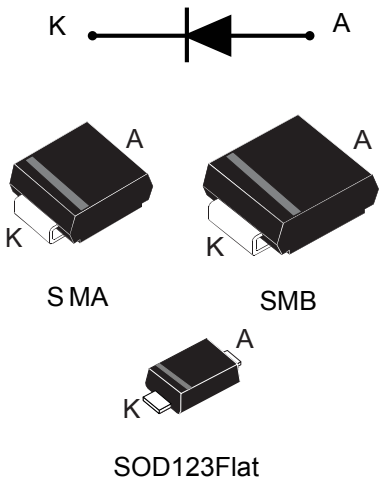
STPS1L40

Datasheet

40 V - 1 A power Schottky rectifier



SMA SMB

SOD123Flat

Features

- Very small conduction losses
- Negligible switching losses
- Low forward voltage drop
- Surface mount miniature packages
- Avalanche rated
- ECOPACK®2 compliant

Applications

- Reverse polarity protection
- Set-top box power supply
- TV power supply
- Battery charger

Description

Single chip Schottky rectifiers suited to switched mode power supplies and high frequency DC to DC converters.

Packaged in SMA, SMB and SOD123Flat, the STPS1L40 is ideal for use in surface mounting and used in low voltage, high frequency inverters, free-wheeling and polarity protection applications.

Product status
STPS1L40

Product summary	
Symbol	**Value**
$I_{F(AV)}$	1 A
V_{RRM}	40 V
$T_{j(max.)}$	175 °C
$V_{F(typ.)}$	0.37 V

1 Characteristics

Table 1. Absolute ratings (limiting values at 25 °C, unless otherwise specified)

Symbol	Parameter			Value	Unit
V_{RRM}	Repetitive peak reverse voltage			40	V
$I_{F(RMS)}$	Forward rms current	SMA/SMB		8	A
$I_{F(AV)}$	Average forward current δ = 0.5, square wave	SMA/SMB	T_L = 155 °C	1	A
		SOD123Flat	T_L = 160 °C		
I_{FSM}	Surge non repetitive forward current	SMA/SMB	t_p = 10 ms sinusoidal	60	A
		SOD123Flat		50	
P_{ARM}	Repetitive peak avalanche power		t_p = 10 µs, T_j = 125 °C	65	W
T_{stg}	Storage temperature range			-65 to +175	°C
T_j	Operating junction temperature(1)			+175	°C

1. *$(dP_{tot}/dT_j) < (1/R_{th(j-a)})$ condition to avoid thermal runaway for a diode on its own heatsink.*

Table 2. Thermal resistance parameter

Symbol	Parameter		Max. value	Unit
$R_{th(j-l)}$	Junction to lead	SMA	30	°C/W
		SMB	25	
		SOD123Flat	20	

For more information, please refer to the following application note :

- AN5088 : Rectifiers thermal management, handling and mounting recommendations

Table 3. Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
I_R(1)	Reverse leakage current	T_j = 25 °C	$V_R = V_{RRM}$	-		35	µA
		T_j = 125 °C		-	6	10	mA
V_F(1)	Forward voltage drop	T_j = 25 °C	I_F = 1 A	-		0.50	V
		T_j = 125 °C		-	0.37	0.42	
		T_j = 25 °C	I_F = 2 A	-		0.63	
		T_j = 125 °C		-	0.50	0.61	

1. *Pulse test: t_p = 380 µs, δ < 2%*

To evaluate the conduction losses, use the following equation:

$P = 0.23 \times I_{F(AV)} + 0.19 \times I_F{}^2{}_{(RMS)}$

For more information, please refer to the following application notes related to the power losses :

- AN604: Calculation of conduction losses in a power rectifier
- AN4021: Calculation of reverse losses on a power diode

