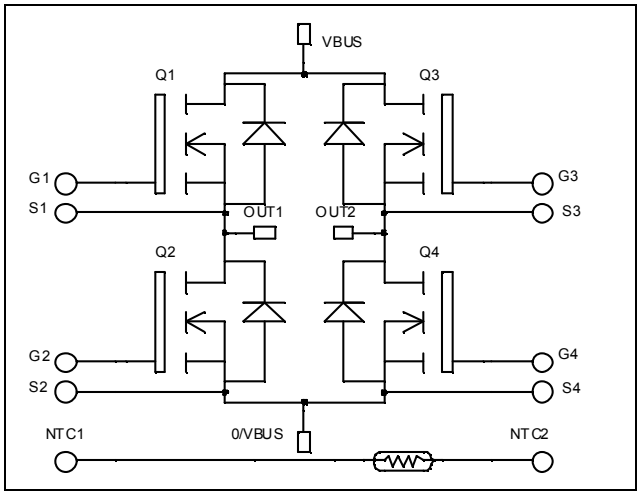
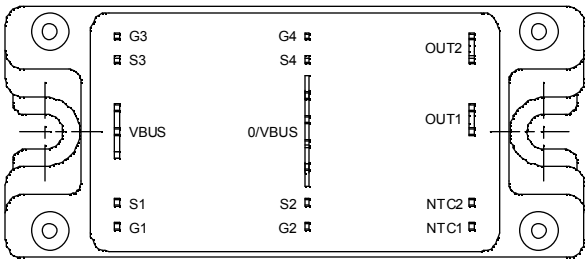
Full - Bridge MOSFET Power Module

V_{DSS} = 500V
R_{DSon} = 75mΩ typ @ Tj = 25°C
I_D = 46A @ Tc = 25°C





Application

- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies

Features

- Power MOS 7® FREDFETs
  - Low R_{DSon}
  - Low input and Miller capacitance
  - Low gate charge
  - Fast intrinsic reverse diode
  - Avalanche energy rated
  - Very rugged
- Kelvin source for easy drive
- Very low stray inductance
  - Symmetrical design
  - Lead frames for power connections
- Internal thermistor for temperature monitoring
- High level of integration

Benefits

- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Solderable terminals both for power and signal for easy PCB mounting
- Low profile
- RoHS Compliant

Absolute maximum ratings

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{DSS}	Drain - Source Breakdown Voltage		500	V
I_D	Continuous Drain Current	T_c = 25°C	46	A
		T_c = 80°C	34	
I_{DM}	Pulsed Drain current		184	
V_{GS}	Gate - Source Voltage		±30	V
R_{DSon}	Drain - Source ON Resistance		90	mΩ
P_D	Maximum Power Dissipation	T_c = 25°C	357	W
I_{AR}	Avalanche current (repetitive and non repetitive)		46	A
E_{AR}	Repetitive Avalanche Energy		50	mJ
E_{AS}	Single Pulse Avalanche Energy		2500	

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handing Procedures Should Be Followed. See application note APT0502 on www.microsemi.com

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All ratings @ T_j = 25°C unless otherwise specified

Electrical Characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
I_{DSS}	Zero Gate Voltage Drain Current	V_{GS} = 0V, V_{DS} = 500V	T_j = 25°C			100	µA
		V_{GS} = 0V, V_{DS} = 400V	T_j = 125°C			500	
$R_{DS(on)}$	Drain – Source on Resistance	V_{GS} = 10V, I_D = 23A			75	90	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 2.5mA		3		5	V
I_{GSS}	Gate – Source Leakage Current	V_{GS} = ±30 V, V_{DS} = 0V				±100	nA

