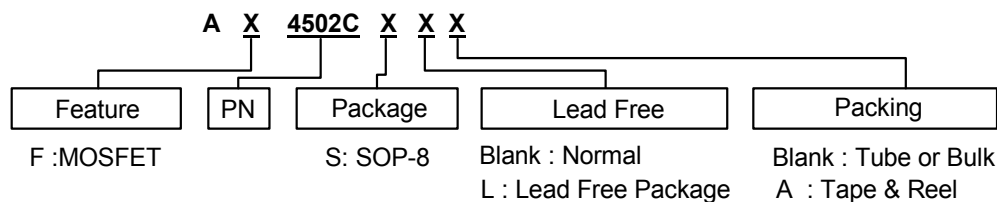
### ■ Pin Assignments



### ■ Pin Descriptions

Pin Name	Description
S1	Source (NMOS)
G1	Gate (NMOS)
D1	Drain (NMOS)
S2	Source (PMOS)
G2	Gate (PMOS)
D2	Drain (PMOS)

### ■ Ordering information





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

Symbol	Parameter	N-Channel	P-Channel	Units	
$V_{DS}$	Drain-Source Voltage	30	-30	V	
$V_{GS}$	Gate-Source Voltage	20	-25		
$I_D$	Continuous Drain Current (Note 1)	$T_A=25^\circ\text{C}$	10	-8.5	A
		$T_A=70^\circ\text{C}$	8.1	-6.8	
$I_{DM}$	Pulsed Drain Current (Note 2)	$\pm 50$	$\pm 50$	A	
$I_S$	Continuous Source Current (Diode Conduction) (Note 1)	2.3	-2.1	A	
$P_D$	Power Dissipation (Note 1)	$T_A=25^\circ\text{C}$	2.1	2.1	W
		$T_A=70^\circ\text{C}$	1.3	1.3	
$T_J, T_{STG}$	Operating Junction and Storage Temperature Range	-	-55 to 150	$^\circ\text{C}$	

### ■ Thermal Resistance Ratings

Symbol	Parameter	Maximum	Units
$R_{\theta JC}$	Maximum Junction-to-Case (Note 1)	40	$^\circ\text{C/W}$
$R_{\theta JA}$	Maximum Junction-to-Ambient (Note 1)	60	$^\circ\text{C/W}$

Note 1: surface Mounted on 1"x 1" FR4 Board.

Note 2: Pulse width limited by maximum junction temperature

### ■ Specifications ( $T_A=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Limits				Unit
			Ch	Min.	Typ.	Max.	
<b>Static</b>							
$V_{(BR)DSS}$	Drain-Source breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	N	30	-	-	V
		$V_{GS}=0V, I_D=-250\mu A$	P	-30	-	-	
$V_{GS(th)}$	Gate-Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	N	1	1.95	3	V
		$V_{DS}=V_{GS}, I_D=-250\mu A$	P	-1.0	-1.6	-3	
$I_{GSS}$	Gate-Body Leakage	$V_{GS}=20V, V_{DS}=0V$	N	-	-	$\pm 100$	nA
		$V_{GS}=-20V, V_{DS}=0V$	P	-	-	$\pm 100$	
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=24V, V_{GS}=0V$	N	-	-	1	uA
		$V_{DS}=-24V, V_{GS}=0V$	P	-	-	-1	
$I_{D(on)}$	On-State Drain Current (Note 3)	$V_{DS}=5V, V_{GS}=10V$	N	20	-	-	A
		$V_{DS}=-5V, V_{GS}=-10V$	P	-50	-	-	
$r_{DS(on)}$	Drain-Source On-Resistance (Note 3)	$V_{GS}=10V, I_D=10A$	N	-	11	13.5	m $\Omega$
		$V_{GS}=4.5V, I_D=8.4A$		-	15	20	
		$V_{GS}=-10V, I_D=-8.5A$	P	-	16	19	
		$V_{GS}=-4.5V, I_D=-6.8A$		-	26	30	
$g_{fs}$	Forward Transconductance (Note 3)	$V_{DS}=15V, I_D=10A$	N	-	40	-	S
		$V_{DS}=-15V, I_D=-9.5A$	P	-	31	-	



