

Automotive Single 2-Input NAND Gate**Features**

- Wide Supply Voltage Range from 1.65 V to 5.5 V
- I/O Tolerance Inputs to 5.5 V
- All Inputs with Schmitt-Trigger Action
- CMOS Low Power Dissipation
- I_{OFF} Supports Partial Power-down Protection
- ESD Protection: ± 4 -kV HBM Model, ± 1 -kV CDM Model
- Latch-up Performance Exceeds 100 mA per JESD 78, Class II
- AEC-Q100 Qualified for Automotive Applications, Grade 1

Applications

- Automotive Body Electronics

Description

The T74L1G00Q is a single 2-input NAND gate with V_{CC} supply from 1.65 V to 5.5 V. Schmitt-Trigger action with slower rise-and-fall times and better noise immunity. I_{OFF} circuits can prevent backflow current during power-down, thus supporting partial power-down protection.

The T74L1G00Q is available in the SOT353 package and is AEC-Q100 qualified for automotive applications.

Device Table

Device	Package	Body Size
T74L1G00Q-SC5R-S	SOT353	2 mm x 1.25 mm

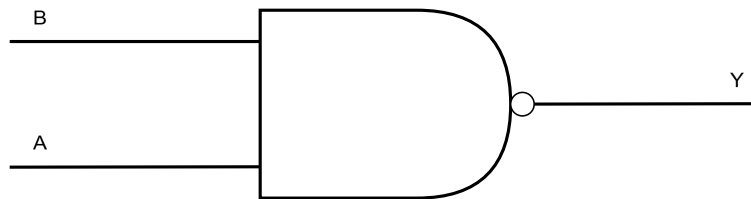
Typical Application Circuit

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Revision History

Date	Revision	Notes
2025-04-24	Rev.Pre.0	Initial version.
2025-10-21	Rev.A.0	Released version.

Pin Configuration and Functions

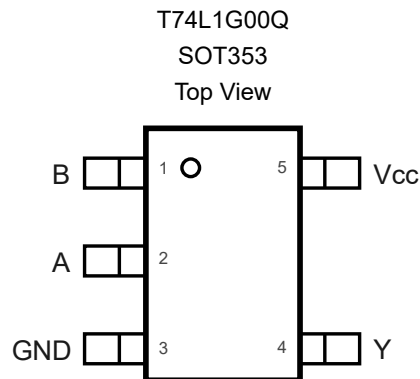


Table 1. Pin Functions

Pin No.	Name	I/O	Description
1	B	I	Input B
2	A	I	Input A
3	GND	Power	Ground
4	Y	O	Output Y
5	V _{CC}	Power	Supply pin

Function Table

Table 2. Truth Table

Input		Output
A	B	Y
L	L	H
L	H	H
H	L	H
H	H	L

(1) H = High voltage level.

(2) L = Low voltage level.

(3) X = Don't care.

Automotive Single 2-Input NAND Gate

Specifications

Absolute Maximum Ratings ⁽¹⁾

Parameter		Min	Max	Unit
V _{CC}	Supply Voltage	−0.5	6.5	V
V _I	Input Voltage ⁽²⁾	−0.5	6.5	V
V _O	Output Voltage, in Power-off Mode ⁽²⁾	−0.5	6.5	V
V _O	Output Voltage, in Active Mode ⁽²⁾	−0.5	V _{CC} + 0.5	V
I _O	Continuous Output Current	−50	50	mA
I _{IK}	Input Clamp Current, V _I < 0	−50		mA
I _{OK}	Output Clamp Current, V _O < 0	−50		mA
	Continuous Current through V _{CC} or GND	−100	100	mA
T _J	Junction Temperature		150	°C
T _{STG}	Storage Temperature	−65	150	°C

(1) Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) The minimum input and output voltage ratings may be exceeded if the input and output current ratings are observed.

ESD, Electrostatic Discharge Protection

Symbol	Parameter	Condition	Minimum Level	Unit
HBM	Human Body Model ESD	AEC Q100-002, all pins ⁽¹⁾	±4,000	V
CDM	Charged Device Model ESD	AEC Q100-011, all pins	±1,000	V

(1) AEC Q100-002 indicates that HBM stress should conform to the ANSI/ESDA/JEDEC JS-001 specification.

Recommended Operating Conditions

All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation.

