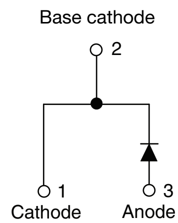
Hyperfast Rectifier, 30 A FRED Pt® G5

TO-220AC 2L



FEATURES

- Best in class forward voltage drop and switching losses trade off
- Optimized for high speed operation
- 175 °C maximum operating junction temperature
- Polyimide passivation
- Meets JESD 201 class 1A whisker test
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT
HALOGEN FREE

LINKS TO ADDITIONAL RESOURCES

3D Models

DESCRIPTION / APPLICATIONS

Featuring a unique combination of low conduction and switching losses, this rectifier is the right choice for soft switched and resonant converters, as well as medium frequency hard switching converters. This device is specifically designed to improve efficiency of high speed LLC output rectification stages of EV / HEV battery charging stations and high frequency stages of UPS applications.

PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	30 A
V_R	600 V
V_F at I_F at 125 °C	1.15 V
t_{rr} (typ.)	25 ns
T_J max.	175 °C
Package	2L TO-220AC
Circuit configuration	Single

MECHANICAL DATA

Case: 2L TO-220AC
Molding compound meets UL 94 V-0 flammability rating

Terminals: matte tin plated leads, solderable per J-STD-002

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Repetitive peak reverse voltage	V_{RRM}		600	V
Average rectified forward current	$I_{F(AV)}$	T_C = 113 °C, D = 0.50	30	A
Repetitive peak forward current	I_{FRM}	T_C = 113 °C, D = 0.50, f = 20 kHz	60	
Non-repetitive peak surge current	I_{FSM}	T_C = 25 °C, t_p = 10 ms, sine wave	330	
Operating junction and storage temperature	T_J, T_{Stg}		-55 to +175	°C

ELECTRICAL SPECIFICATIONS (T_J = 25 °C unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Breakdown voltage, blocking voltage	V_{BR}, V_R	I_R = 100 µA	600	-	-	V
Forward voltage	V_F	I_F = 30 A	-	1.3	1.6	
		I_F = 30 A, T_J = 125 °C	-	1.15	-	
Reverse leakage current	I_R	V_R = V_R rated	-	-	20	µA
		T_J = 125 °C, V_R = V_R rated	-	-	500	
Junction capacitance	C_T	V_R = 200 V	-	36	-	pF
Series inductance	L_S	Measured to lead 5 mm from package body	-	8	-	nH

DYNAMIC RECOVERY CHARACTERISTICS (T_J = 25 °C unless otherwise specified)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Reverse recovery time	t_{rr}	I_F = 1.0 A, dI_F/dt = 100 A/μs, V_R = 30 V	-	25	-	ns
		T_J = 25 °C; I_F = 20 A, dI_F/dt = 1000 A/μs, V_R = 400 V	-	41	-	
		T_J = 125 °C; I_F = 20 A, dI_F/dt = 1000 A/μs, V_R = 400 V	-	58	-	
Peak recovery current	I_{RRM}	T_J = 25 °C; I_F = 20 A, dI_F/dt = 1000 A/μs, V_R = 400 V	-	19	-	A
		T_J = 125 °C; I_F = 20 A, dI_F/dt = 1000 A/μs, V_R = 400 V	-	32	-	
Reverse recovery charge	Q_{rr}	T_J = 25 °C; I_F = 20 A, dI_F/dt = 1000 A/μs, V_R = 400 V	-	419	-	nC
		T_J = 125 °C; I_F = 20 A, dI_F/dt = 1000 A/μs, V_R = 400 V	-	1176	-	
Reverse recovery time	t_{rr}	T_J = 25 °C; I_F = 30 A, dI_F/dt = 1000 A/μs, V_R = 400 V	-	46	-	ns
		T_J = 125 °C; I_F = 30 A, dI_F/dt = 1000 A/μs, V_R = 400 V	-	65	-	
Peak recovery current	I_{RRM}	T_J = 25 °C; I_F = 30 A, dI_F/dt = 1000 A/μs, V_R = 400 V	-	21	-	A
		T_J = 125 °C; I_F = 30 A, dI_F/dt = 1000 A/μs, V_R = 400 V	-	36	-	
Reverse recovery charge	Q_{rr}	T_J = 25 °C; I_F = 30 A, dI_F/dt = 1000 A/μs, V_R = 400 V	-	550	-	nC
		T_J = 125 °C; I_F = 30 A, dI_F/dt = 1000 A/μs, V_R = 400 V	-	1560	-	

