FAIRCHILD™

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FDA8440

N-Channel Logic Level PowerTrench® MOSFET
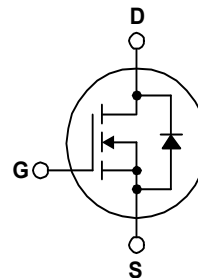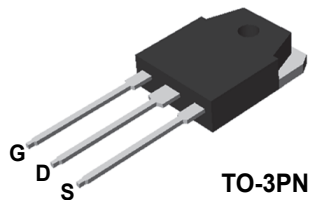
40 V, 100 A, 2.1 mΩ

Features

- $R_{DS(on)}$ = 1.46 mΩ (Typ.) @ V_{GS} = 10 V, I_D = 80 A
- $Q_{G(tot)}$ = 345 nC (Typ.) @ V_{GS} = 10 V
- Low Miller Charge
- Low Q_{rr} Body Diode
- UIS Capability (Single Pulse and Repetitive Pulse)
- 160 A Guarantee for 2 sec
- RoHS Compliant

Application

- Power tools
- Motor drives and Uninterruptible Power Supplies
- Synchronous Rectification
- Battery Protection Circuit

TO-3PN

MOSFET Maximum Ratings T_C = 25°C unless otherwise noted.

Symbol	Parameter		FDA8440	Unit
V_{DSS}	Drain to Source Voltage		40	V
V_{GSS}	Gate to Source Voltage		±20	V
I_D	Drain Current - Continuous (T_C = 155°C)		100	A
	- Continuous (T_A = 25°C, V_{GS} = 10 V, $R_{\theta JA}$ = 40°C/W)		30	A
	- Pulsed		500	A
E_{AS}	Single Pulsed Avalanche Energy	(Note 1)	1682	mJ
P_D	Power dissipation		306	W
	Derate above 25°C		2.04	W/°C
T_J, T_{STG}	Operating and Storage Temperature		-55 to +175	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.		0.49	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	(Note 2)	40	°C/W

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDA8440	FDA8440	TO-3PN	Tube	N/A	N/A	30 units

Electrical Characteristics T_C = 25°C unless otherwise noted

Symbol	Parameter	Conditions		Min.	Typ.	Max.	Unit
Off Characteristics							
BV_{DSS}	Drain to Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 µA		40	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 32 V		--	--	1	µA
		V_{GS} = 0 V	T_C = 150°C	--	--	250	µA
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±20 V		--	--	±100	nA
On Characteristics							
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 µA		1	--	3	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 4.5 V, I_D = 80 A		--	1.56	2.2	mΩ
		V_{GS} = 10 V, I_D = 80 A		--	1.46	2.1	
		V_{GS} = 10 V, I_D = 80 A, T_C = 175°C		--	2.82	4.1	
Dynamic Characteristics							
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1 MHz		--	18600	24740	pF
C_{oss}	Output Capacitance			--	1840	2450	pF
C_{rss}	Reverse Transfer Capacitance			--	1400	2100	pF
R_G	Gate Resistance	V_{GS} = 0.5 V, f = 1 MHz		--	1.1	--	Ω
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{GS} = 0 V to 10 V	V_{DD} = 20 V	--	345	450	nC
$Q_{g(2)}$	Threshold Gate Charge	V_{GS} = 0 V to 2 V	I_D = 80 A	--	32.5	--	nC
Q_{gs}	Gate to Source Gate Charge		I_g = 1.0 mA	--	49	--	nC
Q_{gs2}	Gate Charge Threshold to Plateau			--	16.5	--	nC
Q_{gd}	Gate to Drain "Miller" Charge			--	74	--	nC
Switching Characteristics							
t_{ON}	Turn-On Time	V_{DD} = 20 V, I_D = 80 A V_{GS} = 10 V, R_{GEN} = 7 Ω		--	175	360	ns
$t_{d(on)}$	Turn-On Delay Time			--	43	95	ns
t_r	Rise Time			--	130	275	ns
$t_{d(off)}$	Turn-Off Delay Time			--	435	875	ns
t_f	Fall Time			--	290	590	ns
t_{OFF}	Turn-Off Time			--	730	1470	ns
Drain-Source Diode Characteristics and Maximum Ratings							
V_{SD}	Source to Drain Diode Voltage	I_{SD} = 80 A		--	--	1.25	V
		I_{SD} = 40 A		--	--	1.0	V
t_{rr}	Reverse Recovery Time	I_{SD} = 75 A, dI_{SD}/dt = 100 A/µs		--	59	--	ns
Q_{RR}	Reverse Recovery Charge	I_{SD} = 75 A, dI_{SD}/dt = 100 A/µs		--	77	--	nC

