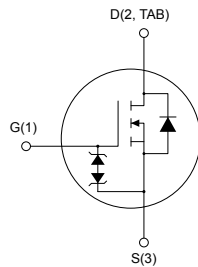
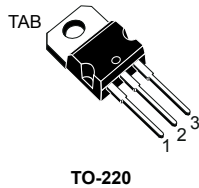


N-channel 600 V, 0.260 Ω typ., 12 A MDmesh DM2 Power MOSFET in a TO-220 package



AM01475V1


Product status links
[STP18N60DM2](#)
Product summary

Order code	STP18N60DM2
Marking	18N60DM2
Package	TO-220
Packing	Tube

Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STP18N60DM2	600 V	0.295 Ω	12 A

- Fast-recovery body diode
- Extremely low gate charge and input capacitance
- Low on-resistance
- 100% avalanche tested
- Extremely high dv/dt ruggedness
- Zener-protected

Applications

- Switching applications

Description

This high-voltage N-channel Power MOSFET is part of the MDmesh DM2 fast-recovery diode series. It offers very low recovery charge (Q_{rr}) and time (t_{rr}) combined with low $R_{DS(on)}$, rendering it suitable for the most demanding high-efficiency converters and ideal for bridge topologies and ZVS phase-shift converters.

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{GS}	Gate-source voltage	±25	V
I_D	Drain current (continuous) at $T_{case} = 25\text{ °C}$	12	A
I_D	Drain current (continuous) at $T_{case} = 100\text{ °C}$	7.6	A
$I_{DM}^{(1)}$	Drain current (pulsed)	48	A
P_{TOT}	Total power dissipation at $T_{case} = 25\text{ °C}$	110	W
$dv/dt^{(2)}$	Peak diode recovery voltage slope	40	V/ns
$dv/dt^{(3)}$	MOSFET dv/dt ruggedness	50	
T_{stg}	Storage temperature range	-55 to 150	°C
T_j	Operating junction temperature range		°C

1. Pulse width is limited by safe operating area.
2. $I_{SD} \leq 12$, $di/dt \leq 400\text{ A}/\mu\text{s}$, $V_{DS(peak)} < V_{(BR)DSS}$, $V_{DD} = 400\text{ V}$
3. $V_{DS} \leq 480\text{ V}$

Table 2. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	1.14	°C/W
$R_{thj-amb}$	Thermal resistance junction-ambient	62.5	

Table 3. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or not repetitive (pulse width limited by T_{jmax})	2.5	A
E_{AR}	Single pulse avalanche energy (starting $T_j = 25\text{ °C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{ V}$)	380	mJ

2 Electrical characteristics

($T_{case} = 25\text{ °C}$ unless otherwise specified)

Table 4. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$, $I_D = 1\text{ mA}$	600			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = 600\text{ V}$			1	μA
		$V_{GS} = 0\text{ V}$, $V_{DS} = 600\text{ V}$, $T_{case} = 125\text{ °C}$ ⁽¹⁾			100	μA
I_{GSS}	Gate-body leakage current	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 25\text{ V}$			± 5	μA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	3	4	5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 6\text{ A}$		0.260	0.295	Ω

1. Defined by design, not subject to production test.

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 100\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	800	-	pF
C_{oss}	Output capacitance		-	40	-	pF
C_{rSS}	Reverse transfer capacitance		-	1.33	-	pF
$C_{oss\ eq.}^{(1)}$	Equivalent output capacitance	$V_{DS} = 0$ to 480 V , $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	80	-	pF
R_G	Intrinsic gate resistance	$f = 1\text{ MHz}$, $I_D = 0\text{ A}$	-	5.6	-	Ω
Q_g	Total gate charge	$V_{DD} = 480\text{ V}$, $I_D = 12\text{ A}$, $V_{GS} = 0$ to 10 V (see Figure 14. Test circuit for gate charge behavior)	-	20	-	nC
Q_{gs}	Gate-source charge		-	5.2	-	nC
Q_{gd}	Gate-drain charge		-	8.5	-	nC

1. $C_{oss\ eq.}$ is defined as a constant equivalent capacitance giving the same charging time as C_{oss} when V_{DS} increases from 0 to 80% V_{DSS}

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 300\text{ V}$, $I_D = 6\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$ (see Figure 13. Test circuit for resistive load switching times and Figure 18. Switching time waveform)	-	13.5	-	ns
t_r	Rise time		-	8	-	ns
$t_{d(off)}$	Turn-off delay time		-	9.5	-	ns
t_f	Fall time		-	32.5	-	ns