Dynamic Characteristics

Symbol	*Characteristic*	*Test Conditions*	*Min*	*Typ*	*Max*	*Unit*
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 25V f = 1MHz		5600		pF
C_{oss}	Output Capacitance			1200		
C_{rss}	Reverse Transfer Capacitance			90		
Q_g	Total gate Charge	V_{GS} = 10V V_{Bus} = 250V I_D = 46A		123		nC
Q_{gs}	Gate – Source Charge			33		
Q_{gd}	Gate – Drain Charge			65		
$T_{d(on)}$	Turn-on Delay Time	**Inductive switching @ 125°C** V_{GS} = 15V V_{Bus} = 333V I_D = 46A R_G = 5Ω		18		ns
T_r	Rise Time			35		
$T_{d(off)}$	Turn-off Delay Time			87		
T_f	Fall Time			77		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 25°C** V_{GS} = 15V, V_{Bus} = 333V I_D = 46A, R_G = 5Ω		755		µJ
E_{off}	Turn-off Switching Energy			726		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 125°C** V_{GS} = 15V, V_{Bus} = 333V I_D = 46A, R_G = 5Ω		1241		µJ
E_{off}	Turn-off Switching Energy			846		

Source - Drain diode ratings and characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
I_S	Continuous Source current (Body diode)		Tc = 25°C			46	A
			Tc = 80°C			34	
V_{SD}	Diode Forward Voltage	V_{GS} = 0V, I_S = - 46A				1.3	V
dv/dt	Peak Diode Recovery ❶					15	V/ns
t_{rr}	Reverse Recovery Time	I_S = - 46A V_R = 333V di_S/dt = 100A/µs	T_j = 25°C		233		ns
			T_j = 125°C		499		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		1.9		µC
			T_j = 125°C		5.7		

❶ dv/dt numbers reflect the limitations of the circuit rather than the device itself.
$I_S \le$ - 46A di/dt ≤ 700A/µs $V_R \le V_{DSS}$ $T_j \le$ 150°C

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Thermal and package characteristics

Symbol	Characteristic			Min	Typ	Max	Unit
R_{thJC}	Junction to Case Thermal Resistance					0.35	°C/W
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, I isol<1mA, 50/60Hz			2500			V
T_J	Operating junction temperature range			-40		150	°C
T_{STG}	Storage Temperature Range			-40		125	
T_C	Operating Case Temperature			-40		100	
Torque	Mounting torque	To Heatsink	M5	2.5		4.7	N.m
Wt	Package Weight					160	g

