

HCD90R1K0

900V N-Channel Super Junction MOSFET

Features

- Very Low FOM ($R_{DS(on)} \times Q_g$)
- Extremely low switching loss
- Excellent stability and uniformity
- 100% Avalanche Tested
- Built-in ESD Diode

Key Parameters

Parameter	Value	Unit
$BV_{DSS} @ T_{j,max}$	950	V
I_D	5.5	A
$R_{DS(on), max}$	1.0	Ω
Q_g, Typ	13.7	nC

Application

- Switch Mode Power Supply (SMPS)
- TV power & LED Lighting Power
- AC to DC Converters
- Telecom

Package & Internal Circuit

D-PAK	SYMBOL

Absolute Maximum Ratings

$T_C=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-Source Voltage	900	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$)	5.5	A
	Drain Current - Continuous ($T_C = 100^\circ\text{C}$)	3.5	A
$I_{DM}^1)$	Drain Current - Pulsed	16.5	A
$E_{AS}^2)$	Single Pulsed Avalanche Energy	77	mJ
I_{AR}	Avalanche Current	1.35	A
dv/dt	MOSFET dv/dt ruggedness, $V_{DS}=0\dots 400\text{V}$	50	V/ns
dv/dt	Reverse diode dv/dt , $V_{DS}=0\dots 400\text{V}$, $I_{DS} \leq I_D$	15	V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	66	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$

Thermal Resistance Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	1.9	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient , Max.	62.5	$^\circ\text{C}/\text{W}$

Electrical Characteristics $T_J=25\text{ }^{\circ}\text{C}$ unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
On Characteristics						
V_{GS}	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 220\text{ }\mu\text{A}$	2.0	-	4.0	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}$, $I_D = 1.35\text{ A}$	-	0.87	1.0	Ω
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}$, $I_D = 1\text{ mA}$	900	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 900\text{ V}$, $V_{GS} = 0$	-	-	1	μA
		$V_{DS} = 900\text{ V}$, $T_C = 150^{\circ}\text{C}$	-	-	100	μA
I_{GSS}	Gate-Body Leakage Current	$V_{GS} = \pm 20\text{ V}$, $V_{DS} = 0\text{ V}$	-	-	± 1	μA
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = 500\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1.0\text{ MHz}$	-	602	-	pF
C_{oss}	Output Capacitance		-	13.3	-	pF
C_{rss}	Reverse Transfer Capacitance		-	2.64	-	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Time	$V_{DS} = 450\text{ V}$, $I_D = 2.8\text{ A}$, $R_G = 25\text{ }\Omega$ (Note 3,4)	-	23	-	ns
t_r	Turn-On Rise Time		-	18	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	74	-	ns
t_f	Turn-Off Fall Time		-	17	-	ns
$Q_{g(}}$	Total Gate Charge	$V_{DS} = 720\text{ V}$, $I_D = 2.8\text{ A}$, $V_{GS} = 10\text{ V}$ (Note 3,4)	-	13.7	-	nC
Q_{gs}	Gate-Source Charge		-	2.9	-	nC
Q_{gd}	Gate-Drain Charge		-	4.2	-	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current	-	-	5.5	A	
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current	-	-	16.5	A	
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}$, $I_S = 2.8\text{ A}$	-	-	1.3	V
trr	Reverse Recovery Time	$V_R = 400\text{ V}$, $I_F = 2.8\text{ A}$ $dI_F/dt = 100\text{ A}/\mu\text{s}$	-	252	-	ns
Qrr	Reverse Recovery Charge		-	1.8	-	μC

Notes :

- Repetitive Rating : Pulse width limited by maximum junction temperature
- $I_{AS}=1.35\text{ A}$ $V_{DD}=50\text{ V}$, $R_G=25\Omega$, Starting $T_J=25^{\circ}\text{C}$
- Pulse Test : Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$
- Essentially Independent of Operating Temperature