Table 7. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		12	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		48	A
$V_{SD}^{(2)}$	Forward on voltage	$V_{GS} = 0\text{ V}$, $I_{SD} = 12\text{ A}$	-		1.6	V
t_{rr}	Reverse recovery time	$I_{SD} = 12\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 60\text{ V}$ (see Figure 15. Test circuit for inductive load switching and diode recovery times)	-	125		ns
Q_{rr}	Reverse recovery charge		-	0.675		μC
I_{RRM}	Reverse recovery current		-	11		A
t_{rr}	Reverse recovery time	$I_{SD} = 12\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 60\text{ V}$, $T_j = 150\text{ }^\circ\text{C}$ (see Figure 15. Test circuit for inductive load switching and diode recovery times)	-	190		ns
Q_{rr}	Reverse recovery charge		-	1.225		μC
I_{RRM}	Reverse recovery current		-	13		A

1. Pulse width is limited by safe operating area.
2. Pulse test: pulse duration = 300 μs , duty cycle 1.5%.

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

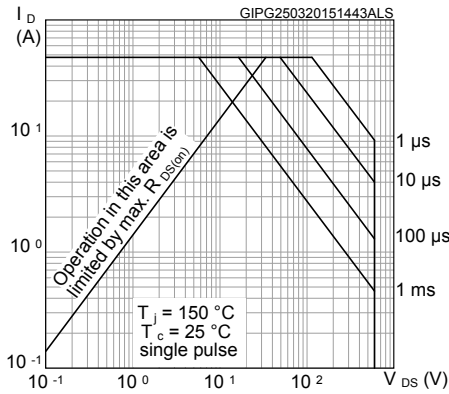


Figure 2. Thermal impedance

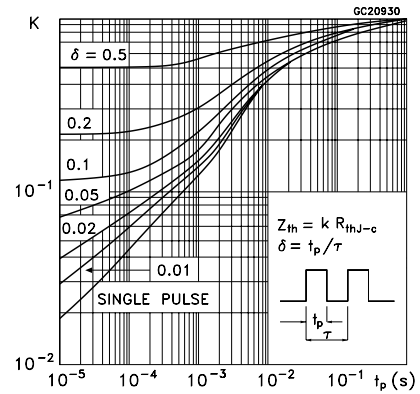


Figure 3. Output characteristics

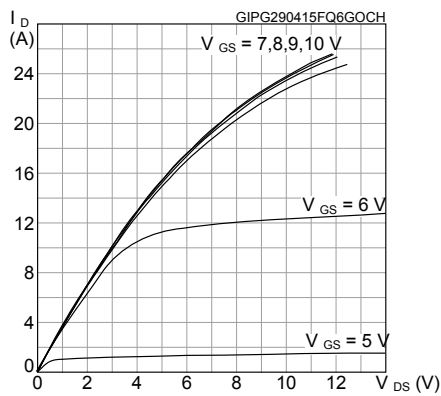


Figure 4. Transfer characteristics

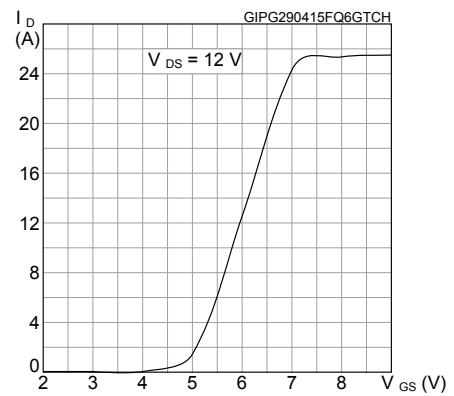


Figure 5. Gate charge vs gate-source voltage

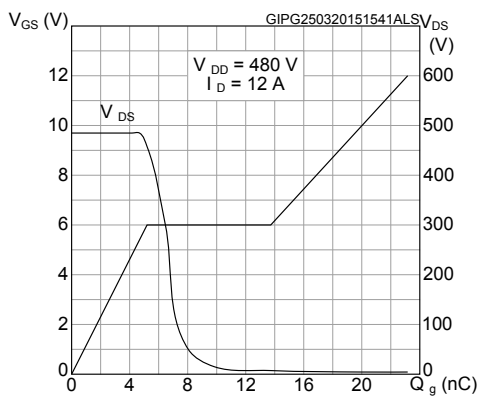


Figure 6. Static drain-source on-resistance

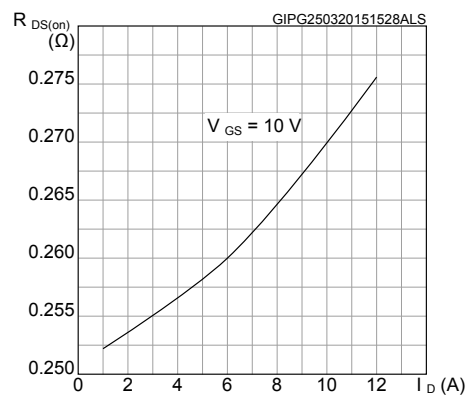


Figure 7. Capacitance variations

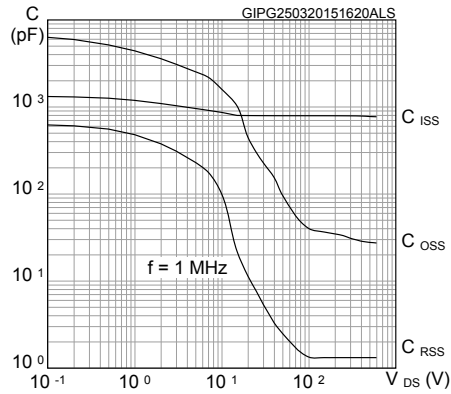


Figure 8. Normalized gate threshold voltage vs temperature

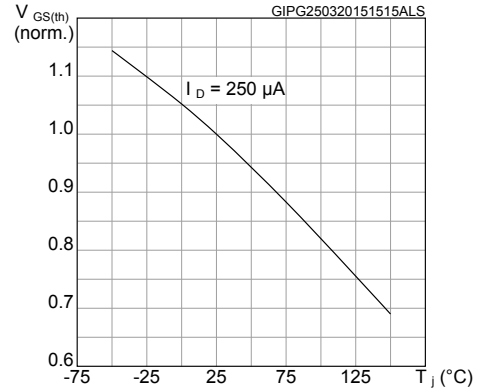


Figure 9. Normalized on-resistance vs temperature

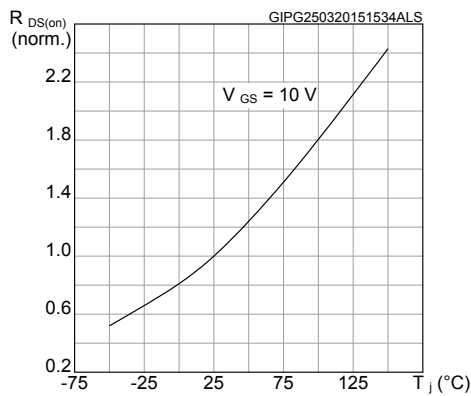


Figure 10. Normalized $V_{(BR)DSS}$ vs temperature

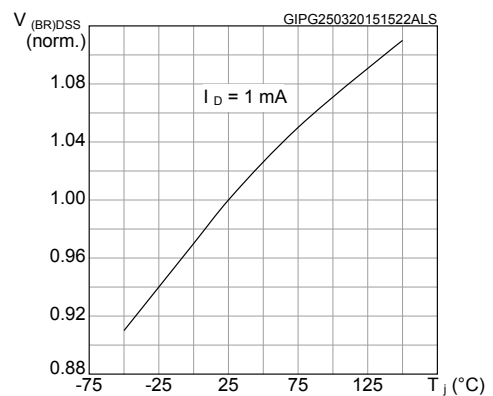


Figure 11. Source-drain diode forward characteristics

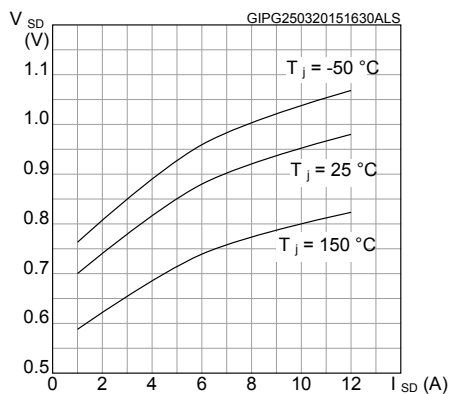
