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FQA19N60

N-Channel QFET® MOSFET

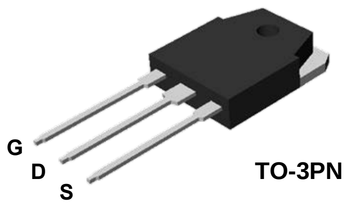
600 V, 18.5 A, 380 mΩ

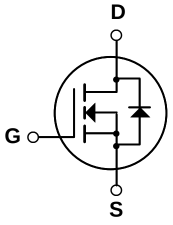
Description

This N-Channel enhancement mode power MOSFET is produced using Fairchild Semiconductor®'s proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state resistance, and to provide superior switching performance and high avalanche energy strength. These devices are suitable for switched mode power supplies, active power factor correction (PFC), and electronic lamp ballasts.

Features

- 18.5 A, 600 V, $R_{DS(on)}$ = 380 mΩ (Max.) @ V_{GS} = 10 V, I_D = 9.3 A
- Low Gate Charge (Typ. 70 nC)
- Low Crss (Typ. 35 pF)
- 100% Avalanche Tested





Absolute Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Parameter		FQA19N60	Unit
V_{DSS}	Drain-Source Voltage		600	V
I_D	Drain Current - Continuous (T_C = 25°C)		18.5	A
	- Continuous (T_C = 100°C)		11.7	A
I_{DM}	Drain Current - Pulsed	(Note 1)	74	A
V_{GSS}	Gate-Source Voltage		± 30	V
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	1150	mJ
I_{AR}	Avalanche Current	(Note 1)	18.5	A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	30	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	4.5	V/ns
P_D	Power Dissipation (T_C = 25°C)		300	W
	- Derate above 25°C		2.38	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150	°C
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds		300	°C

Thermal Characteristics

Symbol	Parameter	FQA19N60	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.42	°C/W
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink, Typ.	0.24	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	40	°C/W

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Electrical Characteristics

T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 µA	600	--	--	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250 µA, Referenced to 25°C	--	0.65	--	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 600 V, V_{GS} = 0 V	--	--	10	µA
		V_{DS} = 480 V, T_C = 125°C	--	--	100	µA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 30 V, V_{DS} = 0 V	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = -30 V, V_{DS} = 0 V	--	--	-100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 µA	3.0	--	5.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 9.3 A	--	0.3	0.38	Ω
g_{FS}	Forward Transconductance	V_{DS} = 50 V, I_D = 9.3 A (Note 4)	--	16	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	--	2800	3600	pF
C_{oss}	Output Capacitance		--	350	450	pF
C_{rss}	Reverse Transfer Capacitance		--	35	45	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 300 V, I_D = 18.5 A, R_G = 25 Ω (Note 4, 5)	--	65	140	ns
t_r	Turn-On Rise Time		--	210	430	ns
$t_{d(off)}$	Turn-Off Delay Time		--	150	310	ns
t_f	Turn-Off Fall Time		--	135	280	ns
Q_g	Total Gate Charge	V_{DS} = 480 V, I_D = 18.5 A, V_{GS} = 10 V (Note 4, 5)	--	70	90	nC
Q_{gs}	Gate-Source Charge		--	17	--	nC
Q_{gd}	Gate-Drain Charge		--	33	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	18.5	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	74	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 18.5 A	--	--	1.4	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_S = 18.5 A, dI_F / dt = 100 A/µs (Note 4)	--	420	--	ns
Q_{rr}	Reverse Recovery Charge		--	4.7	--	µC

Notes:
1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L = 6.2mH, I_{AS} = 18.5A, V_{DD} = 50V, R_G = 25 Ω, Starting T_J = 25°C
3. $I_{SD} \leq$ 18.5A, di/dt $\leq$ 200A/µs, $V_{DD} \leq BV_{DSS}$, Starting T_J = 25°C
4. Pulse Test : Pulse width $\leq$ 300µs, Duty cycle $\leq$ 2%
5. Essentially independent of operating temperature

