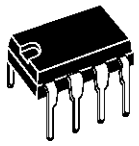
SGS-THOMSON MICROELECTRONICS

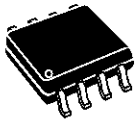
L9637

ISO INTERFACE

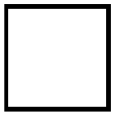
- WIDE OPERATING POWER SUPPLY VOLTAGE RANGE 4.5V VS 45V
- REVERSE SUPPLY (BATTERY) PROTECTED DOWN TO VS -24V
- LOW QUIESCENT CURRENT IN OFF CONDITION I_{QTYP} = 100µA
- TTL COMPATIBLE TX INPUT
- BIDIRECTIONAL K-I/O PIN WITH SUPPLY VOLTAGE DEPENDENT INPUT THRESHOLD
- OVERTEMPERATURE SHUT DOWN FUNCTION SELECTIVE TO K-I/O PIN
- HIGH SIGNAL VOLTAGE RANGE -24V VK +45V
- OUTPUT CURRENT LIMITATION IK = 60MA
- DEFINED OFF OUTPUT STATUS IN UNDERVOLTAGE OR VS OR GND LACK CONDITION
- CONTROLLED OUTPUT SLOPE FOR LOW EMI
- HIGH INPUT IMPEDANCE DURING VS OR GND LACK
- DEFINED OUTPUT ON STATUS OF LO OR RX DURING INPUT SIGNAL LACK AT LI OR K
- DEFINED K OUTPUT OFF DURING TX INPUT SIGNAL LACK



Minidip



SO8



Die (on request)

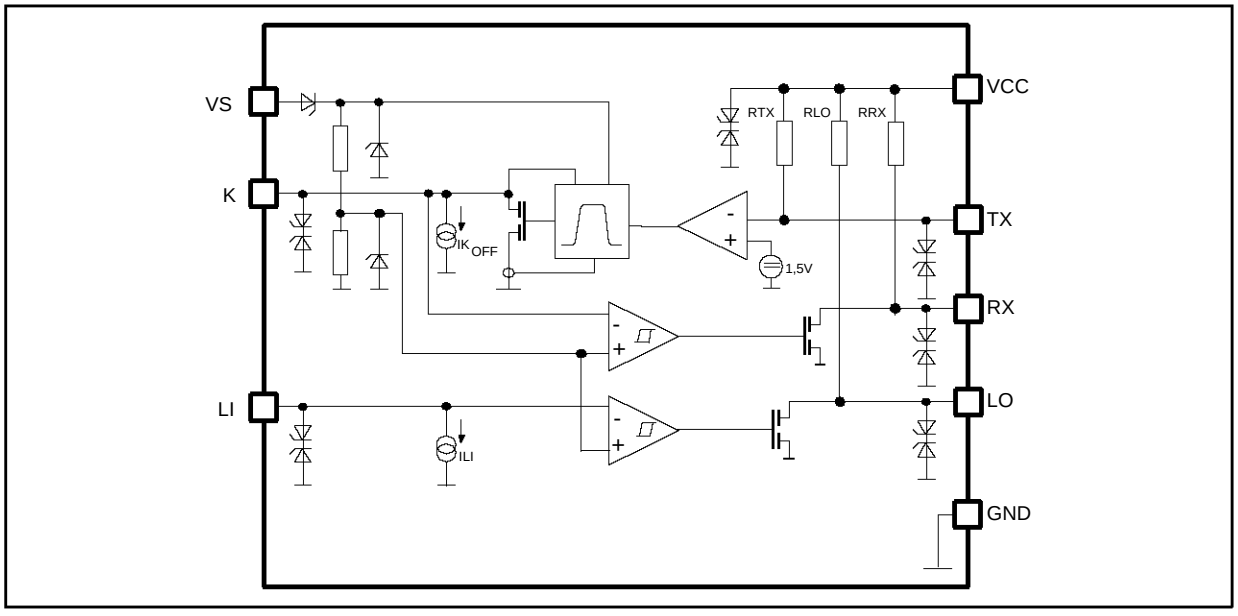
ORDERING NUMBERS: L9637 (minidip)
L9637D (SO8)

- SEPARATE L COMPARATOR WITH K - I EQUAL FUNCTIONALLITY
- INTEGRATED PULL UP RESISTANCES
- EMV ROBUSTNESS OPTIMIZED
- ESD: ALL PINS ARE GUARANTED TILL 600V

DESCRIPTION

The L9637 is a monolithic integrated circuit containing the whole standard ISO 9141 compatible interface functions.