Parameter		Min	Typ	Max	Unit
V _{CC}	Supply Voltage	1.65		5.5	V
V _I	Input Voltage	0		5.5	V
V _O	Output Voltage	0		V _{CC}	V
T _A	Ambient Temperature	−40		125	°C
Δt/ΔV	Input Transition Rise-and-Fall Rate, V _{CC} = 1.65 V to 2.7 V			20	ns/V
	Input Transition Rise-and-Fall Rate, V _{CC} = 2.7 V to 5.5 V			10	ns/V

Thermal Information

Package Type	θ_{JA}	θ_{JC}	Unit
SOT353	246.6	68.2	°C/W

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Electrical Characteristics – DC Parameter

All test conditions: $T_A = -40^{\circ}\text{C}$ to 125°C , all typical values are measured at $T_A = 25^{\circ}\text{C}$, unless otherwise noted.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{IH}	High-Level Input Voltage	$V_{CC} = 1.65\text{ V to }1.95\text{ V}$	$0.7V_{CC}$			V
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	1.7			V
		$V_{CC} = 2.7\text{ V to }3.6\text{ V}$	2			V
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	$0.7V_{CC}$			V
V_{IL}	Low-Level Input Voltage	$V_{CC} = 1.65\text{ V to }1.95\text{ V}$			$0.3V_{CC}$	V
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$			0.7	V
		$V_{CC} = 2.7\text{ V to }3.6\text{ V}$			0.8	V
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$			$0.3V_{CC}$	V
V_{OH}	High-Level Output Voltage	$I_{OH} = -100\text{ }\mu\text{A};$ $V_{CC} = 1.65\text{ V to }5.5\text{ V}$	$V_{CC} - 0.1$			V
		$I_{OH} = -4\text{ mA}; V_{CC} = 1.65\text{ V}$	0.95			V
		$I_{OH} = -8\text{ mA}; V_{CC} = 2.3\text{ V}$	1.7			V
		$I_{OH} = -12\text{ mA}; V_{CC} = 2.7\text{ V}$	1.9			V
		$I_{OH} = -24\text{ mA}; V_{CC} = 3\text{ V}$	2			V
		$I_{OH} = -32\text{ mA}; V_{CC} = 4.5\text{ V}$	3.4			V
V_{OL}	Low-Level Output Voltage	$I_{OL} = 100\text{ }\mu\text{A};$ $V_{CC} = 1.65\text{ V to }5.5\text{ V}$			0.1	V
		$I_{OL} = 4\text{ mA}; V_{CC} = 1.65\text{ V}$			0.7	V
		$I_{OL} = 8\text{ mA}; V_{CC} = 2.3\text{ V}$			0.45	V
		$I_{OL} = 12\text{ mA}; V_{CC} = 2.7\text{ V}$			0.6	V
		$I_{OL} = 24\text{ mA}; V_{CC} = 3\text{ V}$			0.8	V
		$I_{OL} = 32\text{ mA}; V_{CC} = 4.5\text{ V}$			0.8	V
I_I	Input Leakage Current	$V_I = \text{GND or }5.5\text{ V};$ $V_{CC} = 0\text{ V to }5.5\text{ V}$	-1	± 0.1	1	μA
I_{OFF}	Power-off Leakage Current	$V_I \text{ or } V_O = 5.5\text{ V};$ $V_{CC} = 0\text{ V}$	-1	± 0.1	1	μA
I_{CC}	Supply Current	$V_I = \text{GND or }V_{CC}; I_O = 0\text{ A};$ $V_{CC} = 1.65\text{ V to }5.5\text{ V}$		0.1	2	μA
ΔI_{CC}	Additional Supply Current	$V_I = V_{CC} - 0.6\text{ V}; I_O = 0\text{ A};$ $V_{CC} = 2.3\text{ V to }5.5\text{ V}$		0.1	10	μA
$C_I^{(1)}$	Input Capacitance			2.1		pF

(1) Spec limit is based on bench characterization and design simulation, not tested in production.

Electrical Characteristics – AC Parameter

All test conditions: $T_A = -40^{\circ}\text{C}$ to 125°C , all typical values are measured at $T_A = 25^{\circ}\text{C}$, unless otherwise noted.