Typical Characteristics

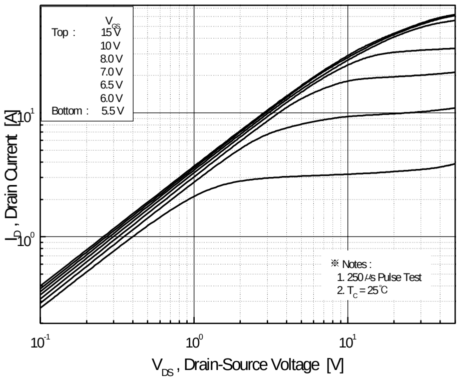

Figure 1. On-Region Characteristics

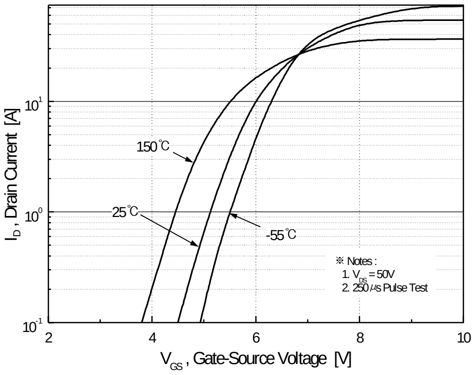

Figure 2. Transfer Characteristics

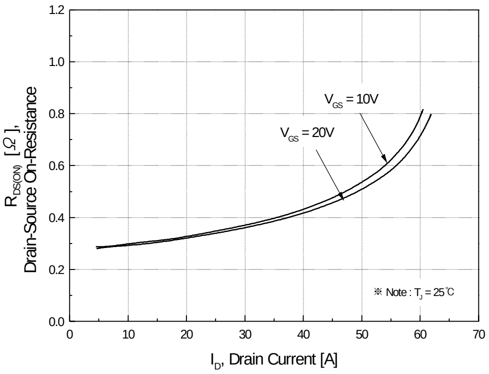

Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

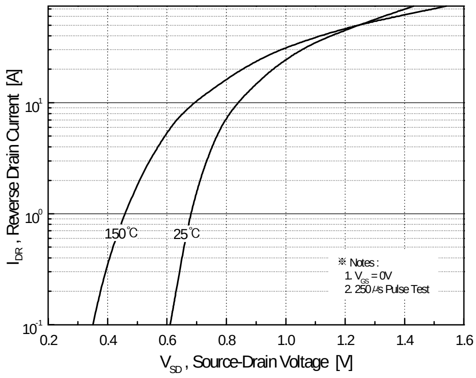

Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

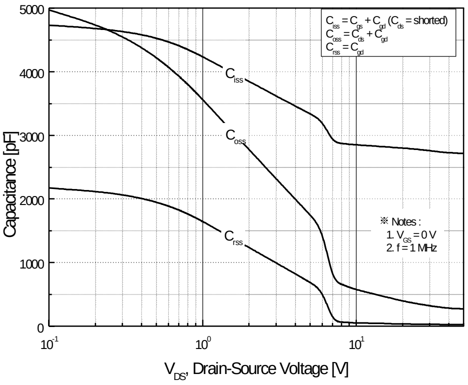

Figure 5. Capacitance Characteristics

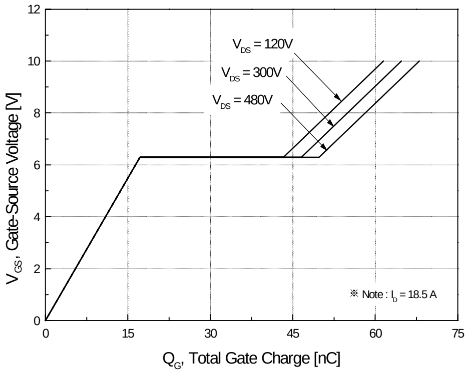

Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

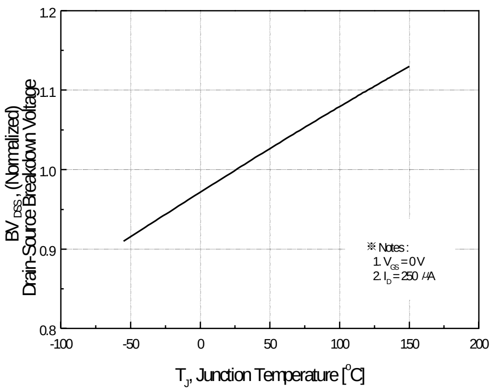

Figure 7. Breakdown Voltage Variation vs. Temperature