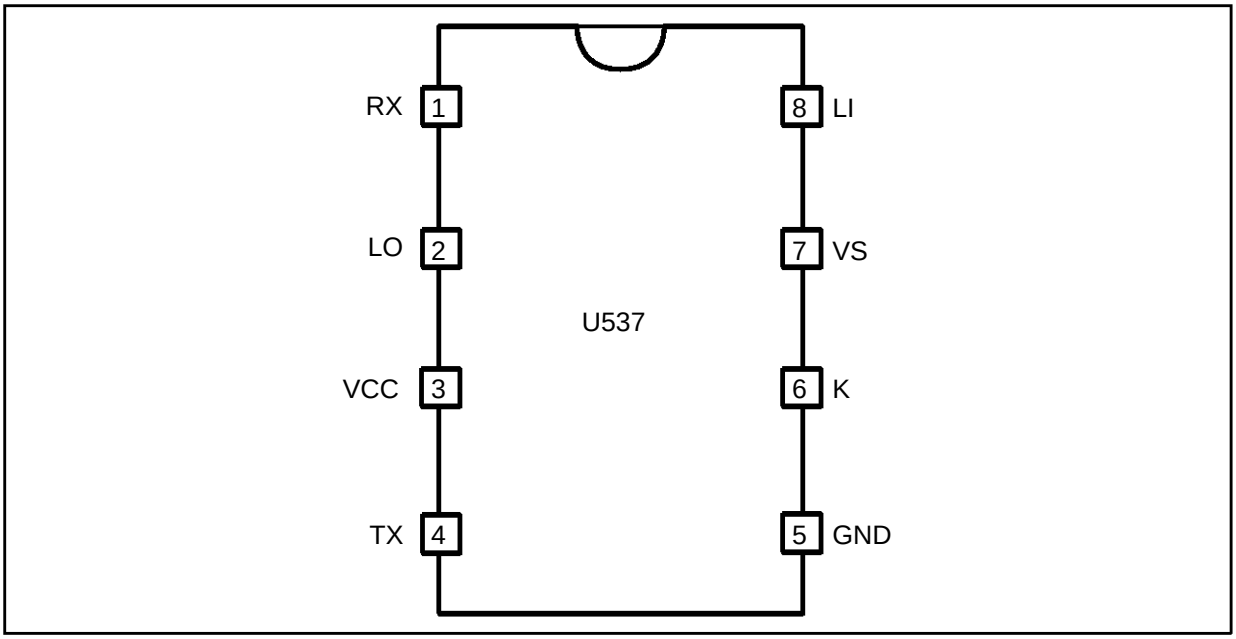
BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS (No damage or latch)

Symbol	Parameter	Value	Unit
V_S	Supply Voltage	-24 to +45	V
V_{CC}	Stabilized Voltage	-0.3 to +10	V
V_{IN}	Input Voltage @ LI Input Voltage @ TX	-24 to +45 -24 to +10	V V
V_{out}	Output Voltage @ K, RX, LO	-24 to +45	V
i_{PIN}	Transient pin current t < 2ms to survive interference "Schaffner" pulses in connection with suitable external series resistance	-30 to +30	mA

PIN CONNECTION (Top view)



THERMAL DATA

Symbol	Parameter	Min.	Typ.	Max.	Unit
$T_{jMonitor}$	Temperature K switch off Temperature K switch on	160 140	175 155	190 170	°C °C
$R_{th\ j\text{-}amb}$ (*)	Thermal steady state junction to ambient resistance for **SO8** Thermal steady state junction to ambient resistance for **Minidip**	130 80	155 100	180 120	°C/W °C/W

(*) Refering to "Thermal Management in Surface Mount Technology" ST-databook

PIN DESCRIPTION

N.	Name	Function
1	RX	Output for K as input
2	LO	Output L comparator
3	VCC	Stabilized voltage supply
4	TX	Input for K as output
5	GND	Common GND
6	K	Bidirectional I/O
7	VS	Supply voltage
8	LI	Input L comparator

OPERATING RANGE (The electrical characteristics are valid within the below defined operating range, unless otherwise specified).