NOTES:

1: Starting T_J = 25°C, L = 1 mH, I_{AS} = 58 A, V_{DD} = 36 V, V_{GS} = 10 V.

2: Pulse width = 100 s.

Typical Performance Characteristics
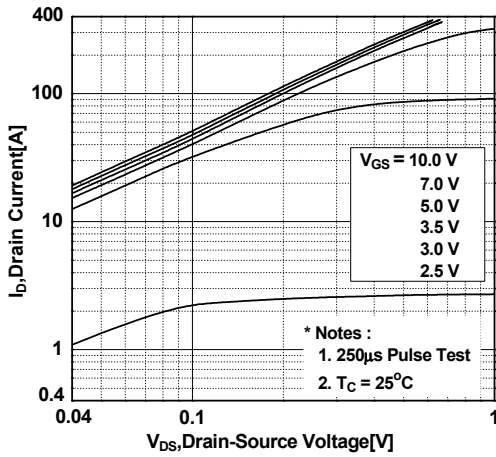
Figure 1. On-Region Characteristics

$V_{GS} = 10.0$ V
7.0 V
5.0 V
3.5 V
3.0 V
2.5 V

* Notes :
1. 250µs Pulse Test
2. $T_C = 25^oC$

Figure 2. Transfer Characteristics

150^oC
-55^oC
25^oC

* Notes :
1. $V_{DS} = 20V$
2. 250µs Pulse Test
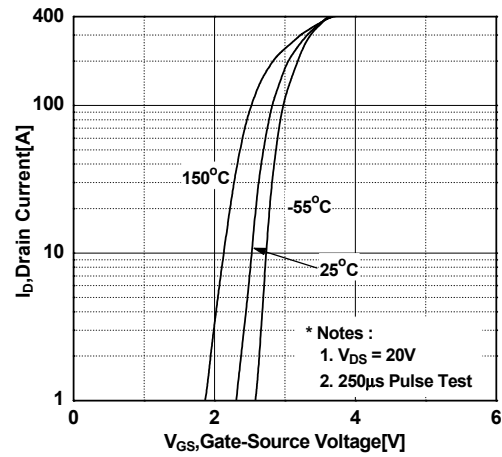
Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

$V_{GS} = 4.5V$

$V_{GS} = 10V$

* Note : $T_J = 25^oC$
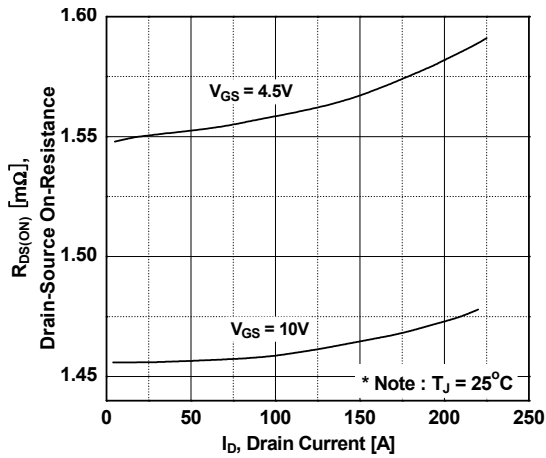
Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperatue

