Micro Metal Gearmotors





Pololu Micro Metal Gearmotors are available in a variety of different gear ratios, from 5:1 up to 1000:1, and with five different motor options:

- LP 6V: Low-power 6 V with precious metal brushes
- MP 6V: Medium-power 6 V with precious metal brushes
- **HP 6V:** High-power 6 V with precious metal brushes
- **HPCB 6V:** High-power 6 V with long-life carbon brushes
- HPCB 12V: High-power 12 V with long-life carbon brushes



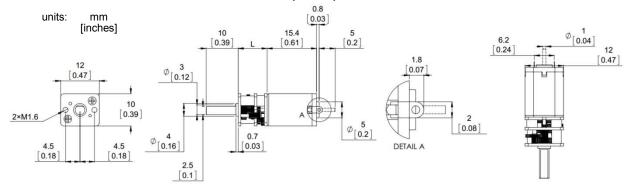


carbon brushes

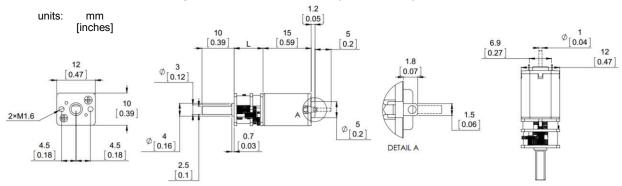
precious metal brushes

Each motor is available with an optional extended rear motor shaft to allow for the addition of an encoder such as Pololu items #4760 (https://www.pololu.com/product/4760) and #4761 (https://www.pololu.com/product/4761) Magnetic Encoder Pair Kits.

Dimensions of versions with carbon brushes (HPCB)



Dimensions of versions with precious metal brushes (HP, MP, LP)



L = 9 mm [0.35 in] for all gear ratios except 1000:1. L = 12.5 mm [0.49 in] for the 1000:1 gear ratio. Max length for M1.6 mounting screws is 1.3 mm (from gearbox mounting surface). Approximate weight is 10 g.

Micro Metal Gearmotors



Performance summary and table of contents

Motor Type	Rated Voltage	Pololu Item #	Gear Ratio	No Load		At Maximum Efficiency					Max	Stall Extrapolation ⁽²⁾		
				Speed	Current	Speed	Torque	Current	Output	Efficiency	Power	Torque	Current	Graph
				RPM	mA	RPM	kg⋅mm	Α	w	%	W	kg⋅mm	Α	Page
Low-Power (LP 6V)		1100, 2200	4.995	(±20%) 2500	(±50%) 50	- (1)	- (1)	- (1)	- (1)	- (1)	0.37	0.5		
	6 V	1099, 2201	9.96	1300	40	- ⁽¹⁾	- ⁽¹⁾	- (1)	- (1)	- (1)	0.37	1.0		
		4780, 4781	15.25	860		640	0.40	0.11	0.27	40	0.37	1.7		3
		993, 2202 1098, 2203	29.86 51.45	450 270		320 200	0.66 1.0	0.11 0.10	0.22	34 34	0.31	2.9 4.4		<u>4</u> 5
		2360, 2209	75.81	180		140	1.3	0.10	0.19	33	0.29	6.4		6
		992, 2204	100.37	130		100	1.7	0.10	0.17	28	0.25	7.4	0.36	7
		1097, 2205 1096, 2206	150.58 210.59	90 65		67 46	2.6 4.1	0.11 0.12	0.18 0.19	28 27	0.25 0.25	11 16		8
		1095, 2207	248.98	54		39	4.1	0.12	0.19	26	0.23	17		10
		1094, 2208	297.92	45		34	4.4	0.09	0.15	27	0.22	20		11
		4790, 4791	379.17	36		29	5.4	0.08	0.16	34	0.27	29		12
		1596, 3058 2362, 2376	986.41 4.995	13 4400		10 - ⁽¹⁾	12 - ⁽¹⁾	0.09	0.12 - ⁽¹⁾	24 - ⁽¹⁾	0.70	55 0.6		13
Medium-Power (MP 6V)		2363, 2377	9.96	2200	70	- (1)	- (1)	- (1)	- (1)	- (1)	0.70	1.1	0.67	
		4782, 4783	15.25	1400		1000	0.47	0.21	0.50	39	0.70	2.0		14
		2364, 2378 2365, 2379	29.86 51.45	720 420		510 310	0.80 1.2	0.21 0.19	0.41 0.38	33 33	0.57 0.55	3.3 5.4		15 16
		2366, 2380	75.81	290		220	1.6	0.19	0.35	34	0.54	7.8		17
	6 V	2367, 2381	100.37	220		170	1.9	0.17	0.32	33	0.50	9.4		18
		2368, 2382	150.58	150		110	2.6	0.15	0.30	33	0.48	13		19
		2369, 2383 2370, 2384	210.59 248.98	100 88		83 69	3.4 4.5	0.16 0.17	0.29	31 31	0.46	17 22		20
		2371, 2385	297.92	73		56	5.0	0.17	0.29	29	0.44	24		22
		4792, 4793	379.17	57		46	6.9	0.16	0.33	34	0.53	36		23
High-Power (HP 6V)	6 V	2372, 3059 1000, 2210	986.41 4.995	22 6100	120	17 - ⁽¹⁾	13 - ⁽¹⁾	0.16	0.23	24 - ⁽¹⁾	- ⁽³⁾	67 1.1	1.6	24
		999, 2211	9.96	3100	100	2300	0.46	0.42	1.1	43	1.6	2.2		25
		4784, 4785	15.25	2000		1600	0.58	0.37	0.95	42	1.5	3.0		26
		1093, 2212	29.86	1000		830	1.0	0.36	0.89	41	1.5	5.7		27
		998, 2213 2361, 2215	51.45 75.81	590 410		490 340	1.5 2.3	0.32 0.34	0.75 0.80	38 40	1.3 1.4	8.6 13		28 29
		1101, 2214	100.37	310		250	2.9	0.33	0.73	37	1.3	17		30
[B]王		997, 2386	150.58	210		170	3.9	0.31	0.68	37	1.2	24		31
		996, 2216 995, 2217	210.59 248.98	150 120		120 100	5.0 5.5	0.32 0.30	0.62 0.59	32 32	1.1	30 34		32 33
		994, 2218	297.92	100		87	6.5	0.30	0.58	31	1.1	40		34
		4794, 4795	379.17	84		70	8.4	0.28	0.61	36	- (3)	55		35
		1595, 2373	986.41	31		26 - ⁽¹⁾	20 - ⁽¹⁾	0.32	0.53		- (3)	120		36
ς.	6 V	3060, 3082 3061, 3071	4.995 9.96	6500 3300	150	2300	0.42	0.51	1.0	33	1.3	0.9 1.7	1.5	37
she		4786, 4787	15.25	2100		1500	0.60	0.49	0.94	32	1.3	2.5		38
Bru		3062, 3072	29.86	1100		840	1.0	0.43	0.85	33	1.2	4.5		39
<u>ة</u> ج		3063, 3073 3064, 3074	51.45 75.81	650 430		490 330	1.6 2.5	0.42	0.80 0.87	32 34	1.2	7.4 11		40
arb SB 6		3065, 3075	100.37	330		260	3.3	0.43	0.86	33	1.3	16		42
High-Power, Carbon Brushes (HPCB 6V)		3066, 3076	150.58	220		170	4.1	0.39	0.73	31	1.1	20		43
		3067, 3077	210.59	160		120	5.9	0.40	0.74	31	1.1	28		44
횬		3068, 3078 3069, 3079	248.98 297.92	130 110		100 85	6.6 7.4	0.40 0.42	0.71 0.65	29 26	1.1	32 34		45 46
Hig		4796, 4797	379.17	85		68	10	0.40	0.71	30	- (3)	50		47
		3070, 3080	986.41	33		26	22	0.39	0.59	25	_ (3)	110	<u> </u>	48
ω		3036, 3047 3037, 3048	4.995 9.96	6800 3400	80	2500	0.43	0.25	1.1	37	1.5 1.5	0.9 1.7	4	49
Brushes	12 V	4788, 4789	15.25	2200		1700	0.43	0.23	1.0	37	1.4	2.5		50
		3038, 3049	29.86	1100		840	1.0	0.23	0.82	30	1.1	3.9		51
u (S		3039, 3050	51.45	650		500	1.5	0.22	0.79	31	1.1	6.7		52
High-Power, Carbon (HPCB 12V)		3040, 3051 3041, 3052	75.81 100.37	450 330		350 260	2.1 2.9	0.20 0.21	0.76 0.78	31 31	1.1 1.1	10 13	0.75	53 54
		3041, 3052	150.58	220		170	4.2	0.21	0.73	28	1.0	18	0.75	55
		3043, 3054	210.59	160		120	5.6	0.21	0.71	28	1.0	25		56
		3044, 3055 3045, 3056	248.98 297.92	130 110		110 87	6.6	0.21 0.21	0.72 0.65	29 26	1.1	30 33		57 58
		4798, 4799	379.17	85		87 67	7.3 11	0.21	0.65	31	- (3)	50		58
		3046, 3057	986.41	35		27	21	0.19	0.59	25	- (3)	100		60

Notes:

- (1) Max efficiency data and performance graphs currently unavailable for all 5:1 gear ratios and LP and MP 10:1 gear ratios.
- (2) Listed stall torques and currents are theoretical extrapolations; units will typically stall well before these points as the motors heat up. Stalling or overloading gearmotors can greatly decrease their lifetimes and even result in immediate damage. The recommended upper limit for instantaneous torque is 25 kg·mm for the 380:1 and 1000:1 gearboxes, and 20 kg·mm for all other gear ratios; we strongly advise keeping applied loads well under these limits. Stalls can also result in rapid (potentially on the order of seconds) thermal damage to the motor windings and brushes, especially for the versions that use high-power (HP and HPCB) motors; a general recommendation for brushed DC motor operation is 25% or less of the stall current.
- (3) Operating these versions at maximum power is likely to damage the gearboxes.