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### ■ Specifications (T<sub>A</sub>=25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Limits				Unit
			Ch	Min.	Typ.	Max.	
<b>Dynamic</b>							
Q <sub>g</sub>	Total Gate Charge	N-Channel V <sub>DS</sub> =15V, V <sub>GS</sub> =4.5V	N	-	12	19	nC
			P	-	13	26	
Q <sub>gs</sub>	Gate-Source Charge	I <sub>D</sub> =10A P-Channel	N	-	3.3	-	
			P	-	5.8	-	
Q <sub>gd</sub>	Gate-Drain Charge	V <sub>DS</sub> =-15V, V <sub>GS</sub> =-4.5V I <sub>D</sub> =-10A	N	-	4.5	-	
			P	-	12	-	
<b>Switching</b>							
t <sub>d(on)</sub>	Turn-On Delay Time	N-Channel V <sub>DD</sub> =15, V <sub>GS</sub> =10V I <sub>D</sub> =1A, R <sub>GEN</sub> =25Ω	N	-	20	30	nS
			P	-	15	26	
t <sub>r</sub>	Rise Time	P-Channel V <sub>DD</sub> =-15, V <sub>GS</sub> =-10V I <sub>D</sub> =-1A, R <sub>GEN</sub> =15Ω	N	-	9	20	
			P	-	16	21	
t <sub>d(off)</sub>	Turn-Off Delay Time		N	-	70	102	
			P	-	62	108	
t <sub>f</sub>	Fall-Time		N	-	20	81	
			P	-	46	71	

