MIC58P01

8-Bit Parallel-Input Protected Latched Driver

General Description

The MIC58P01 parallel-input latched driver is a high-voltage (80V), high-current (500mA) integrated circuit comprised of eight CMOS data latches, a bipolar Darlington transistor driver for each latch, and CMOS control circuitry for the common CLEAR, STROBE, and OUTPUT ENABLE functions. Similar to the MIC5801, additional protection circuitry supplied on this device includes thermal shutdown, under voltage lockout (UVLO), and overcurrent shutdown.

The bipolar/CMOS combination provides an extremely low-power latch with maximum interface flexibility. The MIC58P01 has open-collector outputs capable of sinking 500 mA and integral diodes for inductive load transient suppression with a minimum output breakdown voltage rating of 80V (50V sustaining). The drivers may be paralleled for higher load current capability.

With a 5V logic supply, the MIC58P01 will typically operate at better than 5MHz. With a 12V logic supply, significantly higher speeds are obtained. The CMOS inputs are compatible with standard CMOS, PMOS, and NMOS circuits. TTL circuits may require pull-up resistors.

Each of these eight outputs has an independent overcurrent shutdown of 500mA. Upon current shutdown, the affected channel will turn OFF until V_{DD} is cycled or the ENABLE/RESET pin is pulsed high. Current pulses less than 2µs will not activate current shutdown. Temperatures above 165°C will shut down all outputs. The UVLO circuit disables the outputs at low V_{DD}; hysteresis of 0.5V is provided.

Datasheets and support documentation are available on Micrel's web site at: www.micrel.com.

Features

- 4.4MHz Minimum Data Input Rate
- High-Voltage, High-Current Outputs
- Per-Output Overcurrent Shutdown (500mA typical)
- Under Voltage Lockout
- Thermal Shutdown
- Output Transient Protection Diodes
- CMOS, PMOS, NMOS, and TTL Compatible Inputs
- Internal Pull-Down Resistors
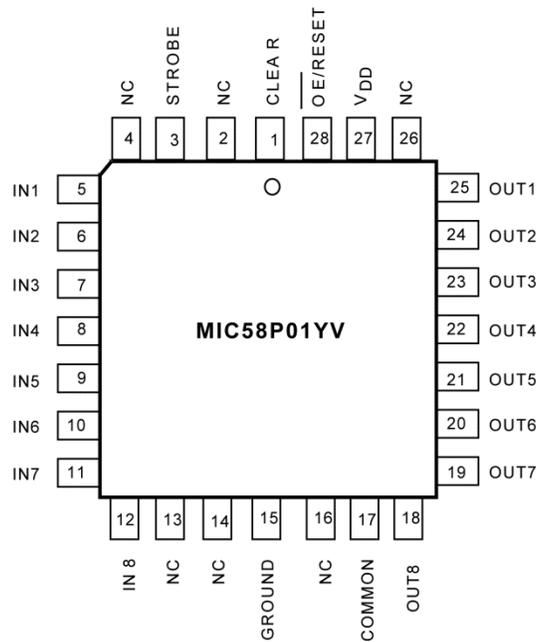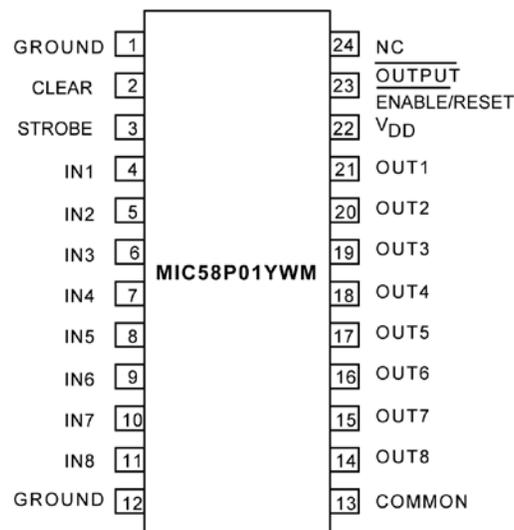- Low-Power CMOS Latches