Symbol ⁽¹⁾	Parameter	Conditions	Min	Typ	Max	Unit
t_{PD} ⁽²⁾	Propagation Delay at 30-pF C_{LOAD}	$C_{LOAD} = 30\text{ pF};$ $V_{CC} = 1.65\text{ V to }1.95\text{ V}$	3.2	8.3	15.2	ns
		$C_{LOAD} = 30\text{ pF};$ $V_{CC} = 2.3\text{ V to }2.7\text{ V}$	2.1	5.7	9.3	ns
	Propagation Delay at 50-pF C_{LOAD}	$C_{LOAD} = 50\text{ pF};$ $V_{CC} = 2.7\text{ V}$	2.5	5.7	8.8	ns
		$C_{LOAD} = 50\text{ pF};$ $V_{CC} = 3\text{ V to }3.6\text{ V}$	1.9	5.1	8	ns
		$C_{LOAD} = 50\text{ pF};$ $V_{CC} = 4.5\text{ V to }5.5\text{ V}$	1.5	4.4	6.2	ns
C_{PD} ⁽³⁾	Power Dissipation Capacitance	$f = 10\text{ MHz};$ $V_{CC} = 3.3\text{ V}$		13		pF

(1) Spec limit is based on bench characterization and design simulation, not tested in production.

(2) t_{PD} is the same as t_{PLH} and t_{PHL} .

(3) C_{PD} is used to determine the dynamic power dissipation (PD in μW).

$$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$$

Where:

f_i = Input frequency in MHz;

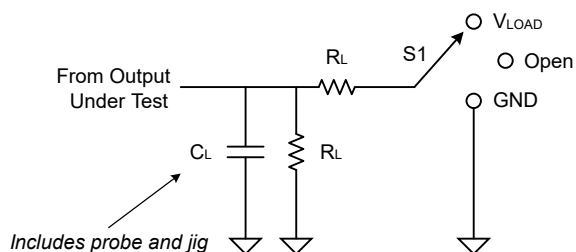
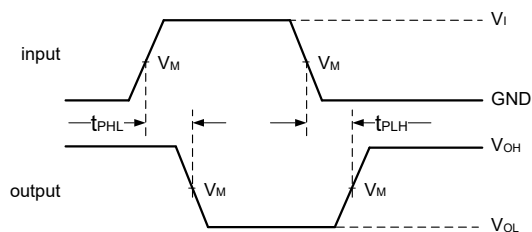
f_o = Output frequency in MHz;

C_L = Output load capacitance in pF;

V_{CC} = Supply voltage in Volts;

N = Number of inputs switching;

$\Sigma(C_L \times V_{CC}^2 \times f_o)$ = Sum of the outputs.

Parameter Measurement Waveforms

Figure 1. Timing Measurement Load Circuit

Figure 2. Propagation Delay Times
Table 3. Test Data

V _{CC}	Inputs		C _L	R _L	V _M	S1
	V _I	t _r /t _f				t _{PHL} /t _{PLH}
1.65 V to 1.95 V	V _{CC}	≤ 2 ns	30 pF	1 kΩ	0.5V _{CC}	Open
2.3 V to 2.7 V	V _{CC}	≤ 2 ns	30 pF	500 Ω	0.5V _{CC}	Open
2.7 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	1.5 V	Open
3 V to 3.6 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	1.5 V	Open
4.5 V to 5.5 V	V _{CC}	≤ 2.5 ns	50 pF	500 Ω	0.5V _{CC}	Open

Application and Implementation

Note

Information in the following application sections is not part of the 3PEAK's component specification and 3PEAK does not warrant its accuracy or completeness. 3PEAK's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

Typical Application

Figure 3 shows the typical application schematic.

