



AF8510C

N AND P-CHANNEL ENHANCEMENT MODE POWER MOSFET

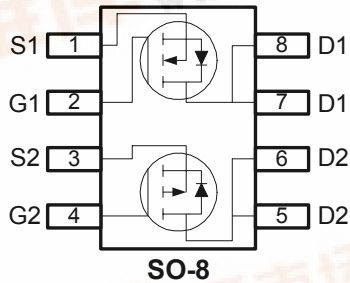
■ Features

- Lower On-Resistance
- Simple Drive Requirement
- Fast Switching Performance
- Pb Free Plating Product

■ Product Summary

CH	BV _{DSS} (V)	R _{DS(ON)} (mΩ)	I _D (A)
N	30	28	6.9
P	-30	55	-5.3

■ Pin Assignments



■ General Description

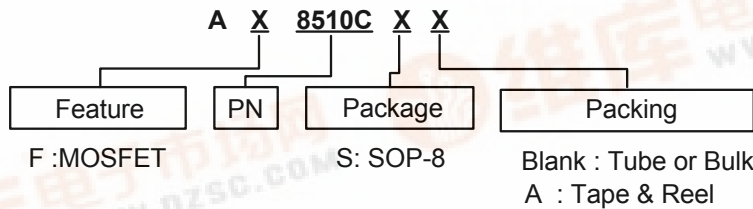
The advanced power MOSFET provides the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The SO-8 package is universally preferred for all commercial-industrial surface mount applications and suited for low voltage applications such as DC/DC converters.

■ 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

Symbol	Parameter	N-Channel	P-Channel	Units	
V_{DS}	Drain-Source Voltage	30	-30	V	
V_{GS}	Gate-Source Voltage	± 20	± 20		
I_D	Continuous Drain Current (Note 1)	$T_A=25^\circ\text{C}$	6.9	-5.3	V
		$T_A=70^\circ\text{C}$	5.5	-4.2	
I_{DM}	Pulsed Drain Current (Note 2)	30	-30	A	
P_D	Total Power Dissipation	$T_A=25^\circ\text{C}$		2.0	W
	Linear Deratmg Factor			0.016	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating Junction and Storage Temperature Range			-55 to 150	$^\circ\text{C}$

■ Thermal Data

Symbol	Parameter	Maximum	Units	
Rthj-amb	Thermal Resistance Junction-ambient (Note 1)	Max.	62.5	$^\circ\text{C}/\text{W}$

■ N-CH Electrical Characteristics at $T_J=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0\text{V}, I_D=250\mu\text{A}$	30	-	-	V
BV_{DSS} / T_J	Breakdown Voltage Temperature Coefficient	Reference to 25°C , $I_D=1\text{mA}$	-	0.02	-	$\text{V}/^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance (Note 3)	$V_{GS}=10\text{V}, I_D=5\text{A}$	-	-	28	$\text{m}\Omega$
		$V_{GS}=4.5\text{V}, I_D=3\text{A}$	-	-	40	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1	-	3	V
g_{fs}	Forward Transconductance	$V_{DS}=10\text{V}, I_D=5\text{A}$	-	4.6	-	S
I_{DSS}	Drain-Source Leakage Current ($T_J=25^\circ\text{C}$)	$V_{DS}=30\text{V}, V_{GS}=0\text{V}$	-	-	1	μA
	Drain-Source Leakage Current ($T_J=70^\circ\text{C}$)	$V_{DS}=24\text{V}, V_{GS}=0\text{V}$	-	-	25	
I_{GSS}	Gate-Source Leakage	$V_{GS}=\pm 20\text{V}$	-	-	± 100	nA
Q_g	Total Gate Charge (Note 3)	$I_D=6.9\text{A}$	-	10	16	nC
Q_{gs}	Gate-Source Charge	$V_{DS}=24\text{V}$	-	2	-	
Q_{gd}	Gate-Drain ("Miller") Charge	$V_{GS}=4.5\text{V}$	-	6	-	
$t_{d(on)}$	Turn-On Delay Time (Note 3)	$V_{DS}=15\text{V}$, $I_D=1\text{A}$, $R_G=3.3\Omega, V_{GS}=10\text{V}$ $R_D=15\Omega$	-	8	-	ns
t_r	Rise Time		-	7	-	
$t_{d(off)}$	Turn-Off Delay Time		-	20	-	
t_f	Fall-Time		-	6	-	
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$	-	540	870	pF
C_{oss}	Output Capacitance	$V_{DS}=25\text{V}$	-	160	-	
C_{rss}	Reverse Transfer Capacitance	$f=1.0\text{MHz}$	-	120	-	