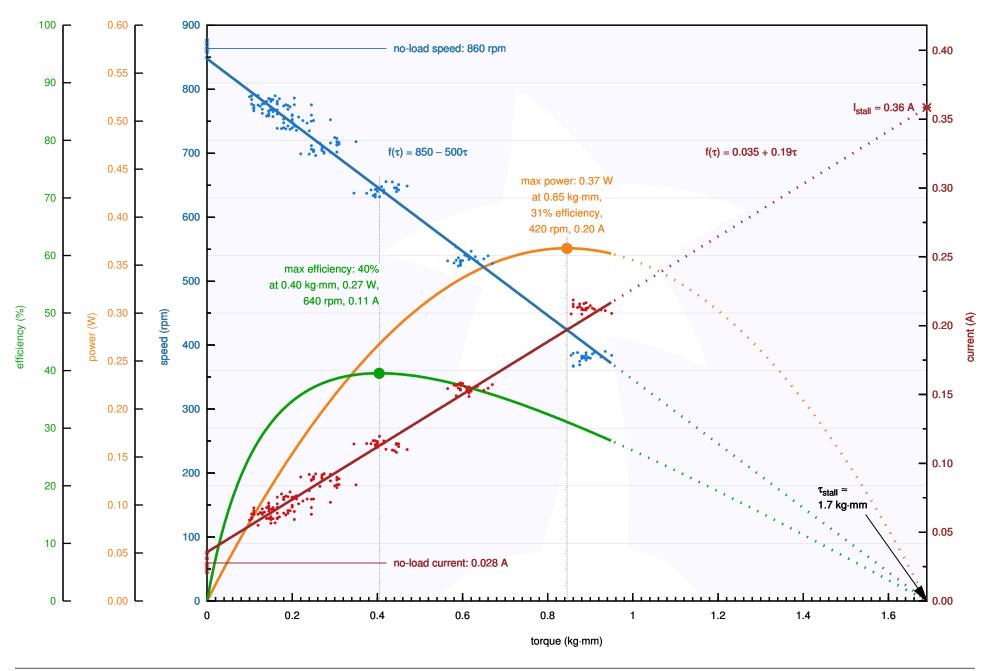
Micro Metal Gearmotors



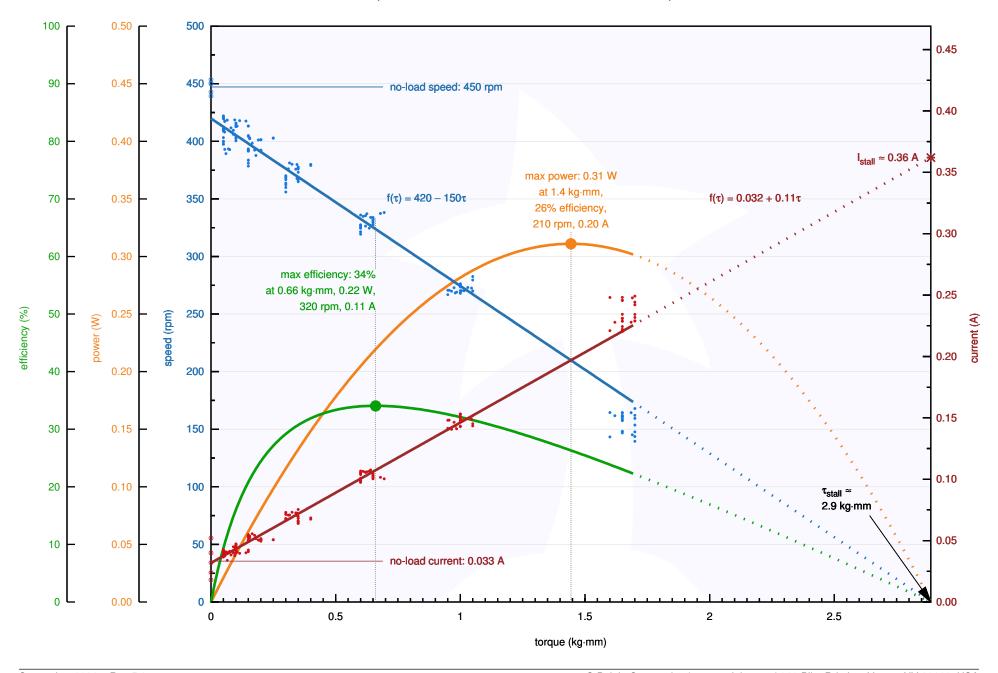
Exact gear ratios

Nominal	Exact		Nominal	Exact	
5:1	$\frac{27 \times 37}{20 \times 10}$	= 4.995 : 1	150:1	$\frac{25 \times 32 \times 34 \times 35 \times 38}{12 \times 11 \times 14 \times 13 \times 10}$	≈ 150.5828 : 1
10:1	$\frac{35 \times 37}{13 \times 10}$	≈ 9.9615 : 1	210:1	$\frac{25 \times 34 \times 34 \times 35 \times 38}{12 \times 9 \times 13 \times 13 \times 10}$	≈ 210.5906 : 1
15:1	$\frac{25 \times 34 \times 31}{12 \times 9 \times 16}$	≈ 15.2488 : 1	250:1	$\frac{25 \times 34 \times 37 \times 35 \times 38}{12 \times 10 \times 10 \times 14 \times 10}$	≈ 248.9792 : 1
30:1	$\frac{31 \times 33 \times 35 \times 34}{16 \times 14 \times 13 \times 14}$	≈ 29.8609 : 1	298:1	$\frac{25 \times 34 \times 37 \times 35 \times 38}{12 \times 9 \times 10 \times 13 \times 10}$	≈ 297.9238 : 1
50:1	$\frac{32 \times 33 \times 35 \times 38}{15 \times 14 \times 13 \times 10}$	≈ 51.4462: 1	380:1	$\frac{25 \times 35 \times 39 \times 36 \times 39}{12 \times 9 \times 9 \times 13 \times 10}$	= 379.16: 1
75 : 1	$\frac{34 \times 34 \times 35 \times 38}{13 \times 12 \times 13 \times 10}$	≈ 75.8126 : 1	1000:1	$\frac{25 \times 34 \times 35 \times 34 \times 34 \times 34 \times 27}{12 \times 9 \times 12 \times 14 \times 14 \times 14 \times 9}$	≈ 986.4064 : 1
100:1	$\frac{35 \times 37 \times 35 \times 38}{12 \times 11 \times 13 \times 10}$	≈ 100.3700 : 1			

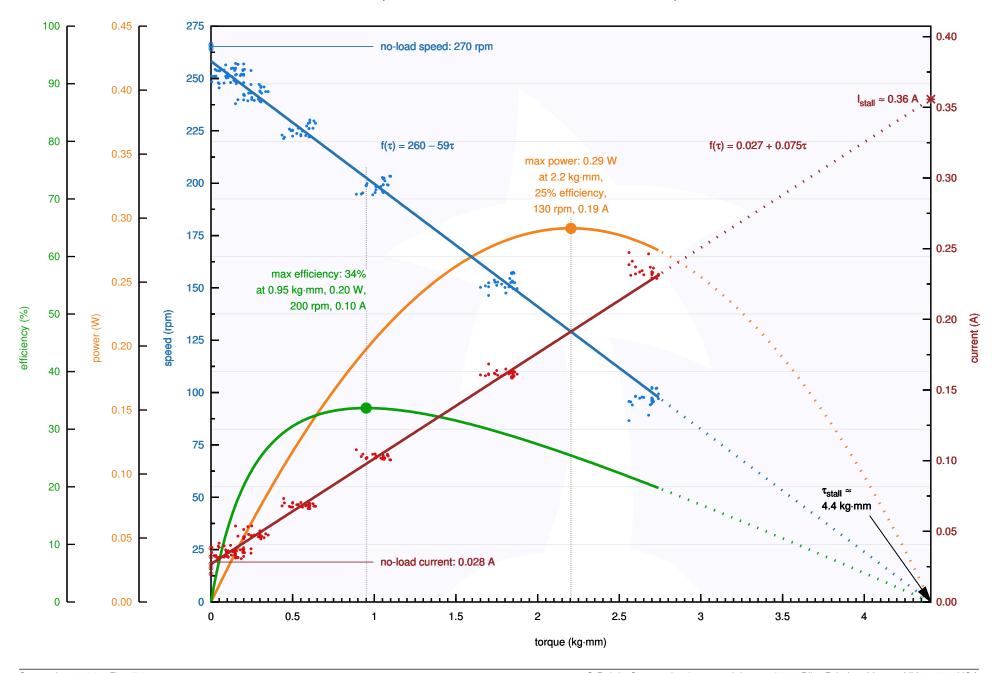
Pololu Items #4780, #4781 (15:1 Micro Metal Gearmotor LP 6V) Performance at 6 V



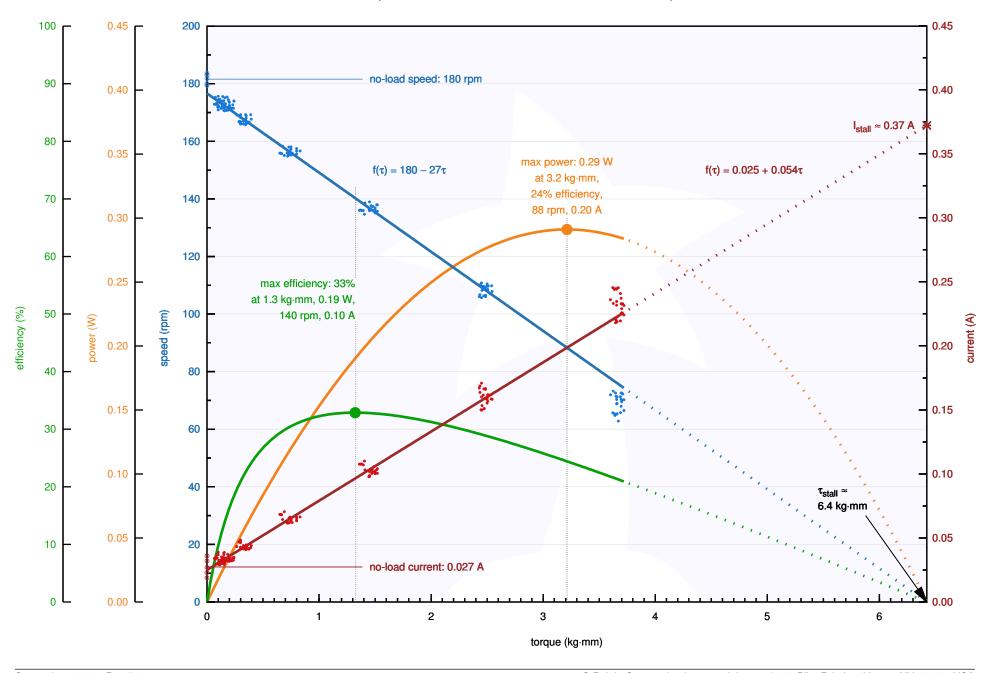
Pololu Items #993, #2202 (30:1 Micro Metal Gearmotor LP 6V) Performance at 6 V



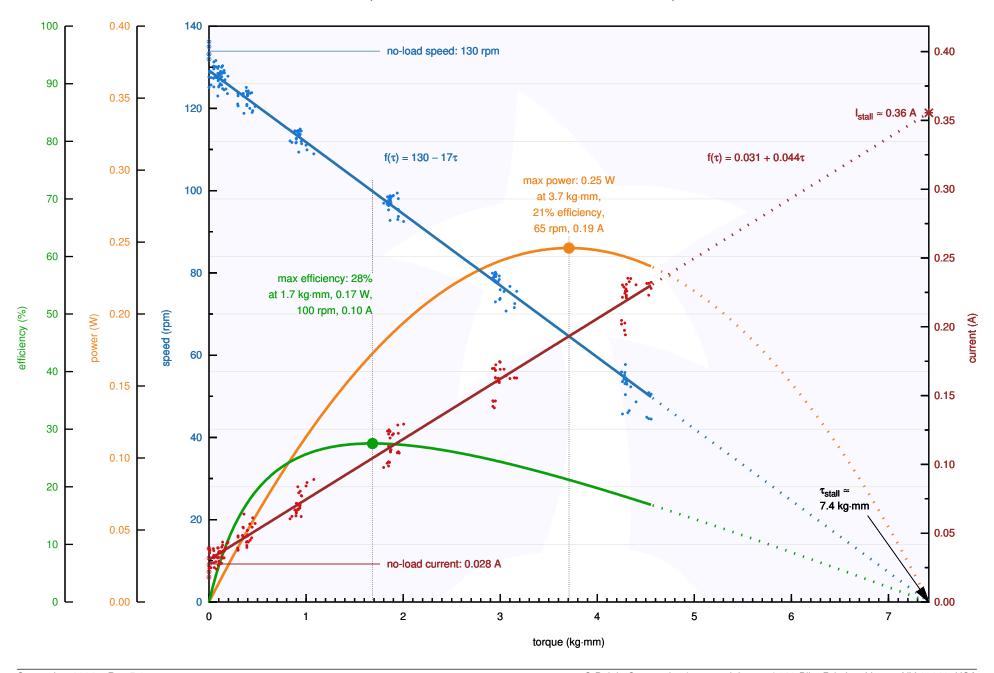
Pololu Items #1098, #2203 (50:1 Micro Metal Gearmotor LP 6V) Performance at 6 V



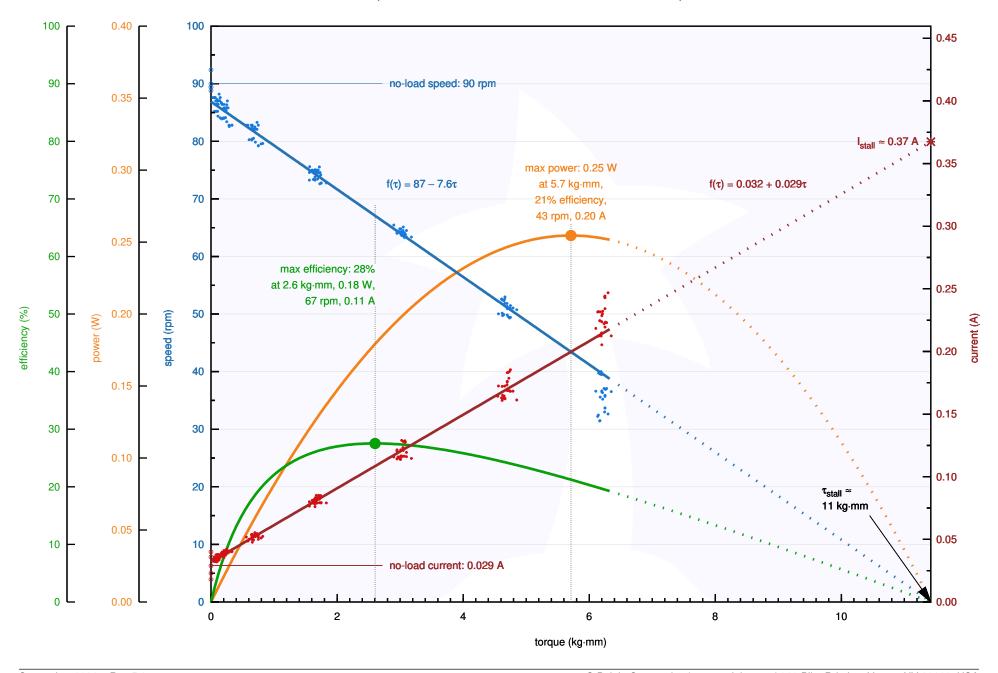
Pololu Items #2360, #2209 (75:1 Micro Metal Gearmotor LP 6V) Performance at 6 V