1.1 Characteristics (curves)

Figure 1. Average forward power dissipation versus average forward current

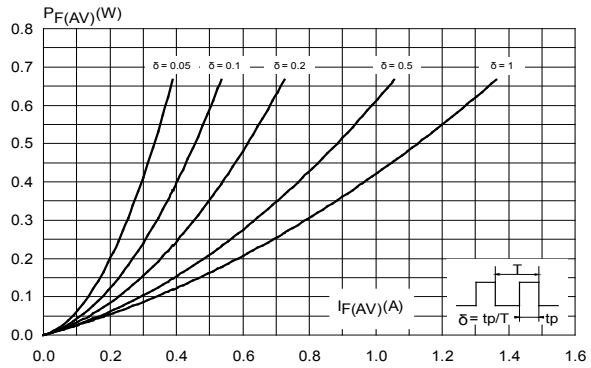


Figure 2. Average forward current versus ambient temperature (SMA, δ = 0.5)

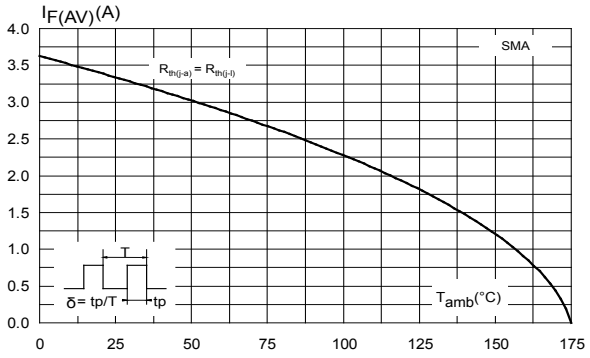


Figure 3. Average forward current versus ambient temperature (SMB, δ = 0.5)

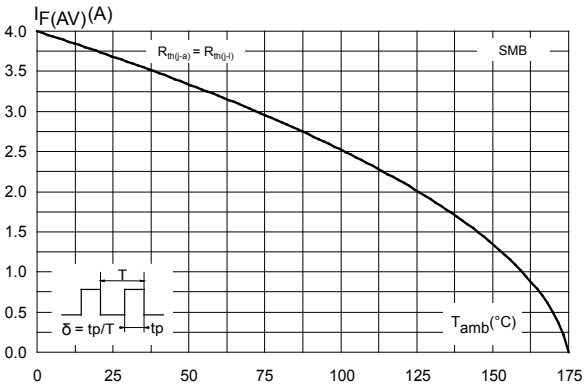


Figure 4. Average forward current versus ambient temperature (SOD123Flat, δ = 0.5)

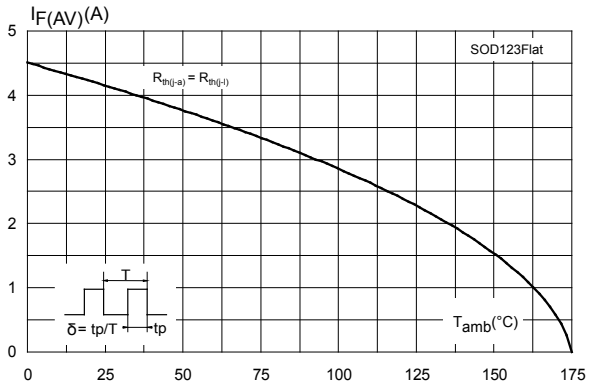


Figure 5. Normalized avalanche power derating versus pulse duration (T_j = 125 °C)

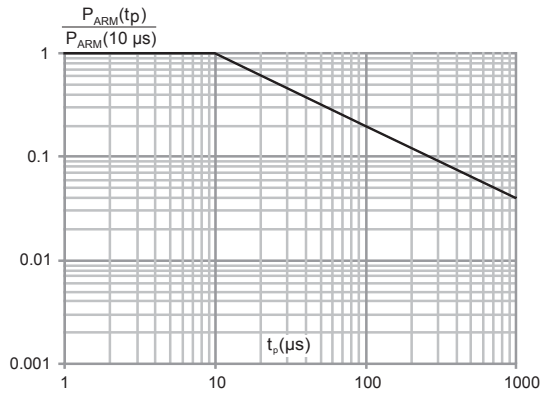


Figure 6. Relative variation of thermal impedance junction to ambient versus pulse duration (SMA)