150^oC
25^oC

Notes:
1. $V_{GS} = 0V$
2. 250µs Pulse Test
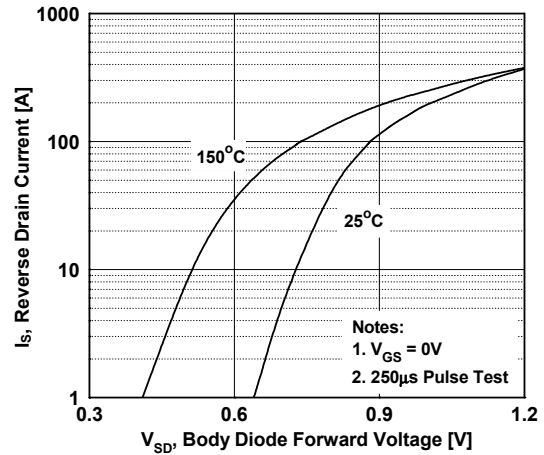
Figure 5. Capacitance Characteristics

$C_{iss} = C_{gs} + C_{gd}$ (C_{ds} = shorted)
$C_{oss} = C_{ds} + C_{gd}$
$C_{rss} = C_{gd}$

C_{iss}

C_{oss}

C_{rss}

* Note:
1. $V_{GS} = 0V$
2. f = 1MHz
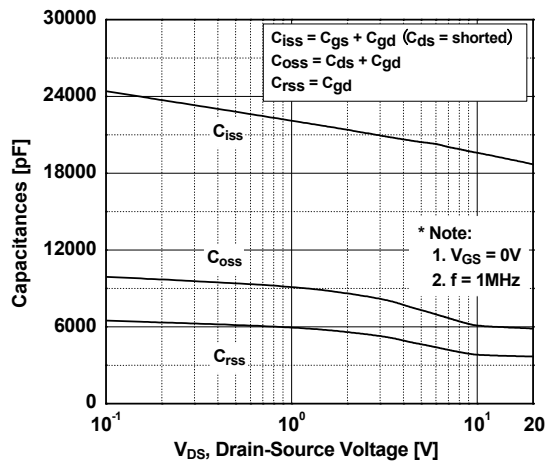
Figure 6. Gate Charge Characteristics

$V_{DS} = 25V$
$V_{DS} = 20V$
$V_{DS} = 15V$

* Note : $I_D = 80A$
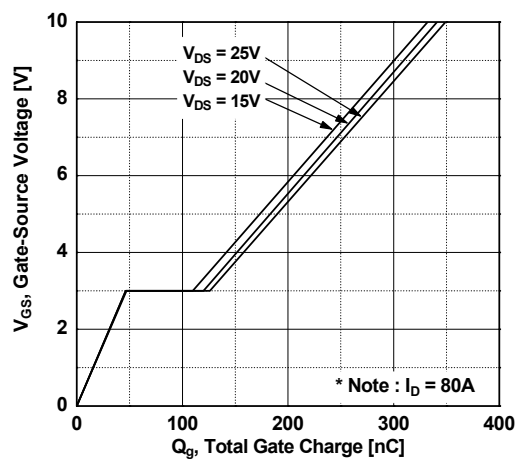
Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

* Notes :
1. V_{GS} = 0V
2. I_D = 250µA
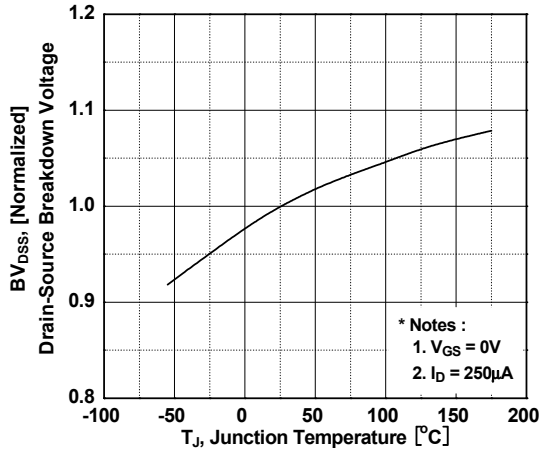
Figure 8. On-Resistance Variation vs. Temperature