Typical Application

CIRCUITRY BELOW DASHED LINE IS INCLUDED IN EACH OF THE 8 CHANNELS.
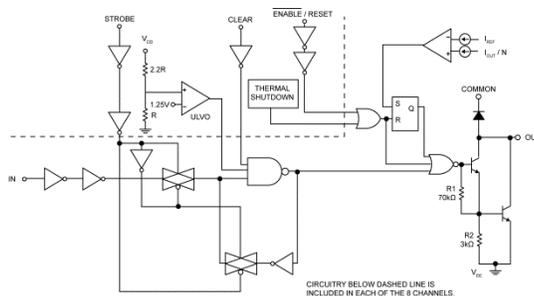
Ordering Information

Part Number	Junction Temperature Range	Package	Pb-Free
MIC58P01YV	–40°C to +85°C	28-Pin PLCC	√
MIC58P01YWM	–40°C to +85°C	28-Pin Wide SOIC	√

Pin Configuration

28-Pin PLLC (V)
(Top View)

Top row pins: 4 (NC), 3 (STROBE), 2 (NC), 1 (CLEAR), 28 (OE/RESET), 27 (V_{DD}), 26 (NC)

Left side: IN1 5, IN2 6, IN3 7, IN4 8, IN5 9, IN6 10, IN7 11

Center: MIC58P01YV

Right side: 25 OUT1, 24 OUT2, 23 OUT3, 22 OUT4, 21 OUT5, 20 OUT6, 19 OUT7

Bottom row pins: 12 (IN8), 13 (NC), 14 (NC), 15 (GROUND), 16 (NC), 17 (COMMON), 18 (OUT8)

28-Pin PLLC (V)
(Top View)

24-Pin SOIC (WM)

GROUND	1	24 NC
CLEAR	2	23 OUTPUT ENABLE/RESET
STROBE	3	22 V_{DD}
IN1	4	21 OUT1
IN2	5	20 OUT2
IN3	6	19 OUT3
IN4	7	18 OUT4
IN5	8	17 OUT5
IN6	9	16 OUT6
IN7	10	15 OUT7
IN8	11	14 OUT8
GROUND	12	13 COMMON

MIC58P01YWM
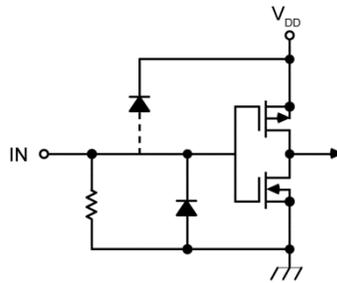
24-Pin SOIC (WM)
(not pin compatible with MIC5801YWM)

Typical Input

Pin Description

Pin Number (PLCC)	Pin Number (SOIC)	Pin Name	Pin Function
1	2	CLEAR	Resets all Latches and turns all outputs OFF (open).
3	3	STROBE	Input Strobe Pin. Loads output latches when High.
5 – 12	4 – 11	IN_N	Parallel Inputs, 1 through 8.
15	1, 12	GROUND	Logic and Output Ground pin.
17	13	COMMON	Transient suppression diode common cathode pin.
18 – 25	14 – 21	OUT_N	Parallel Outputs, 8 through 1.
27	22	V_{DD}	Logic Supply voltage.
28	23	$\overline{OUTPUT\ ENABLE}$ / RESET	When Low, Outputs are active. When High, outputs are inactive and device is reset from a fault condition. An undervoltage condition emulates a high OE output.

Absolute Maximum Ratings[1]

Output Voltage (V_{CE}) ....+80V
Logic Supply Voltage (V_{DD}) ....+15V
Input Voltage Range (V_{IN}) .... −0.3V to V_{DD} +0.3V
Operating Temperature Range (T_A)...........−55°C to +85°C
Storage Temperature Range (T_S) ....−65°C to +125°C
ESD Rating[3]... ESD Sensitive

Operating Ratings[2]

Package Power Dissipation, P_D
MIC58P01YV 1.6W
Derate above T_A = +25°C ....16mW/°C
MIC58P01YWM 1.4W
Derate above T_A = +25°C ....14mW/°C
Operating Temperature Range (T_A)............−40°C to +85°C

Electrical Characteristics[4]

V_{DD} = 5V, T_A = 25°C, unless otherwise noted.