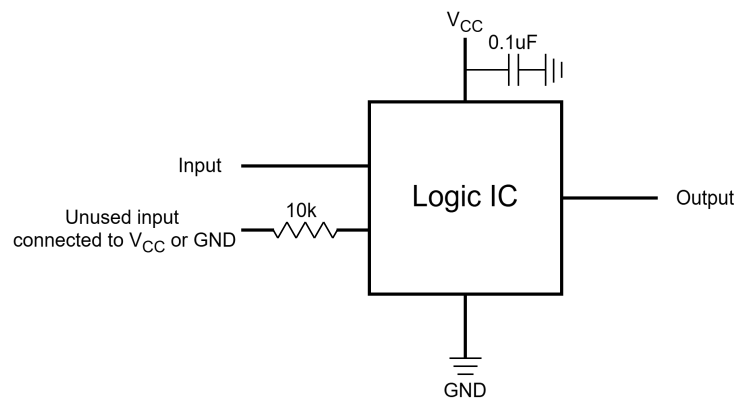
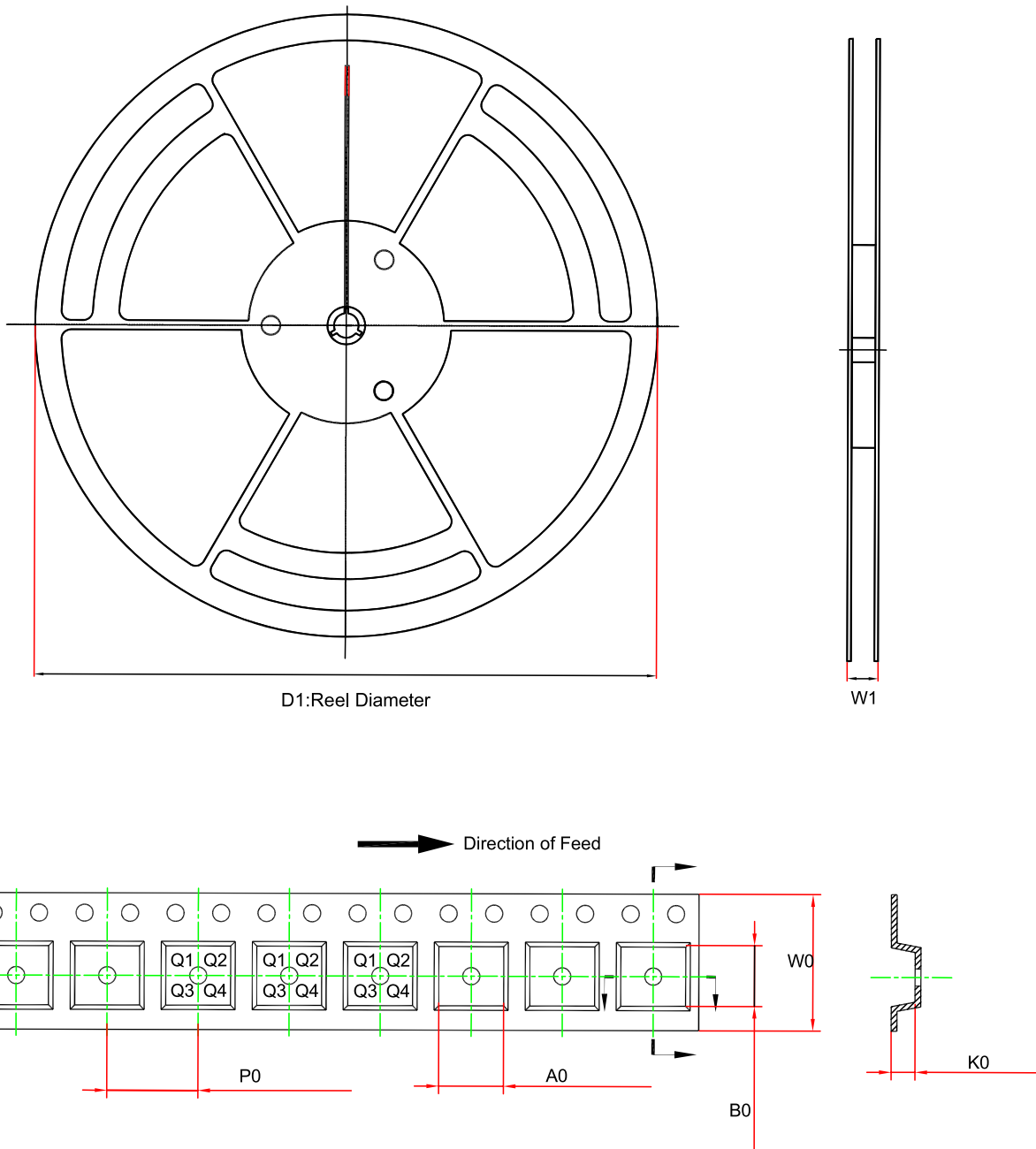