* Notes :
1. V_{GS} = 10V
2. I_D = 80A
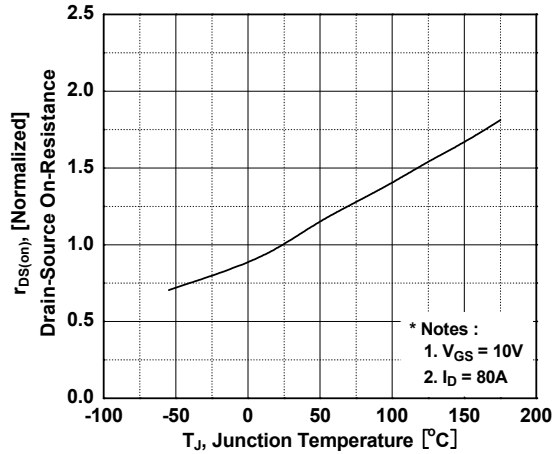
Figure 9. Unclamped Inductive Switching Capability

T_J = 25°C

T_J = 150°C
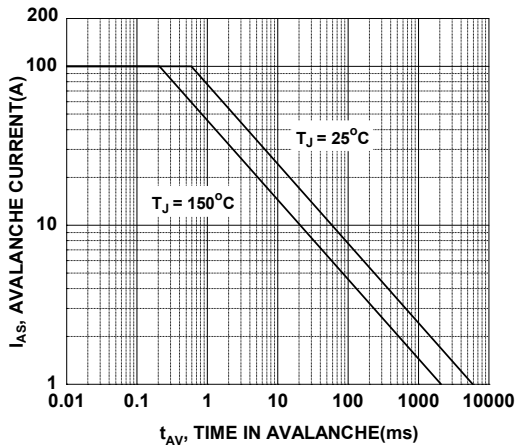
Figure 10. Safe Operating Area

Operation in This Area is Limited by $R_{DS(on)}$

100µs
1ms
10ms
100ms

* Notes :
1. T_C = 25°C
2. T_J = 175°C
3. Single Pulse
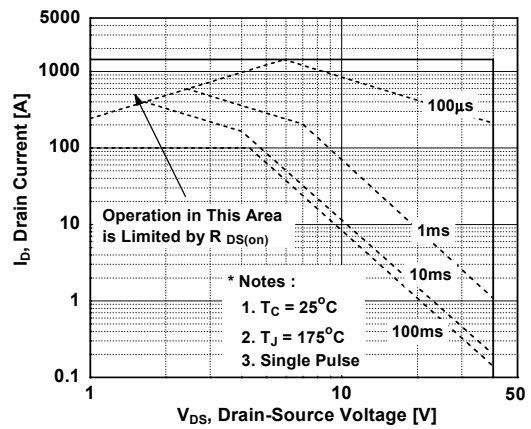
Figure 11. Transient Thermal Response Curve