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
I_{CEX}	Output Leakage Current	V_{CE} = 80V, T_A = +25°C			50	µA
		V_{CE} = 80V, T_A = +70°C			100	
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	I_C = 100mA		0.9	1.1	V
		I_C = 200mA		1.1	1.3	
		I_C = 350mA		1.3	1.6	
$V_{IN(0)}$	Input Voltage (Low)				1.0	V
$V_{IN(1)}$	Input Voltage (High)	V_{DD} = 12V	10.5			
		V_{DD} = 10V	8.5			
		V_{DD} = 5V, Note 5	3.5			
R_{IN}	Input Resistance	V_{DD} = 12V	50	200		kΩ
		V_{DD} = 10V	50	300		
		V_{DD} = 5V	50	600		
$I_{DD(1ON)}$	Supply Current	One Driver ON, V_{DD} = 12V, Outputs Open		3.3	4.5	mA
		One Driver ON, V_{DD} = 10V, Outputs Open		3.1	4.5	
		One Driver ON, V_{DD} = 5V, Outputs Open		2.4	3.6	
$I_{DD(ON)}$		All Drivers ON, V_{DD} = 12V, Outputs Open		6.4	10.0	mA
		All Drivers ON, V_{DD} = 10V, Outputs Open		6.0	9.0	
		All Drivers ON, V_{DD} = 5V, Outputs Open		4.7	7.5	
$I_{DD(OFF)}$		All Drivers OFF, V_{DD} = 12V, Outputs Open, Inputs = 0V		3.0	4.5	mA
		All Drivers OFF, V_{DD} = 5V, Outputs Open, Inputs = 0V		2.2	3.6	
I_R	Clamp Diode Leakage Current	V_R = 80V, T_A = +25°C			50	µA
		V_R = 80V, T_A = +70°C			100	
I_{LIM}	Overcurrent Threshold	Per Output		500		mA
V_{SU}	Start-Up Voltage	Note 6	3.5	4.0	4.5	V

Notes:

1. Exceeding the absolute maximum ratings may damage the device.

2. The device is not guaranteed to function outside its operating ratings.

3. Micrel CMOS devices have input-static protection but are susceptible to damage when exposed to extremely high static electrical charges.

4. Specification for packaged product only.

5. Operation of these devices with standard TTL or DTL may require the use of appropriate pull-up resistors to insure a minimum logic "1".

6. Under-Voltage Lockout is guaranteed to release device at no more than 4.5V, and disable the device at no less than 3.0V.

Electrical Characteristics[4] (Continued)

V_{DD} = 5V, T_A = 25°C, unless otherwise noted.

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
$V_{DD\ MIN}$	Minimum Operating V_{DD}		3.0	3.5	4.0	V
V_F	Clamp Diode Forward Voltage	I_F = 350mA		1.7	2.0	V
	Thermal Shutdown			165		°C
	Thermal Shutdown Hystersis			10		°C

Truth Table

IN_N	Strobe	Clear	Output Enable	OUT_N t – 1	OUT_N t
0	1	0	0	X	OFF
1	1	0	0	X	ON
X	X	1	X	X	OFF
X	X	X	1	X	OFF
X	0	0	0	ON	ON
X	0	0	0	OFF	OFF