Typical Characteristics

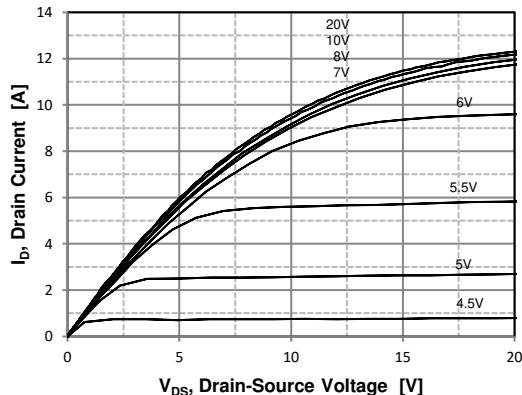


Figure 1. On Region Characteristics

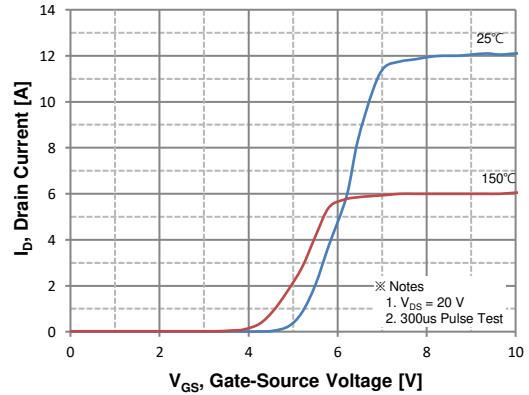


Figure 2. Transfer Characteristics

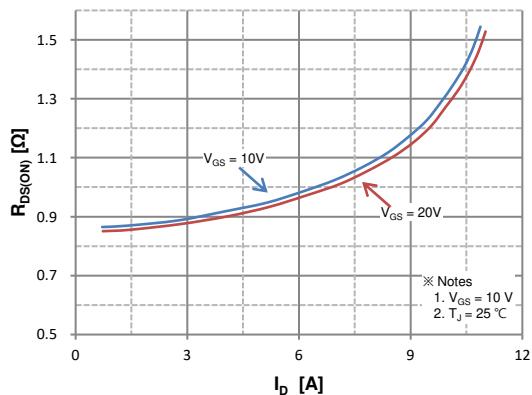


Figure 3. On Resistance Variation vs Drain Current and Gate Voltage

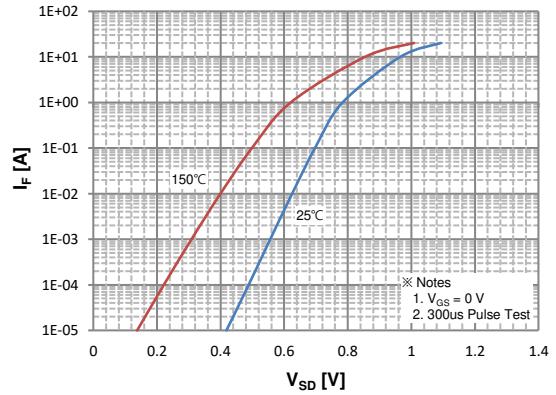


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