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Thermal resistance, junction-to-case	R_{thJC}		-	-	1.3	°C/W
Weight			-	2.0	-	g
			-	0.07	-	oz.
Mounting torque			6.0 (5.0)	-	12 (10)	kgf · cm (lbf · in)
Maximum junction and storage temperature range	T_J, T_{Stg}		-55	-	175	°C
Marking device		Case style 2L TO-220AC	E5TH3006			

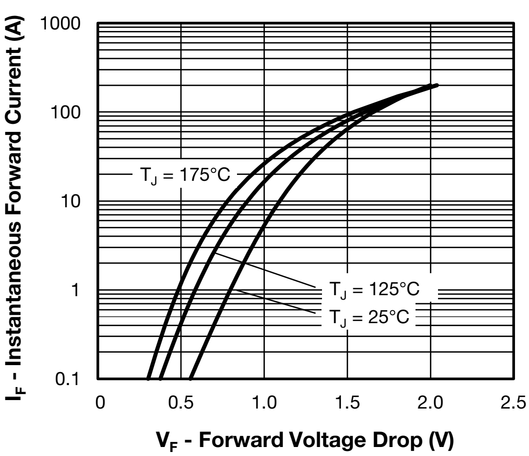


Fig. 1 - Forward Voltage Drop Characteristics, Per Leg

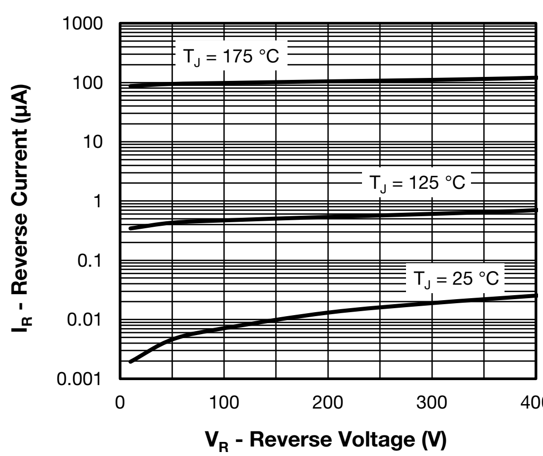


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage, Per Leg

