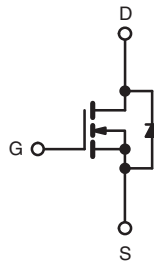
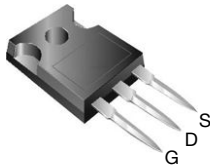


## Power MOSFET

PRODUCT SUMMARY		
$V_{DS}$ (V) at $T_J$ max.	560	
$R_{DS(on)}$ ( $\Omega$ )	$V_{GS} = 10$ V	0.270
$Q_g$ (Max.) (nC)	76	
$Q_{gs}$ (nC)	21	
$Q_{gd}$ (nC)	34	
Configuration	Single	

**TO-247AC**


N-Channel MOSFET

### FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- Low Figure-of-Merit  $R_{on} \times Q_g$
- 100 % Avalanche Tested
- High Peak Current Capability
- $dV/dt$  Ruggedness
- Improved  $T_{rr}/Q_{rr}$
- Improved Gate Charge
- High Power Dissipations Capability
- Compliant to RoHS Directive 2002/95/EC



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
Available


ORDERING INFORMATION	
Package	TO-247AC
Lead (Pb)-free	SiHG20N50C-E3
Lead (Pb)-free and Halogen-free	SiHG20N50C-GE3

ABSOLUTE MAXIMUM RATINGS ( $T_C = 25$ °C, unless otherwise noted)			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	$V_{DS}$	500	V
Gate-Source Voltage	$V_{GS}$	$\pm 30$	
Continuous Drain Current ( $T_J = 150$ °C) <sup>e</sup>	$V_{GS}$ at 10 V	$T_C = 25$ °C	A
		$T_C = 100$ °C	
Pulsed Drain Current <sup>a</sup>	$I_{DM}$	80	
Linear Derating Factor		1.8	W/°C
Single Pulse Avalanche Energy <sup>b</sup>	$E_{AS}$	361	mJ
Maximum Power Dissipation	$P_D$	250	W
Peak Diode Recovery $dV/dt$ <sup>c</sup>	$dV/dt$	5	V/ns
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to + 150	°C
Soldering Recommendations (Peak Temperature)	for 10 s	300 <sup>d</sup>	

#### Notes

- Repetitive rating; pulse width limited by maximum junction temperature.
- $V_{DD} = 50$  V, starting  $T_J = 25$  °C,  $L = 2.5$  mH,  $R_g = 25$   $\Omega$ ,  $I_{AS} = 17$  A.
- $I_{SD} \leq 18$  A,  $dI/dt \leq 380$  A/ $\mu$ s,  $V_{DD} \leq V_{DS}$ ,  $T_J \leq 150$  °C.
- 1.6 mm from case.
- Limited by maximum junction temperature.

THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	$R_{thJA}$	-	40	°C/W
Maximum Junction-to-Case (Drain)	$R_{thJC}$	-	0.5	

SPECIFICATIONS ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}$ , $I_D = 250\text{ }\mu\text{A}$	500	-	-	V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$ , $I_D = 1\text{ mA}$	-	700	-	mV/ $^\circ\text{C}$
Gate-Source Threshold Voltage (N)	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$	3.0	-	5.0	V
Gate-Source Leakage	$I_{GSS}$	$V_{GS} = \pm 30\text{ V}$	-	-	$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 500\text{ V}$ , $V_{GS} = 0\text{ V}$	-	-	25	$\mu\text{A}$
		$V_{DS} = 400\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 125\text{ }^\circ\text{C}$	-	-	250	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$   $I_D = 10\text{ A}$	-	0.225	0.270	$\Omega$
Forward Transconductance	$g_{fs}$	$V_{DS} = 50\text{ V}$ , $I_D = 10\text{ A}$	-	6.4	-	S
<b>Dynamic</b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1.0\text{ MHz}$	-	2451	2942	pF
Output Capacitance	$C_{oss}$		-	300	360	
Reverse Transfer Capacitance	$C_{rss}$		-	26	32	
Total Gate Charge	$Q_g$	$V_{GS} = 10\text{ V}$   $I_D = 18\text{ A}$ , $V_{DS} = 400\text{ V}$	-	65	76	nC
Gate-Source Charge	$Q_{gs}$		-	21	-	
Gate-Drain Charge	$Q_{gd}$		-	29	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 250\text{ V}$ , $I_D = 18\text{ A}$ , $R_g = 9.1\text{ }\Omega$	-	80	-	ns
Rise Time	$t_r$		-	27	-	
Turn-Off Delay Time	$t_{d(off)}$		-	32	-	
Fall Time	$t_f$		-	44	-	
Gate Input Resistance	$R_g$	$f = 1\text{ MHz}$ , open drain	-	1.1	-	$\Omega$
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	$I_S$	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	20	A
Pulsed Diode Forward Current	$I_{SM}$		-	-	80	
Body Diode Voltage	$V_{SD}$	$T_J = 25\text{ }^\circ\text{C}$ , $I_S = 18\text{ A}$ , $V_{GS} = 0\text{ V}$	-	-	1.5	V
Body Diode Reverse Recovery Time	$t_{rr}$	$T_J = 25\text{ }^\circ\text{C}$ , $I_F = I_S$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $V = 35\text{ V}$	-	503	-	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$		-	6.7	-	$\mu\text{C}$
Reverse Recovery Current	$I_{RRM}$		-	30	-	A