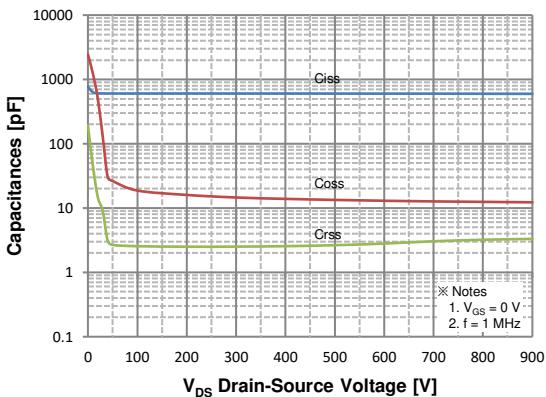


Figure 5. Capacitance Characteristics

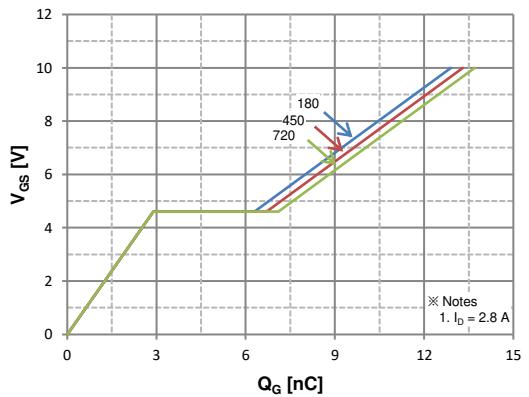


Figure 6. Gate Charge Characteristics

Typical Characteristics

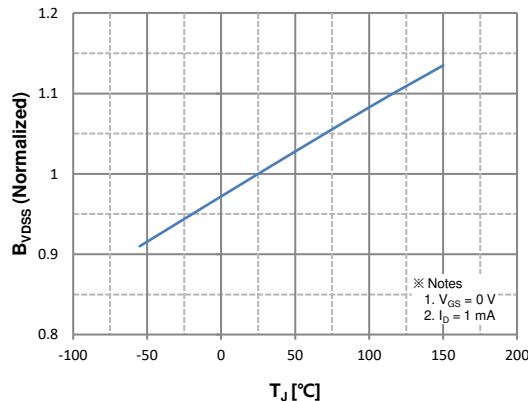


Figure 7. Breakdown Voltage Variation vs. Temperature

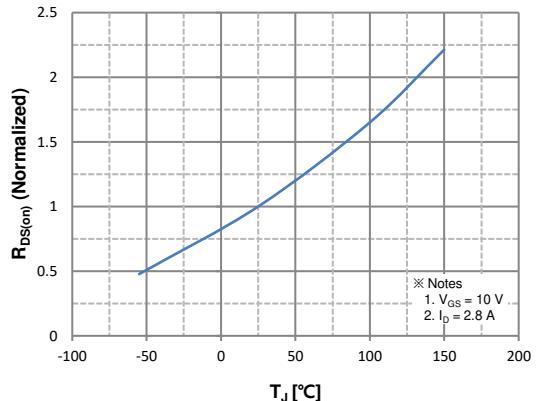