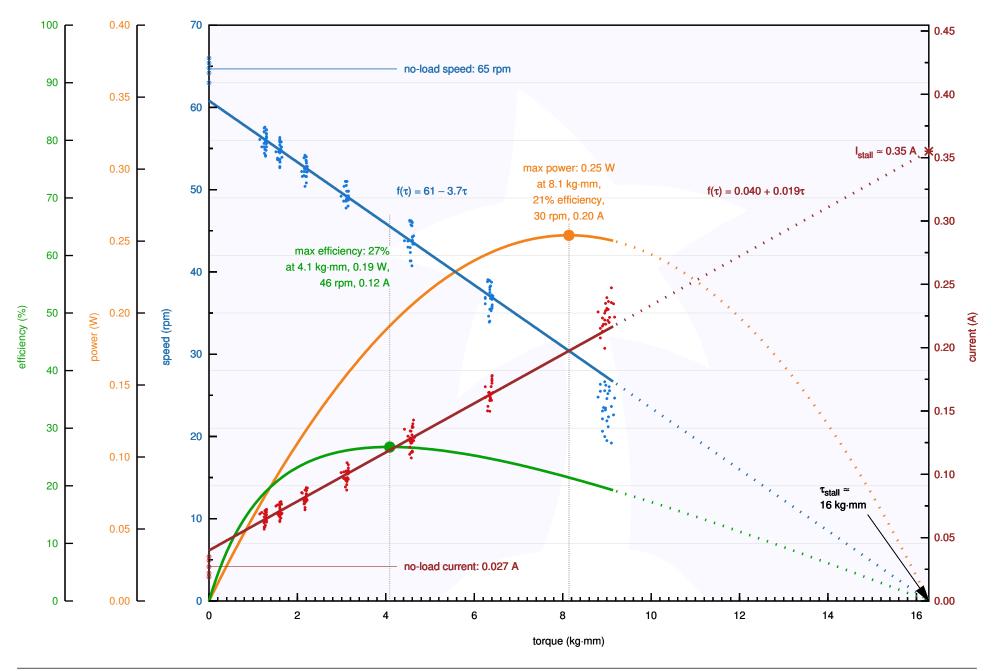
Pololu Items #992, #2204 (100:1 Micro Metal Gearmotor LP 6V) Performance at 6 V



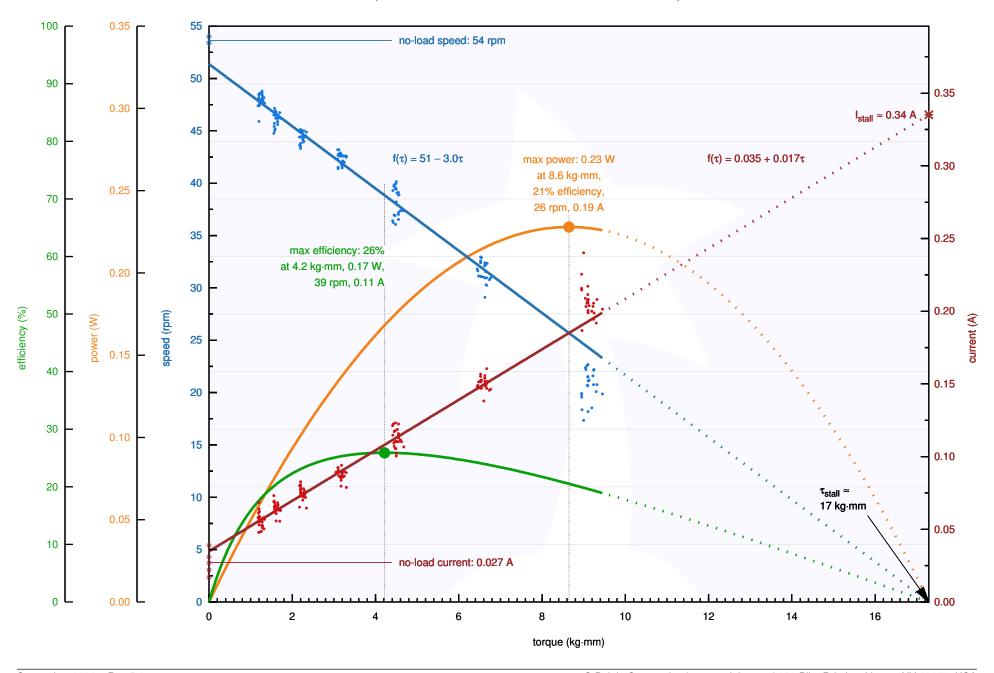
Pololu Items #1097, #2205 (150:1 Micro Metal Gearmotor LP 6V) Performance at 6 V



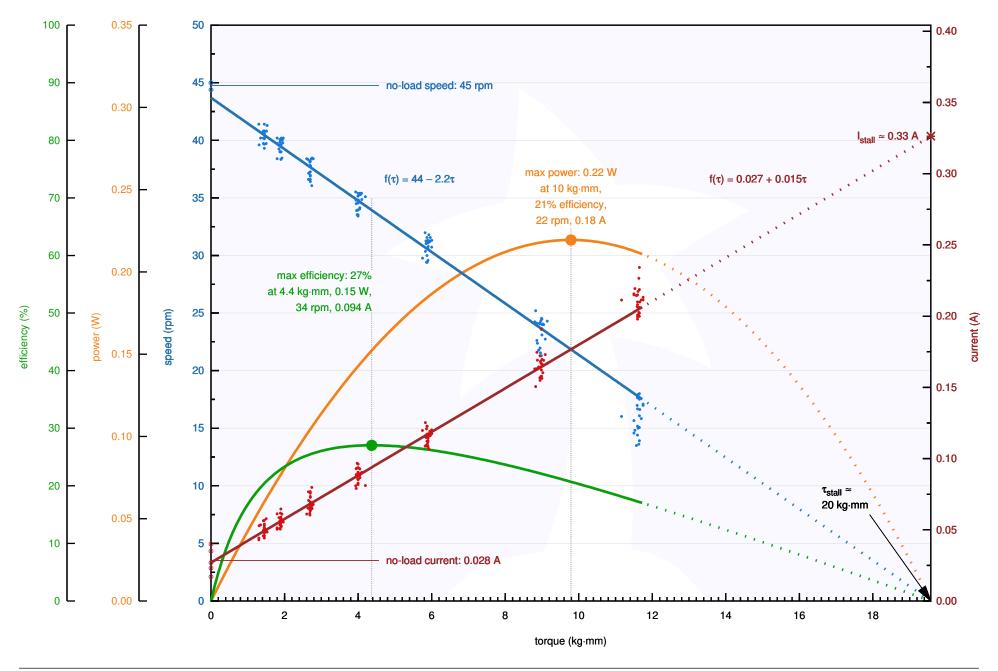
Pololu Items #1096, #2206 (210:1 Micro Metal Gearmotor LP 6V) Performance at 6 V



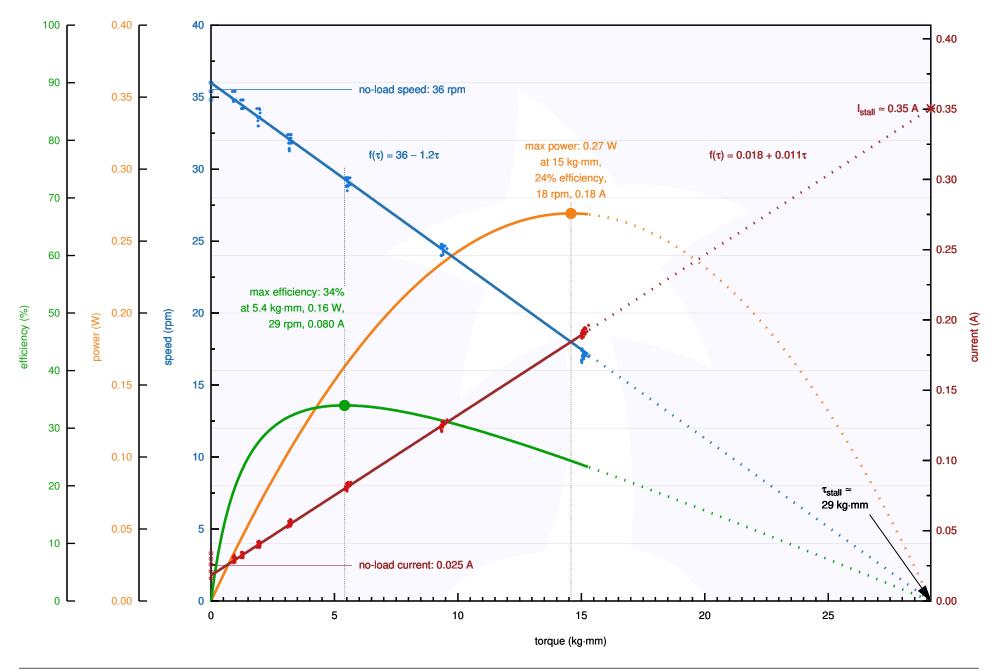
Pololu Items #1095, #2207 (250:1 Micro Metal Gearmotor LP 6V) Performance at 6 V



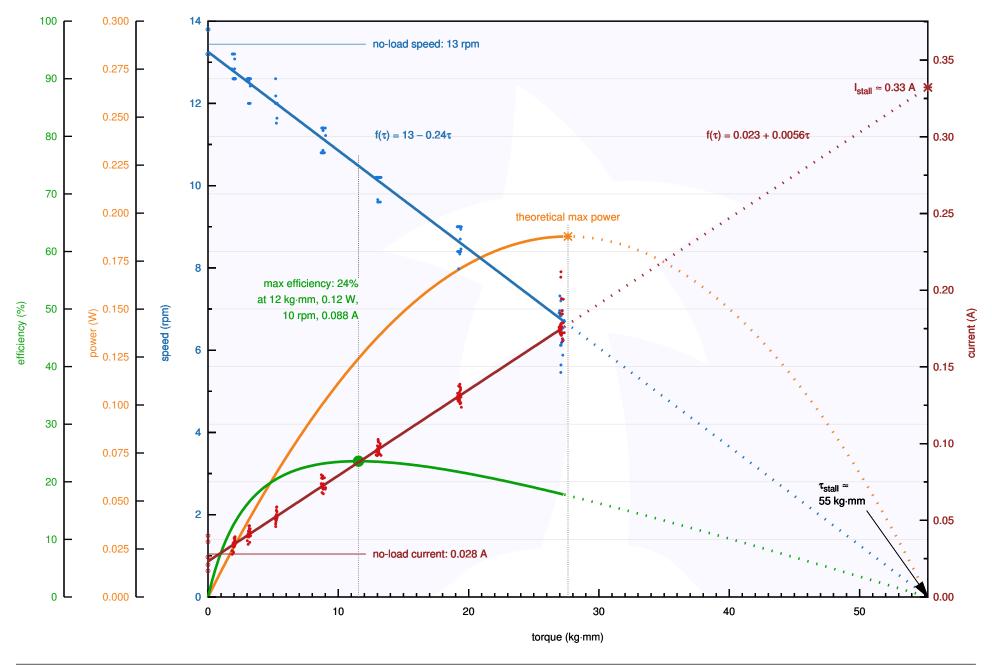
Pololu Items #1094, #2208 (298:1 Micro Metal Gearmotor LP 6V) Performance at 6 V



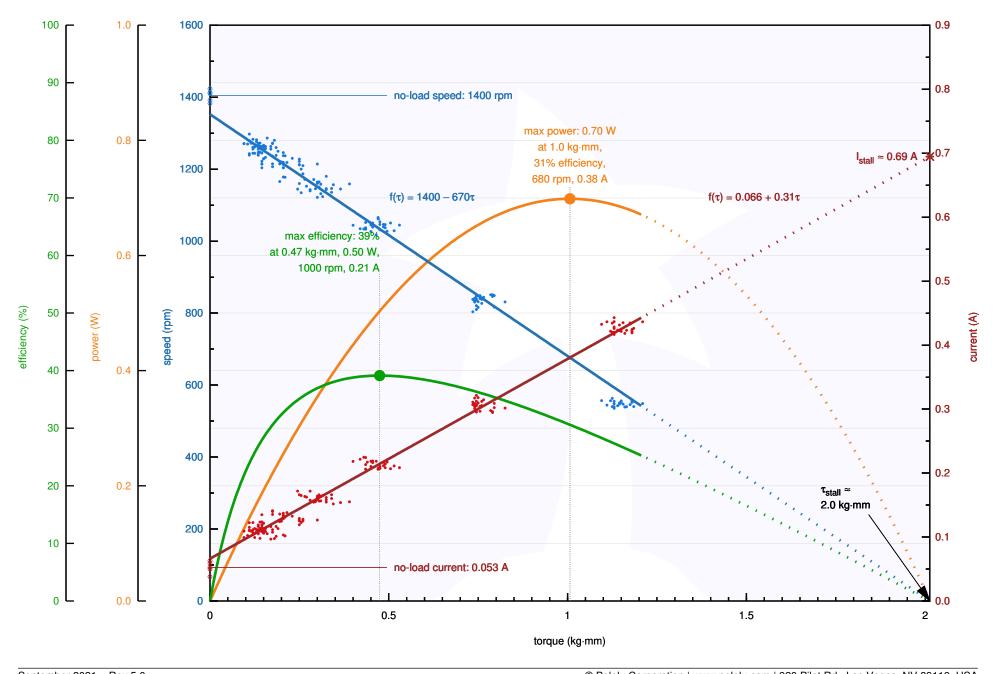
Pololu Items #4790, #4791 (380:1 Micro Metal Gearmotor LP 6V) Performance at 6 V