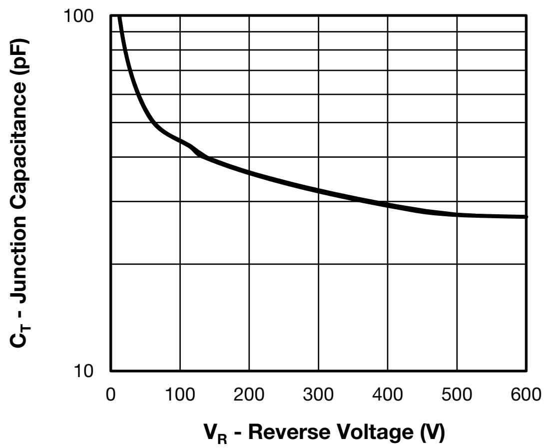


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage, Per Leg

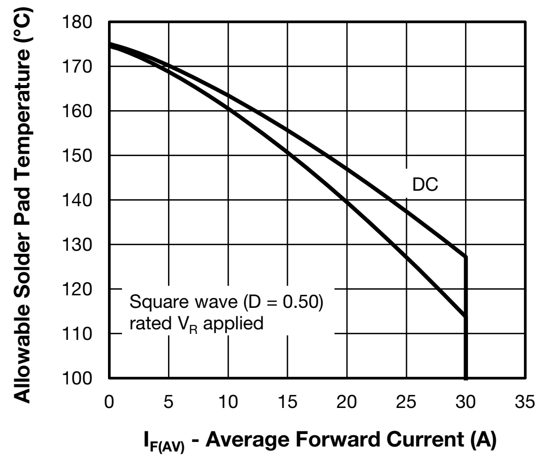


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current, Per Leg

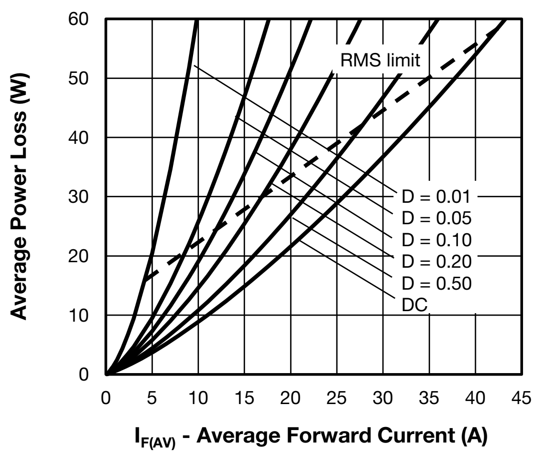


Fig. 5 - Forward Power Loss Characteristics, Per Leg

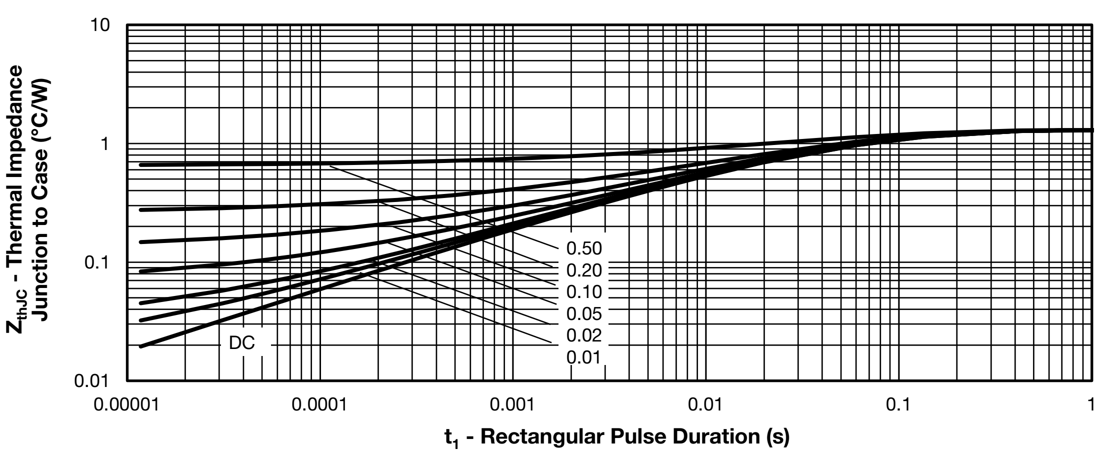


Fig. 6 - Transient Thermal Impedance, Junction to Case, Per Leg

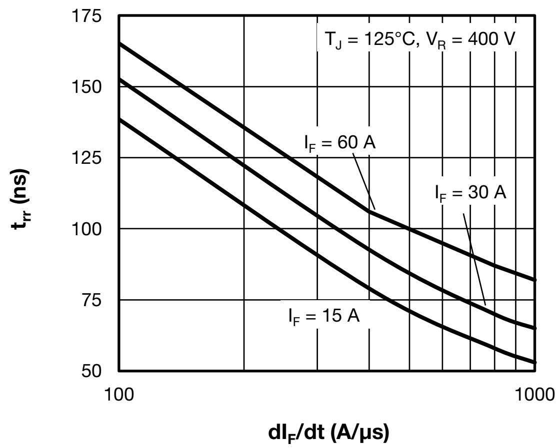


Fig. 7 - Typical Reverse Recovery Time vs. dI_F/dt, Per Leg