**Note 3:** Pulse test: PW ≤ 300us duty cycle ≤ 2%.

**Note 4:** Guaranteed by design, not subject to production testing.

## P & N-Channel 30-V (D-S) MOSFET

### ■ Typical Performance Characteristics

#### Typical Electrical Characteristics (P-Channel)

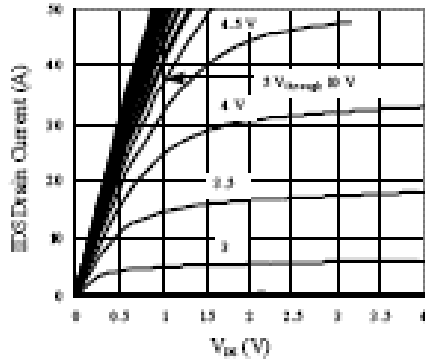


Figure 1. On-Region Characteristics

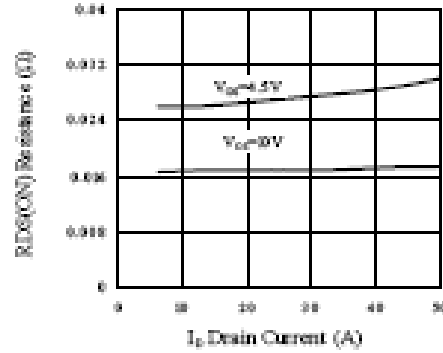


Figure 2. On-Resistance with Drain Current

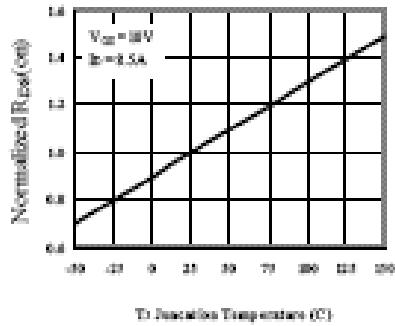


Figure 3. On-Resistance Variation with Temperature

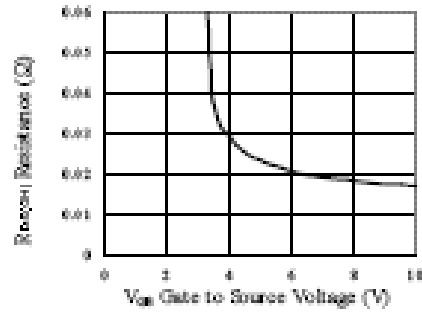


Figure 4. On-Resistance Variation with Gate to Source Voltage

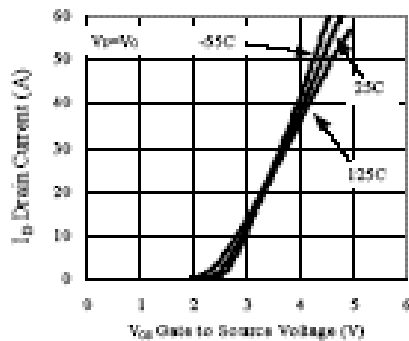


Figure 5. Transfer Characteristics

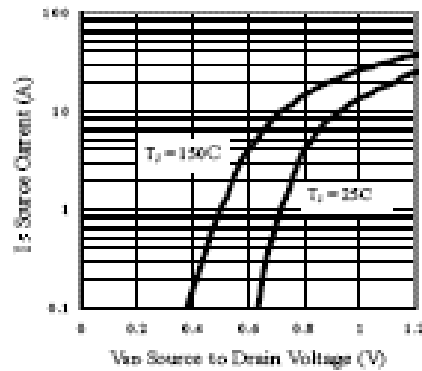


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