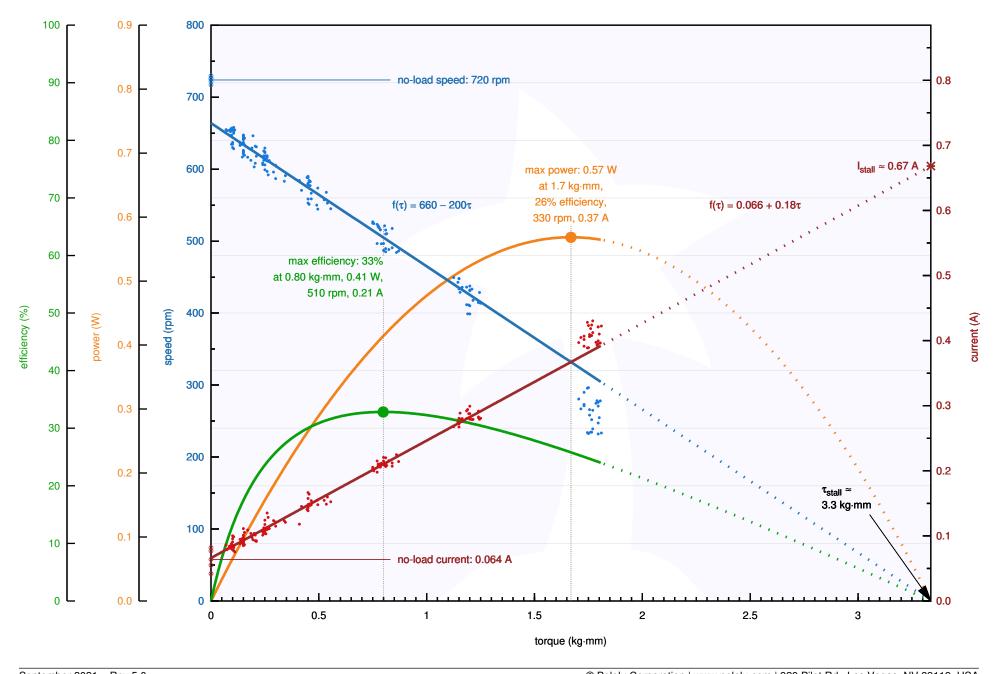
Pololu Items #1596, #3058 (1000:1 Micro Metal Gearmotor LP 6V) Performance at 6 V



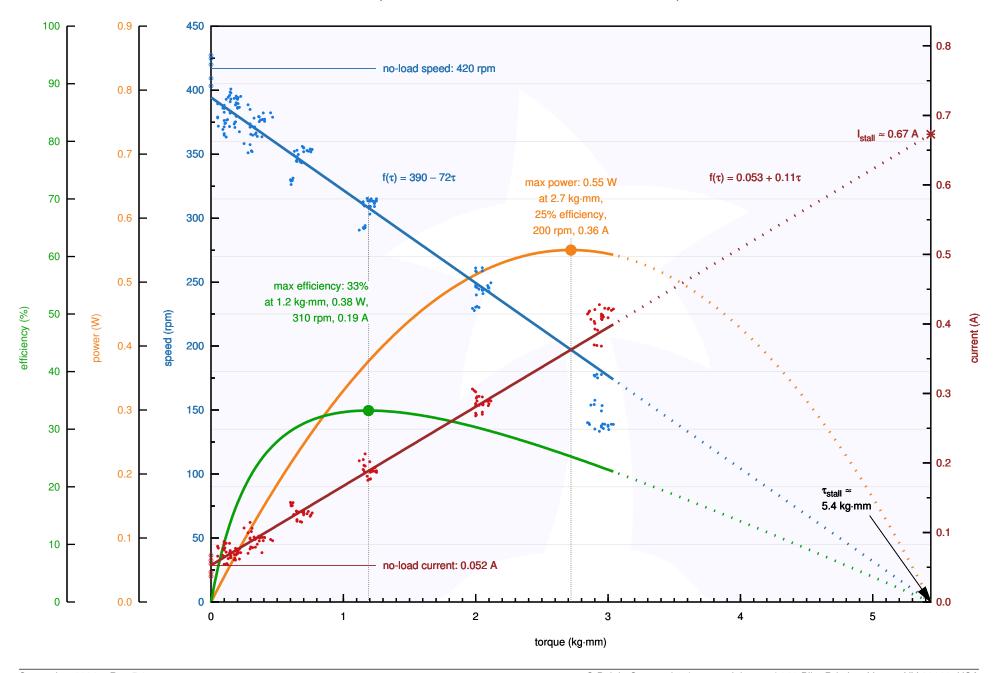
Pololu Items #4782, #4783 (15:1 Micro Metal Gearmotor MP 6V) Performance at 6 V



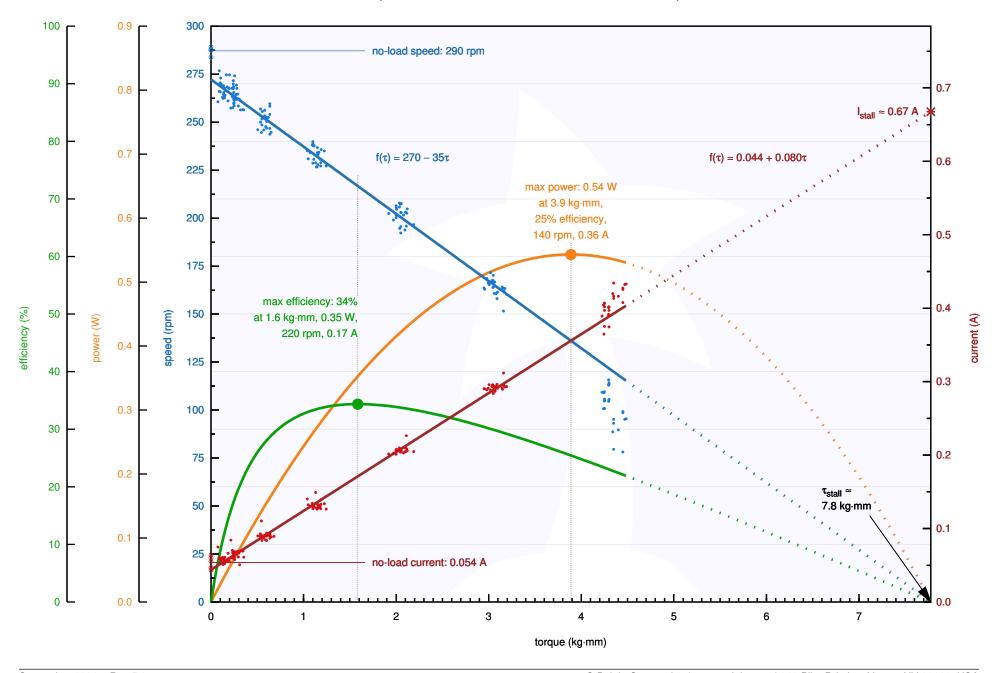
Pololu Items #2364, #2378 (30:1 Micro Metal Gearmotor MP 6V) Performance at 6 V



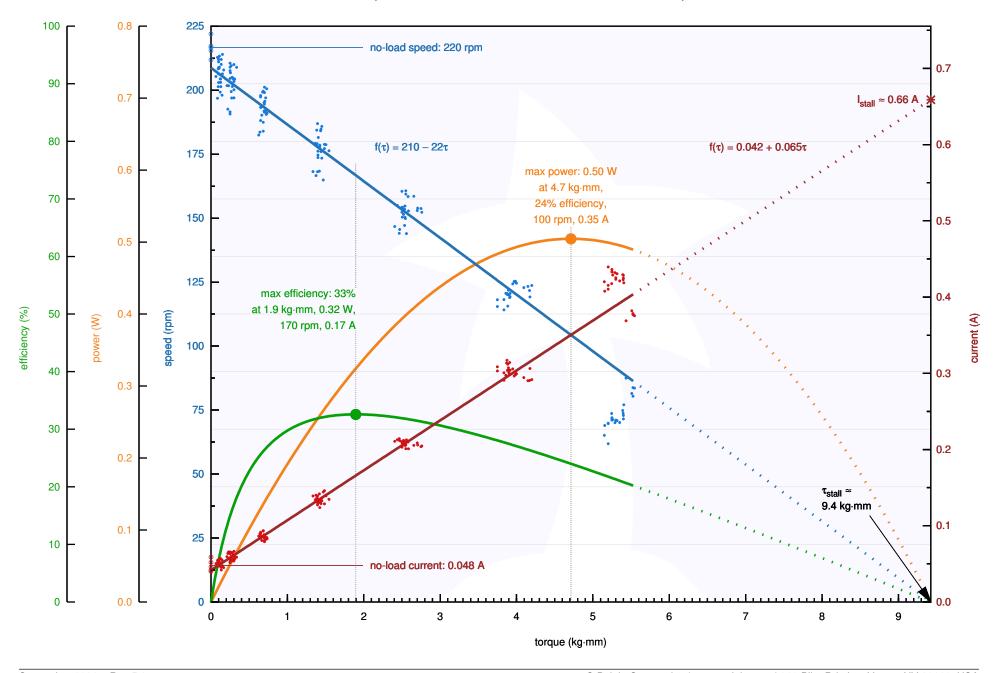
Pololu Items #2365, #2379 (50:1 Micro Metal Gearmotor MP 6V) Performance at 6 V



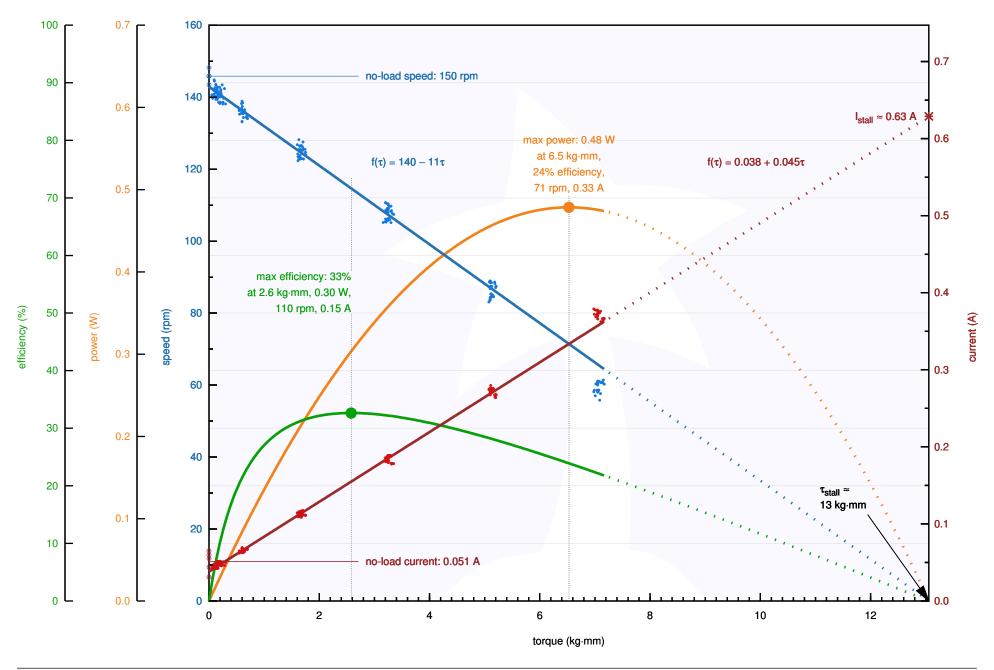
Pololu Items #2366, #2380 (75:1 Micro Metal Gearmotor MP 6V) Performance at 6 V