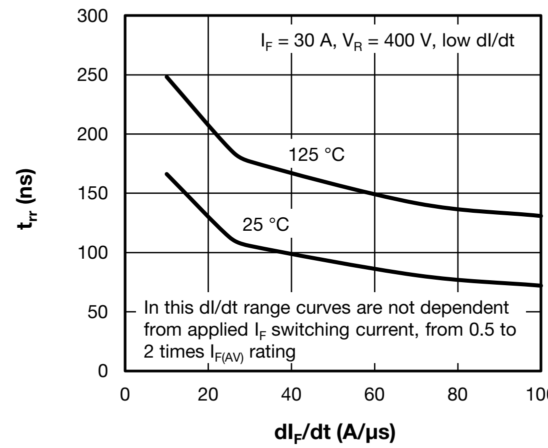


Fig. 10 - Typical Reverse Recovery Time vs. dI_F/dt, Per Leg

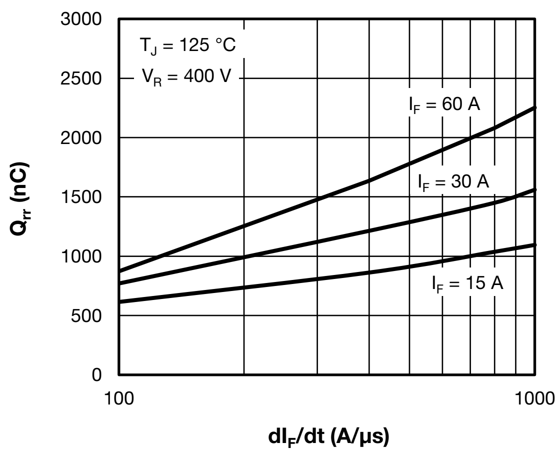


Fig. 8 - Typical Reverse Recovery Charge vs. dI_F/dt, Per Leg

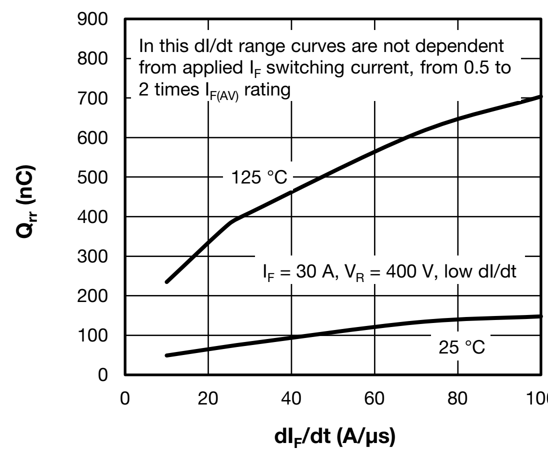


Fig. 11 - Typical Reverse Recovery Charge vs. dI_F/dt, Per Leg

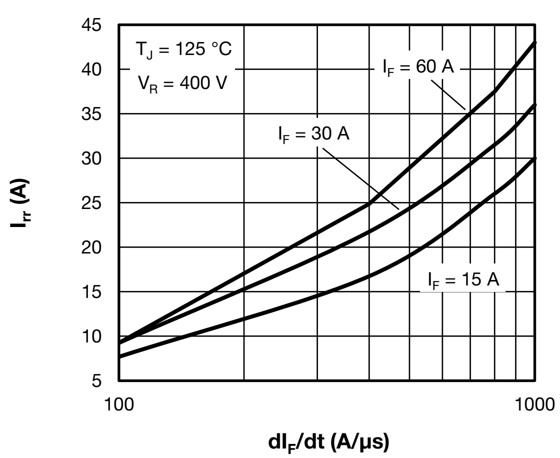


Fig. 9 - Typical Reverse Recovery Current vs. dI_F/dt, Per Leg

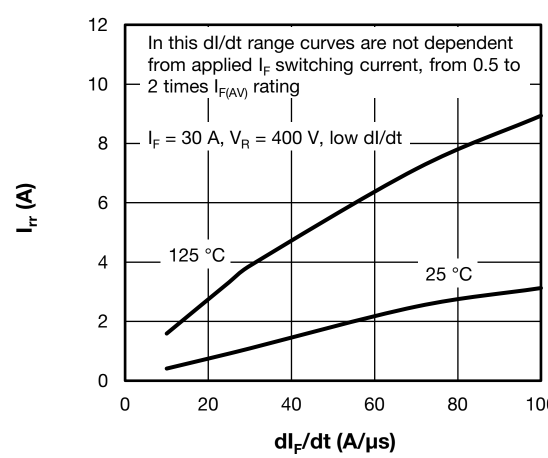


Fig. 12 - Typical Reverse Recovery Current vs. dI_F/dt, Per Leg