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V_S	Supply Voltage		4.5	12	36	V
V_{CC}	Stabilized Voltage		2	5	10	V
T_j	Junction temperature		-40		85 *)	°C

*) Functionally will be guarantied by design until $T_{jMon\ OFF}$

ELECTRICAL CHARACTERISTIC

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
VK_{low}	Input Voltage Low state	RX output status LOW $4.5V \le V_S \le 20V$	-24		$0.45V_S$	V
		RX output status LOW $20V \le V_S$	-24		8	V
VK_{high}	Input Voltage High state	RX output status HIGH $4.5V \le V_S \le 20V$	0.55VS		45	V
		RX output status HIGH $20V \le V_S$	12		45	V
VK_{hys}	Input Threshold Hysteresis			0.025 VS	0.8	V
IK_{off}	Input Current	$VTX \ge VTX_{high}$ $2 < VK \le 45V$ $-24V \le VK \le 2V$	 1 -5	 2	 10 25	 µA µA
RK_{ON}	Output ON Impedance	$VTX \le VTX_{low}$ @ VS > 6.5V @ VS ≥ 4.5V		 10 45	 30 90	 Ω Ω
IK_{SC}	Short Circuit Current		30	60	100	mA
VTX_{low}	Input voltage LOW state		-24		1	V
VTX_{high}	Input voltage HIGH state		2		10	V
		@ V_S > 16V	2.5		10	V
RRX_O RLO_O	Output ON Impedance	$VK \le VK_{low}$; $VLI \le VLI_{low}$ @ V_S > 6.5V @ $V_S \ge 4.5V$		 40 180	 90 360	 Ω Ω
IRX_{SC} ILO_{SC}	Output Short Circuit Current		9	20	30	mA
VRX_H VLO_H	Output Voltage HIGH state	$10M\Omega \le R_{LRX}$ $10M\Omega \le R_{LRX}$	 V_{CC} - 0.25	 V_{CC} - 0.1	 V_{CC}	 V
RLO RRX	Output pull-up resistance	Output status = (HIGH) $-0.15V \le VLO \le V_{CC} + 0.15V$ $-0.15V \le VRX \le V_{CC} + 0.15V$	6	10	18	KΩ
RTX	Input pull up resistance	$-0.15V \le VTX \le V_{CC} + 0.15V$	12	20	36	KΩ
VLI_{low}	Input voltage LOW state	LO output status LOW $4.5V \le V_S \le 20V$	-24		$0.45V_S$	V
		LO output status LOW $20V \le V_S$	-24		8	V
VL_{high}	Input voltage HIGH state	LO output status HIGH $4.5V \le V_S \le 20V$	$0.55V_S$		45	V
		LO output status HIGH $20V \le V_S$	12		45	V
VLI_{hys}	Input threshold hysteresis			$0.025V_S$	0.8	V
ILI	Input current	$2V < VLI \le 45V$	1	2	10	mA
		$-24V \le VLI \le 2V$	-5	2	10	µA

ELECTRICAL CHARACTERISTIC (continued)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$C_{Ki,\ LO,\ RX}$	Internal output capacities				20	pF
f_{LI-LO} f_{K-RX} f_{TX-k}	Transmission Frequency	9V < V_S < 16V (external loads) R_{KO} = 510Ω, C_K ≤ 1.3nF	50	100		kHz
t_{rLI-LO} t_{rK-RX} t_{rTX-K}	Rise Time	for the definition of t1, t_2 see fig.1. 9V < V_S < 16V (external loads) R_{KO} = 510Ω, C_K ≤ 1.3nF		2	6	µs
t_{fLI-LO} t_{fK-RX} t_{fTX-K}	Fall Time			2	6	µs
$t_{OFF,LI-LO}$ $t_{OFF,K-RX}$ $t_{OFF,TX-K}$	Switch OFF time	for the definition of ton, t_{OFF} see fig.1. 9V < V_S < 16V (external loads) R_{KO} = 510Ω, C_K ≤ 1.3nF		4	17	µs
$t_{ON,LI-LO}$ $t_{ON,K-RX}$ $t_{ON,TX-K}$	Switch ON time			4	2.3	µs
I_{CC}	Supply Current	V_{CC} ≤ 5.5V V_{LI}, V_{TX} = 0V		1.4	2	mA
		VLI ≥ VLI_{high} VTX ≥ VTX_{high} @ V_{CC} ≤ 5.5V, T_j ≤ 85°C	-5	<1	5	µA
I_S	Supply current	V_S ≤ 16V V_{LI}, V_{TX} = 0V		1.2	2	mA
		VLI ≥ VLI_{high} VTX ≥ VTX_{high} @ V_S ≤ 12V, T_j ≤ 85°C		100	160	µA