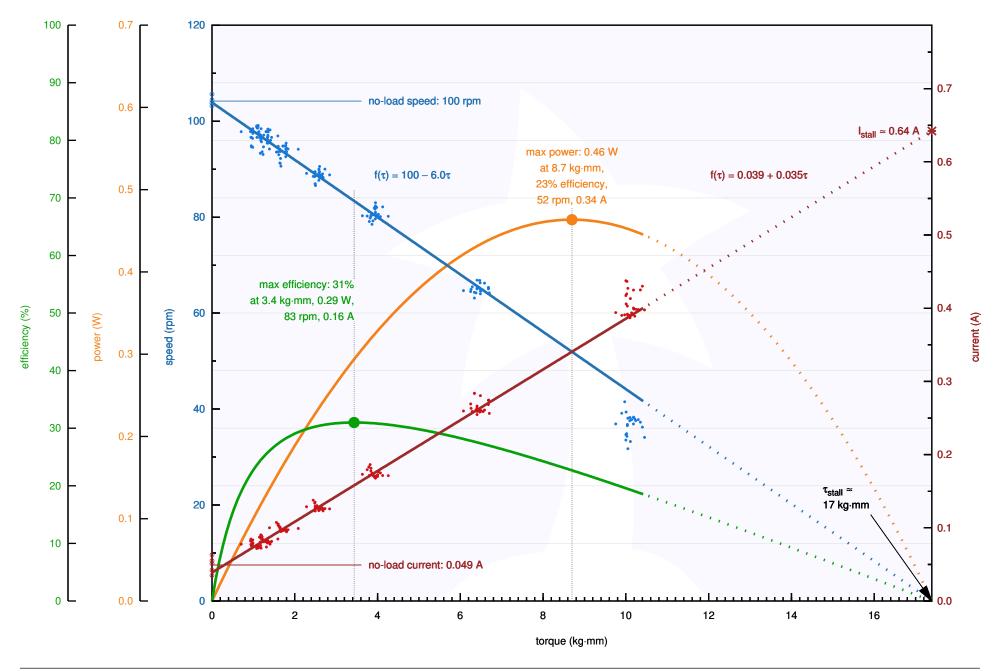
Pololu Items #2367, #2381 (100:1 Micro Metal Gearmotor MP 6V) Performance at 6 V



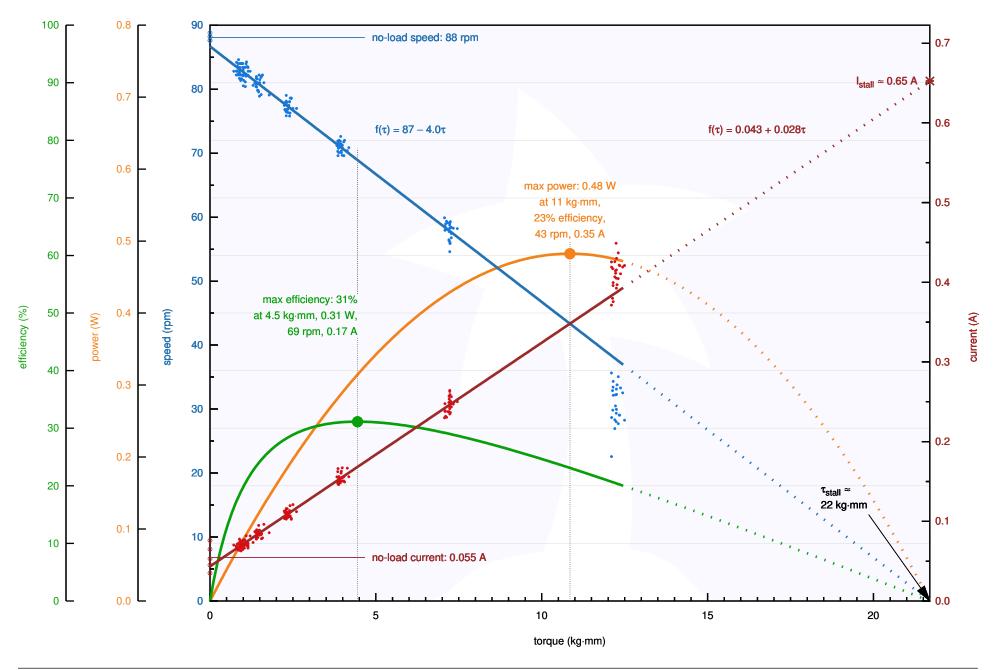
Pololu Items #2368, #2382 (150:1 Micro Metal Gearmotor MP 6V) Performance at 6 V



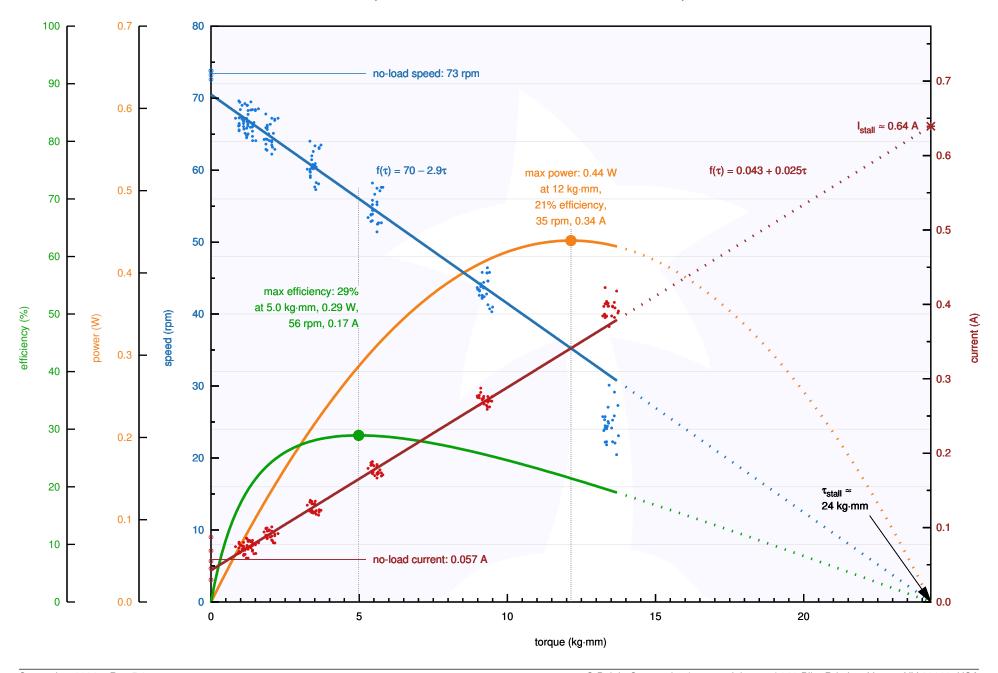
Pololu Items #2369, #2383 (210:1 Micro Metal Gearmotor MP 6V) Performance at 6 V



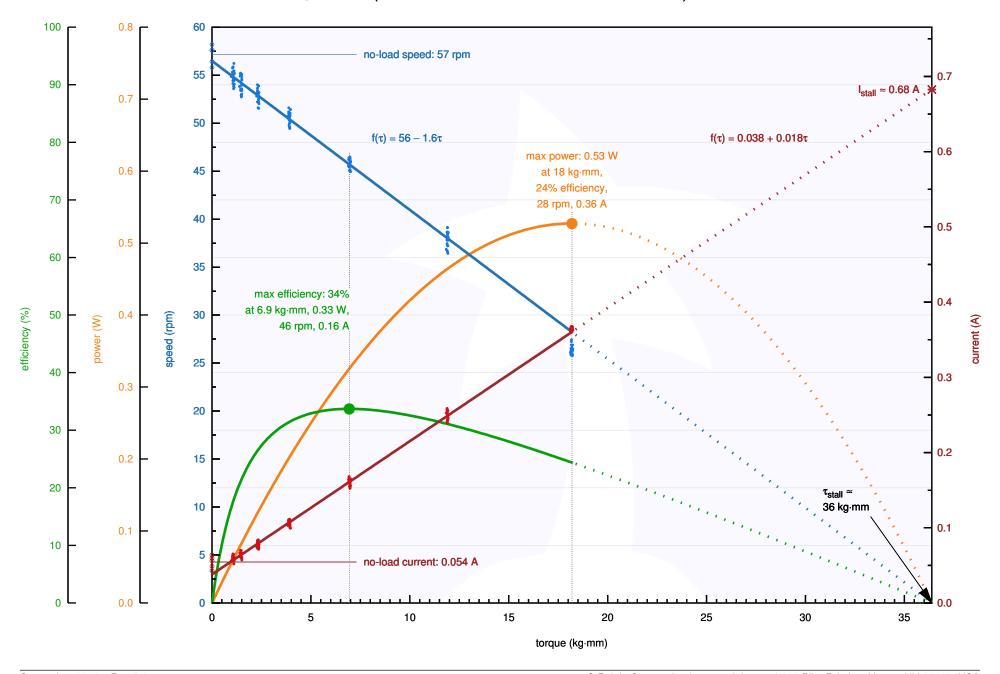
Pololu Items #2370, #2384 (250:1 Micro Metal Gearmotor MP 6V) Performance at 6 V



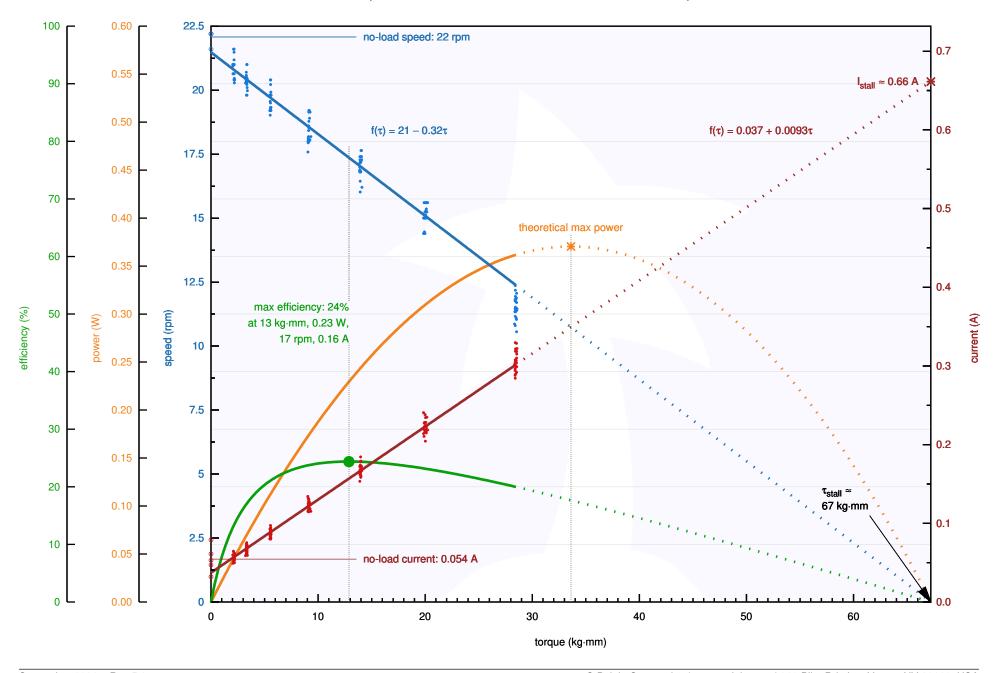
Pololu Items #2371, #2385 (298:1 Micro Metal Gearmotor MP 6V) Performance at 6 V



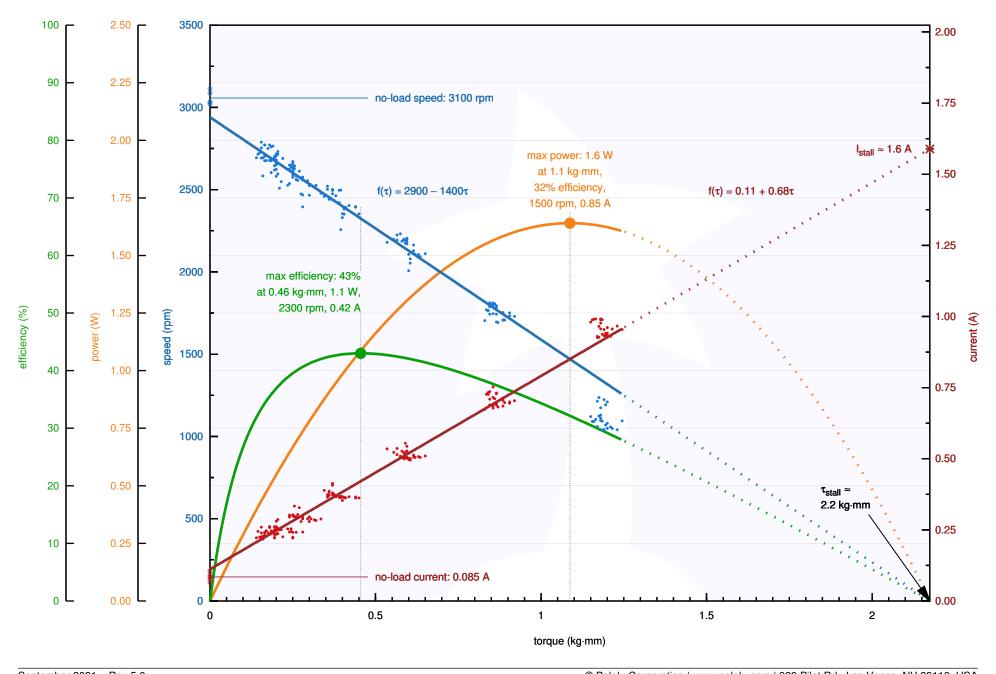
Pololu Items #4792, #4793 (380:1 Micro Metal Gearmotor MP 6V) Performance at 6 V