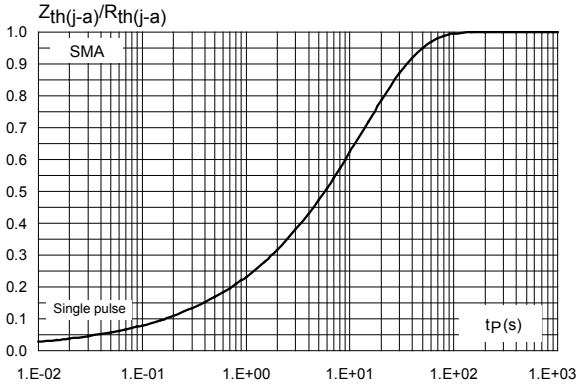


Figure 7. Relative variation of thermal impedance junction to ambient versus pulse duration (SMB)

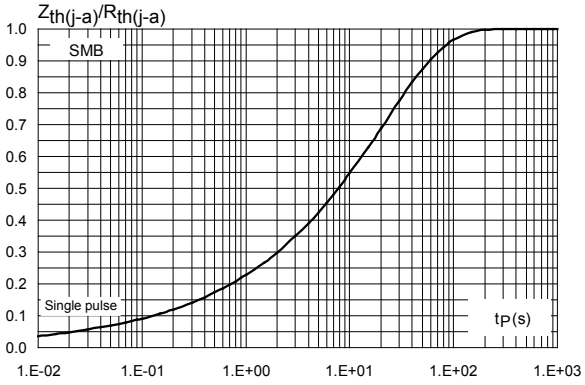


Figure 8. Relative variation of thermal impedance junction to lead versus pulse duration (SOD123Flat)

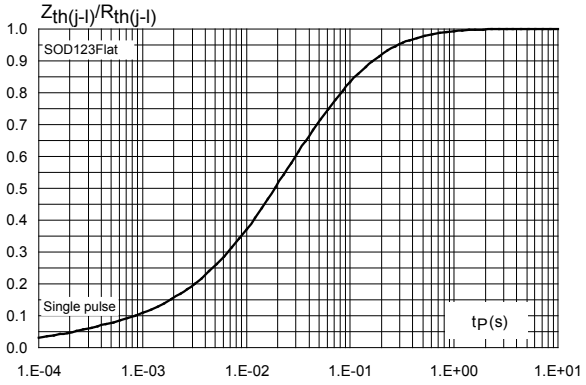


Figure 9. Reverse leakage current versus reverse voltage applied (typical values)

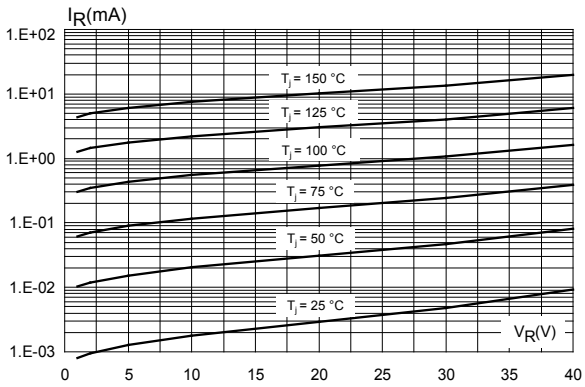


Figure 10. Junction capacitance versus reverse voltage applied (typical values)

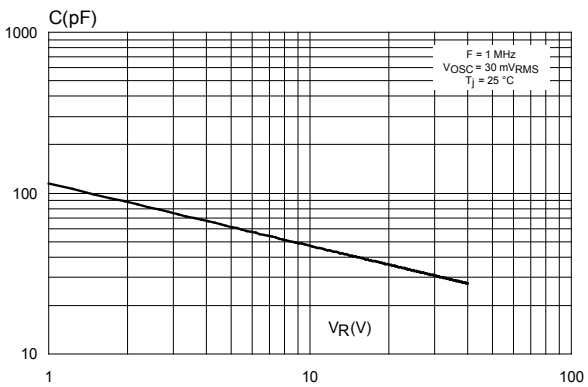


Figure 11. Forward voltage drop versus forward current (typical values)