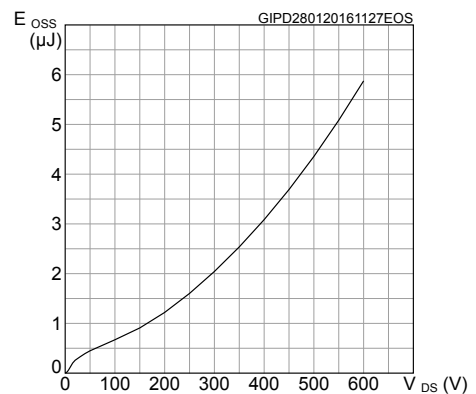
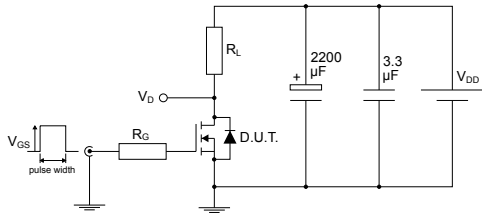


Figure 12. Output capacitance stored energy



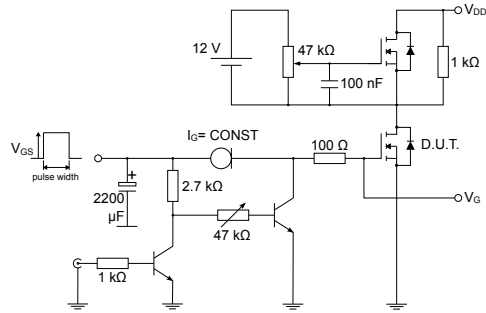
3 Test circuits

Figure 13. Test circuit for resistive load switching times



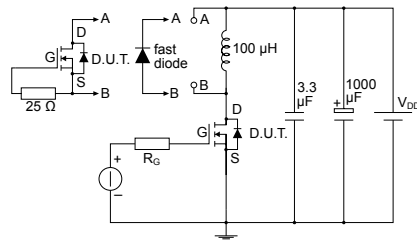
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Figure 14. Test circuit for gate charge behavior



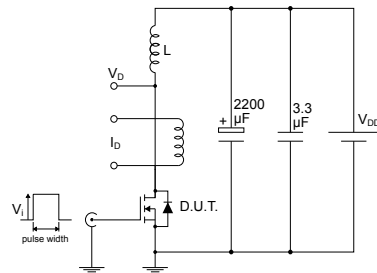
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Figure 15. Test circuit for inductive load switching and diode recovery times



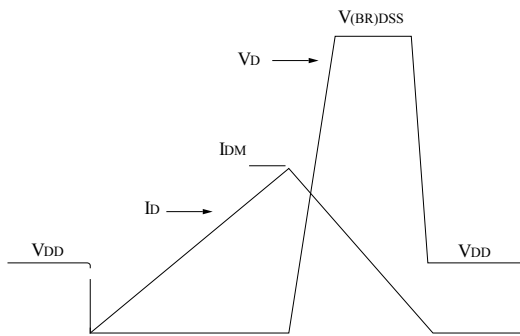
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Figure 16. Unclamped inductive load test circuit



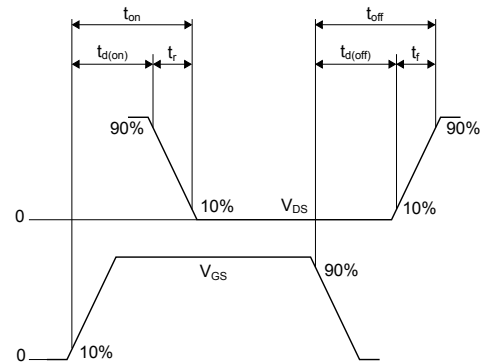
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Figure 17. Unclamped inductive waveform



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Figure 18. Switching time waveform