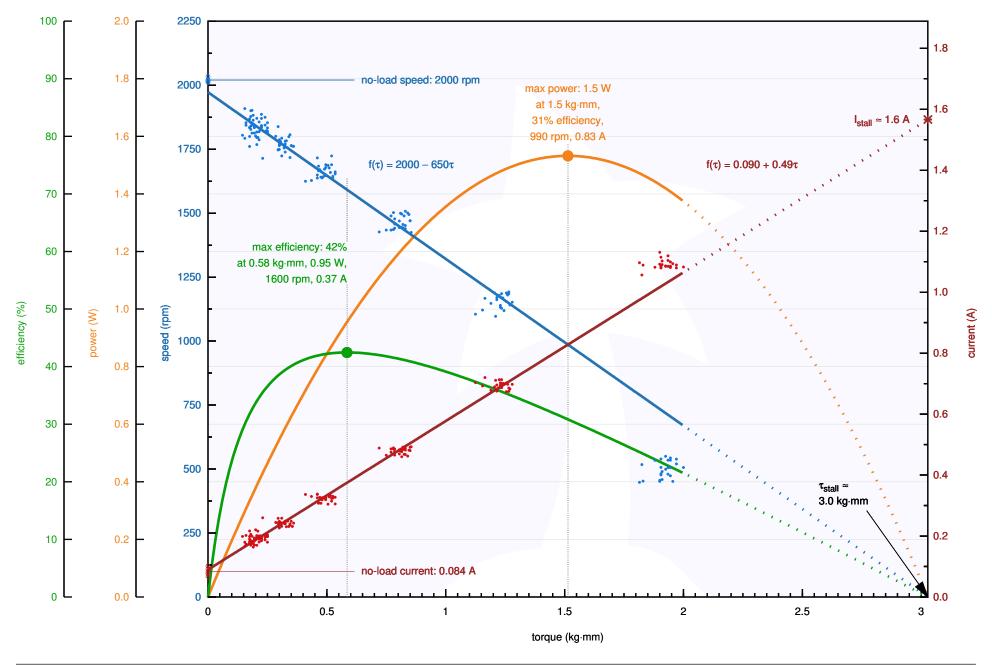
Pololu Items #2372, #3059 (1000:1 Micro Metal Gearmotor MP 6V) Performance at 6 V



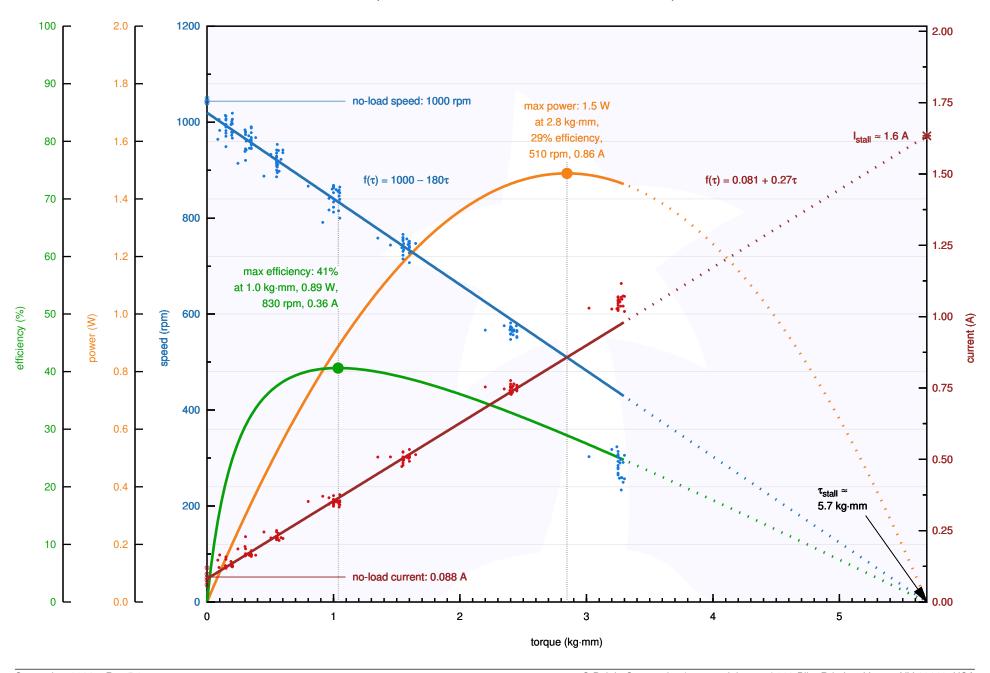
Pololu Items #999, #2211 (10:1 Micro Metal Gearmotor HP 6V) Performance at 6 V



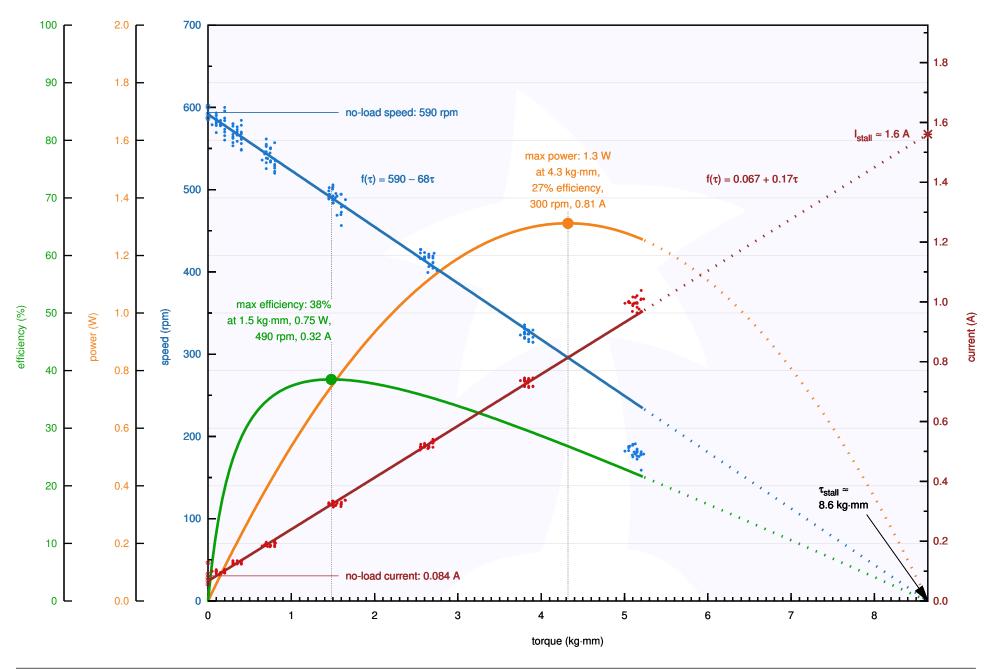
Pololu Items #4784, #4785 (15:1 Micro Metal Gearmotor HP 6V) Performance at 6 V



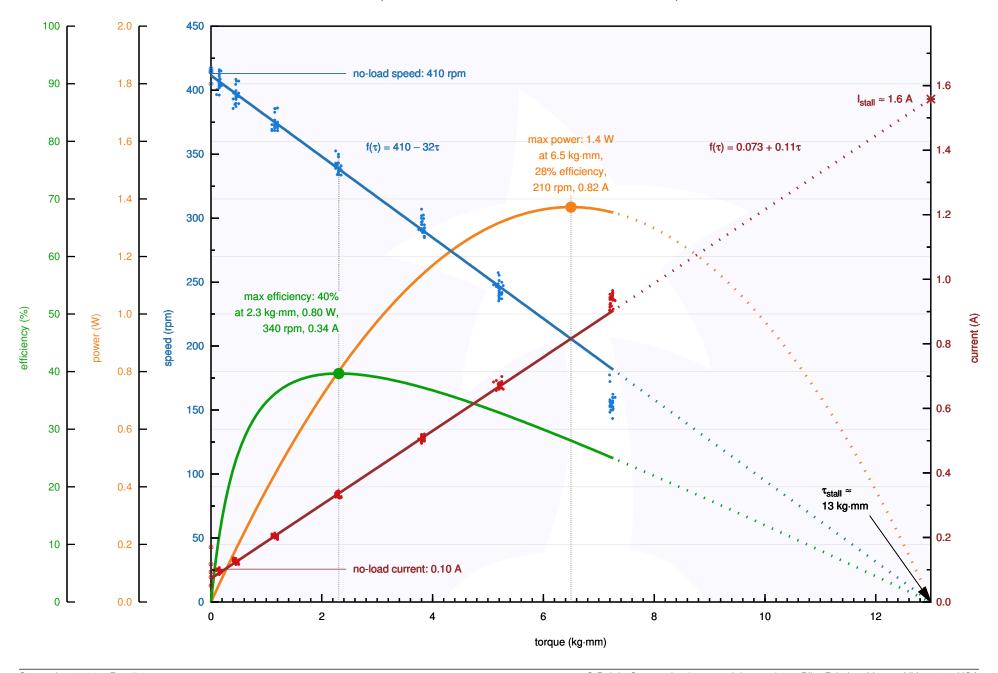
Pololu Items #1093, #2212 (30:1 Micro Metal Gearmotor HP 6V) Performance at 6 V



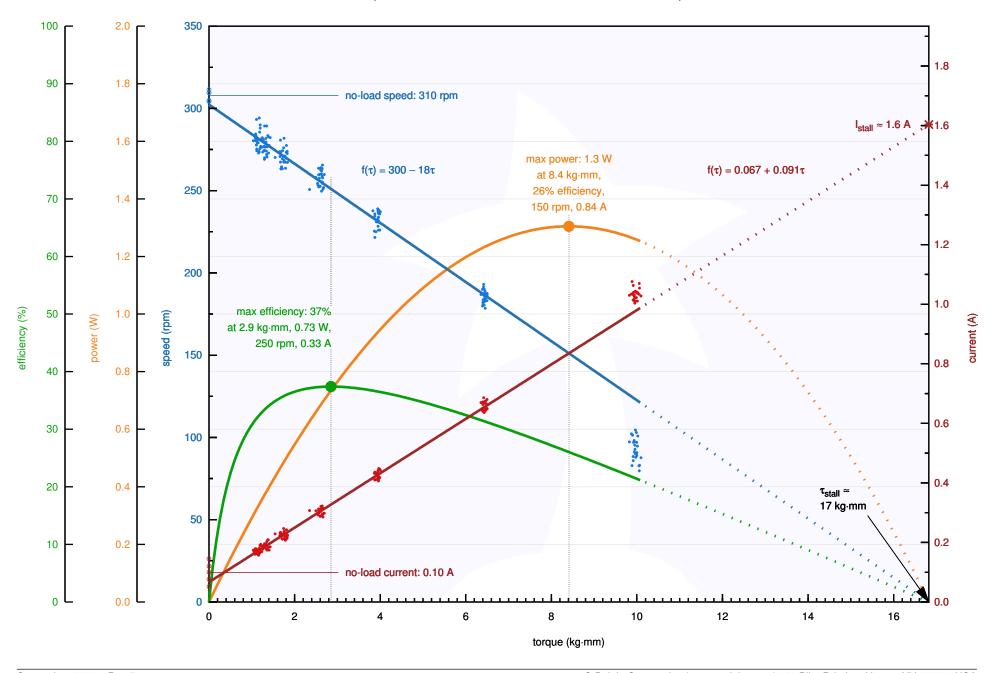
Pololu Items #998, #2213 (50:1 Micro Metal Gearmotor HP 6V) Performance at 6 V



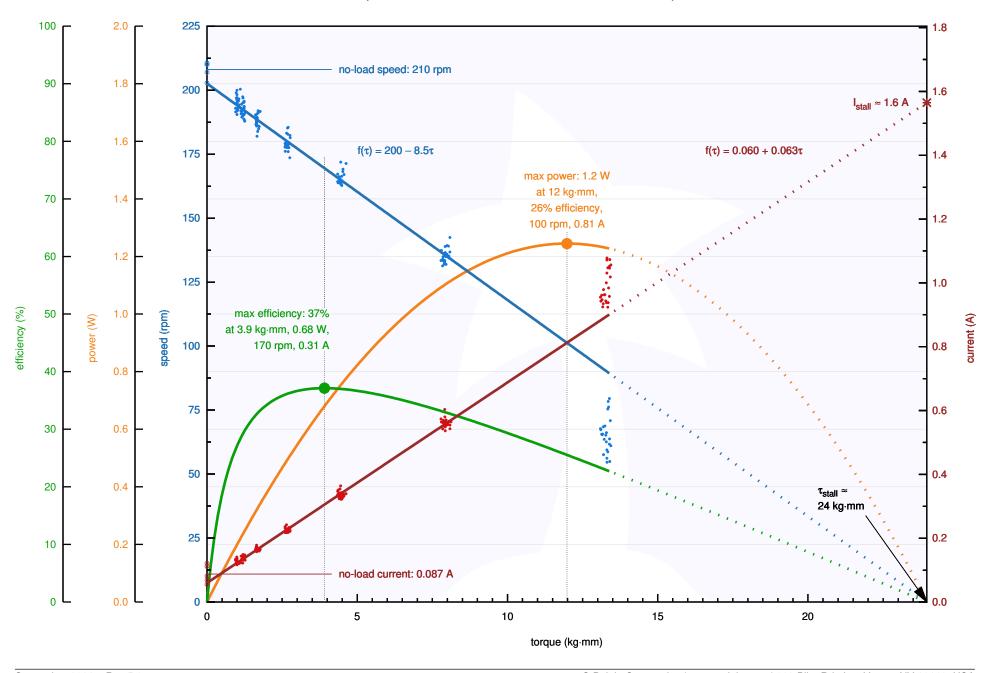
Pololu Items #2361, #2215 (75:1 Micro Metal Gearmotor HP 6V) Performance at 6 V