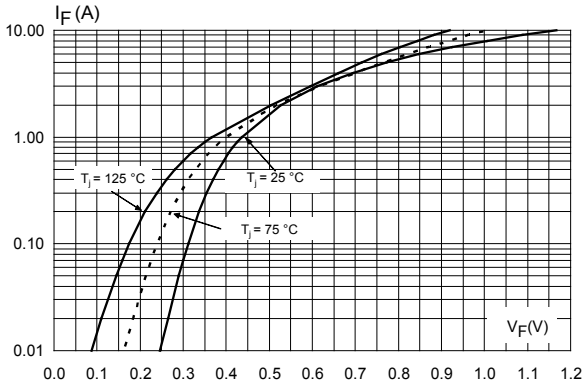


Figure 12. Thermal resistance junction to ambient versus copper surface under each lead (typical values)

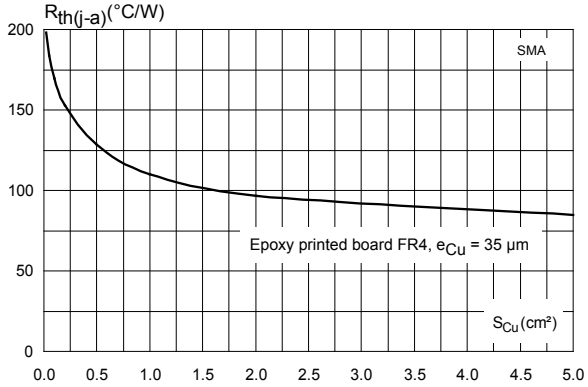


Figure 13. Thermal resistance junction to ambient versus copper surface under each lead (typical values)

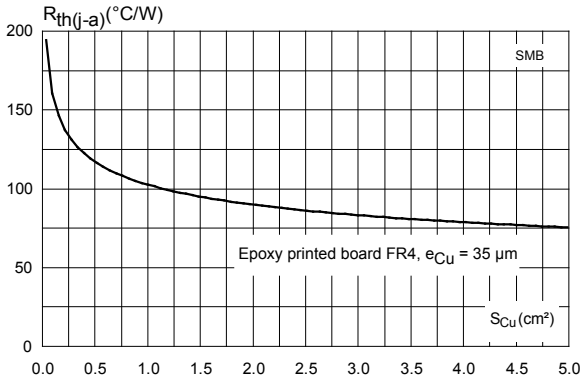
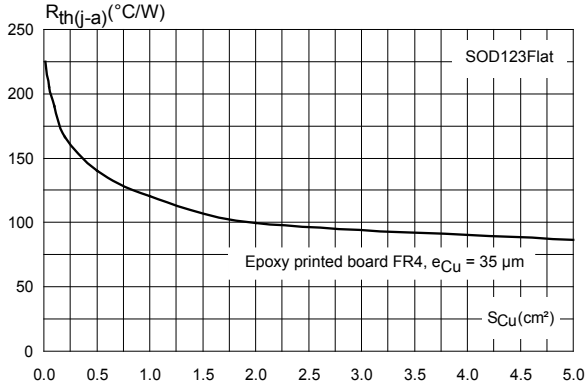


Figure 14. Thermal resistance junction to ambient versus copper surface under each lead (typical values)



