

NCE P-Channel Enhancement Mode Power MOSFET

Description

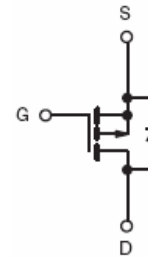
The NCE4435X uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a load switch or in PWM applications.

General Features

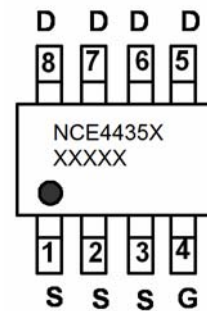
- $V_{DS} = -30V, I_D = -10A$
 $R_{DS(ON)} < 30m\Omega @ V_{GS} = -4.5V$
 $R_{DS(ON)} < 19m\Omega @ V_{GS} = -10V$
- High Power and current handing capability
- Lead free product is acquired
- Surface mount package

Application

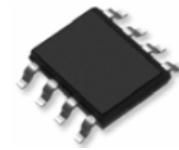
- PWM applications
- Load switch
- Power management



Schematic diagram



Marking and pin assignment



SOP-8 top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
NCE4435X	NCE4435X	SOP-8	Ø330mm	12mm	4000 units

Absolute Maximum Ratings ($T_A = 25^\circ C$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	-30	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous ($T_A = 25^\circ C$)	I_D	-10	A
Drain Current-Continuous ($T_A = 100^\circ C$)		-7.1	
Drain Current-Pulsed ^(Note 1)	I_{DM}	-40	A
Maximum Power Dissipation ($T_A = 25^\circ C$)	P_D	3	W
Maximum Power Dissipation ($T_A = 100^\circ C$)		1.3	
Single pulse avalanche energy ^(Note 5)	E_{AS}	165	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Ambient ^(Note 2)	$R_{\theta JA}$	41.67	$^\circ C/W$
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Electrical Characteristics (T_A=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =-250μA	-30	-33	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =-30V, V _{GS} =0V	-	-	-1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250μA	-1	-1.6	-2.2	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =-10V, I _D =-10A	-	14	19	mΩ
		V _{GS} =-4.5V, I _D =-10A	-	19	30	mΩ
Forward Transconductance	g _{FS}	V _{DS} =-5V, I _D =-10A	-	20	-	S
Dynamic Characteristics (Note 4)						
Input Capacitance	C _{ISS}	V _{DS} =-15V, V _{GS} =0V, F=1.0MHz	-	1400	-	PF
Output Capacitance	C _{OSS}		-	186	-	PF
Reverse Transfer Capacitance	C _{RSS}		-	164	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =-15V, I _D =-10A, V _{GS} =-10V, R _{GEN} =1Ω	-	8.5	-	nS
Turn-on Rise Time	t _r		-	9.5	-	nS
Turn-Off Delay Time	t _{d(off)}		-	26	-	nS
Turn-Off Fall Time	t _f		-	8	-	nS
Total Gate Charge	Q _g	V _{DS} =-15V, I _D =-10A, V _{GS} =-10V	-	32.2	-	nC
Gate-Source Charge	Q _{gs}		-	4.8	-	nC
Gate-Drain Charge	Q _{gd}		-	7.9	-	nC
Drain-Source Diode Characteristics						
Diode Forward Current (Note 2)	I _S		-	-	-10	A
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V, I _S =-10A	-	-	-1.2	V

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. E_{AS} condition: T_J=25°C, V_{DD}=-15V, V_G=10V, L=0.5mH, R_g=25Ω