## P & N-Channel 30-V (D-S) MOSFET

### ■ Typical Performance Characteristics (Continued)

#### Typical Electrical Characteristics (P-Channel)

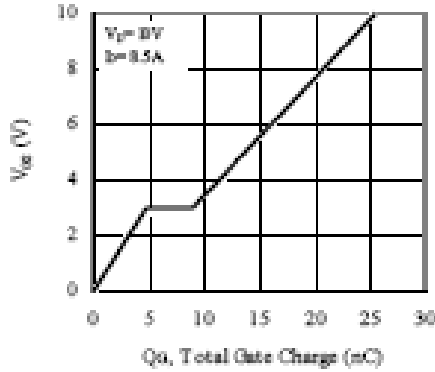


Figure 7. Gate Charge Characteristics

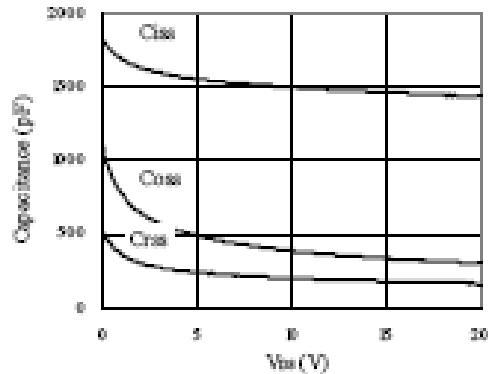


Figure 8. Capacitance Characteristics

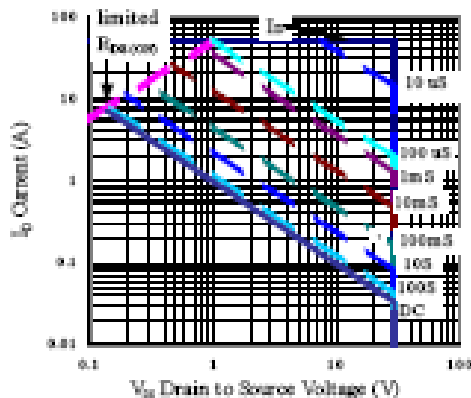


Figure 9. Maximum Safe Operating Area

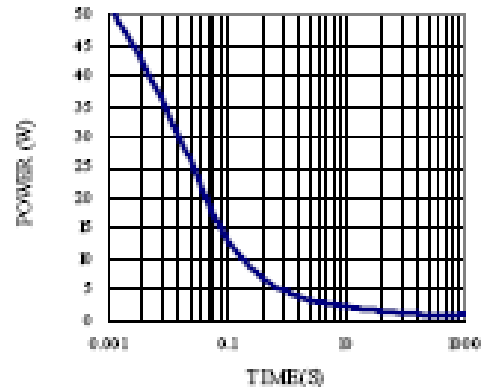


Figure 10. Single Pulse Maximum Power Dissipation

#### Normalized Thermal Transient Junction to Ambient

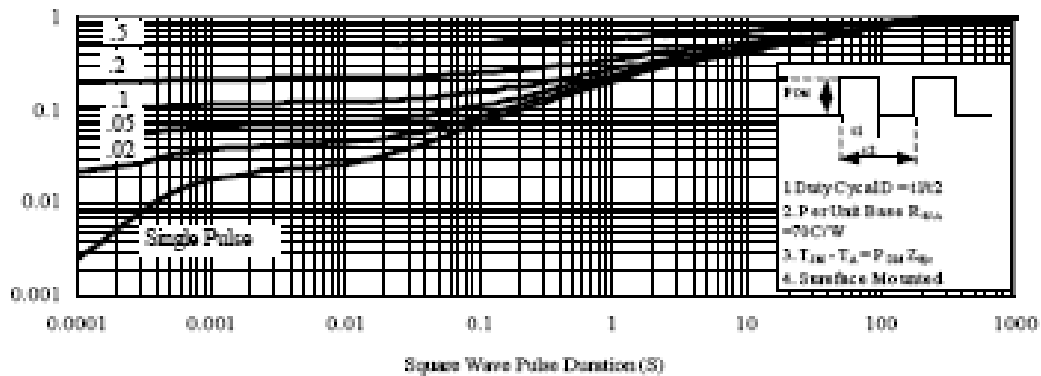
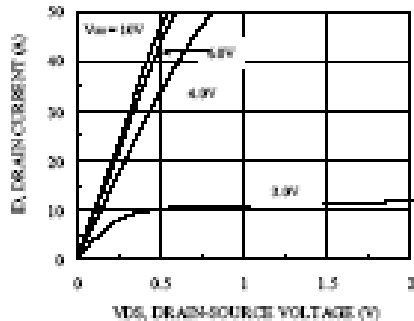
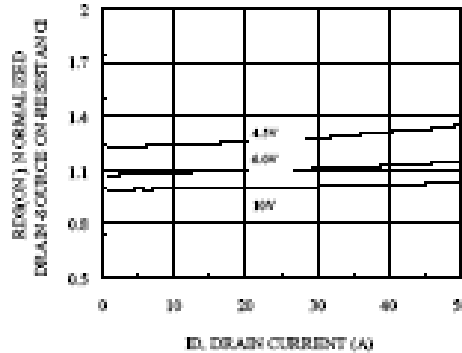
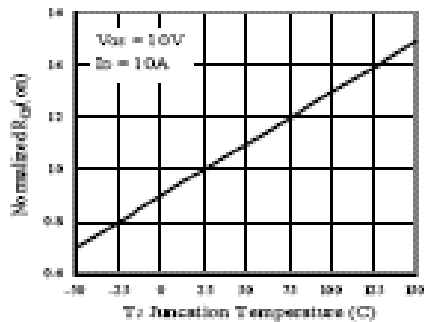
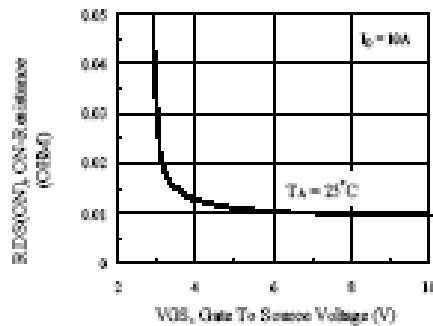
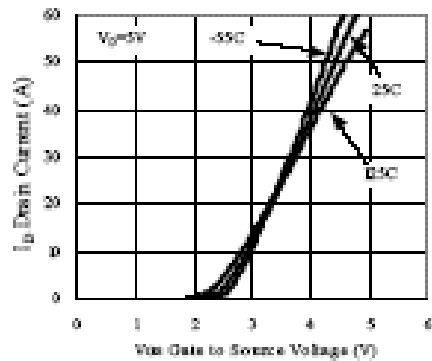
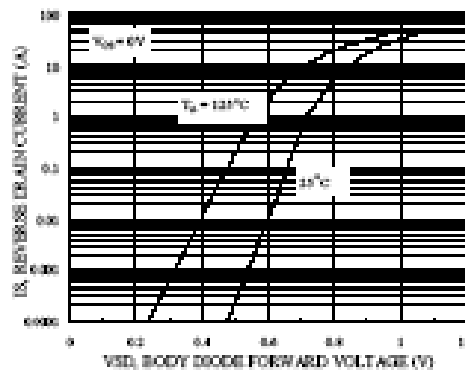