0.5
0.2
0.1
0.05
0.02
0.01
Single pulse

P_{DM}
t_1
t_2

* Notes :
1. $Z_{\theta JC}(t)$ = 0.49°C/W Max.
2. Duty Factor, D=t_1/t_2
3. $T_{JM} - T_C = P_{DM} * Z_{\theta JC}(t)$
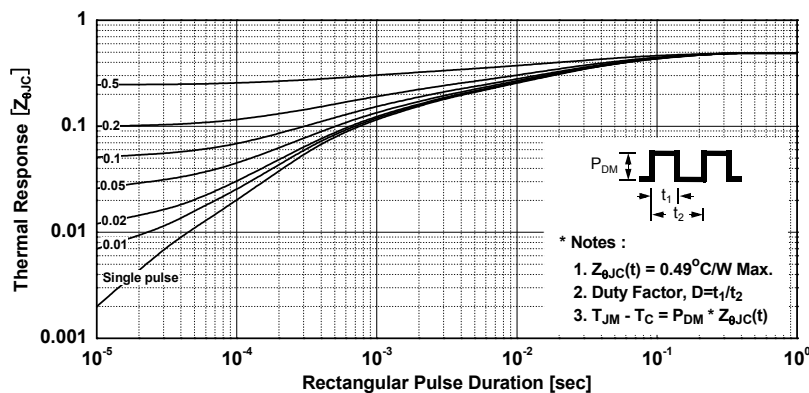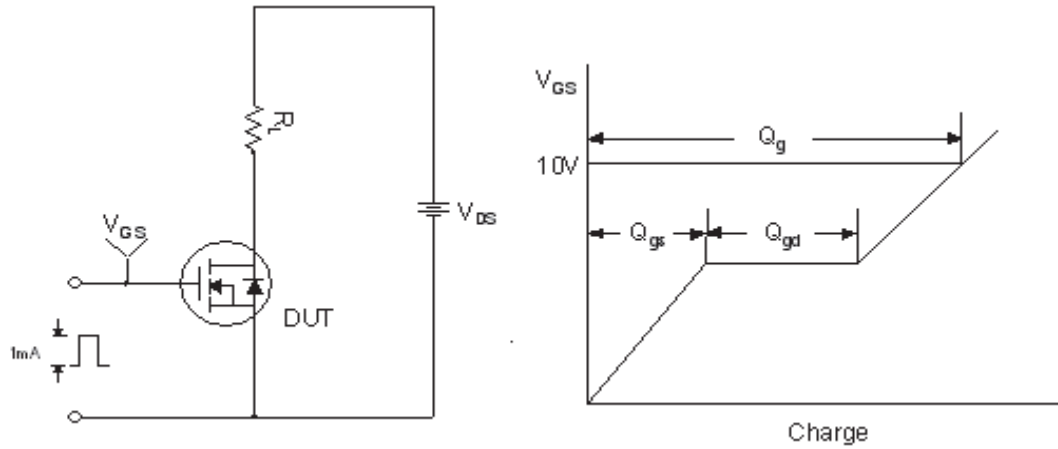
Figure 12. Gate Charge Test Circuit & Waveform
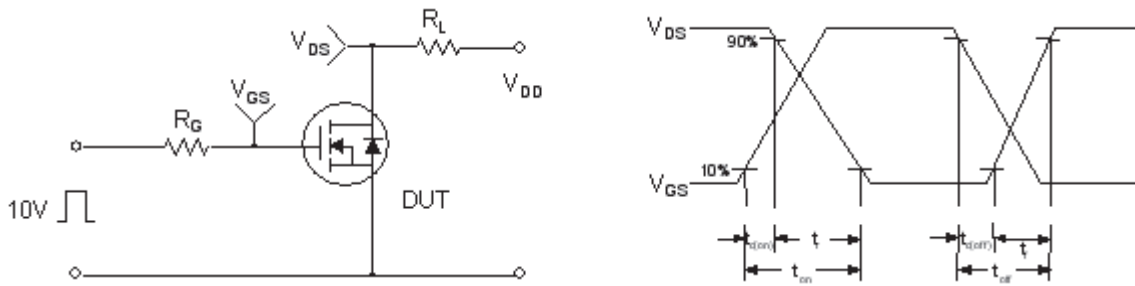
Figure 13. Resistive Switching Test Circuit & Waveforms

$$E_{AS} = \frac{1}{2} L I_{AS}^2$$
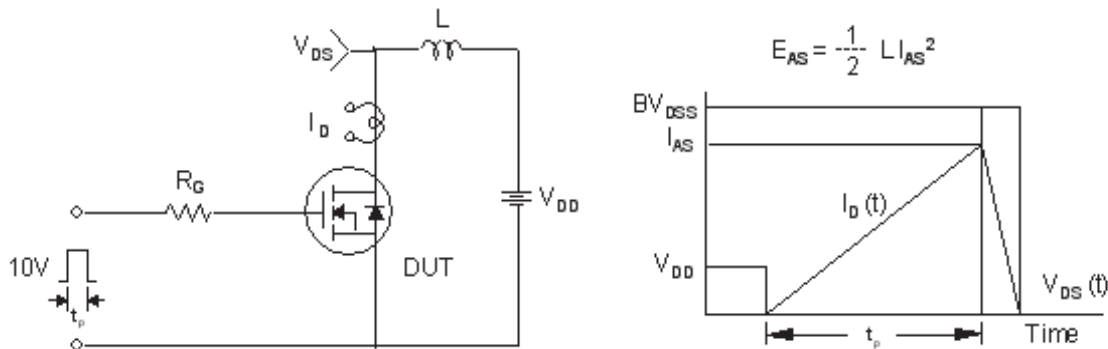
Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