Figure 3. Typical Application Circuit

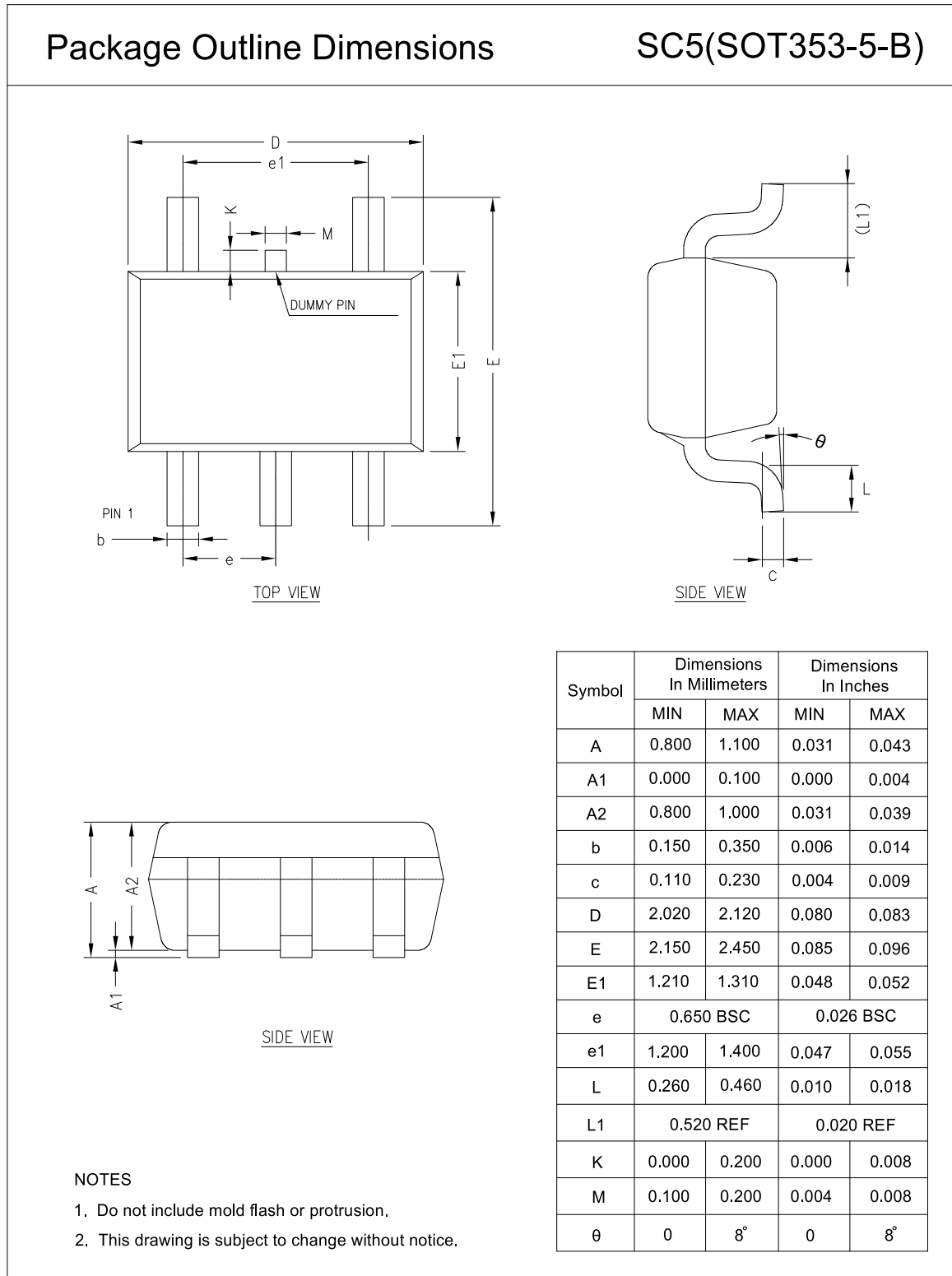
Tape and Reel Information



Order Number	Package	D1 (mm)	W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	W0 (mm)	Pin1 Quadrant
T74L1G00Q-SC5R-S	SOT353	178	12.1	2.4	2.5	1.2	4	8	Q3