Typical Electrical and Thermal Characteristics

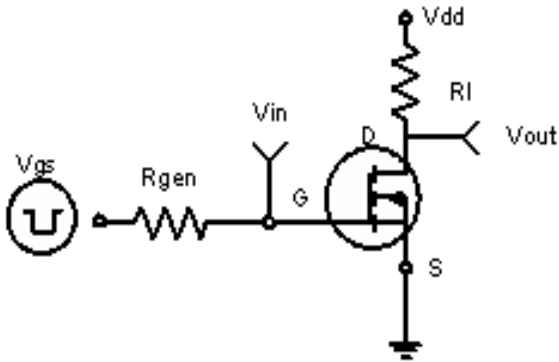


Figure 1: Switching Test Circuit

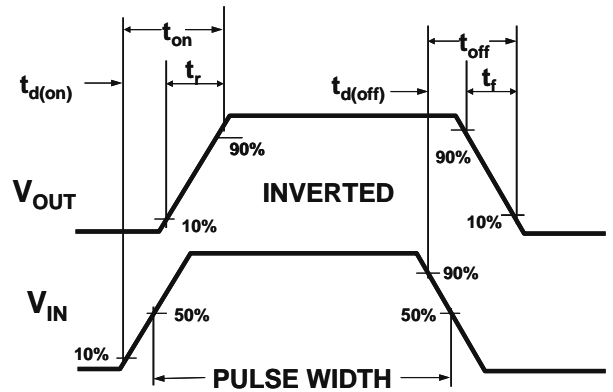


Figure 2: Switching Waveforms

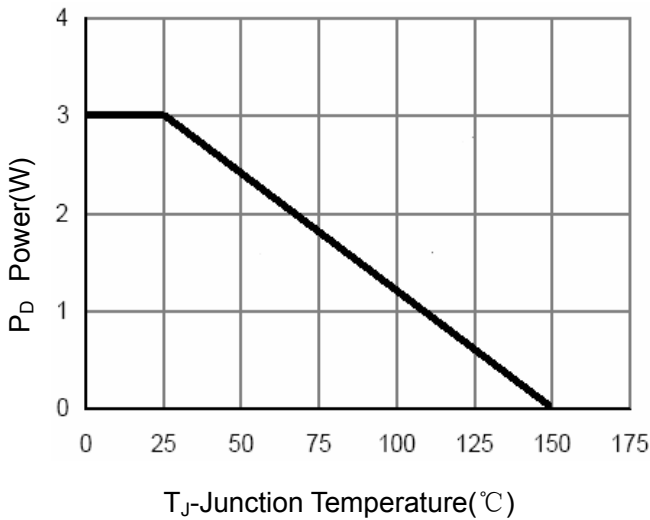


Figure 3 Power Dissipation

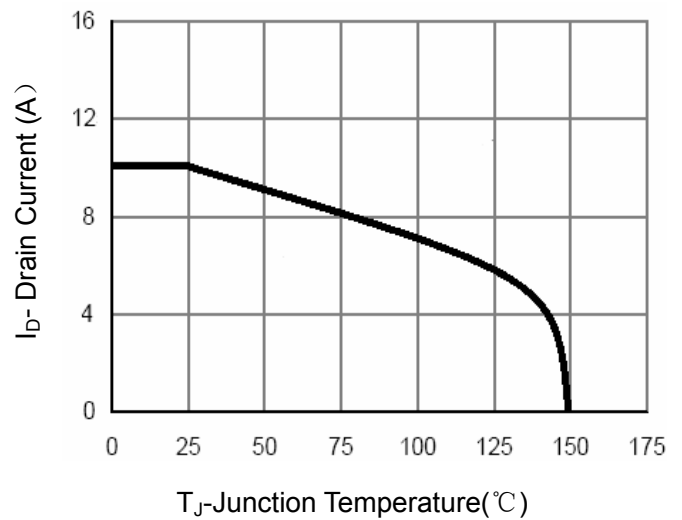


Figure 4 Drain Current