■ Source-Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{SD}	Forward On Voltage (Note 3)	$I_S=1.7\text{A}, V_{GS}=0\text{V}$	-	-	1.2	V
t_{rr}	Reverse Recovery Time	$I_S=6.9\text{A}, V_{GS}=0\text{V}$	-	20	-	ns
Q_{rr}	Reverse Recovery Charge	$di/dt=100\text{A}/\mu\text{s}$	-	11	-	nC



AF8510C

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■ P-CH Electrical Characteristics at $T_J=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	-30	-	-	V
BV_{DSS}/T_J	Breakdown Voltage Temperature Coefficient	Reference to 25°C , $I_D=1mA$	-	-0.023	-	$V/^\circ\text{C}$
		$V_{GS}=-10V, I_D=-5A$	-	-	55	m Ω
		$V_{GS}=-4.5V, I_D=-3A$	-	-	90	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=-250\mu A$	1	-	-3	V
g_{fs}	Forward Transconductance	$V_{DS}=-10V, I_D=-5A$	-	4.9	-	S
I_{DSS}	Drain-Source Leakage Current ($T_J=25^\circ\text{C}$)	$V_{DS}=-30V, V_{GS}=0V$	-	-	-1	μA
	Drain-Source Leakage Current ($T_J=70^\circ\text{C}$)	$V_{DS}=-24V, V_{GS}=0V$	-	-	-25	
I_{GSS}	Gate-Source Leakage	$V_{GS}=\pm 20V$	-	-	± 100	nA
Q_g	Total Gate Charge (Note 3)	$I_D=-5.3A,$ $V_{DS}=-24V,$ $V_{GS}=-4.5V$	-	9	15	nC
Q_{gs}	Gate-Source Charge		-	2	-	
Q_{gd}	Gate-Drain ("Miller") Charge		-	6	-	
$t_{d(on)}$	Turn-On Delay Time (Note 3)	$V_{DS}=-15V,$ $I_D=1A,$ $R_G=3.3\Omega, V_{GS}=-10V$ $R_D=15\Omega$	-	10	-	ns
t_r	Rise Time		-	8	-	
$t_{d(off)}$	Turn-Off Delay Time		-	25	-	
t_f	Fall-Time		-	13	-	
C_{iss}	Input Capacitance	$V_{GS}=0V,$ $V_{DS}=25V,$ $f=1.0MHz$	-	580	930	pF
C_{oss}	Output Capacitance		-	180	-	
C_{rss}	Reverse Transfer Capacitance		-	120	-	

■ Source-Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{SD}	Forward On Voltage (Note 3)	$I_S=1.7A, V_{GS}=0V$	-	-	-1.2	V
t_{rr}	Reverse Recovery Time	$I_S=-5.3A, V_{GS}=0V,$ $di/dt=100A/\mu s$	-	21	-	ns
Q_{rr}	Reverse Recovery Charge		-	17	-	nC