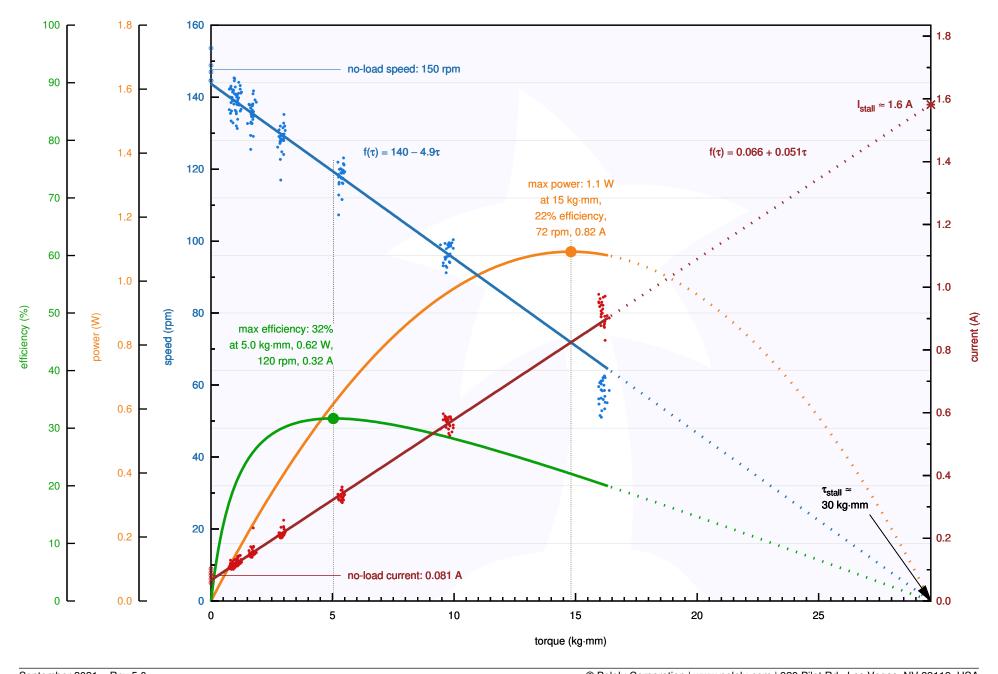
Pololu Items #1101, #2214 (100:1 Micro Metal Gearmotor HP 6V) Performance at 6 V



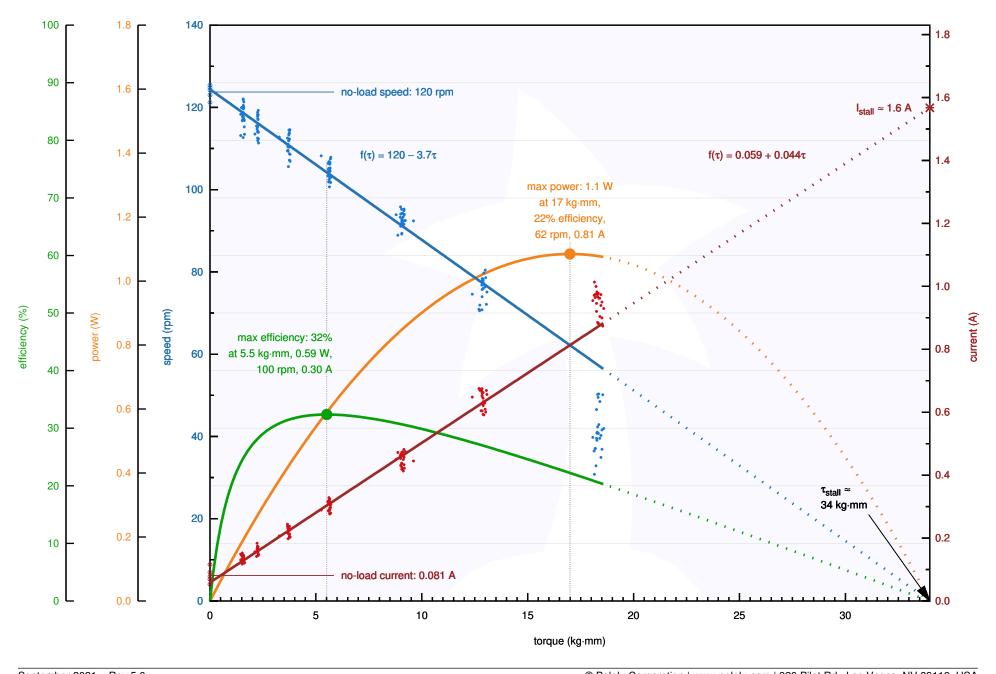
Pololu Items #997, #2386 (150:1 Micro Metal Gearmotor HP 6V) Performance at 6 V



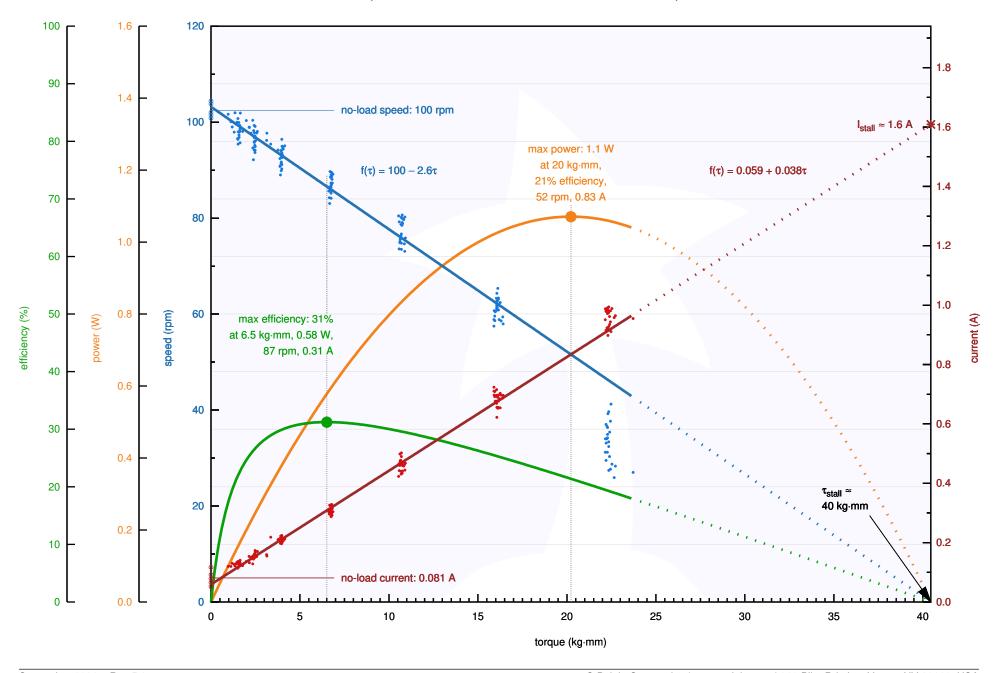
Pololu Items #996, #2216 (210:1 Micro Metal Gearmotor HP 6V) Performance at 6 V



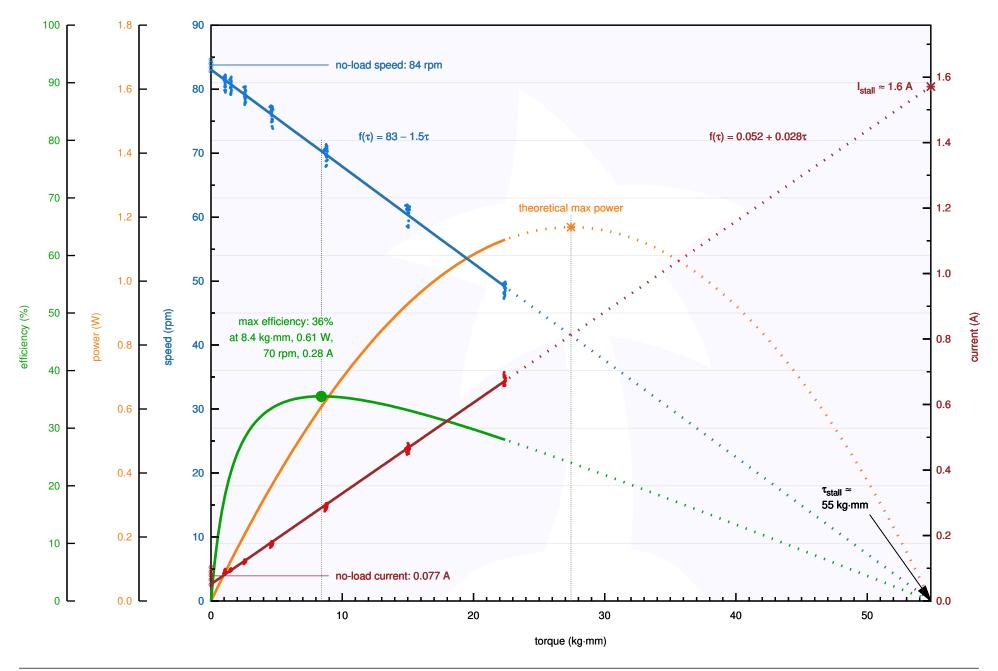
Pololu Items #995, #2217 (250:1 Micro Metal Gearmotor HP 6V) Performance at 6 V



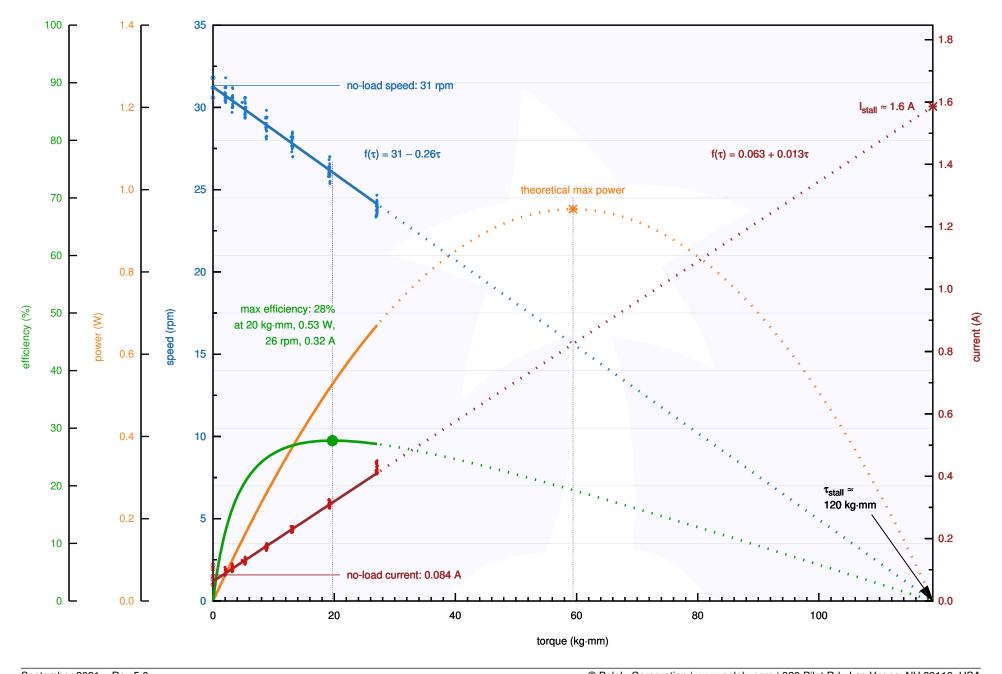
Pololu Items #994, #2218 (298:1 Micro Metal Gearmotor HP 6V) Performance at 6 V