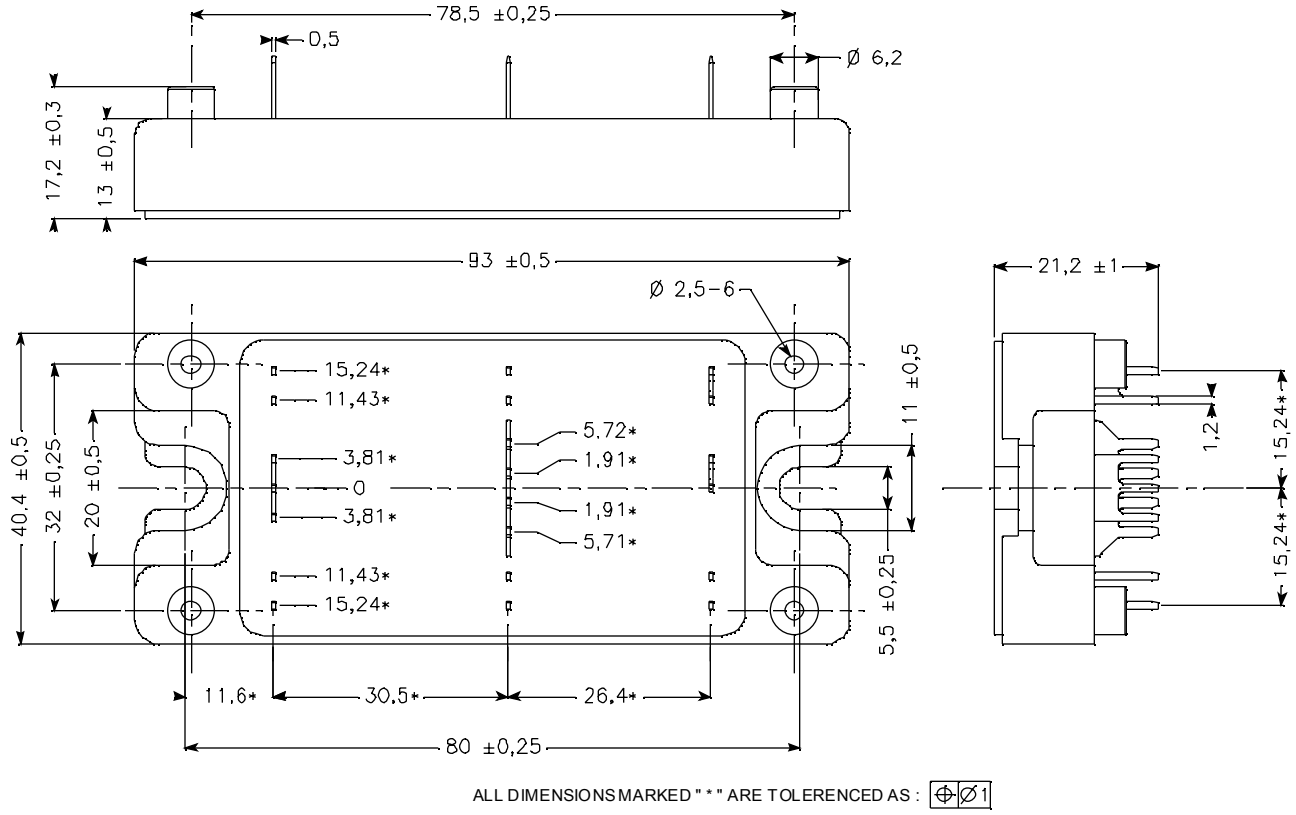
Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

Symbol	Characteristic	Min	Typ	Max	Unit
R_{25}	Resistance @ 25°C		50		kΩ
$B_{25/85}$	T_{25} = 298.15 K		3952		K

$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature
R_T: Thermistor value at T

SP4 Package outline (dimensions in mm)



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See application note APT0501 - Mounting Instructions for SP4 Power Modules on www.microsemi.com

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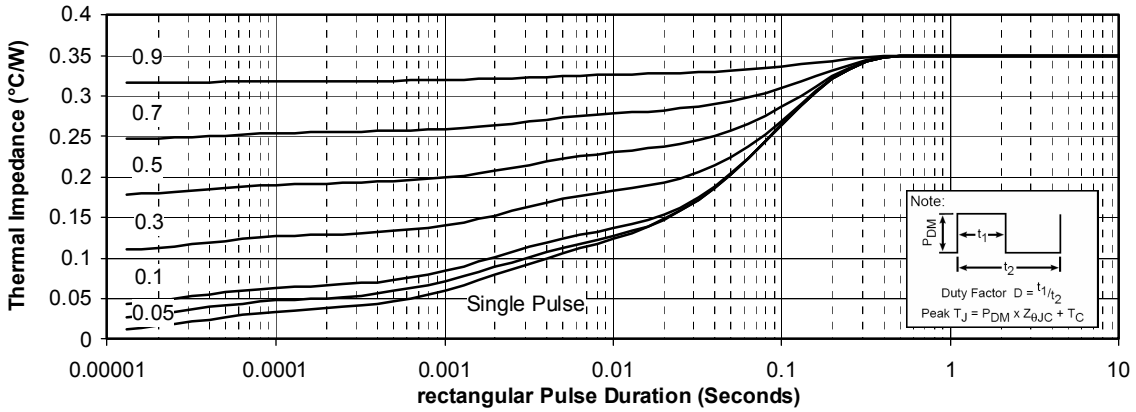
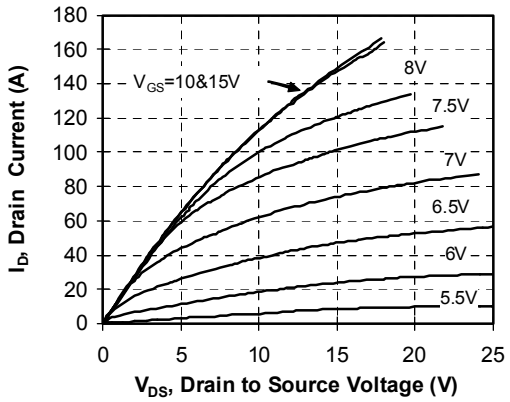
Typical Performance Curve