Figure 11. Transient Thermal Response Curve

**P & N-Channel 30-V (D-S) MOSFET**
**■ Typical Performance Characteristics (Continued)**
**Typical Electrical Characteristics (N-Channel)**

**Figure 1. On-Region Characteristics**

**Figure 2. On-Resistance with Drain Current**

**Figure 3. On-Resistance Variation with Temperature**

**Figure 4. On-Resistance Variation with Gate to Source Voltage**

**Figure 5. Transfer Characteristics**

**Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature**

## P & N-Channel 30-V (D-S) MOSFET

### ■ Typical Performance Characteristics (Continued)

#### Typical Electrical Characteristics (N-Channel)

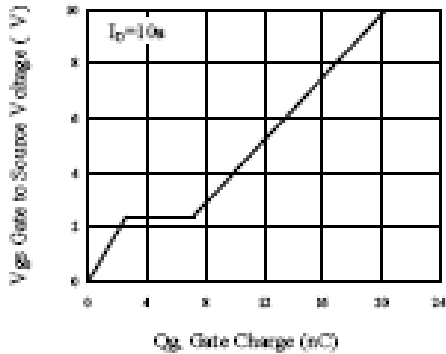


Figure 7. Gate Charge Characteristics

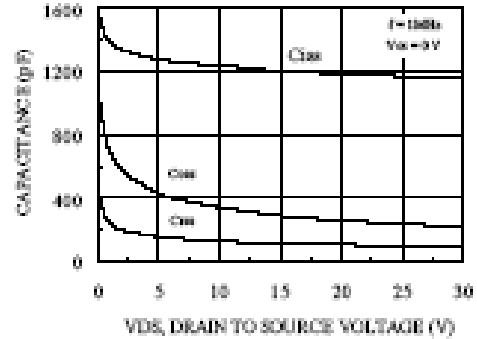


Figure 8. Capacitance Characteristics

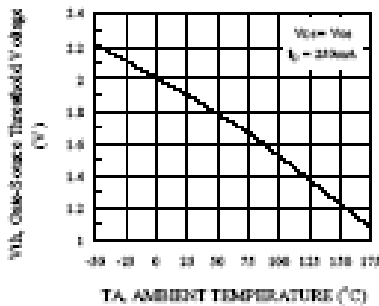


Figure 9. Threshold  $V_t$  Ambient Temperature