Figure 8. On-Resistance Variation vs. Temperature

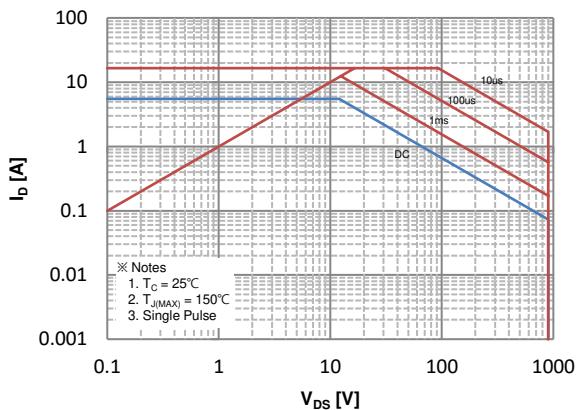


Figure 9. Maximum Safe Operating Area

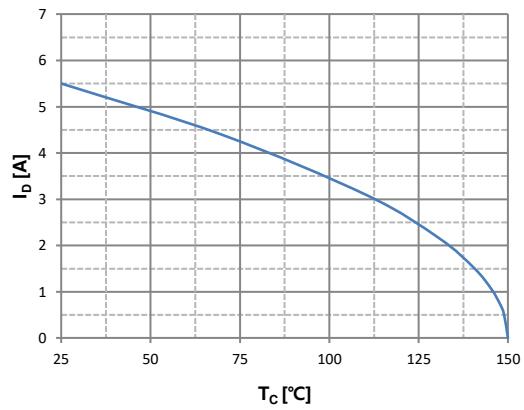


Figure 10. Maximum Drain Current vs. Case Temperature

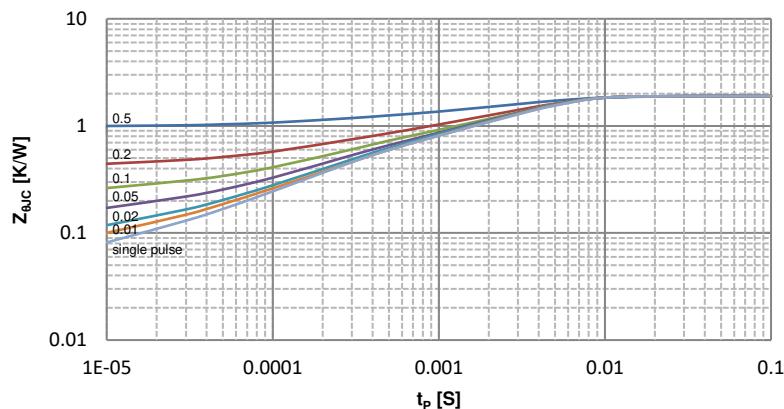


Figure 11. Transient Thermal Response Curve

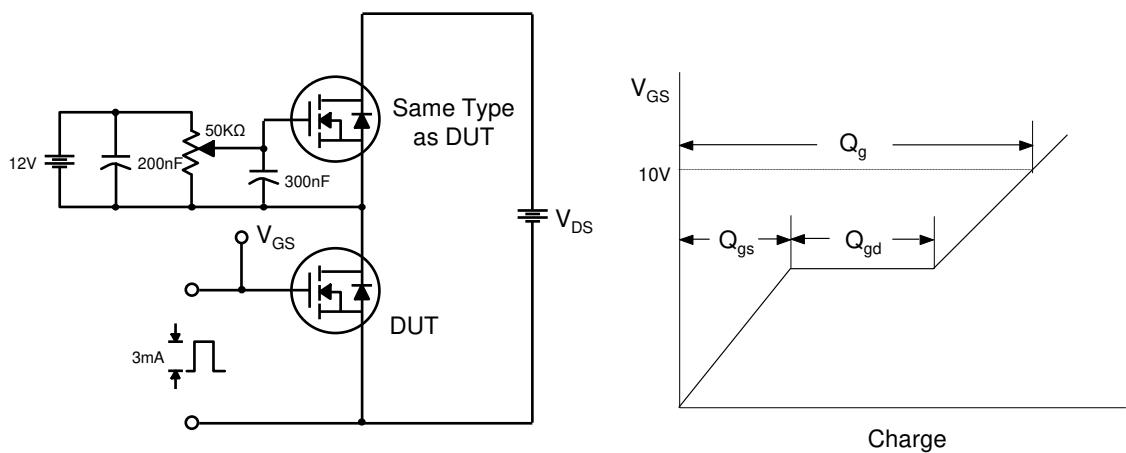
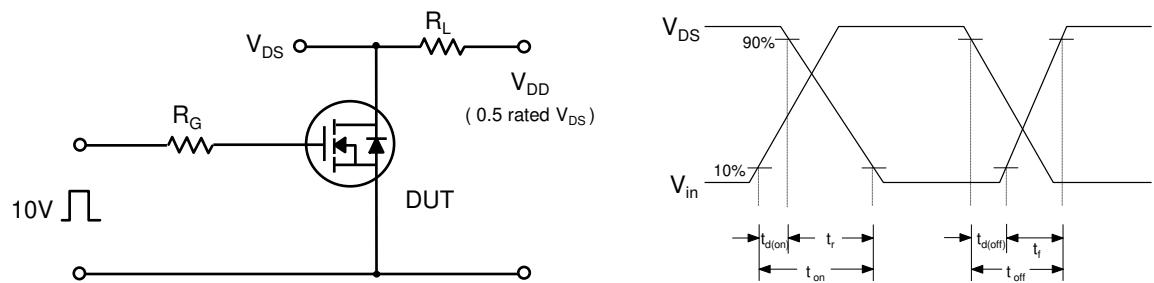