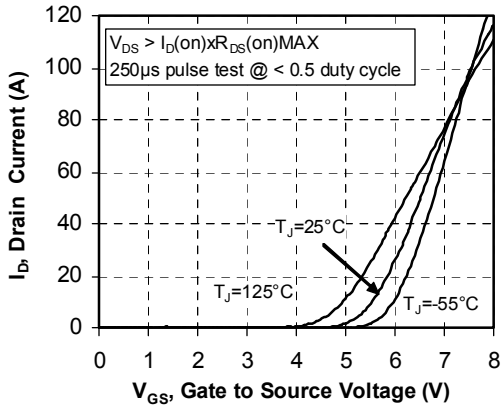
Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration



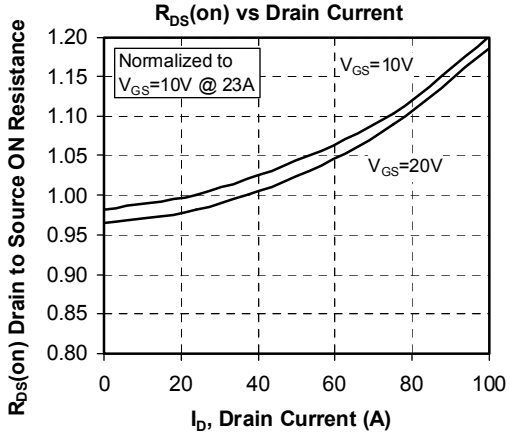
Low Voltage Output Characteristics



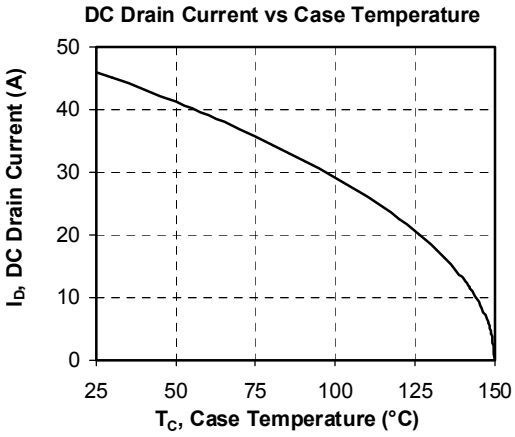
Transfert Characteristics



R_{DS}(on) vs Drain Current



DC Drain Current vs Case Temperature



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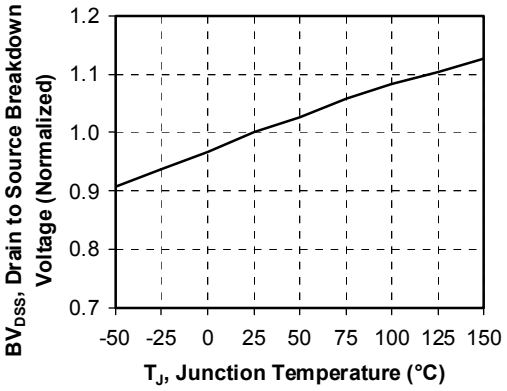
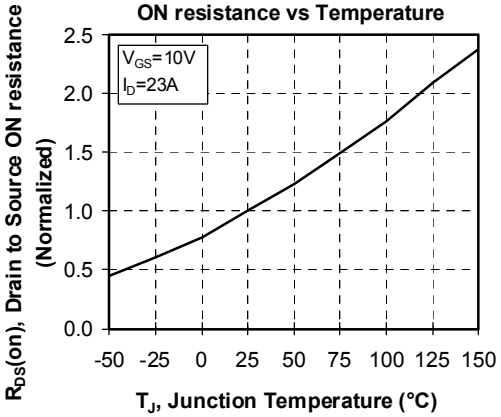
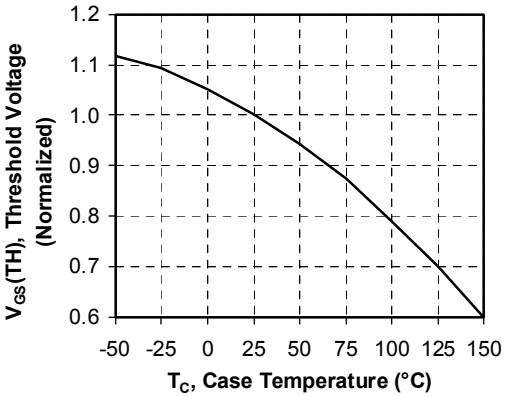
Breakdown Voltage vs Temperature