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## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

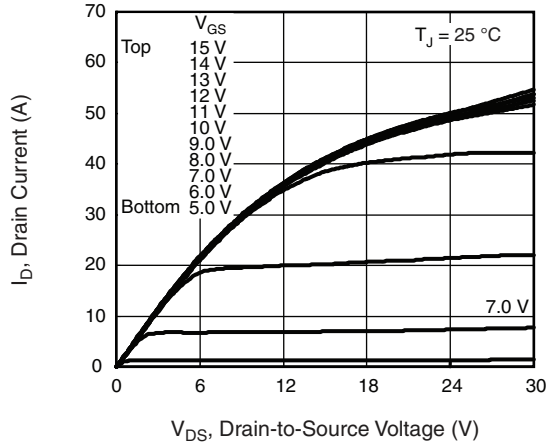


Fig. 1 - Typical Output Characteristics,  $T_C = 25\text{ }^\circ\text{C}$

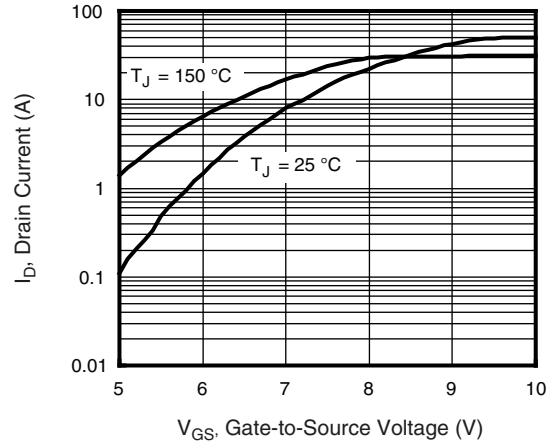


Fig. 3 - Typical Transfer Characteristics

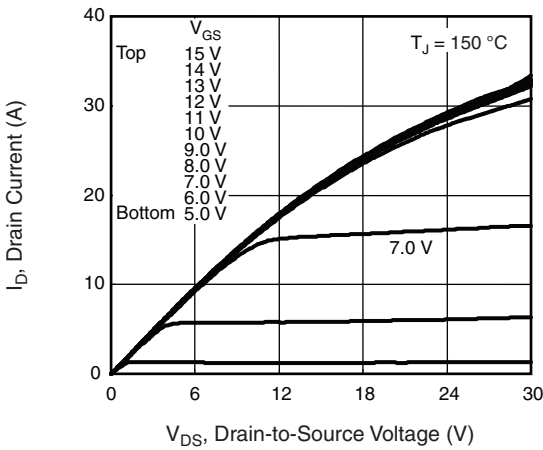


Fig. 2 - Typical Output Characteristics,  $T_C = 150\text{ }^\circ\text{C}$

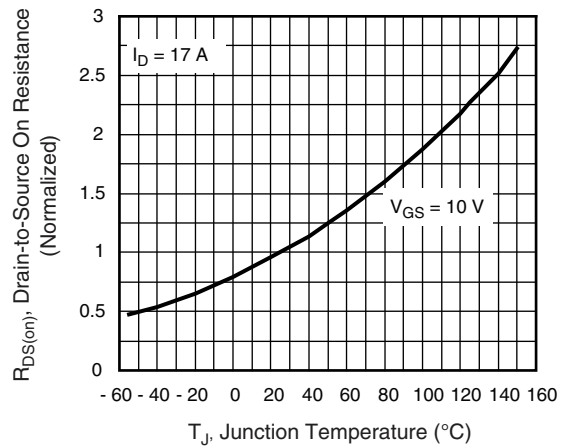