2 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

2.1 SMB package information

- Epoxy meets UL94, V0
- Lead-free package

Figure 15. SMB package outline

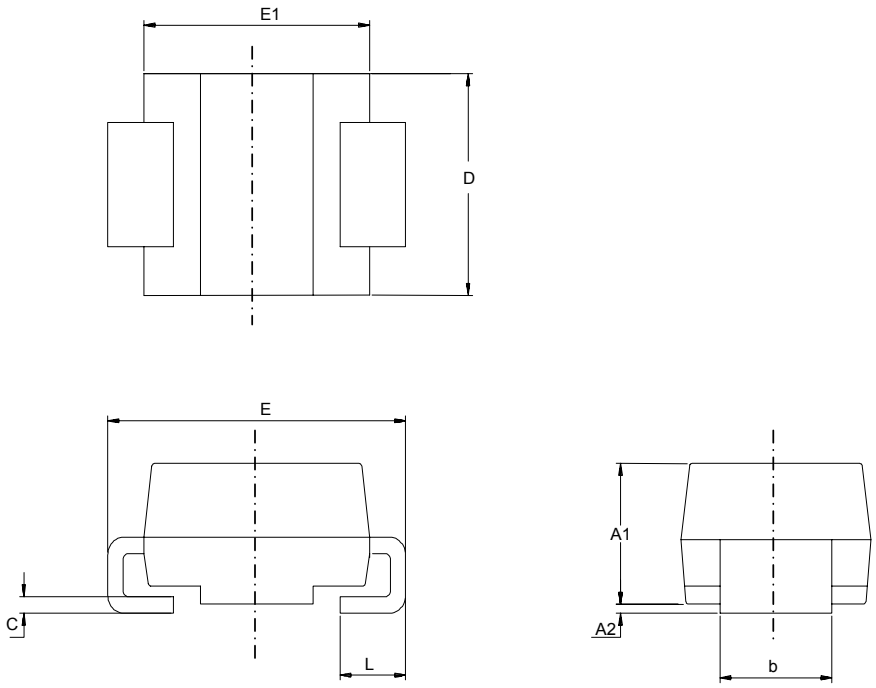
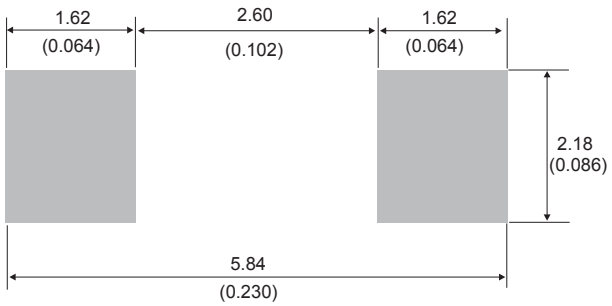


Table 4. **SMB package mechanical data**

Ref.	Dimensions			
	Millimeters		Inches (for reference only)	
	Min.	Max.	Min.	Max.
A1	1.90	2.45	0.074	0.097
A2	0.05	0.20	0.001	0.008
b	1.95	2.20	0.076	0.087
c	0.15	0.40	0.005	0.016
D	3.30	3.95	0.129	0.156
E	5.10	5.60	0.200	0.221
E1	4.05	4.60	0.159	0.182
L	0.75	1.50	0.029	0.060

Figure 16. **SMB recommended footprint**



2.2 SMA package information

- Epoxy meets UL94, V0
- Cooling method : by conduction (C)

Figure 17. SMA package outline

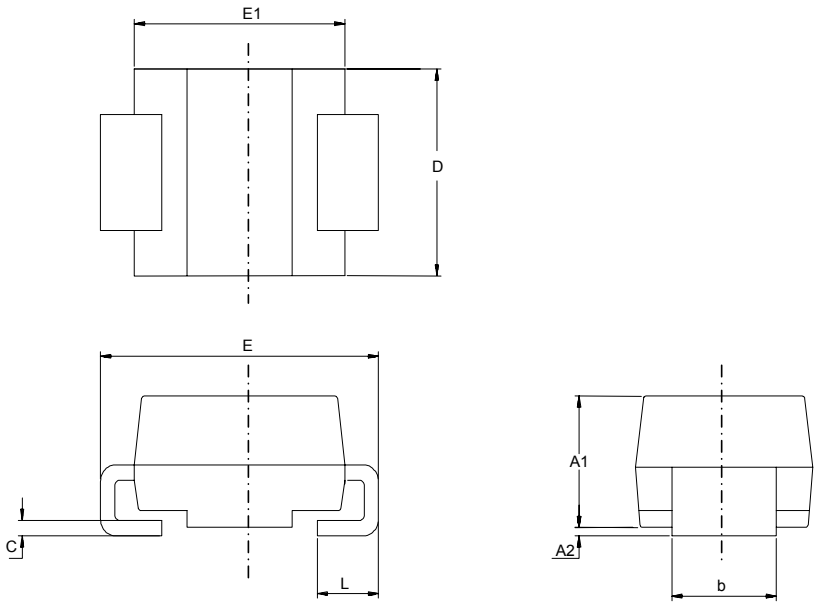
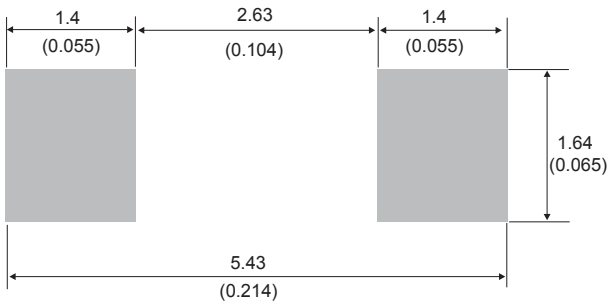