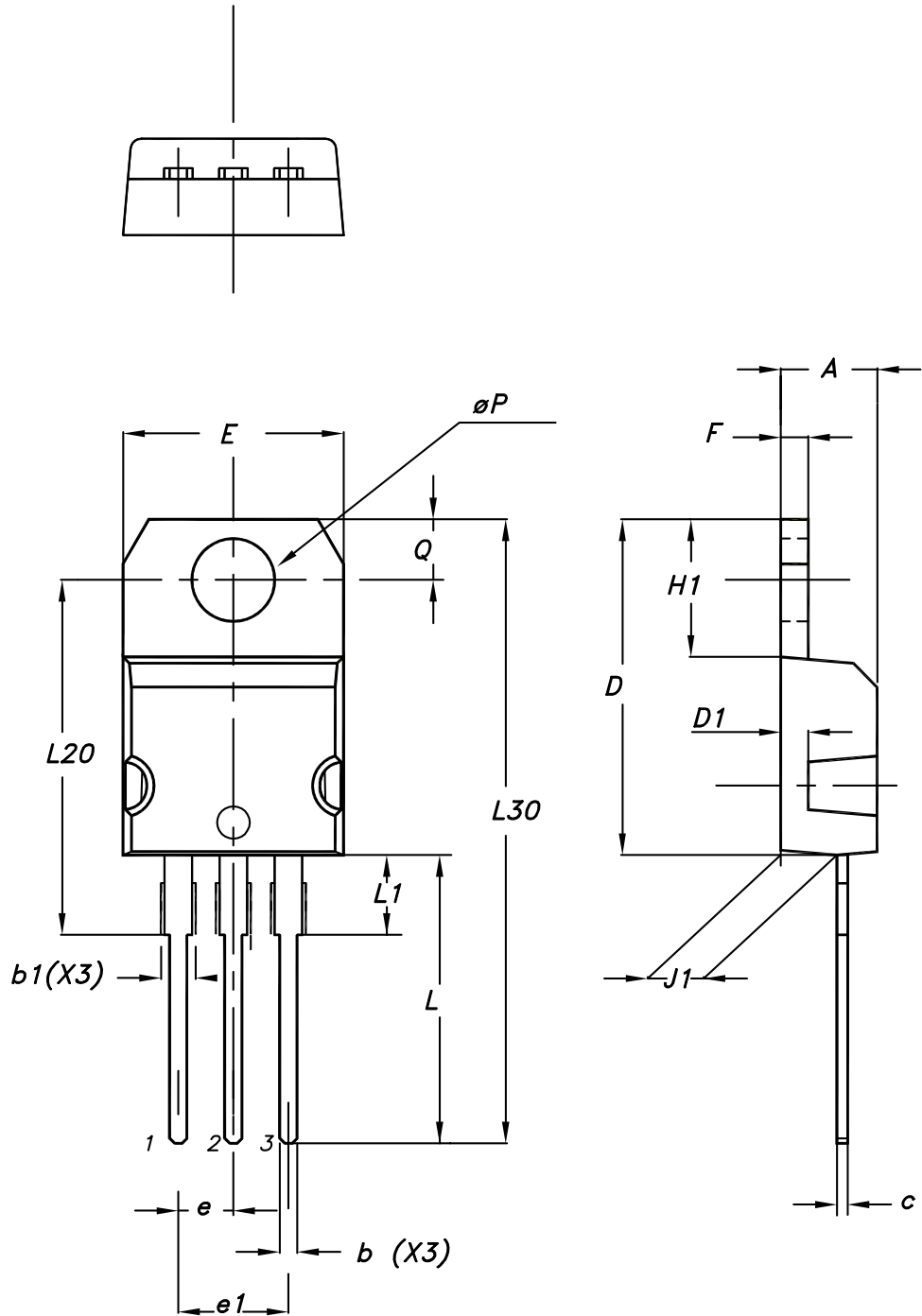
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4 Package information

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.

4.1 TO-220 type A package information

Figure 19. TO-220 type A package outline



0015988_typeA_Rev_22

Table 8. TO-220 type A package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.55
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10.00		10.40
e	2.40		2.70
e1	4.95		5.15
F	1.23		1.32
H1	6.20		6.60
J1	2.40		2.72
L	13.00		14.00
L1	3.50		3.93
L20		16.40	
L30		28.90	
øP	3.75		3.85
Q	2.65		2.95

Revision history

Table 9. Document revision history

Date	Revision	Changes
01-Apr-2015	1	First release.
21-May-2015	2	Text edits throughout document In <i>Section 2.1 Electrical characteristics (curves)</i> : - updated <i>Figure 4: Output characteristics</i> - updated <i>Figure 5: Transfer characteristics</i>
28-Jan-2016	3	Updated <i>Section 2.1: "Electrical characteristics (curves)"</i>
13-Sep-2016	4	Updated title in cover page.
10-Jun-2019	5	Modified Table 1, Table 2, Table 4. Static and Table 7. Source-drain diode . Minor text changes.

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