Fig. 4 - Normalized On-Resistance vs. Temperature

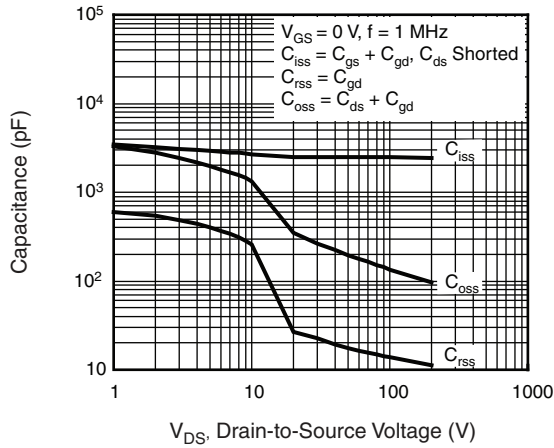


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

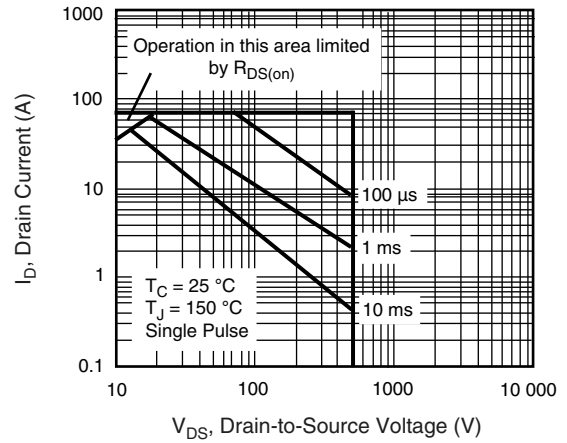


Fig. 8 - Maximum Safe Operating Area

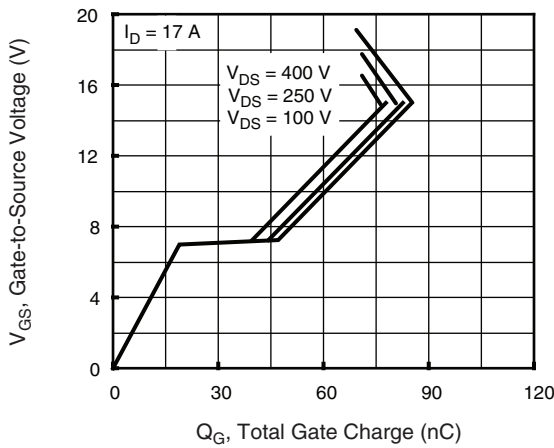


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

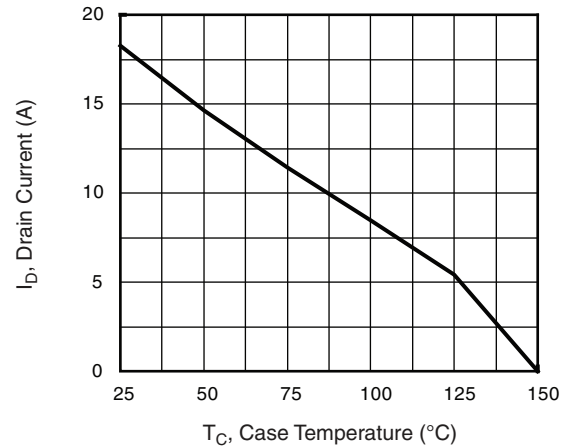


Fig. 9 - Maximum Drain Current vs. Case Temperature

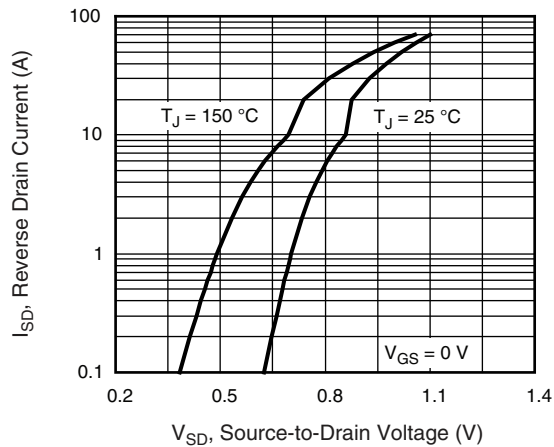