Table 5. SMA package mechanical data

Ref.	Dimensions			
	Millimeters		Inches (for reference only)	
	Min.	Max.	Min.	Max.
A1	1.90	2.45	0.074	0.097
A2	0.05	0.20	0.001	0.008
b	1.25	1.65	0.049	0.065
c	0.15	0.40	0.005	0.016
D	2.25	2.90	0.088	0.115
E	4.80	5.35	0.188	0.211
E1	3.95	4.60	0.155	0.182
L	0.75	1.50	0.029	0.060

Figure 18. **SMA recommended footprint in mm (inches)**



2.3 SOD123Flat package information

Figure 19. SOD123Flat package outline

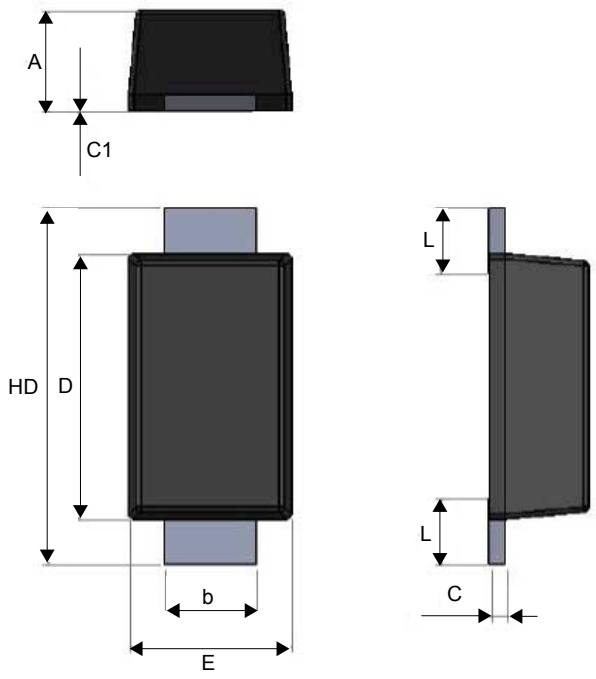
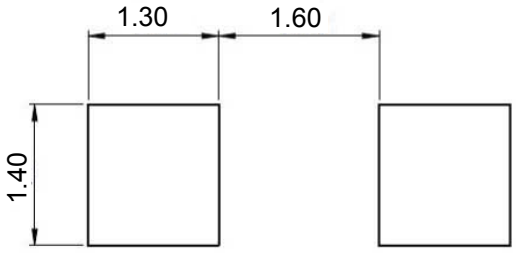


Table 6. SOD123Flat package mechanical data

Ref.	Dimensions					
	Millimeters			Inches (for reference only)		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.86	0.98	1.10	0.034	0.038	0.043
b	0.80	0.90	1.00	0.031	0.035	0.039
c	0.08	0.15	0.25	0.003	0.006	0.009
c1	0.00		0.10	0.000		0.004
D	2.50	2.60	2.70	0.098	0.102	0.106
E	1.50	1.60	1.80	0.059	0.063	0.070
HD	3.30	3.50	3.70	0.130	0.137	0.146
L	0.45	0.65	0.85	0.018	0.025	0.033

Figure 20. **SOD123Flat footprint dimensions (mm)**



3 Ordering information

Table 7. **Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STPS1L40A	GB4	SMA	68 mg	5000	Tape and reel
STPS1L40U	GC4	SMB	107 mg	2500	Tape and reel
STPS1L40ZF	1L4	SOD123Flat	12.5 mg	3000	Tape and reel

Revision history

Table 8. **Document revision history**

Date	Revision	Changes
Jul-2003	4A	Last update.
Aug-2004	5	SMA package dimensions update. Reference A1 max. changed from 2.70 mm (0.106 inch.) to 2.03 mm (0.080).
24-Jun-2009	6	Added STmite flat package.
01-Jul-2016	7	STmite flat package information removed. Added SOD123Flat package.
03-Dec-2018	8	Updated Section Features and Table 1. Absolute ratings (limiting values at 25 °C, unless otherwise specified).

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