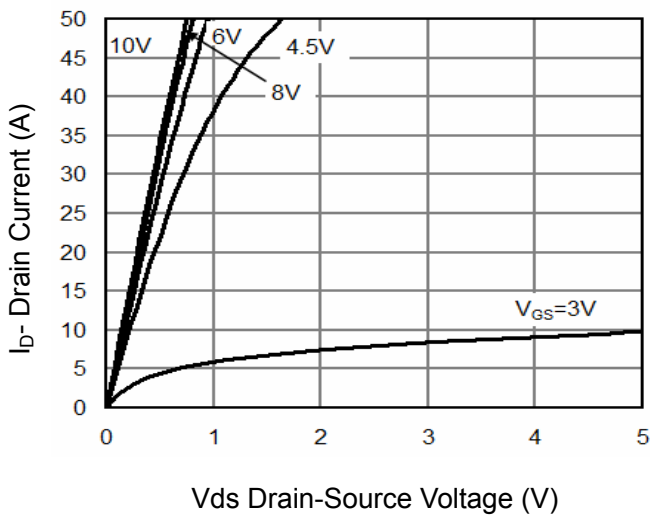


Figure 5 Output Characteristics

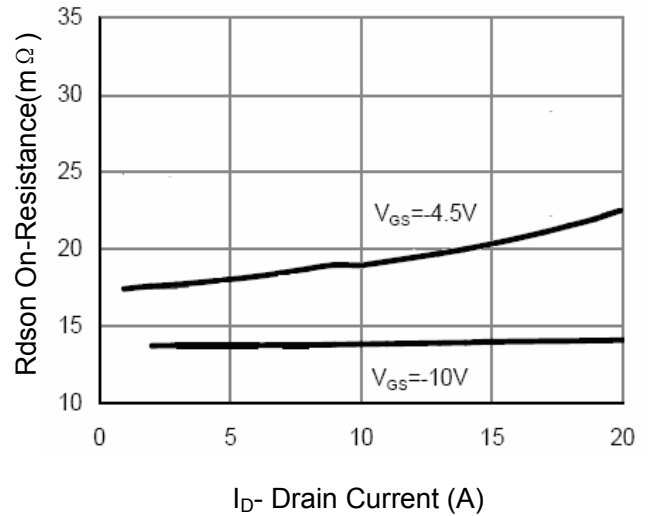


Figure 6 Drain-Source On-Resistance

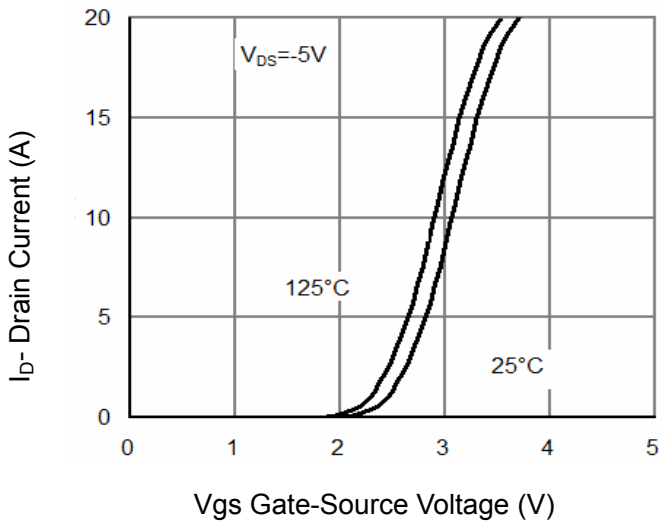


Figure 7 Transfer Characteristics

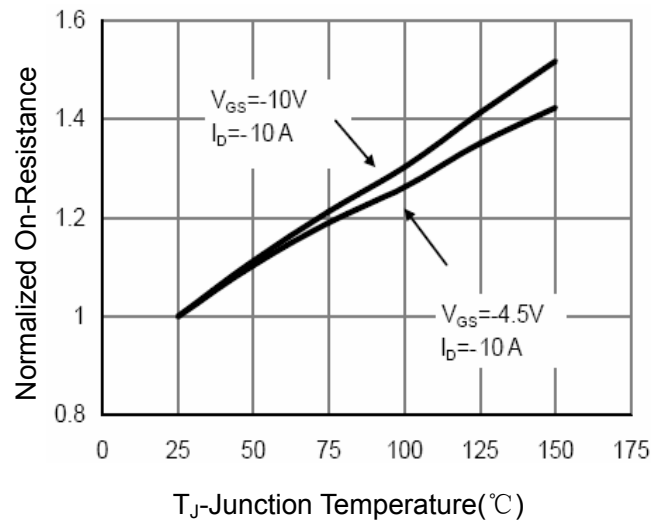


Figure 8 Drain-Source On-Resistance