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

Mechanical Dimensions
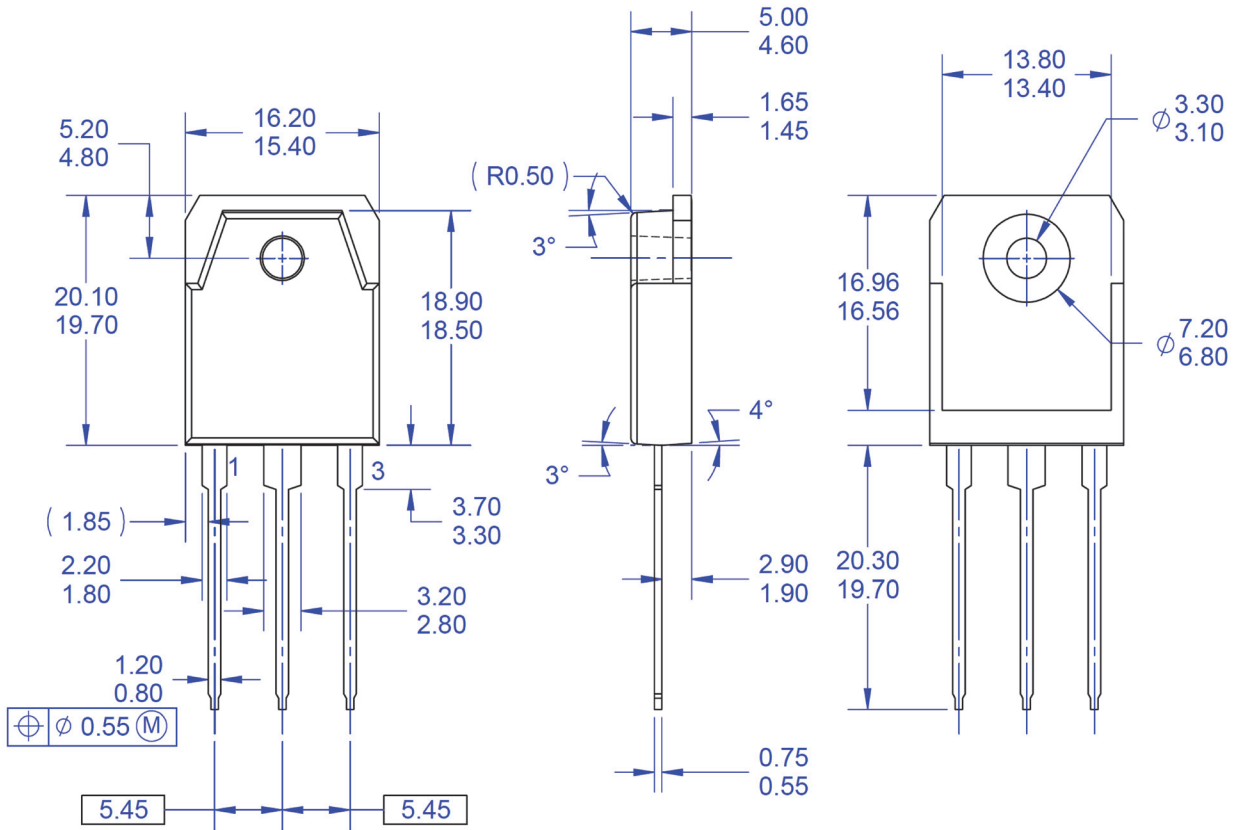
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Figure 16. TO3PN, 3-Lead, Plastic, EIAJ SC-65

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
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