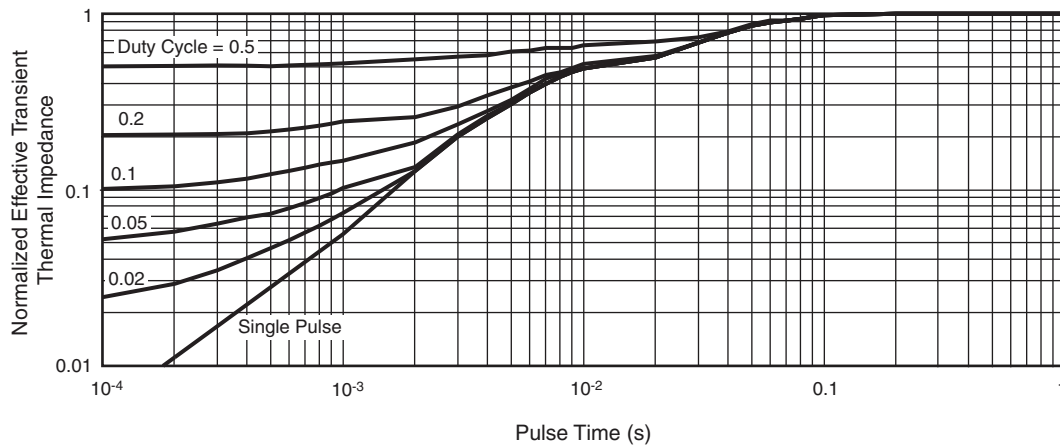
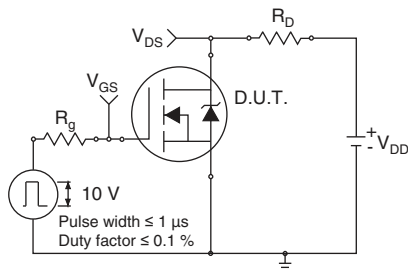


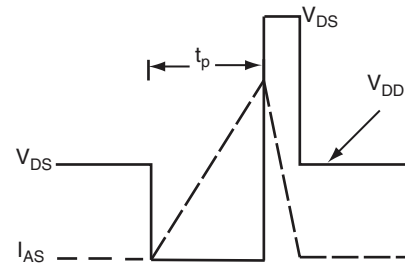
Fig. 7 - Typical Source-Drain Diode Forward Voltage



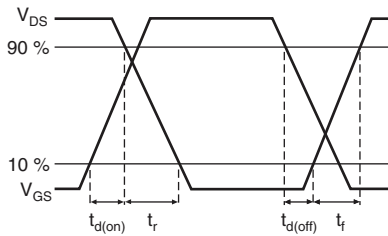
**Fig. 10 - Normalized Thermal Transient Impedance, Junction-to-Case (TO-247)**



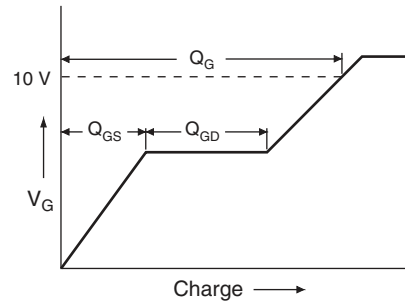
**Fig. 11a - Switching Time Test Circuit**



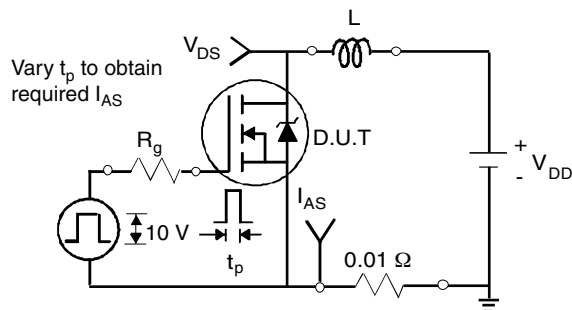
**Fig. 12b - Unclamped Inductive Waveforms**