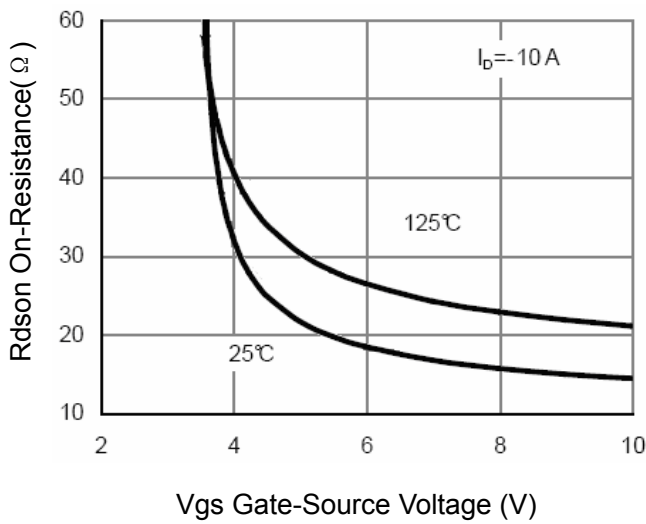


Figure 9 Rdson vs Vgs

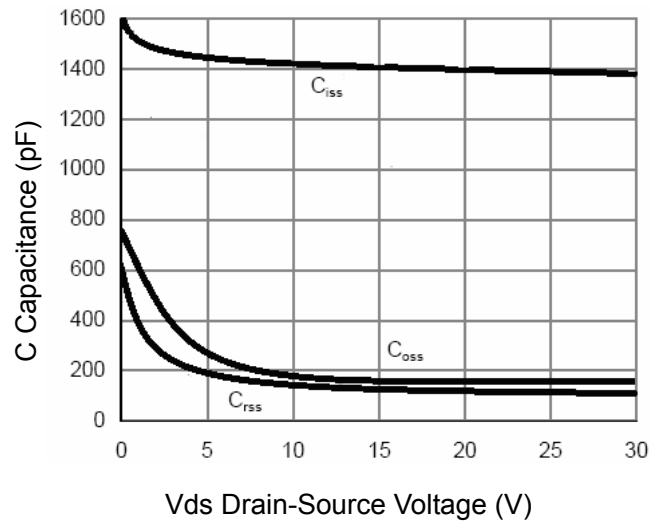


Figure 10 Capacitance vs Vds

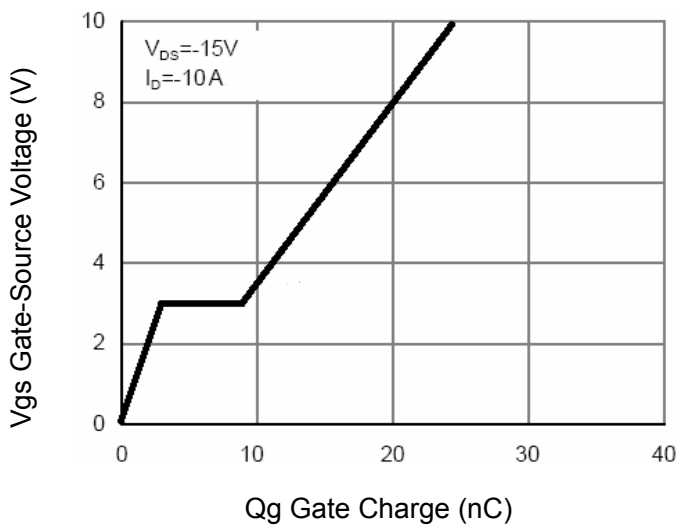


Figure 11 Gate Charge

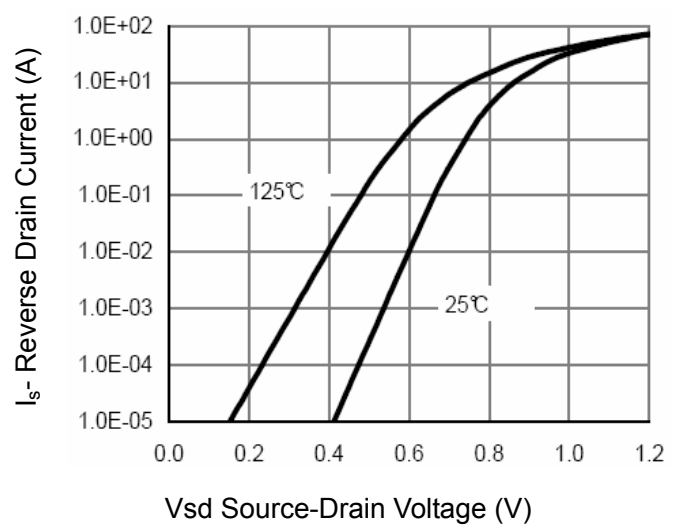


Figure 12 Source- Drain Diode Forward

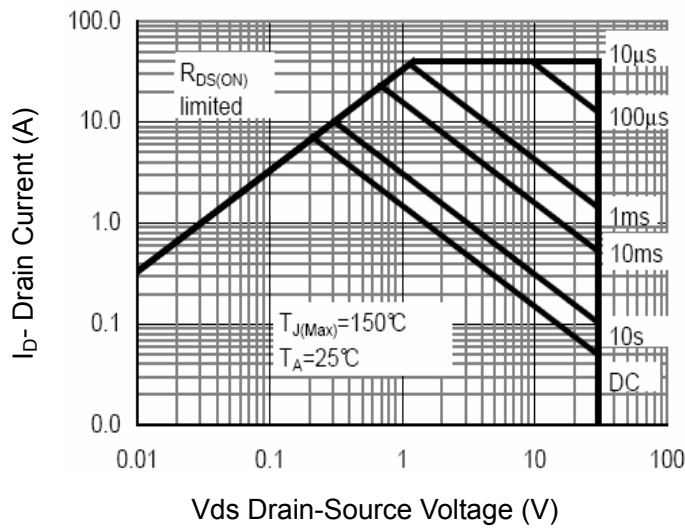