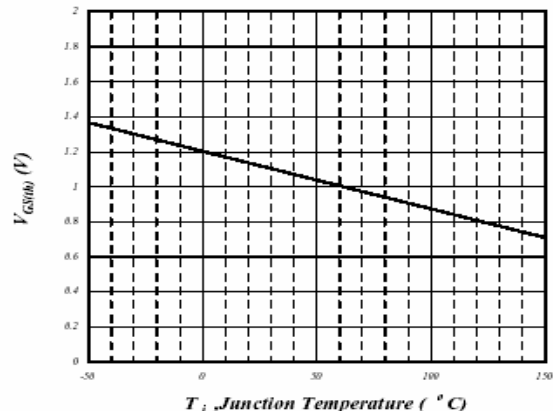
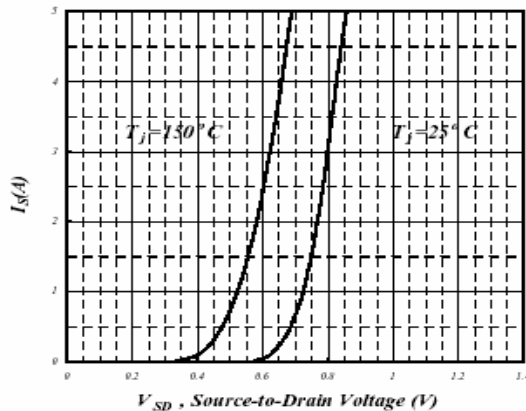
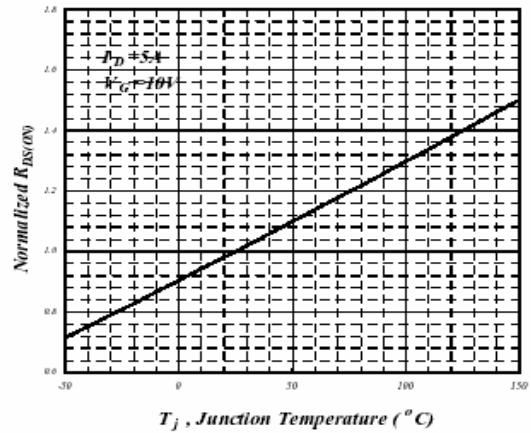
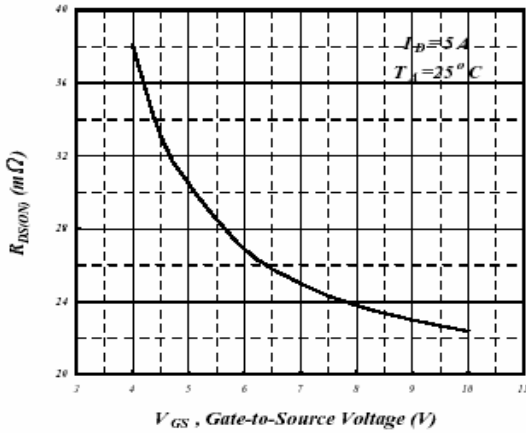
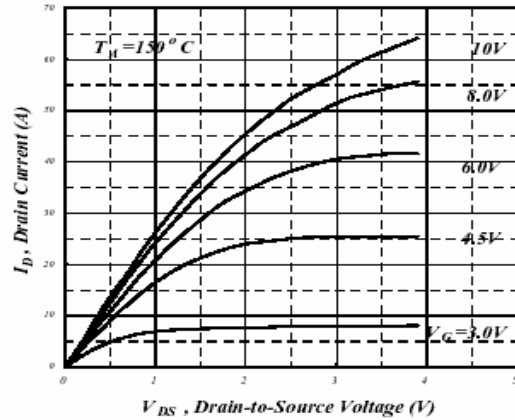
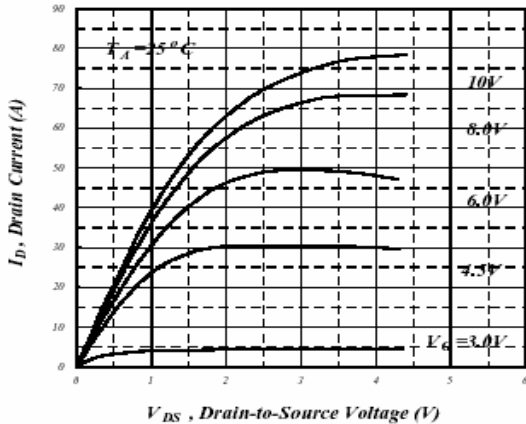
Note 1: Surface mounted on 1 in² copper pad of FR4 board; 135°C/W when mounted on Min. copper pad.

Note 2: Pulse width limited by Max. junction temperature.

Note 3: Pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.