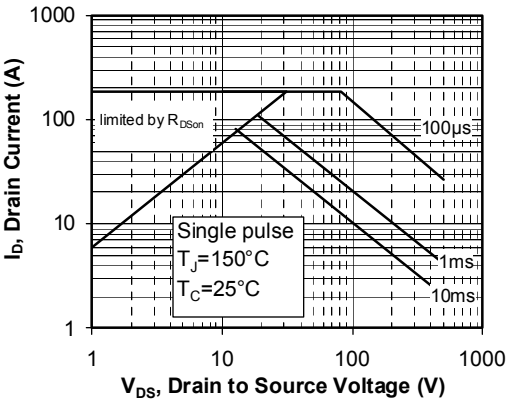
ON resistance vs Temperature



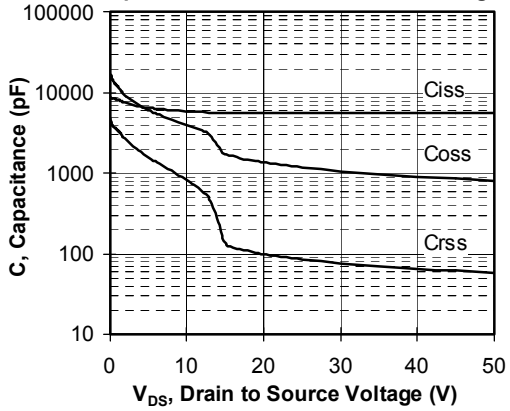
Threshold Voltage vs Temperature



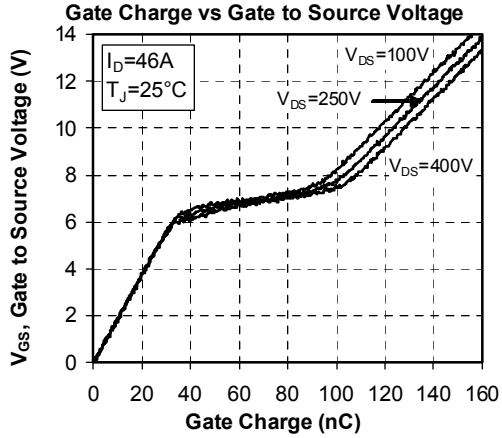
Maximum Safe Operating Area



Capacitance vs Drain to Source Voltage



Gate Charge vs Gate to Source Voltage



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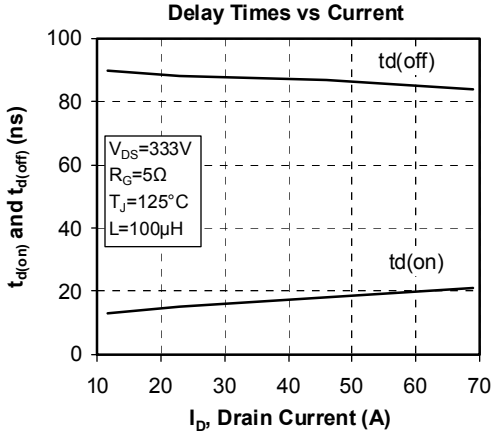
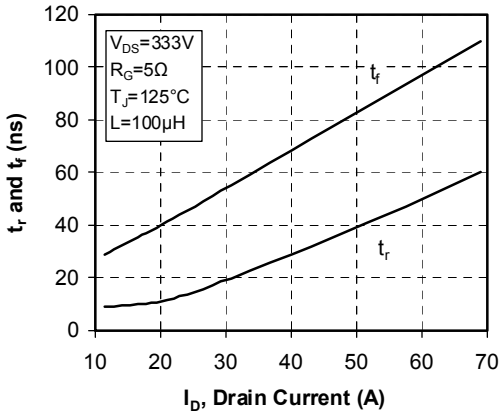
