

Features and Benefits

- Built-in Reverse Voltage Protection
- Built-in RFI Filter
- Power Efficient CMOS and Power MOSFET Drivers allow 400mA without overheating
- Built-in Zener Diodes Protect Outputs
- Eliminate all Fan Components
- Eliminate PC Board
- 5V and 12V Operation
- High Sensitivity for switching symmetry
- Locked Rotor Shutdown

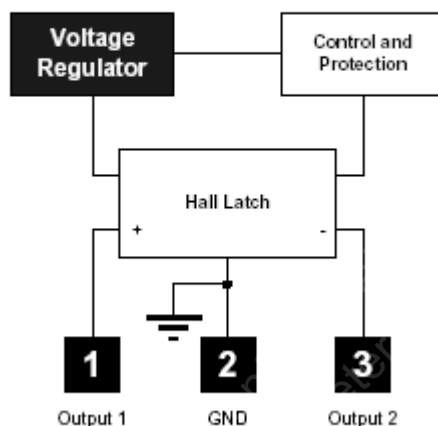
Applications

- Fan sizes up to 90mm
- Current range up to 400mA

Ordering Information

Product Code	Temperature Code	Package Code	Option Code	Packing Form Code
US79	K	UA	AAA-000	BU
US79	K	UA	AAA-001	BU
	(-40°C to 125°C)	(TO-92 flat)	(Package variants)	(Bulk bag delivery form)

1. Functional Diagram



2. Description

The US79KUA is the most advanced Smart Fan Control Hall IC. It is designed for 5V and 12V cooling commutation. The chip contains many features to allow survival in a harsh environment. The IC was designed to eliminate all discrete components such as capacitors, resistors, transistors, diodes, PC board and associated labor, replacing US\$0.25 to US\$0.35 in direct cost.

The K rating guarantees proper operation up to an ambient temperature of 125°C. Hall IC circuitry and power FET output provide a low power dissipation cool chip.

Locked Rotor conditions are detected by the IC when there is no motion for one second and will shut off the motor drive for five seconds. Then, the IC will turn on the drive current for one second. This sequence continues indefinitely until the locked rotor condition is fixed. This feature prevents overheating.

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3. Glossary of Terms

MilliTesla (mT), Gauss: Units of magnetic flux density; 1 milliTesla = 10 Gauss.

Two-Coil Fan: a fan with two coil windings, current alternates from 1 coil to the other depending on the polarity of the magnetic field.

Two-wire Fan: A fan that has only two connections for the power supply plus and minus.

Locked rotor: The condition of a fan that has stopped spinning due to mechanical blockage .

4. Absolute Maximum Ratings

Supply Voltage, V_{DD}	(-0.3 to 18)V
Output Current (Fault), I_{OUT}	500mA
Operating Temperature Range, T_A	-40 to 125°C
Storage Temperature Range, T_S	-55 to 165°C
Maximun Junction Temp, T_J	150°C

Exceeding the absolute maximum ratings may cause permanent damage. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

5. US79 Electrical Specifications

DC operating parameters: $T_A = 25^\circ\text{C}$, $V_{DD} = 12\text{V}$ unless otherwise specified

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Supply Voltage	V_{DD}	Operating	3.5	-	18	V
Supply Current	I_{DD}	Operating		2.0	4	mA
Output Saturation voltage	V_{DSS}	$I_{OUT} = 150\text{mA}$		300	600	mV
Output Saturation voltage	V_{DSS}	$I_{OUT} = 350\text{mA}$		650	1100	mV
Thermal resistance	R_{th}	Operating		190		°C/W
Locked-Rotor Period	t_{on}			0.8		S
Locked-Rotor period	t_{off}			5		S

6. US79 Magnetic Specifications

DC operating parameters: $T_A = 25^\circ\text{C}$, $V_{DD} = 12\text{V}$ unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Operate Point	B_{OP}	Operating		2.5	6.0	mT
Release Point	B_{RP}	Operating	-6.0	-2.5		mT
Hysteresis	B_{HYS}	Operating	2.0	5.0	-	mT