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■ Typical Performance Characteristics (N-Channel)



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■ Typical Performance Characteristics (P-Channel) (Continued)

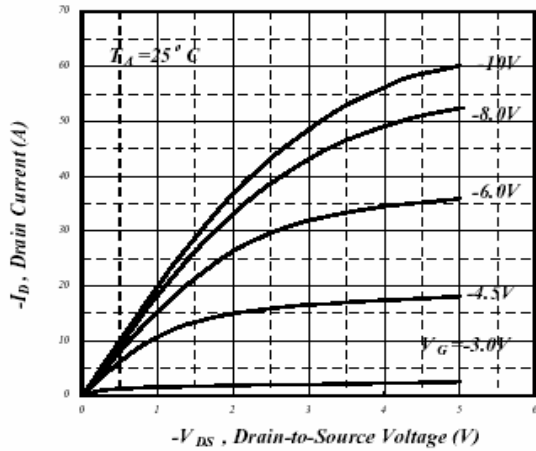


Fig 1. Typical Output Characteristics

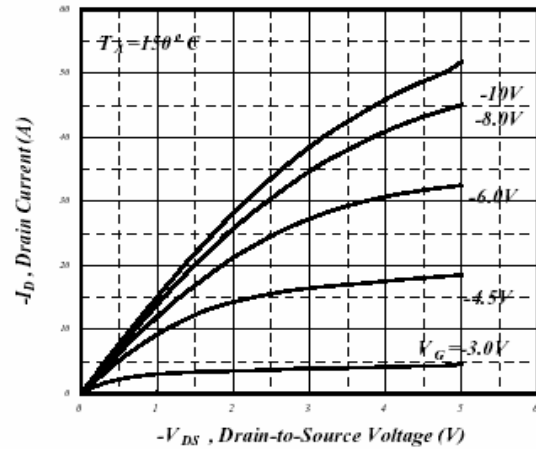


Fig 2. Typical Output Characteristics

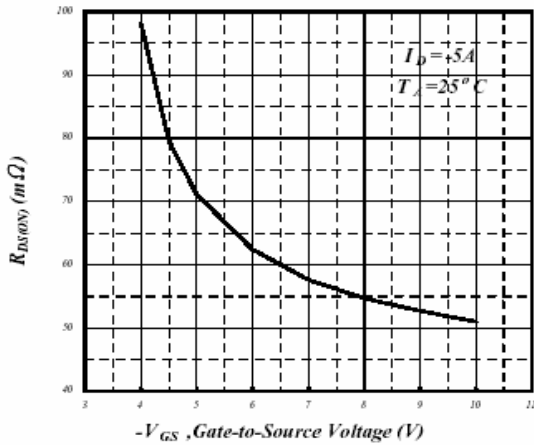


Fig 3. On-Resistance v.s. Gate Voltage

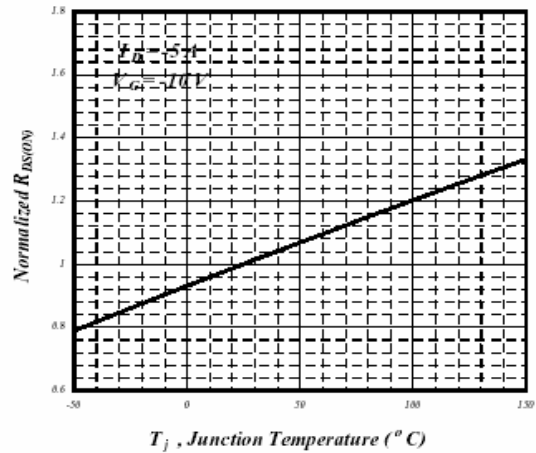


Fig 4. Normalized On-Resistance v.s. Junction Temperature

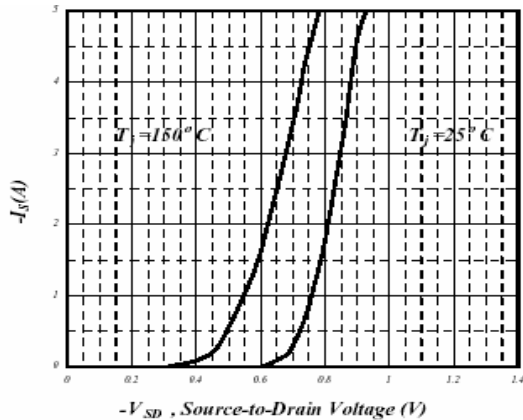


Fig 5. Forward Characteristic of Reverse Diode

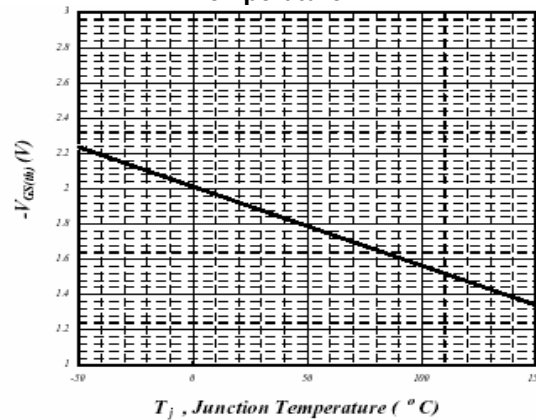


Fig 6. Gate Threshold Voltage v.s. Junction Temperature

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■ Typical Performance Characteristics (P-Channel) (Continued)