Figure 1.

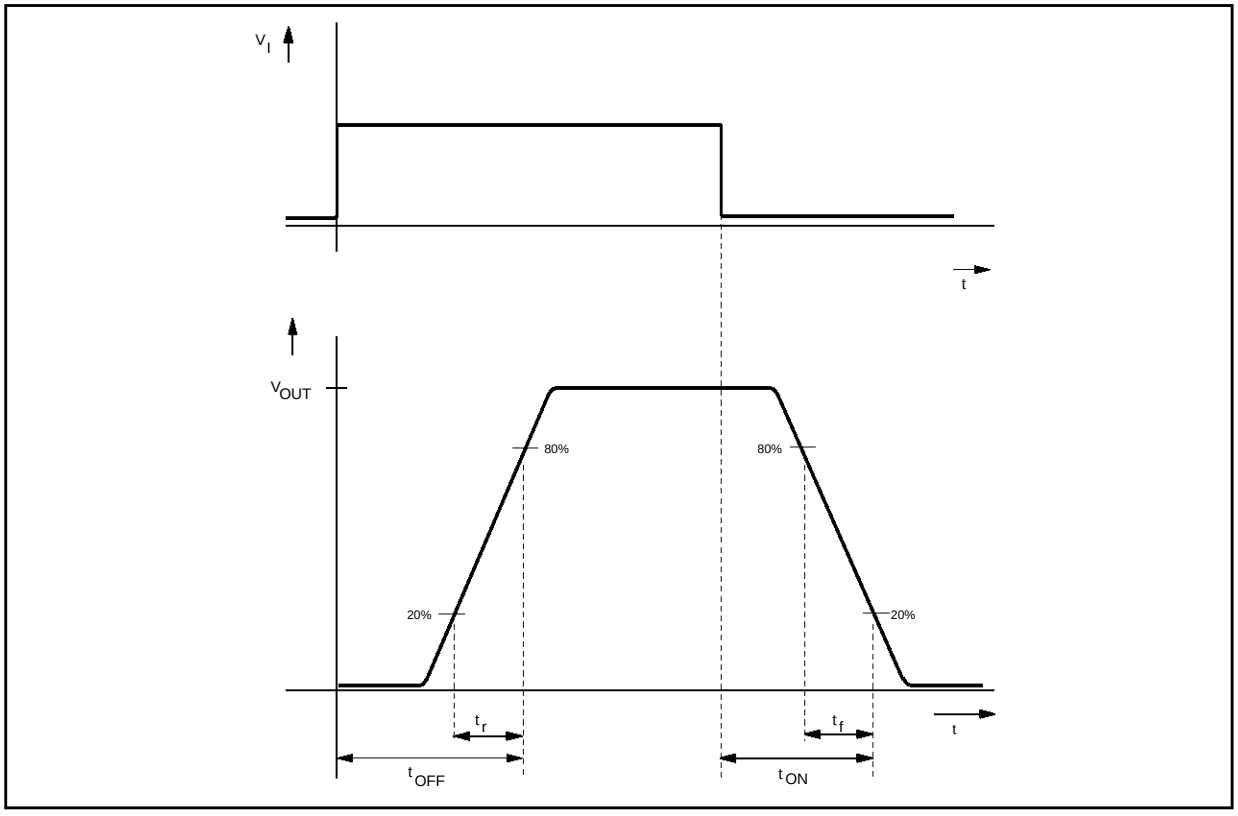
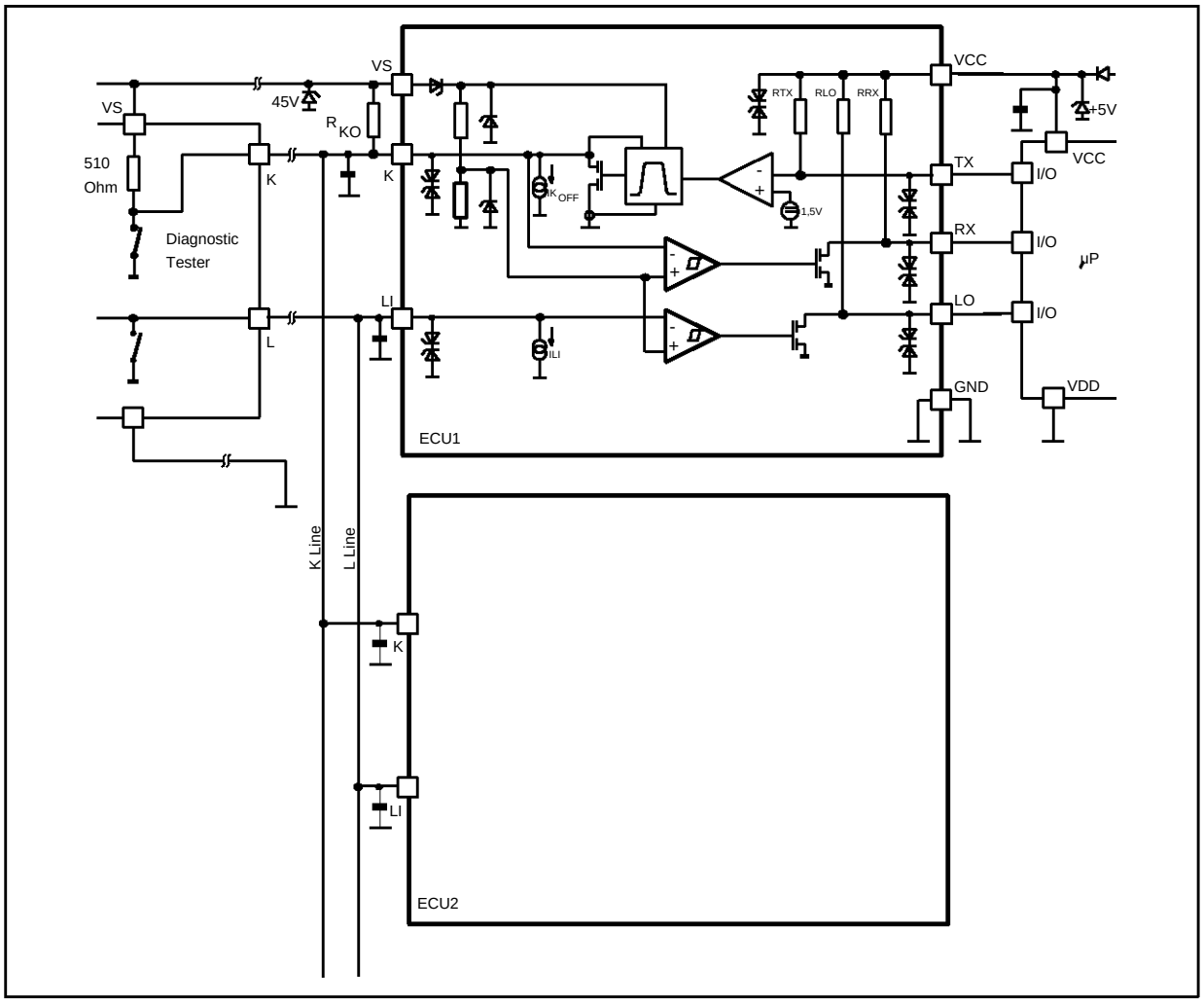


Figure 2: ISO Application Circuit



FUNCTIONAL DESCRIPTION

The L9637 is a monolithic bus driver designed to provide bidirectional serial communication in automotive diagnostic applications according to the specification "Diagnostic Systems ISO9141".