X = Irrelevant

t – 1 = Previous output state

t = Present output state

Information present at an input is transferred to its latch when the STROBE is high. A high CLEAR input will set all latches to the output OFF condition regardless of the Data or STROBE input levels. A high OUTPUT ENABLE will set all outputs to the OFF condition, regardless of any other input conditions. When the OUTPUT ENABLE is low, the outputs depend on the state of their respective latches. If current shutdown is activated, the OUTPUT ENABLE must be pulsed high to restore operation. Over temperature faults are not latched and require no reset pulse.
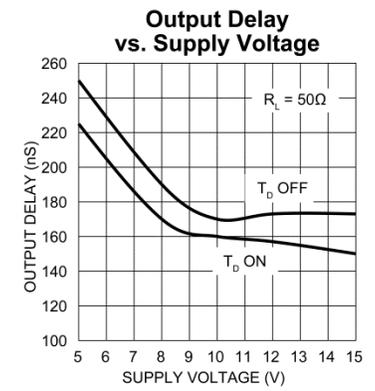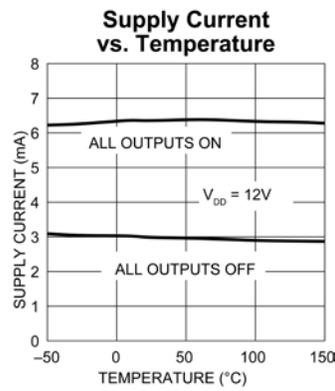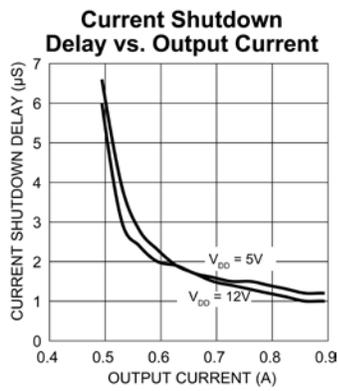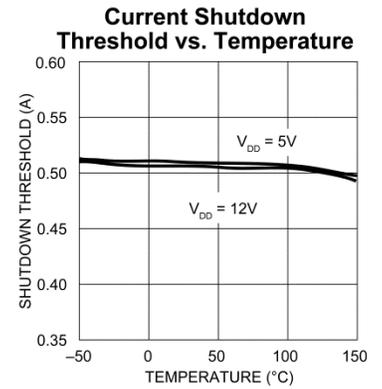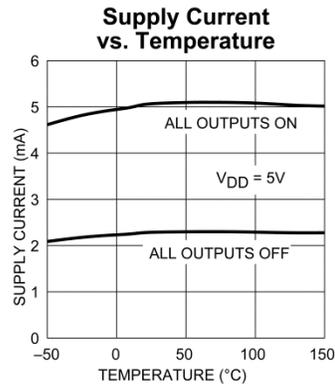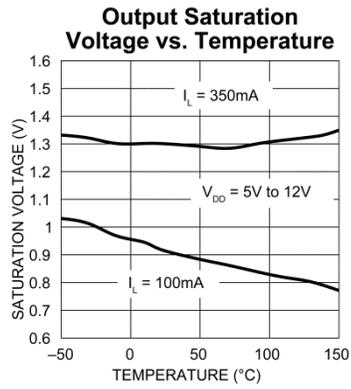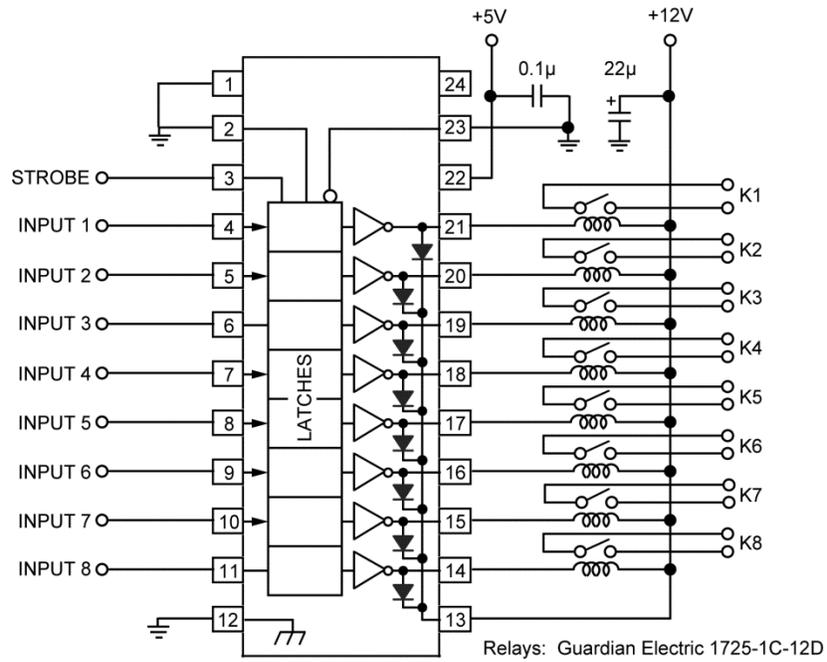
Timing
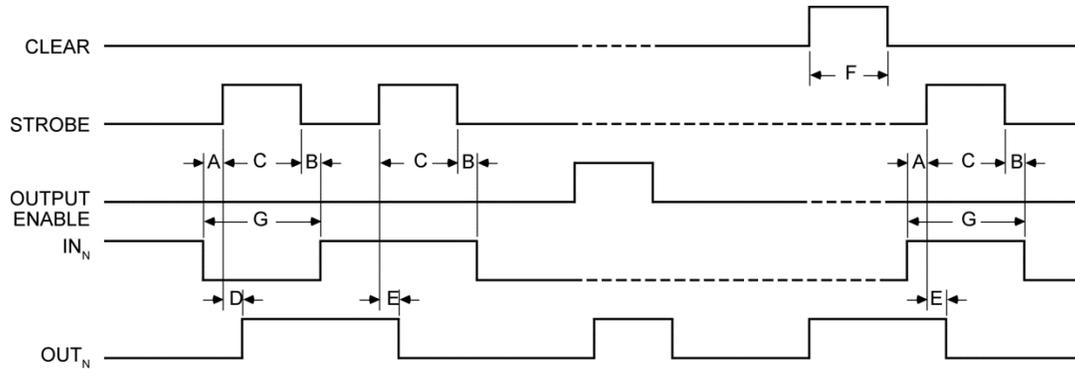
Timing Conditions