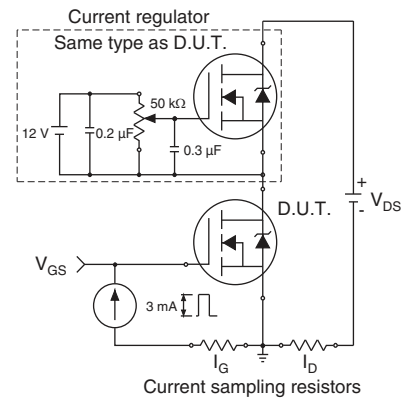
**Fig. 11b - Switching Time Waveforms**



**Fig. 13a - Basic Gate Charge Waveform**

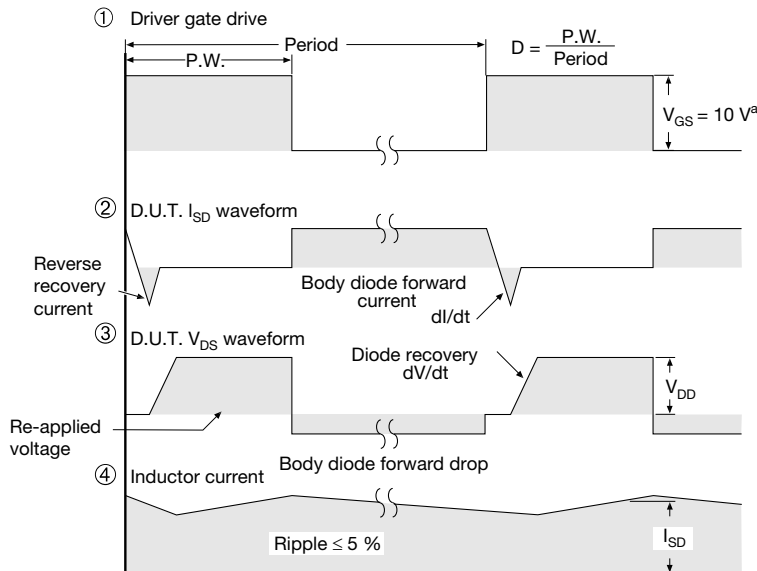
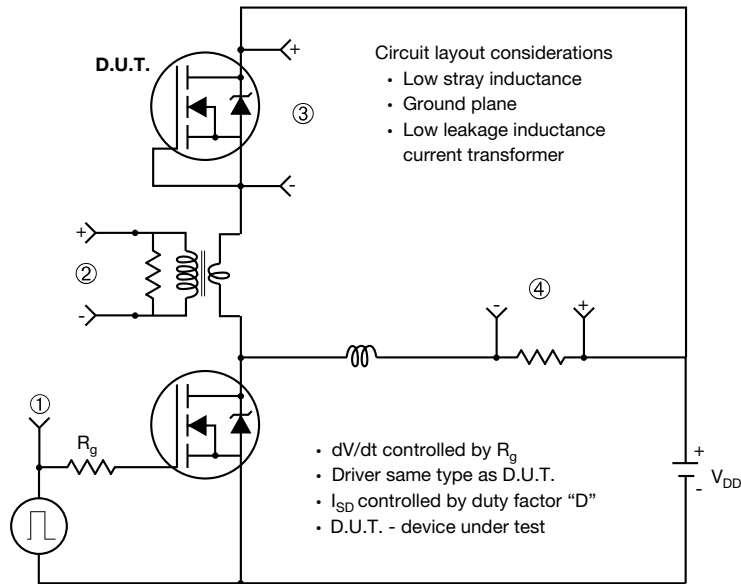


**Fig. 12a - Unclamped Inductive Test Circuit**



**Fig. 13b - Gate Charge Test Circuit**

### Peak Diode Recovery dV/dt Test Circuit



**Note**  
a.  $V_{GS} = 5\text{ V}$  for logic level devices

**Fig. 14 - For N-Channel**

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# TO-247AC (High Voltage)



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.58	5.31	0.180	0.209
A1	2.21	2.59	0.087	0.102
A2	1.17	2.49	0.046	0.098
b	0.99	1.40	0.039	0.055
b1	0.99	1.35	0.039	0.053
b2	1.53	2.39	0.060	0.094
b3	1.65	2.37	0.065	0.093
b4	2.42	3.43	0.095	0.135
b5	2.59	3.38	0.102	0.133
c	0.38	0.86	0.015	0.034
c1	0.38	0.76	0.015	0.030
D	19.71	20.82	0.776	0.820
D1	13.08	-	0.515	-

DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
D2	0.51	1.30	0.020	0.051
E	15.29	15.87	0.602	0.625
E1	13.72	-	0.540	-
e	5.46 BSC		0.215 BSC	
Ø k	0.254		0.010	
L	14.20	16.25	0.559	0.640
L1	3.71	4.29	0.146	0.169
N	7.62 BSC		0.300 BSC	
Ø P	3.51	3.66	0.138	0.144
Ø P1	-	7.39	-	0.291
Q	5.31	5.69	0.209	0.224
R	4.52	5.49	0.178	0.216
S	5.51 BSC		0.217 BSC	

ECN: X13-0103-Rev. D, 01-Jul-13  
DWG: 5971

**Notes**

1. Dimensioning and tolerancing per ASME Y14.5M-1994.
2. Contour of slot optional.
3. Dimension D 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. Thermal pad contour optional with dimensions D1 and E1.
5. Lead finish uncontrolled in L1.
6. Ø P to have a maximum draft angle of 1.5 to the top of the part with a maximum hole diameter of 3.91 mm (0.154").
7. Outline conforms to JEDEC outline TO-247 with exception of dimension c.
8. Xian and Mingxin actually photo.





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