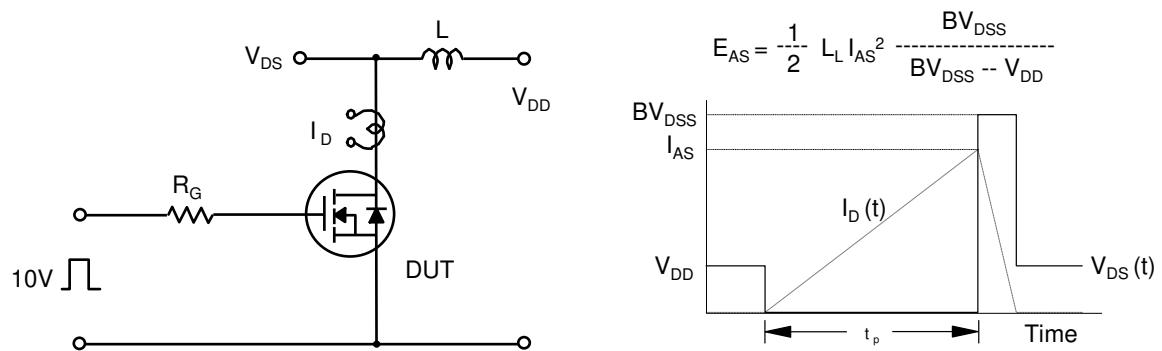
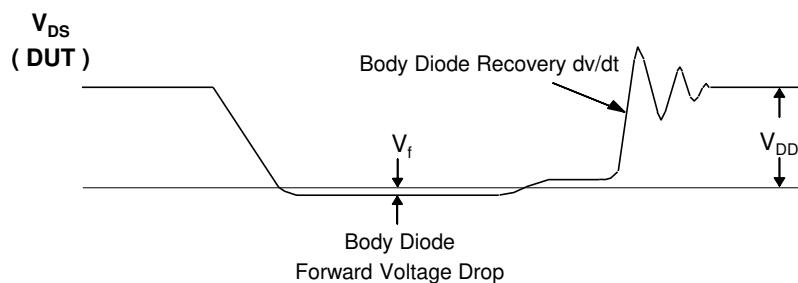
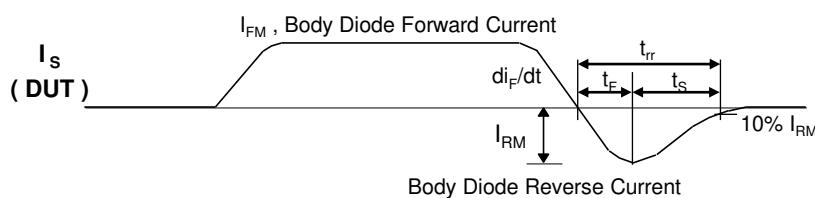
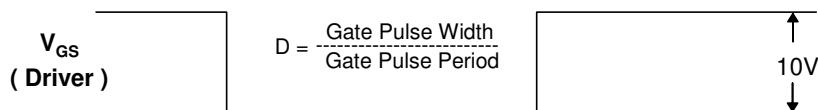
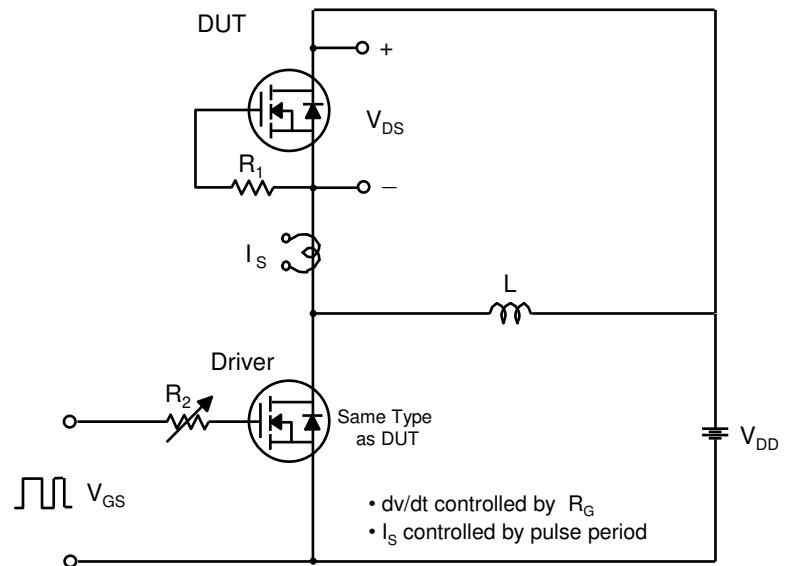
Fig 12. Gate Charge Test Circuit & Waveform**Fig 13. Resistive Switching Test Circuit & Waveforms****Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms**

Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



Package Dimension

D-PAK (TO-252A)

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All Dimension Are In mm. 2. Package Body Sizes Exclude Mold Flash, Protrusion Or Gate Burrs. 3. Mold Flash, Protrusion Or Gate Burrs Shall Not Exceed 0.10 mm Per Side. 4. Package Body Sizes Determined At The Outermost Extremes Of The Plastic Body Exclusive Of Mold Flash, Gate Burrs And Interlead Flash, But Including Any Mismatch Between The Top And Bottom Of The Plastic Body. 5. The Package Top Metal Area Is The Plastic Body Area. 6. The "b" Dimension Does Not Include Dambar Radius. The Allowable Dambar Protrusion Shall Be 0.10 mm Total In Excess Of "b" Dimension At Maximum Material Condition. The Dambar Cannot Be Located On The Lower Radius Of The Foot COPPER EXPOSURE AREA.</p>	SYMBOL	M10	M20	M30	M40	M50	M60	M70	L	1.46	1.55	1.77					L2	6.38	6.55	6.75					L3	6.82	--	7.07					L4	6.30	5.50	4.22					L5	6.45	7.75	8.00					L6	6.65	9.55	10.57					L7	5.65	5.34	5.45					L8	2.50	2.50	1.38					L9	6.65	9.55	10.57					L10	6.65	9.55	10.57					L11	5.65	5.34	5.45					L12	2.50	2.50	1.38					L13	5.65	5.34	5.45					L14	5.65	5.34	5.45					L15	5.65	5.34	5.45					L16	5.65	5.34	5.45					L17	5.65	5.34	5.45					L18	5.65	5.34	5.45					L19	5.65	5.34	5.45					L20	5.65	5.34	5.45					L21	5.65	5.34	5.45					L22	5.65	5.34	5.45					L23	5.65	5.34	5.45					L24	5.65	5.34	5.45					L25	5.65	5.34	5.45					L26	5.65	5.34	5.45					L27	5.65	5.34	5.45					L28	5.65	5.34	5.45					L29	5.65	5.34	5.45					L30	5.65	5.34	5.45					L31	5.65	5.34	5.45					L32	5.65	5.34	5.45					L33	5.65	5.34	5.45					L34	5.65	5.34	5.45					L35	5.65	5.34	5.45					L36	5.65	5.34	5.45					L37	5.65	5.34	5.45					L38	5.65	5.34	5.45					L39	5.65	5.34	5.45					L40	5.65	5.34	5.45					L41	5.65	5.34	5.45					L42	5.65	5.34	5.45					L43	5.65	5.34	5.45					L44	5.65	5.34	5.45					L45	5.65	5.34	5.45					L46	5.65	5.34	5.45					L47	5.65	5.34	5.45					L48	5.65	5.34	5.45					L49	5.65	5.34	5.45					L50	5.65	5.34	5.45					L51	5.65	5.34	5.45					L52	5.65	5.34	5.45					L53	5.65	5.34	5.45					L54	5.65	5.34	5.45					L55	5.65	5.34	5.45					L56	5.65	5.34	5.45					L57	5.65	5.34	5.45					L58	5.65	5.34	5.45					L59	5.65	5.34	5.45					L60	5.65	5.34	5.45					L61	5.65	5.34	5.45					L62	5.65	5.34	5.45					L63	5.65	5.34	5.45					L64	5.65	5.34	5.45					L65	5.65	5.34	5.45					L66	5.65	5.34	5.45					L67	5.65	5.34	5.45					L68	5.65	5.34	5.45					L69	5.65	5.34	5.45					L70	5.65	5.34	5.45					L71	5.65	5.34	5.45					L72	5.65	5.34	5.45					L73	5.65	5.34	5.45					L74	5.65	5.34	5.45					L75	5.65	5.34	5.45					L76	5.65	5.34	5.45					L77	5.65	5.34	5.45					L78	5.65	5.34	5.45					L79	5.65	5.34	5.45					L80	5.65	5.34	5.45					L81	5.65	5.34	5.45					L82	5.65	5.34	5.45					L83	5.65	5.34	5.45					L84	5.65	5.34	5.45					L85	5.65	5.34	5.45					L86	5.65	5.34	5.45					L87	5.65	5.34	5.45					L88	5.65	5.34	5.45					L89	5.65	5.34	5.45					L90	5.65	5.34	5.45					L91	5.65	5.34	5.45					L92	5.65	5.34	5.45					L93	5.65	5.34	5.45					L94	5.65	5.34	5.45					L95	5.65	5.34	5.45					L96	5.65	5.34	5.45					L97	5.65	5.34	5.45					L98	5.65	5.34	5.45					L99	5.65	5.34	5.45					L100	5.65	5.34	5.45				
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