$(T_A = +25°C$, Logic Levels are V_{DD} and Ground, $V_{DD} = 5V)$

A. Minimum data active time before strobe enabled (data set-up time) 50ns

B. Minimum data active time after strobe disabled (data hold time) 50ns

C. Minimum strobe pulse width 125ns

D. Typical time between strobe activation and output on to off transition 500ns

E. Typical time between strobe activation and output off to on transition... 500ns

F. Minimum clear pulse width 300ns

G. Minimum data pulse width 225ns

Typical Characteristics

**Output Saturation
Voltage vs. Temperature**

I_L = 350mA

V_{DD} = 5V to 12V

I_L = 100mA

SATURATION VOLTAGE (V)

TEMPERATURE (°C)

**Supply Current
vs. Temperature**

ALL OUTPUTS ON

V_{DD} = 5V

ALL OUTPUTS OFF

SUPPLY CURRENT (mA)

TEMPERATURE (°C)

**Current Shutdown
Threshold vs. Temperature**

V_{DD} = 5V

V_{DD} = 12V

SHUTDOWN THRESHOLD (A)

TEMPERATURE (°C)

**Current Shutdown
Delay vs. Output Current**

V_{DD} = 5V

V_{DD} = 12V

CURRENT SHUTDOWN DELAY (µS)

OUTPUT CURRENT (A)

**Supply Current
vs. Temperature**

ALL OUTPUTS ON

V_{DD} = 12V

ALL OUTPUTS OFF

SUPPLY CURRENT (mA)

TEMPERATURE (°C)

**Output Delay
vs. Supply Voltage**

R_L = 50Ω

T_D OFF

T_D ON

OUTPUT DELAY (nS)

SUPPLY VOLTAGE (V)