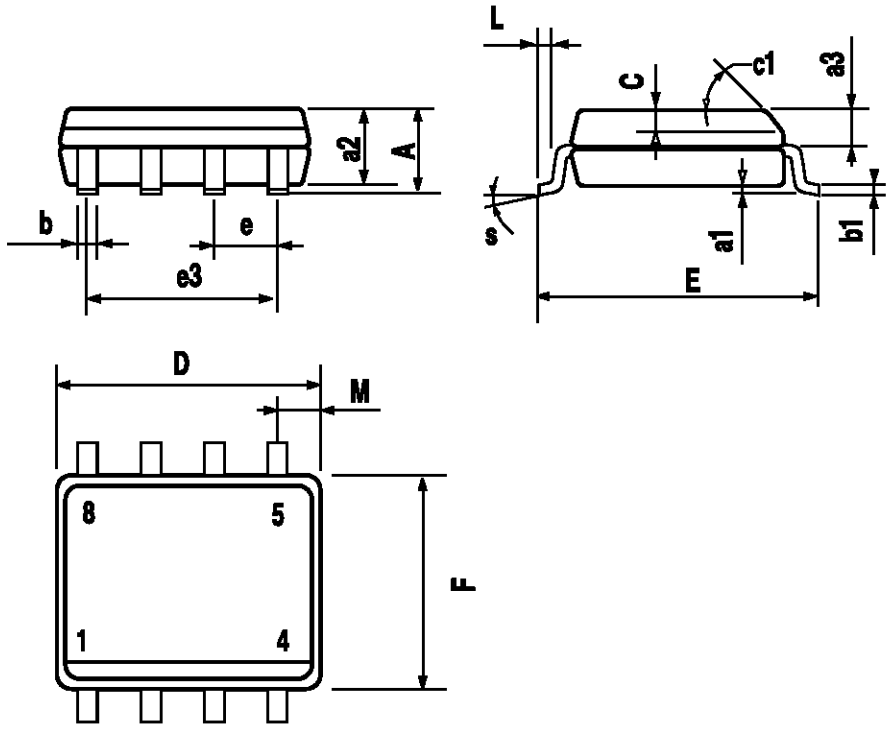
The device provides a bidirectional link, called K, to the V_{Bat} related diagnosis bus. It also includes a separate comparator L which is also able to be linked to the V_{Bat} bus. The input TX and output RX of K are related to V_{CC} with her integrated pull up resistances. Also the L comparator output LO has a pull up resistance connected to V_{CC}.

The maximum external pull up resistance at K related to V_S should not be higher than RK_O ≤5KOhm to achieve clear output conditions.

All V_{Bat} bus defined inputs LI and K have supply voltage dependent thresholds together with sufficent hysteresis to suppress line spikes. These pins are protected against overvoltages, shorts to GND and VS and can also be driven beyond VS and GND. These features are also given for TX, RX and LI only taking into account the behaviour of the internal pull up resistances. The thermal shut down function switches OFF the K output if the chip temperature increases above the thermal shut down threshold. To achieve no fault for VS undervoltage conditions the outputs will be switched OFF and stay at high impedance. The device is also protected against reverse battery condition. During lack of V_S or GND all pins shows high impedance characteristic. To realize a lack of the V_S related bus line LI and K the outputs LO and RX shows defined ON status. Supressing all 4 classes of "Schaffner" signals all pins can be load with short current pulses t ≤ 2ms of max. ±30mA. All these features together with a high possible baud rate >100Kbaud, controlled output slopes for low EMI, a wide power supply voltage range and a very small quiescent current during OFF condition I_q ≤ 80µA make this device high efficient for ISO diagnosis bus systems.

SO8 PACKAGE MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.069
a1	0.1		0.25	0.004		0.010
a2			1.65			0.065
a3	0.65		0.85	0.026		0.033
b	0.35		0.48	0.014		0.019
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.020
c1	45° (typ.)					
D	4.8		5.0	0.189		0.197
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.15		0.157
L	0.4		1.27	0.016		0.050
M			0.6			0.024
S	8° (max.)					



MINIDIP PACKAGE MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A		3.32			0.131	
a1	0.51			0.020		
B	1.15		1.65	0.045		0.065
b	0.356		0.55	0.014		0.022
b1	0.204		0.304	0.008		0.012
D			10.92			0.430
E	7.95		9.75	0.313		0.384
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			6.6			0.260
I			5.08			0.200
L	3.18		3.81	0.125		0.150
Z			1.52			0.060