7. Unique Features

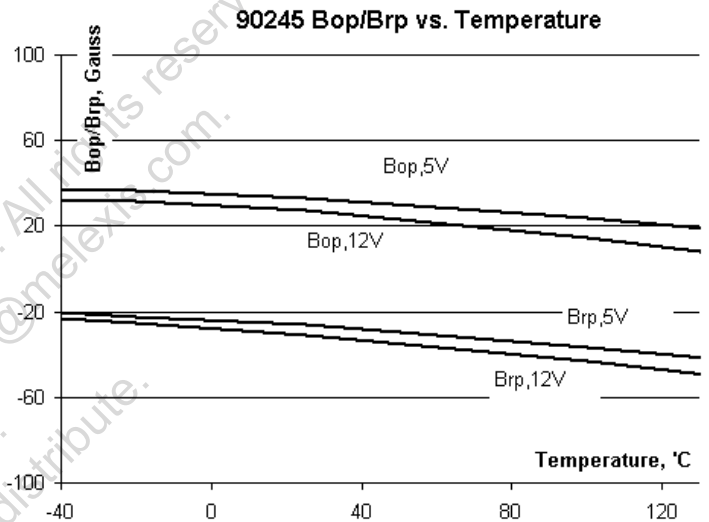
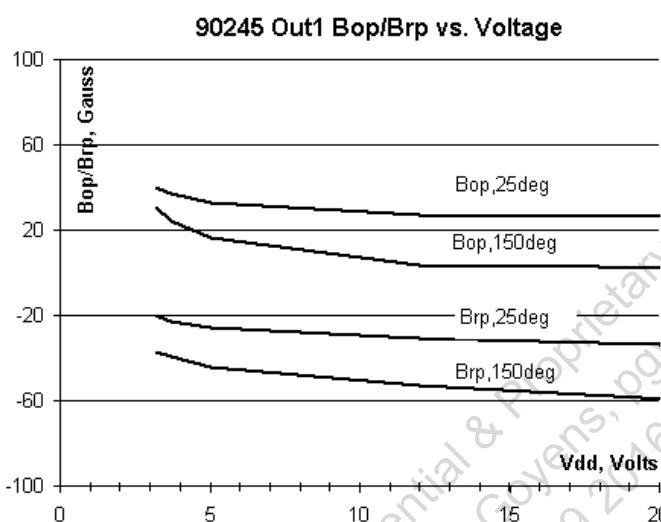
Reverse voltage protection eliminates the need for a diode. Reverse current flows through the coils and the chip. Power dissipation is $(2 * I_{start}/I_{start} * 0.7V)$.

Table 1 presents max temperature for each current.

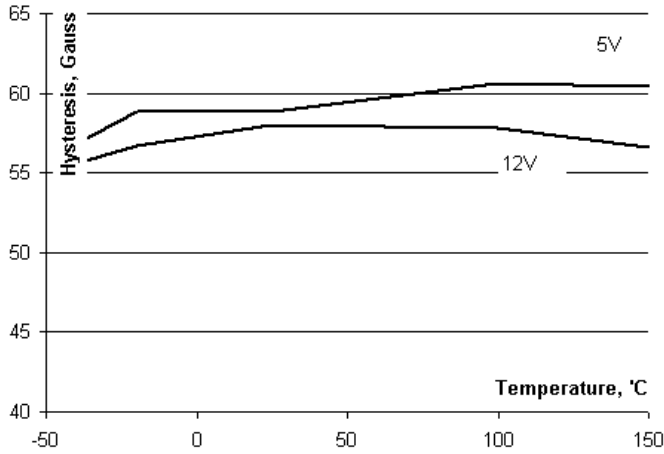
I _{stall} / I _{start}	T _A Maximum Rev V Test
100mA	125°C
200mA	100°C
300mA	70°C
400mA	40°C

Reverse Voltage protection is provided by the motor windings. The 35V Zener diodes clamp the output drivers for over stress protection.