Typical Application Schematic

Relays: Guardian Electric 1725-1C-12D

Package Information and Recommended Landing Pattern[5]
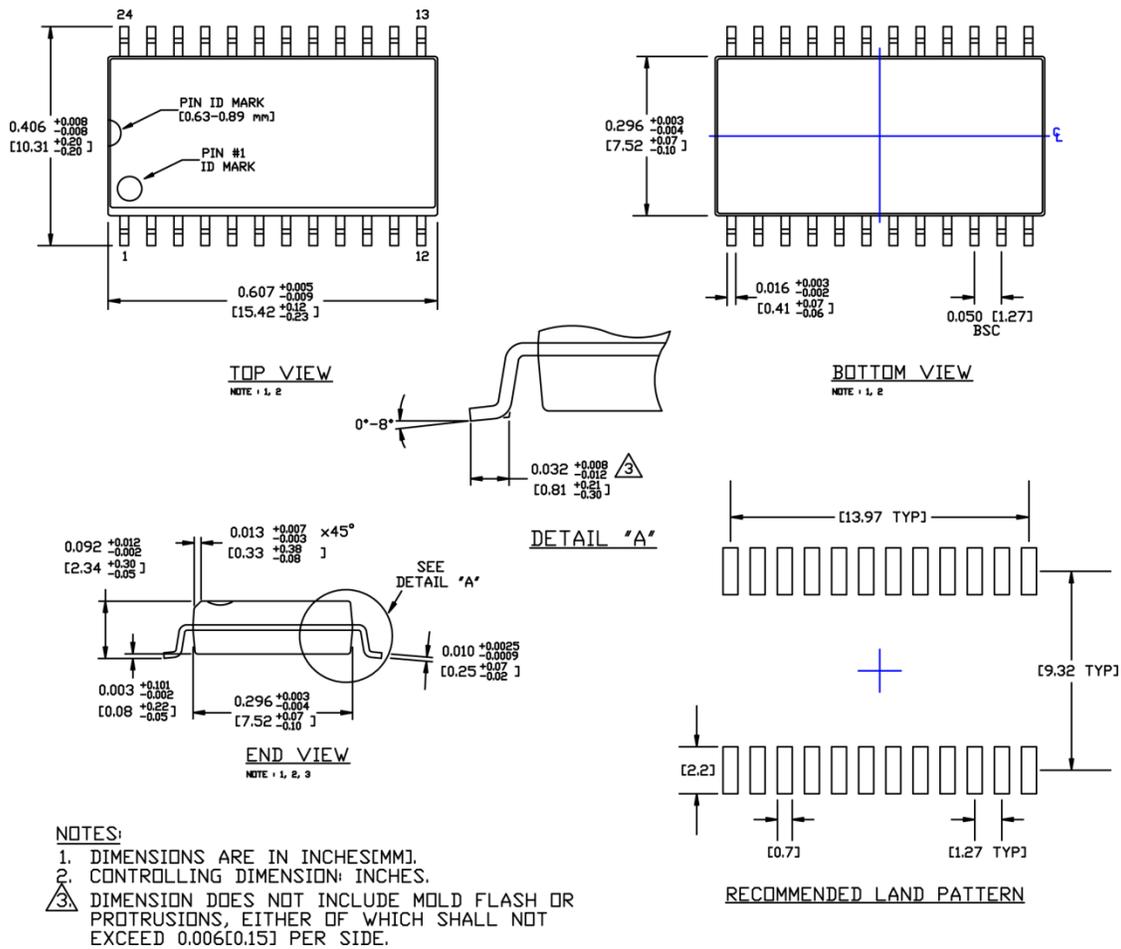
24-Pin Wide SOIC (WM)

Note:

7. Package information is correct as of the publication date. For updates and most current information, go to www.micrel.com.

Package Information and Recommended Landing Pattern[5] (Continued)

0.048[1.22] / 0.042[1.07] X45°

0.048[1.22] / 0.042[1.07] X45°

PIN 1 ID MARK

0.452 +0.004 −0.002 [11.48 +0.10 −0.05]

0.452 +0.004 −0.002 [11.48 +0.10 −0.05]

TOP VIEW

DETAIL "A"

0.490 +0.005 −0.005 [12.45 +0.13 −0.13]

EJECTOR PIN

0.490 +0.005 −0.005 [12.45 +0.13 −0.13]

BOTTOM VIEW

0.020[0.51] MIN.

0.0100 +0.0003 −0.0003 [0.254 +0.008 −0.008]

0.101 +0.019 −0.011 [2.56 +0.46 −0.27]

0.050[1.27] BSC

0.021 [0.53] / 0.013 [0.33]

0.032[0.81] / 0.026[0.66]

0.049±0.007

0.172 +0.008 −0.007 [4.37 +0.20 −0.18]

0.004[0.10]

−C−

SEE DETAIL "A"

SIDE VIEW

0.354 +0.005 −0.005 [9.00 +0.13 −0.13]

0.020 +0.005 −0.005 [0.50 +0.13 −0.13]

0.527 +0.005 −0.005 [13.40 +0.13 −0.13]

0.087 +0.005 −0.005 [2.20 +0.13 −0.13]

0.527 +0.005 −0.005 [13.40 +0.13 −0.13]

RECOMMENDED LAND PATTERN

NOTES:
1. DIMENSIONS ARE IN INCHES [MM].
2. CONTROLLING DIMENSION: INCHES.
3. DIMENSION DOES NOT INCLUDE MOLD FLASH OR PROTRUSIONS, EITHER OF WHICH SHALL NOT EXCEED 0.008 [0.203].
4. LEAD DIMENSION DOES NOT INCLUDE DAMBAR PROTRUSION.
5. MAXIMUM AND MINIMUM SPECIFICATIONS ARE INDICATED AS FOLLOWS : MAX/MIN
6. PACKAGE TOP DIMENSION MAY BE SLIGHTLY SMALLER THAN BOTTOM DIMENSION.

28-Pin PLCC (V)

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