Figure 13 Safe Operation Area

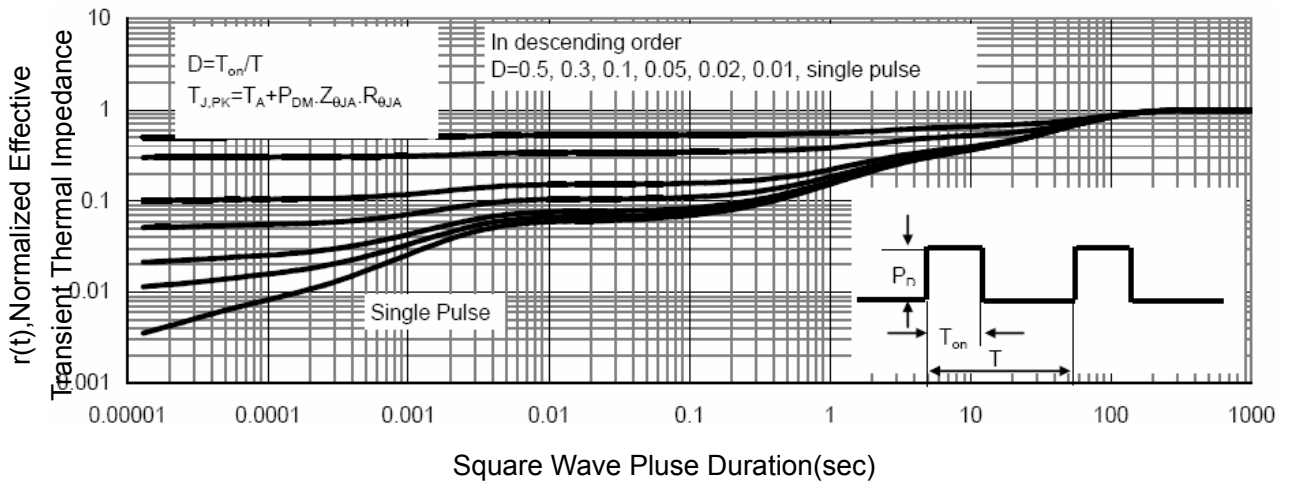
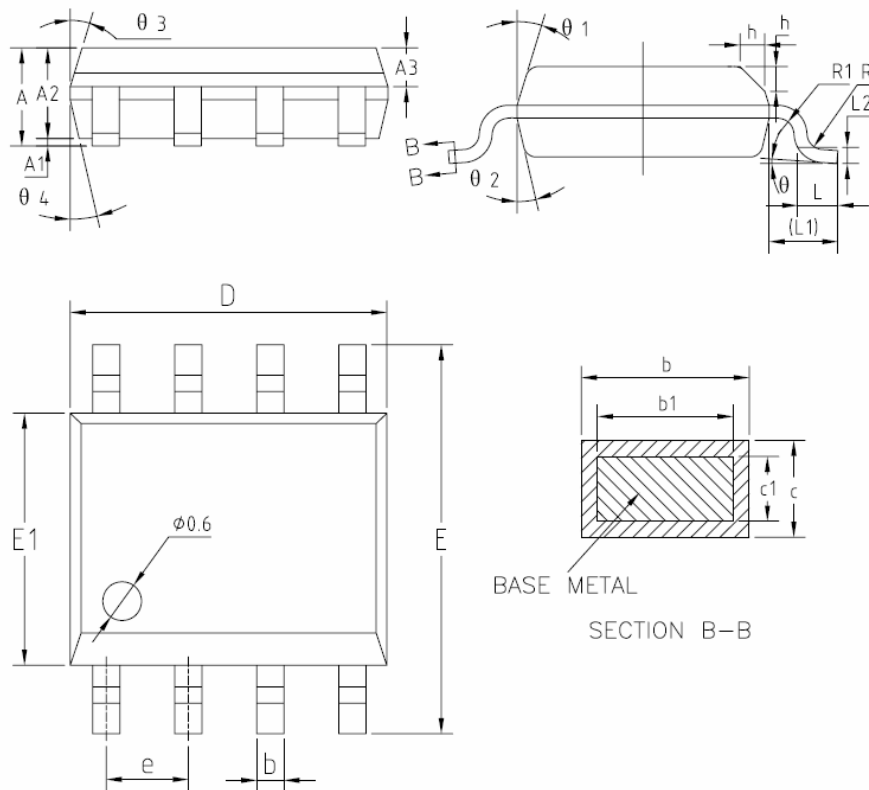


Figure 14 Normalized Maximum Transient Thermal Impedance

SOP-8 Package Information



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	1.35	1.55	1.75
A1	0.10	0.15	0.25
A2	1.25	1.40	1.65
A3	0.50	0.60	0.70
b	0.38	—	0.51
b1	0.37	0.42	0.47
c	0.18	—	0.25
c1	0.17	0.20	0.23
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.17	1.27	1.37
L	0.45	0.60	0.80
L1	1.04REF		
L2	0.25BSC		
R	0.07	—	—
R1	0.07	—	—
h	0.30	0.40	0.50
θ	0°	—	8°
θ_1	15°	17°	19°
θ_2	11°	13°	15°
θ_3	15°	17°	19°
θ_4	11°	13°	15°

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