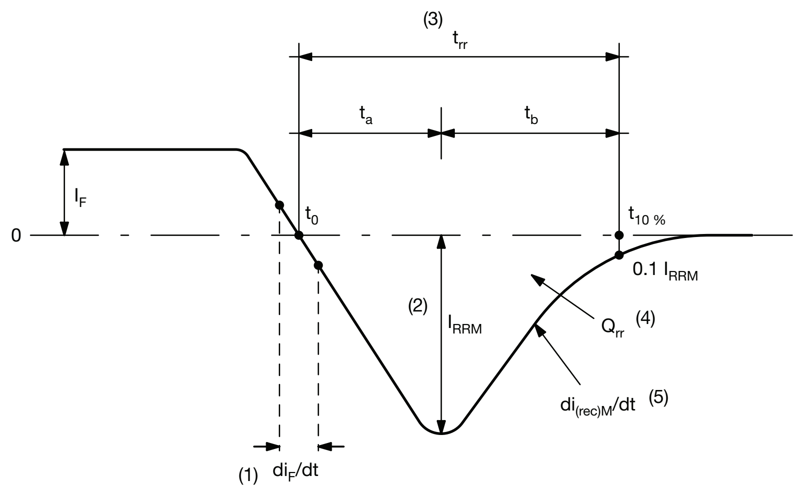


Fig. 13 - Reverse Recovery Waveform and Definitions

Notes

(1) di_F/dt - rate of change of current through zero crossing

(2) I_{RRM} - peak reverse recovery current

(3) t_{rr} - reverse recovery time measured from t_0, crossing point of negative going I_F, to point $t_{10\%}$, 0.1 I_{RRM}

(4) Q_{rr} - area under curve defined by t_0 and $t_{10\ \%}$

$$Q_{rr} = \int_{t_0}^{t_{10\ \%}} I(t)dt$$

(5) $di_{(rec)}M/dt$ - peak rate of change of current during t_b portion of t_{rr}