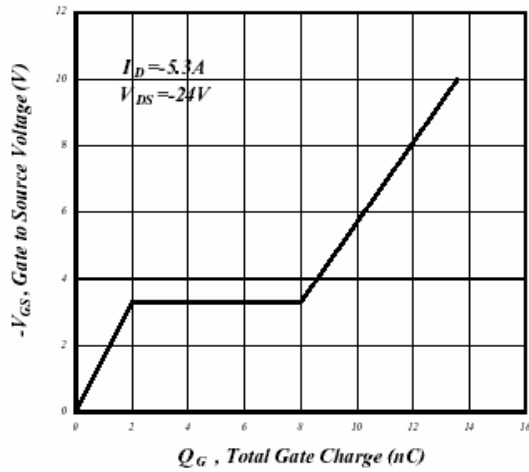


Fig 7. Gate Charge Characteristics

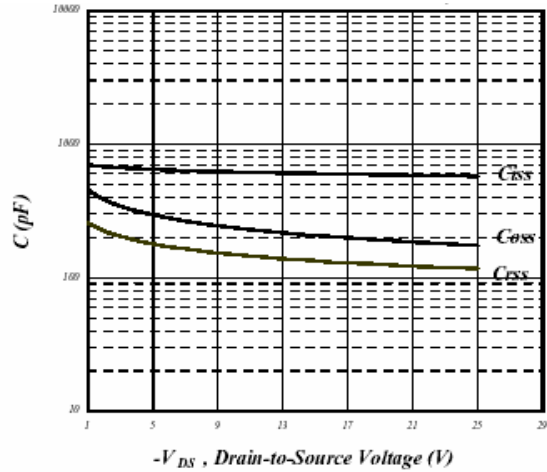


Fig 8. Typical Capacitance Characteristics

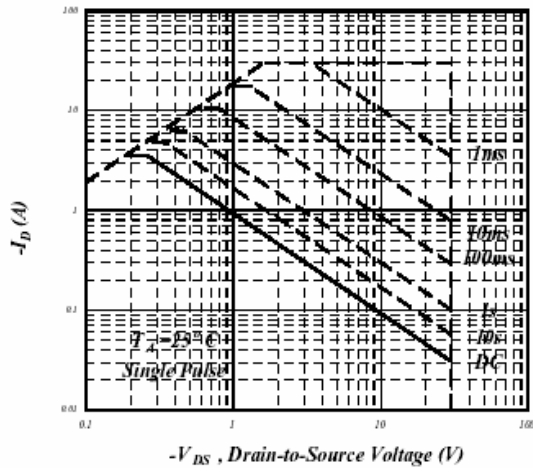


Fig 9. Maximum Safe Operation Area

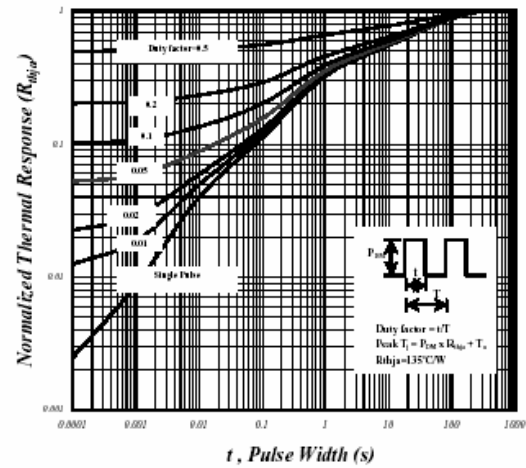


Fig 10. Effective Transient Thermal Impedance

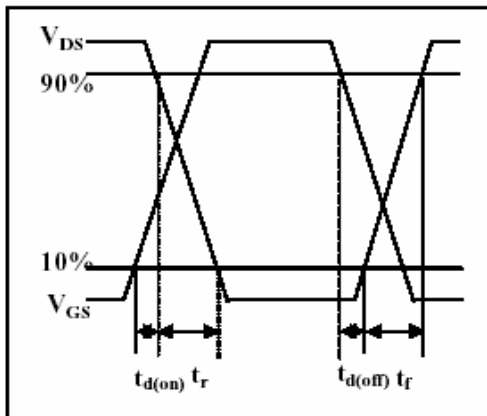