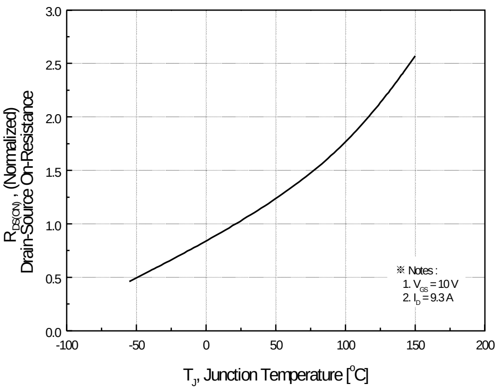

Figure 8. On-Resistance Variation vs. Temperature

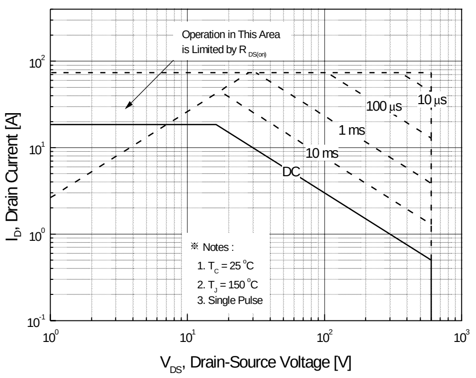

Figure 9. Maximum Safe Operating Area

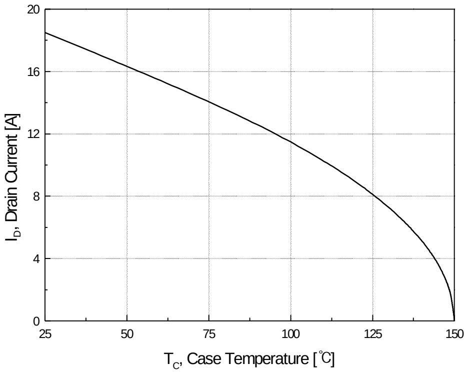

Figure 10. Maximum Drain Current vs. Case Temperature

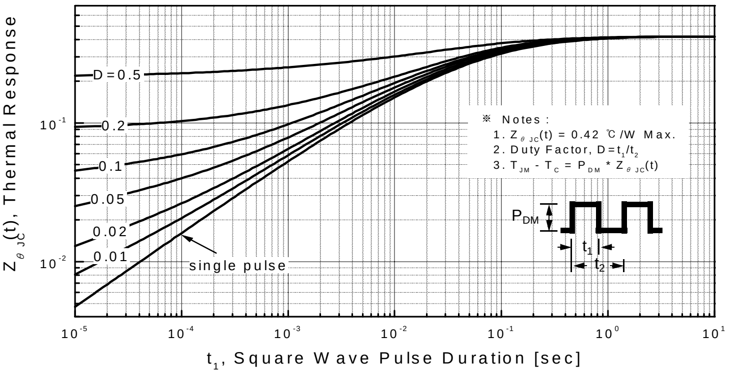

Figure 11. Transient Thermal Response Curve

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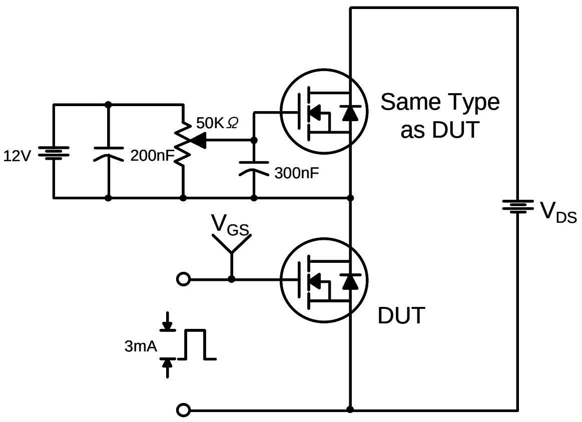
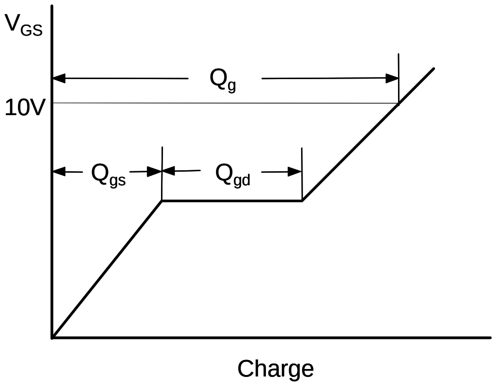
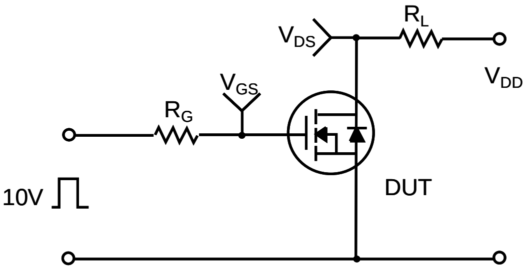
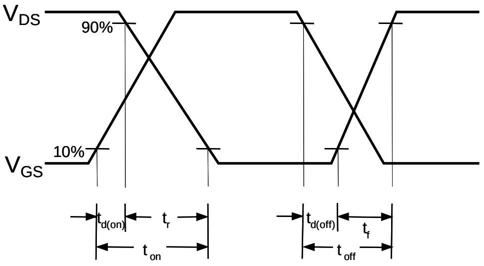
Gate Charge Test Circuit & Waveform