ORDERING INFORMATION TABLE

Device code	VS-	E	5	T	H	30	06	-M3
	1	2	3	4	5	6	7	8

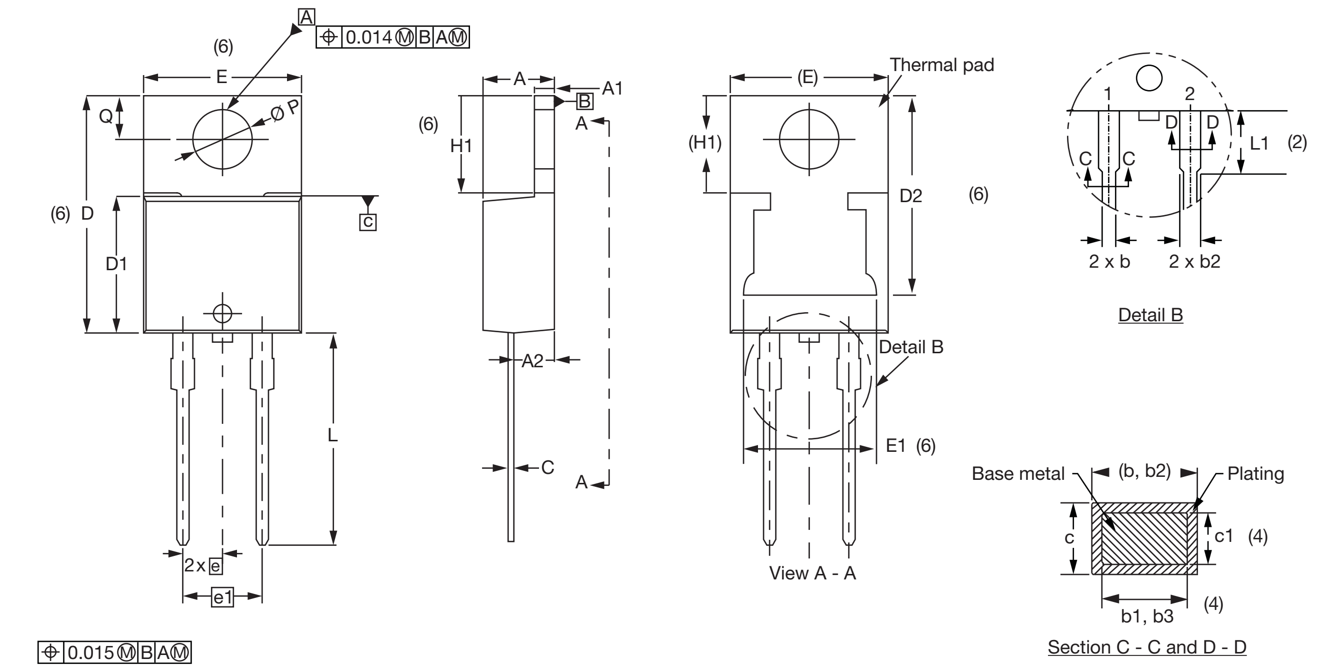
1 - Vishay Semiconductors product
2 - E = single diode
3 - 5 = FRED generation 5
4 - Package: T = 2L TO-220AC
5 - H = hyperfast recovery
6 - Current rating (30 = 30 A)
7 - Voltage rating (06 = 600 V)
8 - Environmental digit:
-M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free

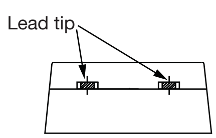
ORDERING INFORMATION (Example)			
PREFERRED P/N	**QUANTITY PER TUBE**	**MINIMUM ORDER QUANTITY**	**PACKAGING DESCRIPTION**
VS-E5TH3006-M3	50	1000	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?96156
Part marking information	www.vishay.com/doc?95391
SPICE model	www.vishay.com/doc?96919

2L TO-220AC

DIMENSIONS in millimeters and inches





Conforms to JEDEC® outline TO-220AC

SYMBOL	MILLIMETERS		INCHES		NOTES		SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.				MIN.	MAX.	MIN.	MAX.	
A	4.25	4.65	0.167	0.183			D2	11.68	13.30	0.460	0.524	6, 7
A1	1.14	1.40	0.045	0.055			E	10.11	10.51	0.398	0.414	3, 6
A2	2.50	2.92	0.098	0.115			E1	6.86	8.89	0.270	0.350	6
b	0.69	1.01	0.027	0.040			e	2.41	2.67	0.095	0.105	
b1	0.38	0.97	0.015	0.038	4		e1	4.88	5.28	0.192	0.208	
b2	1.20	1.73	0.047	0.068			H1	6.09	6.48	0.240	0.255	6
b3	1.14	1.73	0.045	0.068	4		L	13.52	14.02	0.532	0.552	
c	0.36	0.61	0.014	0.024			L1	3.32	3.82	0.131	0.150	2
c1	0.36	0.56	0.014	0.022	4		Ø P	3.54	3.91	0.139	0.154	
D	14.85	15.35	0.585	0.604	3		Q	2.60	3.00	0.102	0.118	
D1	8.38	9.02	0.330	0.355								

Notes

(1) Dimensioning and tolerancing as per ASME Y14.5M-1994

(2) Lead dimension and finish uncontrolled in L1

(3) Dimension D, D1, and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outermost extremes of the plastic body

(4) Dimension b1, b3, and c1 apply to base metal only

(5) Controlling dimensions: inches

(6) Thermal pad contour optional within dimensions E, H1, D2, and E1

(7) Outline conforms to JEDEC® TO-220, except D2

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