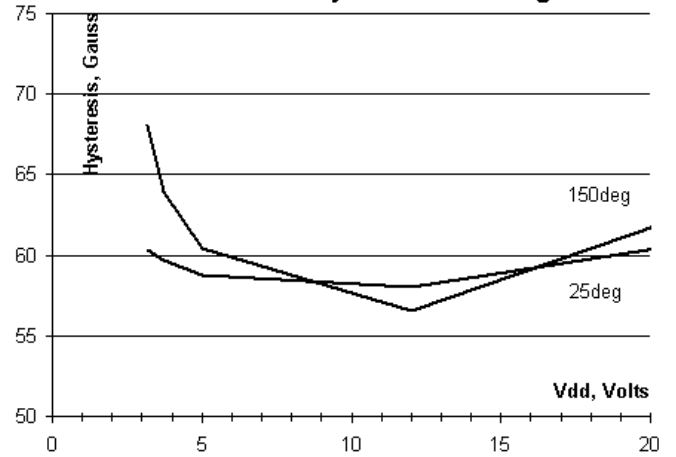
8. Performance Graphs



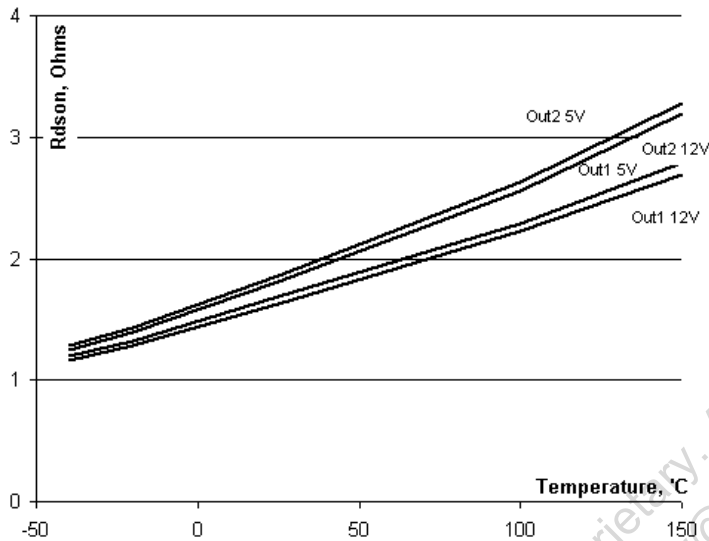
90245 Hysteresis Vs. Temperature



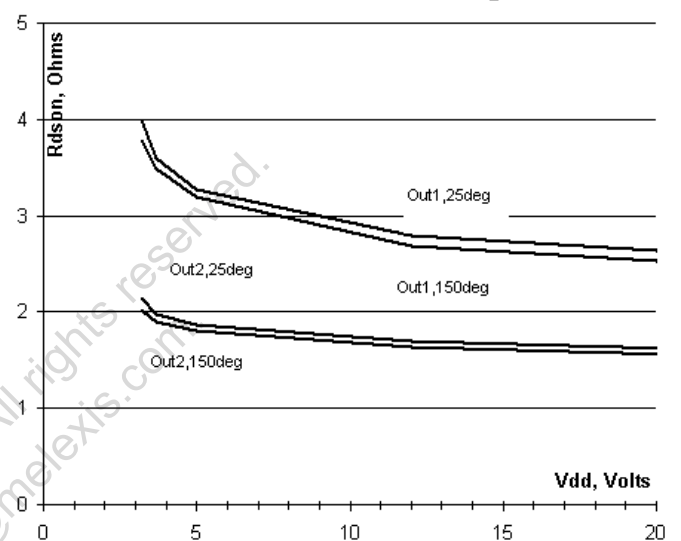
90245 Hysteresis vs. Voltage



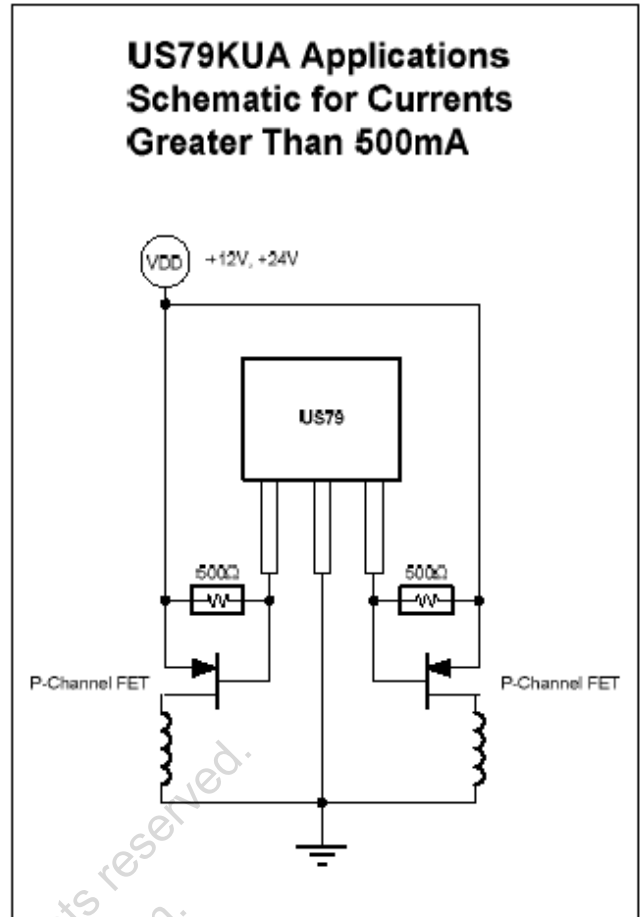
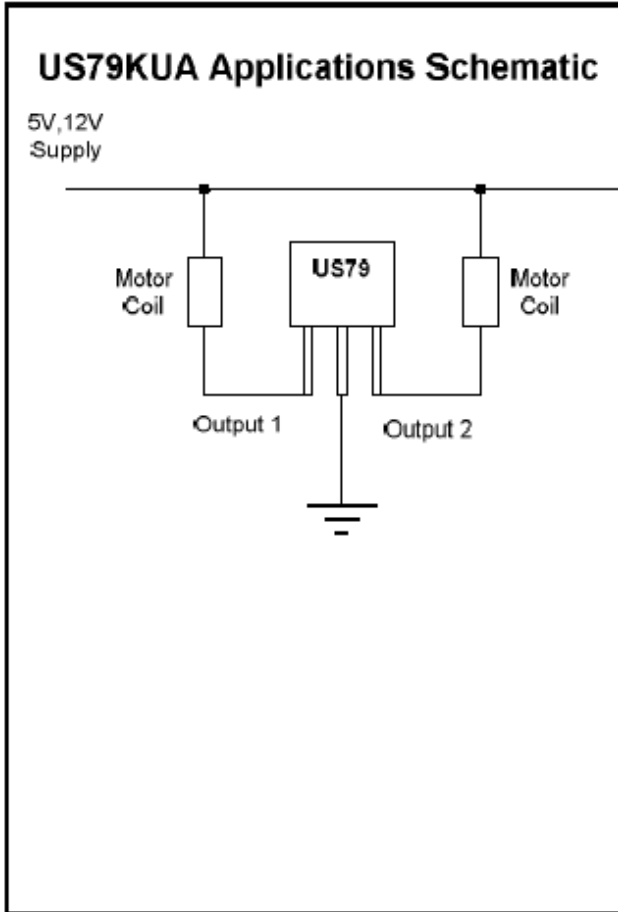
90245 Rdson vs. Temperature



90245 Rdson vs. Voltage



9. Applications Information



10. Reliability Information

This Melexis device is classified and qualified regarding soldering technology, solderability and moisture sensitivity level, as defined in this specification, according to following test methods:

- IPC/JEDEC J-STD-020
Moisture/Reflow Sensitivity Classification For Nonhermetic Solid State Surface Mount Devices (classification reflow profiles according to table 5-2)
- EIA/JEDEC JESD22-A113
Preconditioning of Nonhermetic Surface Mount Devices Prior to Reliability Testing (reflow profiles according to table 2)
- CECC00802
Standard Method For The Specification of Surface Mounting Components (SMDs) of Assessed Quality
- EIA/JEDEC JESD22-B106
Resistance to soldering temperature for through-hole mounted devices
- EN60749-15
Resistance to soldering temperature for through-hole mounted devices
- MIL 883 Method 2003 / EIA/JEDEC JESD22-B102
Solderability

For all soldering technologies deviating from above mentioned standard conditions (regarding peak temperature, temperature gradient, temperature profile etc) additional classification and qualification tests have to be agreed upon with Melexis.

The application of Wave Soldering for SMD's is allowed only after consulting Melexis regarding assurance of adhesive strength between device and board.