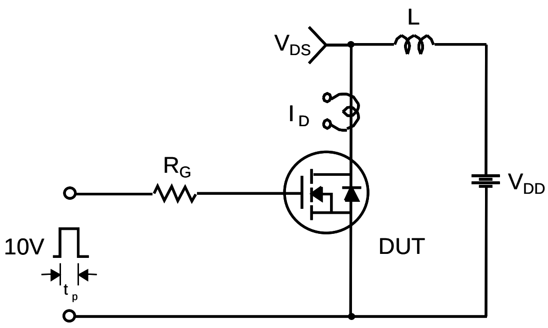


Resistive Switching Test Circuit & Waveforms

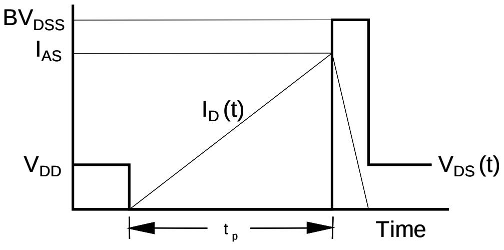




Unclamped Inductive Switching Test Circuit & Waveforms



$$E_{AS} = \frac{1}{2} L I_{AS}^2 \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$



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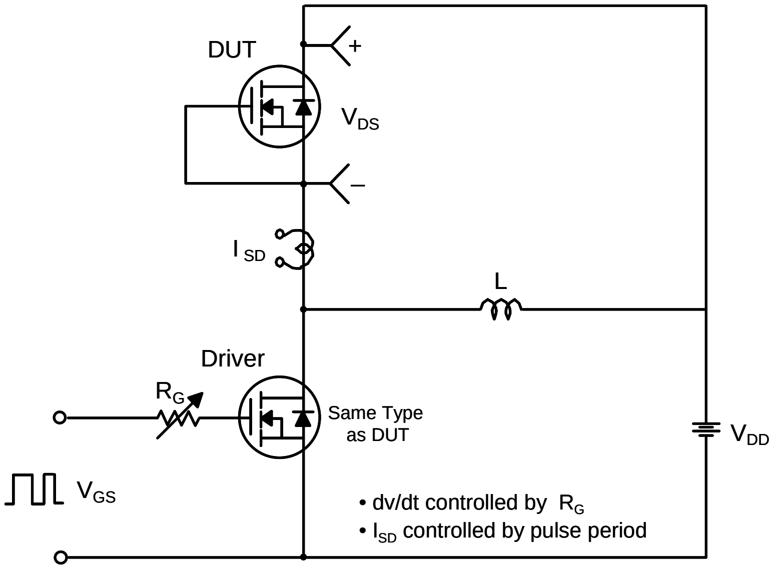
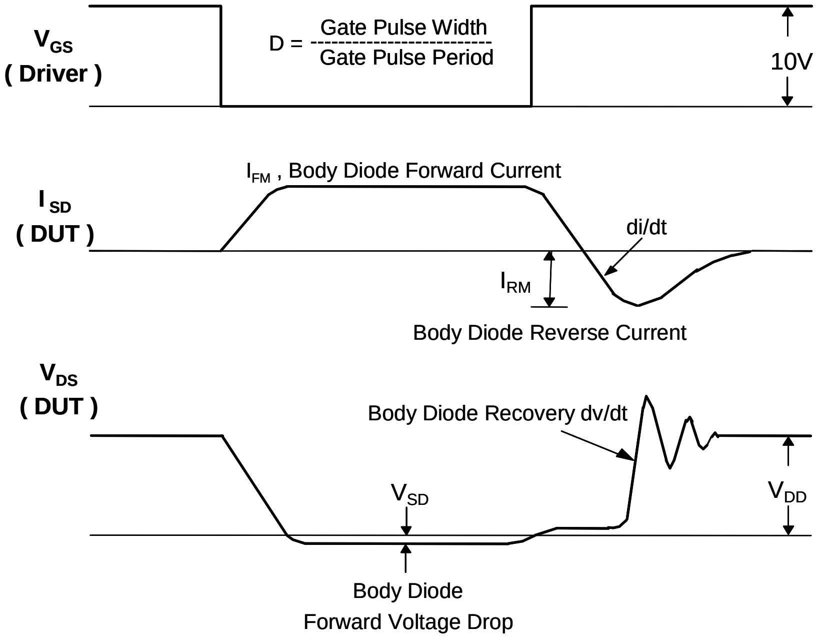
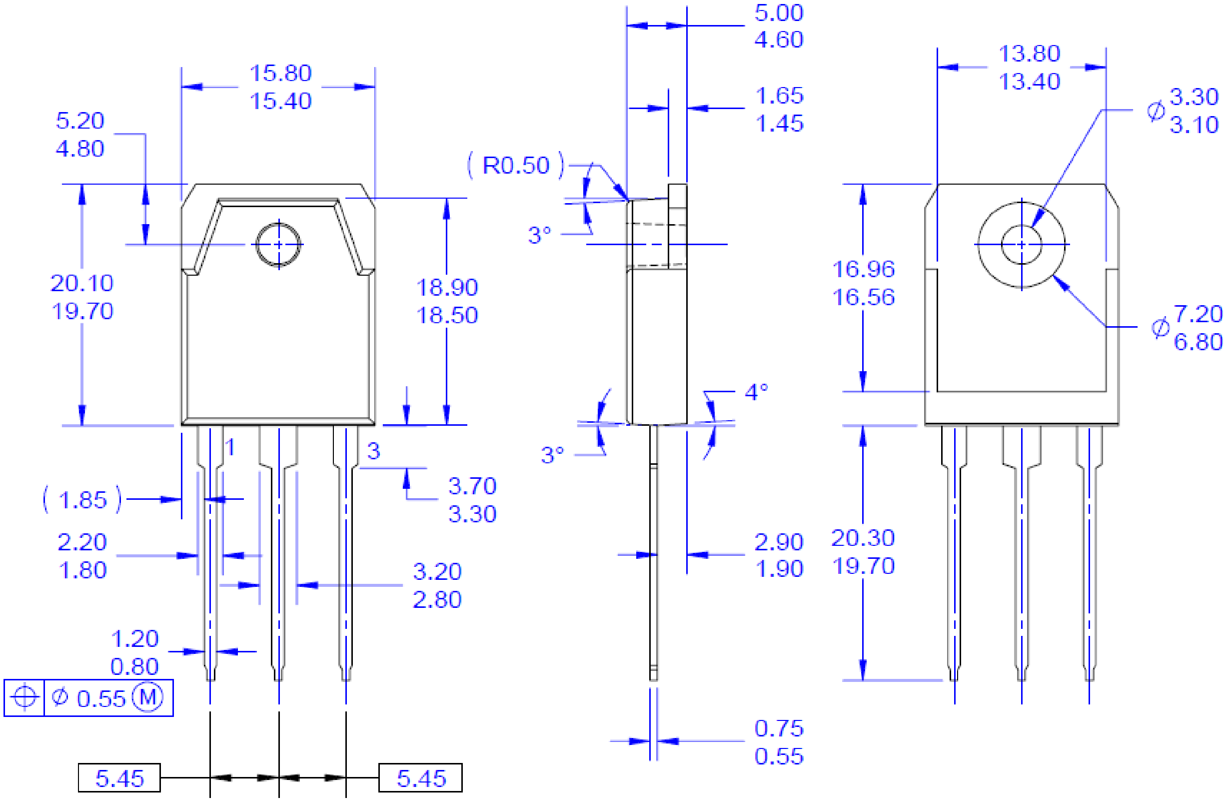
Peak Diode Recovery dv/dt Test Circuit & Waveforms

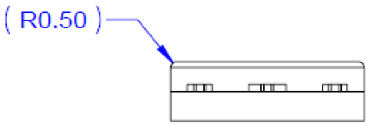




Mechanical Dimensions

TO-3PN





NOTES: UNLESS OTHERWISE SPECIFIED

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C) DIMENSION AND TOLERANCING PER ASME14.5
D) DIMENSIONS ARE EXCLUSSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSSIONS.
E) THIS PACKAGE IS INTENDED ONLY FOR TO3PN.
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Dimensions in Millimeters

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