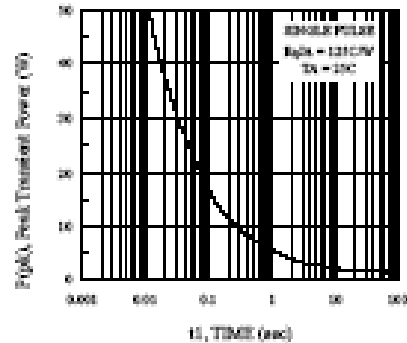


Figure 10. Single Pulse Maximum Power Dissipation

#### Normalized Thermal Transient Junction to Ambient

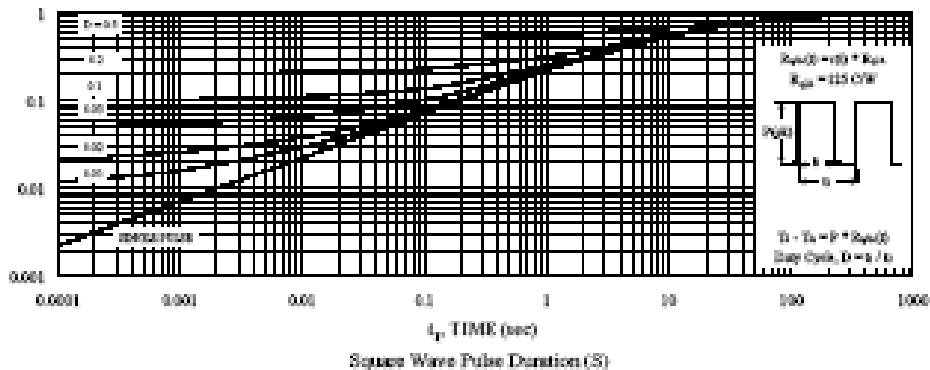
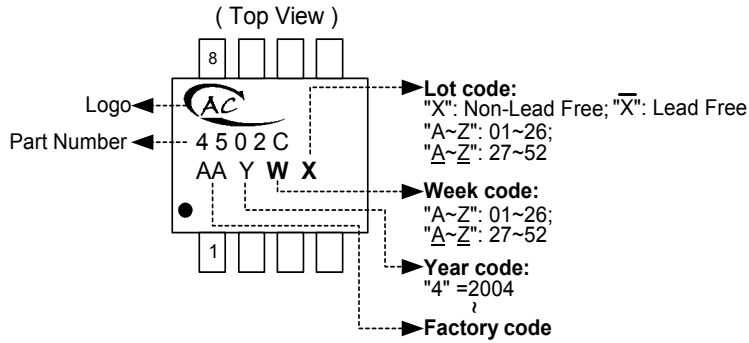


Figure 11. Transient Thermal Response Curve

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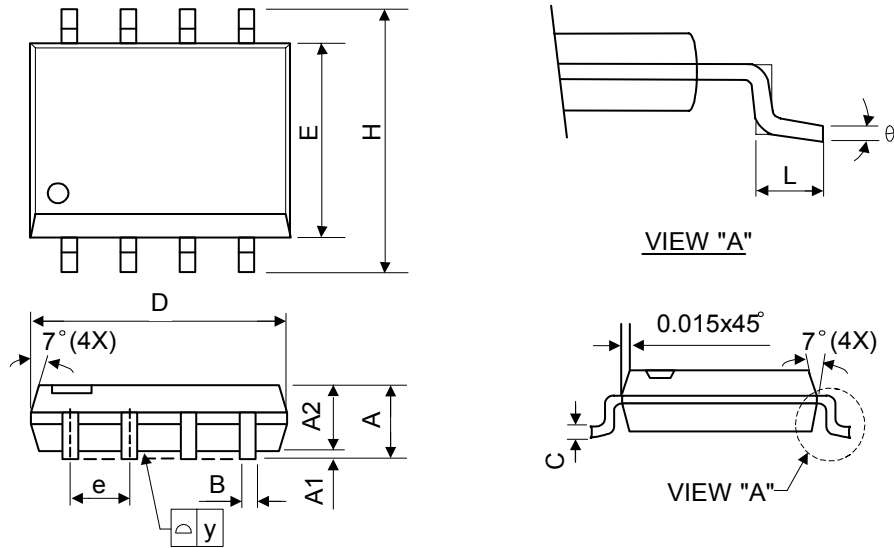
### ■ Marking Information

SOP-8L



### ■ Package Information

Package Type: SOP-8L



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	1.40	1.60	1.75	0.055	0.063	0.069
A1	0.10	-	0.25	0.040	-	0.100
A2	1.30	1.45	1.50	0.051	0.057	0.059
B	0.33	0.41	0.51	0.013	0.016	0.020
C	0.19	0.20	0.25	0.0075	0.008	0.010
D	4.80	5.05	5.30	0.189	0.199	0.209
E	3.70	3.90	4.10	0.146	0.154	0.161
e	-	1.27	-	-	0.050	-
H	5.79	5.99	6.20	0.228	0.236	0.244
L	0.38	0.71	1.27	0.015	0.028	0.050
y	-	-	0.10	-	-	0.004
θ	0°	-	8°	0°	-	8°