Based on Melexis commitment to environmental responsibility, European legislation (Directive on the Restriction of the Use of Certain Hazardous substances, RoHS) and customer requests, Melexis has installed a Roadmap to qualify their package families for lead free processes also. Various lead free generic qualifications are running, current results on request.

For more information on manufacturability/solderability see quality page at our website:

<http://www.melexis.com/html/pdf/MLXleadfree-statement.pdf>

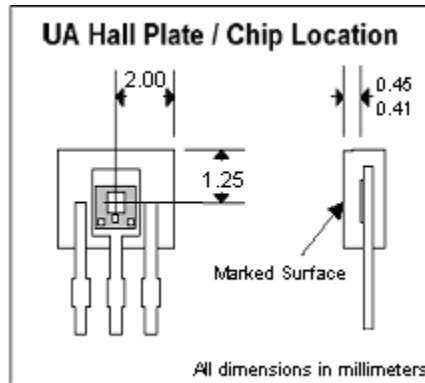
11. ESD Precautions

Electronic semiconductor products are sensitive to Electro Static Discharge (ESD).

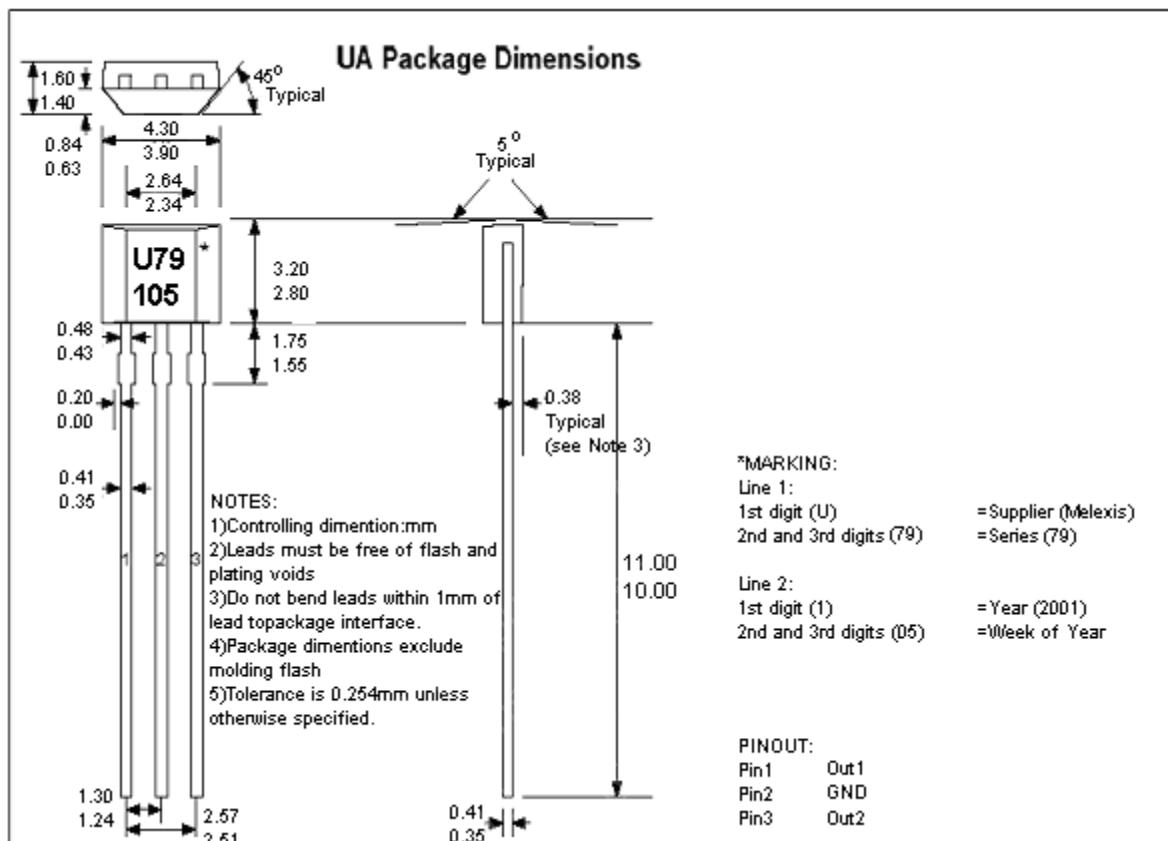
Always observe Electro Static Discharge control procedures whenever handling semiconductor products.