Fig 11. Switching Time Waveform

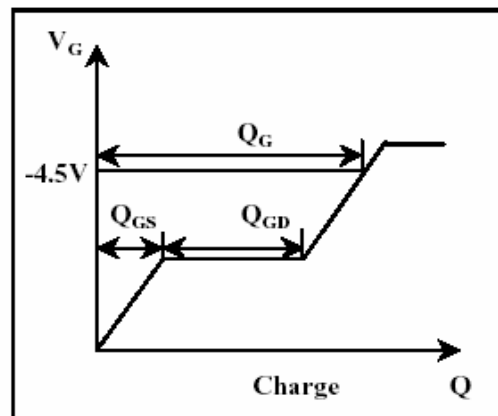
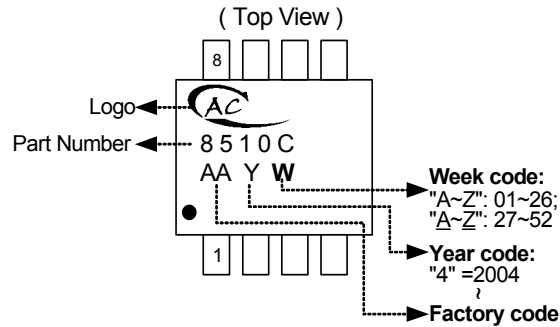


Fig 12. Gate Charge Waveform

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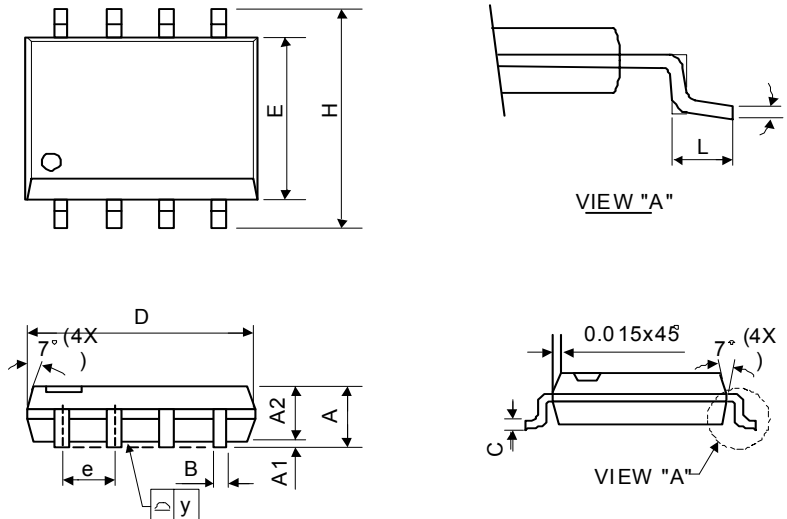
■ Marking Information

SO-8L



■ Package Information

Package Type: SO-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
	0°	-	8°	0°	-	8°