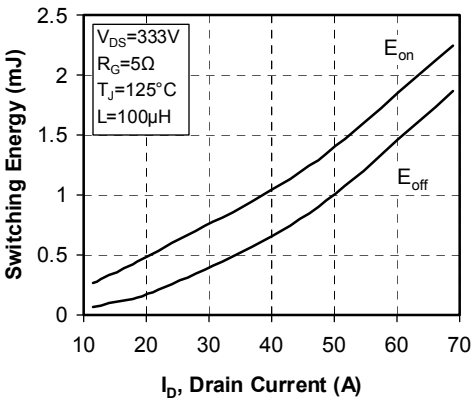
Delay Times vs Current



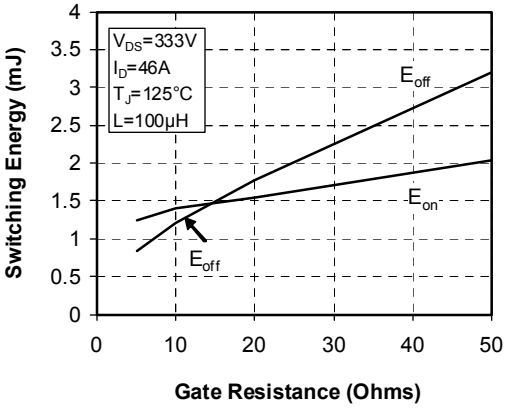
Rise and Fall times vs Current



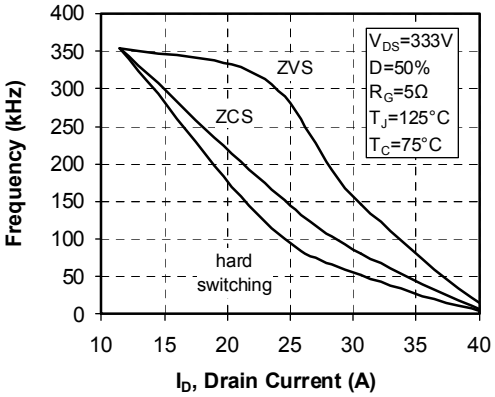
Switching Energy vs Current



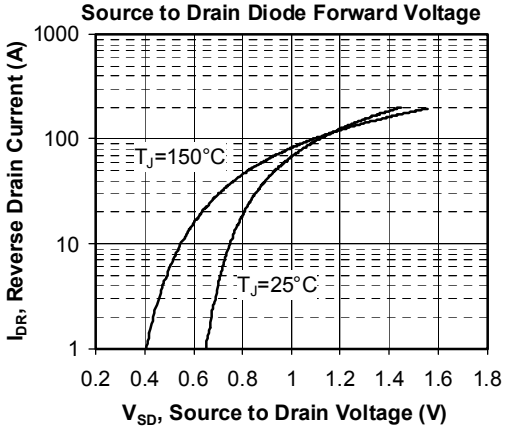
Switching Energy vs Gate Resistance



Operating Frequency vs Drain Current



Source to Drain Diode Forward Voltage



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