12. UA Package Information

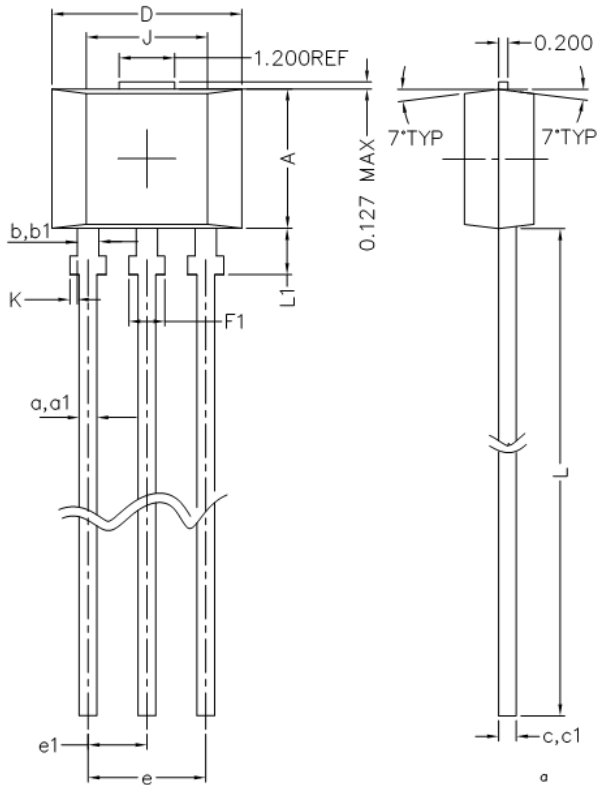
12.1. Hall plate location



12.2. AAA000 Package variant

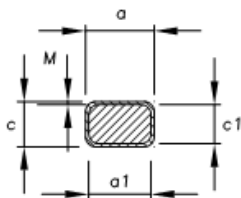
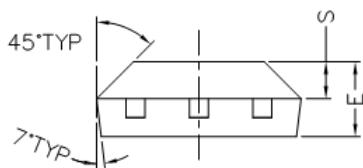


12.3. AAA001 Package variant



SYMBOL	DIMENSIONS [MM/INCH]		
	MIN	NOM	MAX
A	2.80 .110	3.00 .118	3.20 .126
a1	0.35 .014	—	0.41 .016
a	0.35 .014	—	0.44 .017
b1	0.43 .017	—	0.49 .019
b	0.43 .017	—	0.52 .020
c1	0.35 .014	—	0.41 .016
c	0.35 .014	—	0.44 .017
F1	0.45 .018	—	0.66 .026
K	0.00 .000	—	0.15 .006
D	3.90 0.153	4.10 .161	4.30 .169

SYMBOL	DIMENSIONS [MM/INCH]		
	MIN	NOM	MAX
e1	1.24 .049	1.27 .050	1.30 .051
E	1.40 .055	1.50 .059	1.60 .063
J	2.51 .099	2.62 0.103	2.72 .107
L	14.00 .551	14.50 .5709	15.00 .5906
L1	0.90 .035	1.0 .039	1.10 0.43
S	0.63 .025	0.74 .029	0.84 .033
e	2.51 .099	2.54 .100	2.57 .101
M	—	—	0.0152 .0006



NOTES :

1. DIMENSIONS A AND D DO NOT INCLUDE MOLD GATE AND SIDE FLASH (PROTUSION) ALLOWABLE IS 0.127 [0.005] PER SIDE. A AND D ARE MAXIMUM PLASTIC BODY SIZE DIMENSIONS INCLUDING MOLD MISMATCH.

2. CONTROLLING DIMENSION IN MM.

3. a1, b1, c1 ARE DIM FOR BARE LEAD FRAMES
 4. a, b, c ARE DIM FOR PLATED LEAD FRAMES.

Notes : Main differences between 000 and 001 package variants

- The main difference is the position of the dambar : L1max reduced from 0.175mm to 0.107mm
- The dambar of the 001 package has wettable flanks for improved solderability in case of Surface Mount Assembly.
- 000 may still have a very small change of flash mould between the dambar and the package body. This possibility is further reduced with the 001 version.

13. Disclaimer

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