Package Outline Dimensions

SOT353

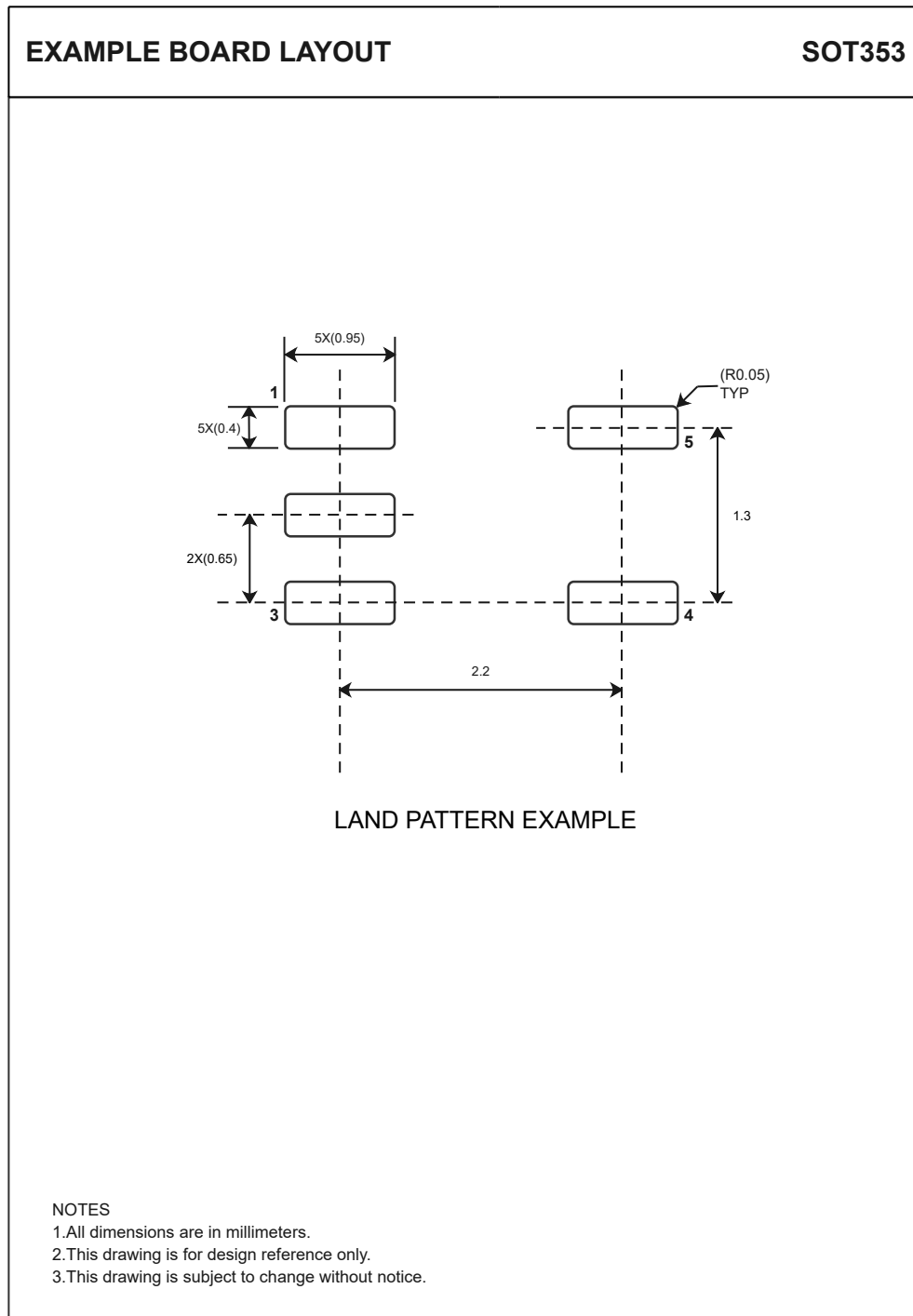


NOTES

- Do not include mold flash or protrusion.
- This drawing is subject to change without notice.

Land Pattern

SOT353



Order Information

Order Number	Operating Temperature Range	Package	Marking Information	MSL	Transport Media, Quantity	Eco Plan
T74L1G00Q-SC5R-S	-40 to 125°C	SOT353	VA	MSL1	Tape and Reel,3000	Green

Green: 3PEAK defines "Green" to mean RoHS compatible and free of halogen substances.

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