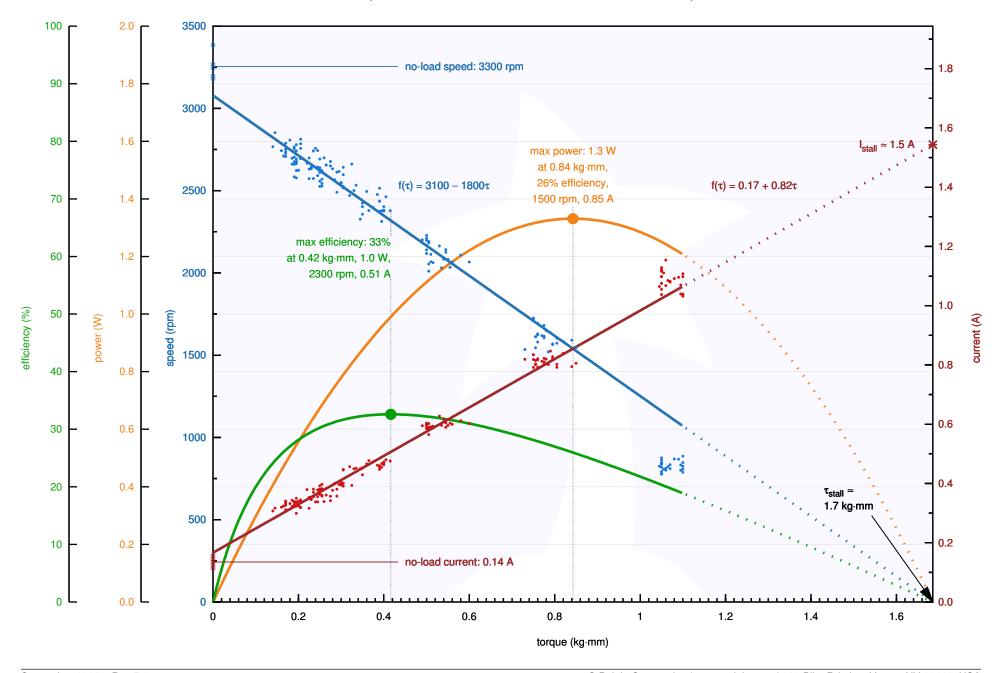
Pololu Items #4794, #4795 (380:1 Micro Metal Gearmotor HP 6V) Performance at 6 V



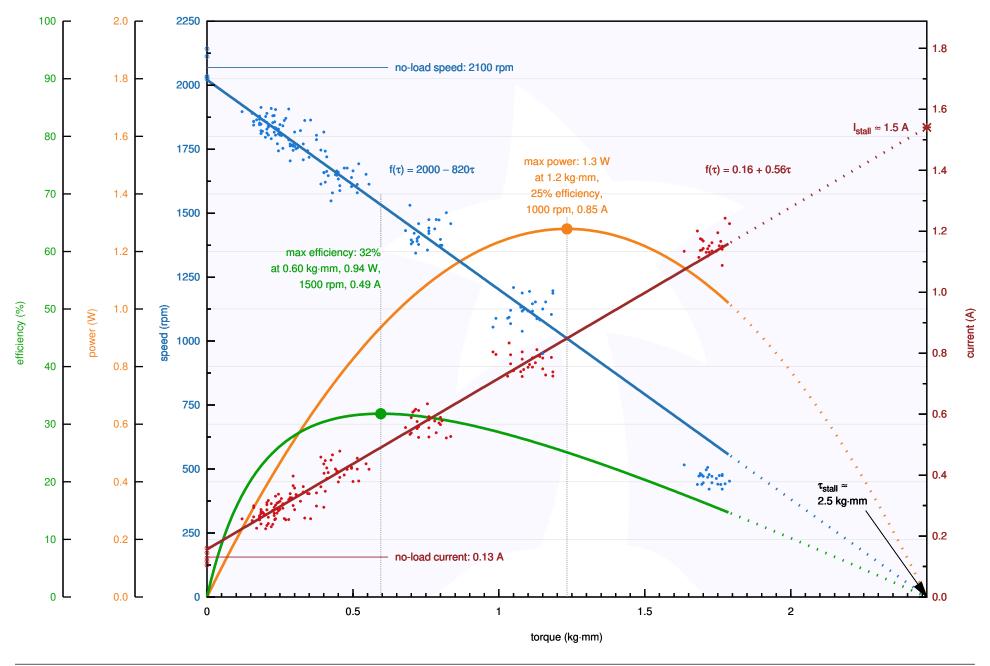
Pololu Items #1595, #2373 (1000:1 Micro Metal Gearmotor HP 6V) Performance at 6 V



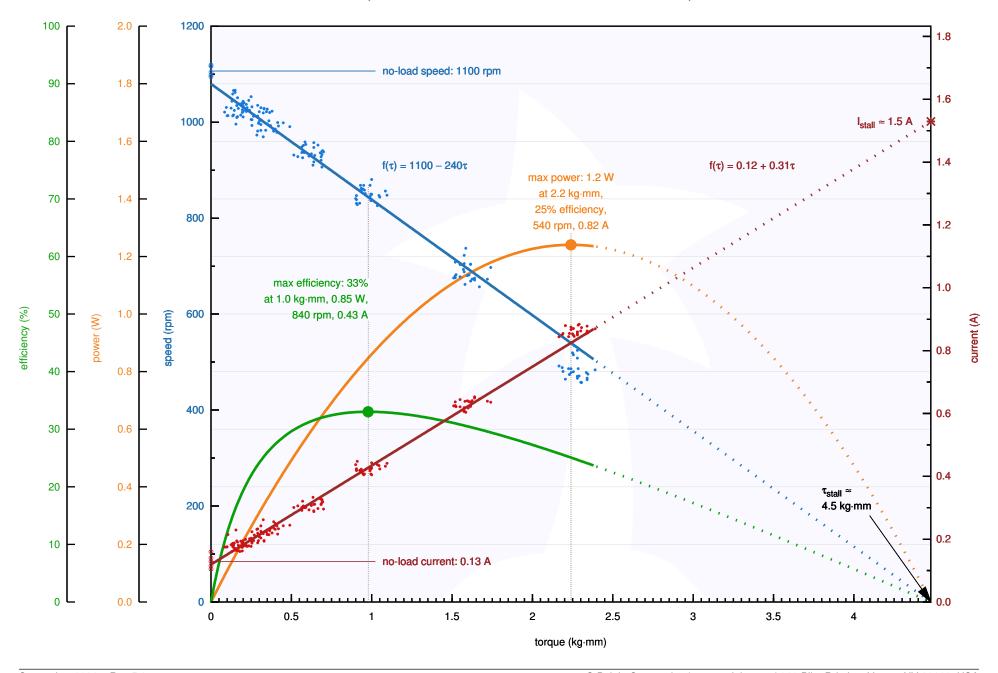
Pololu Items #3061, #3071 (10:1 Micro Metal Gearmotor HPCB 6V) Performance at 6 V



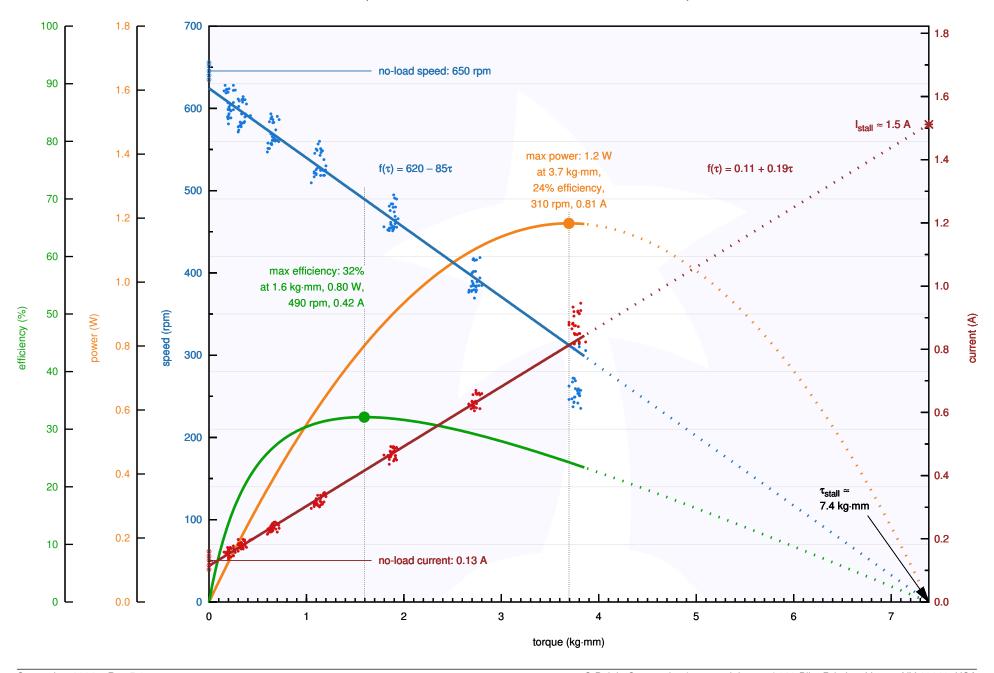
Pololu Items #4786, #4787 (15:1 Micro Metal Gearmotor HPCB 6V) Performance at 6 V



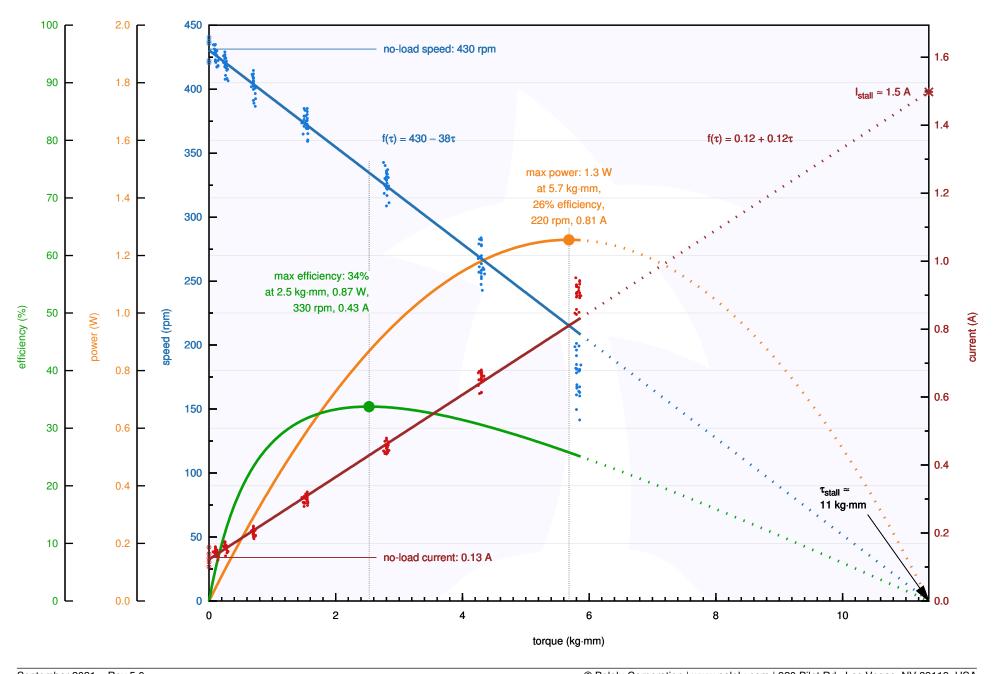
Pololu Items #3062, #3072 (30:1 Micro Metal Gearmotor HPCB 6V) Performance at 6 V



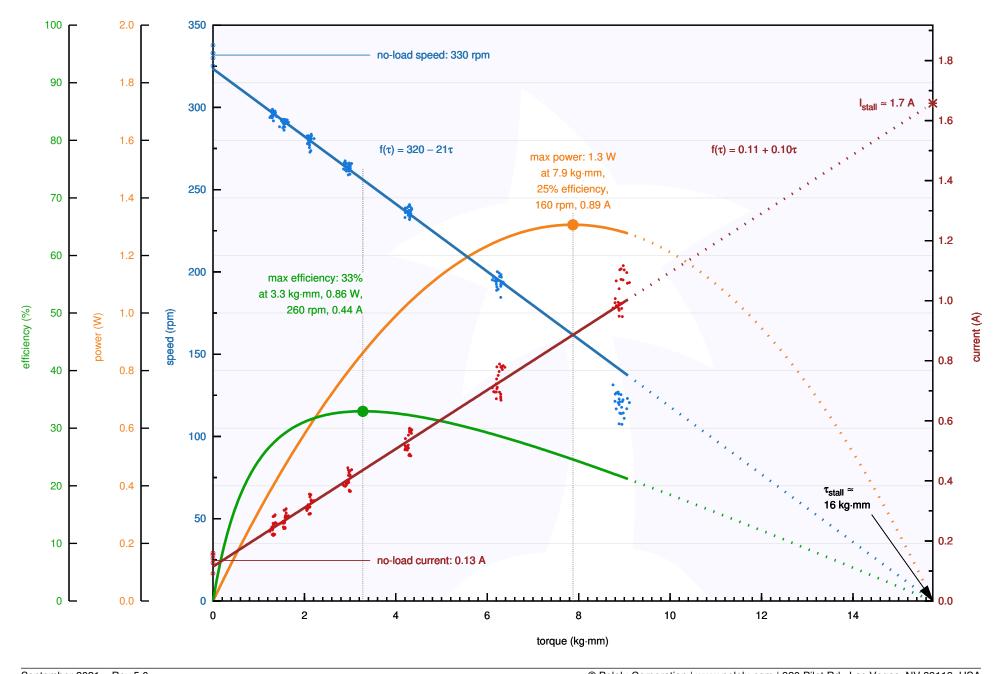
Pololu Items #3063, #3073 (50:1 Micro Metal Gearmotor HPCB 6V) Performance at 6 V



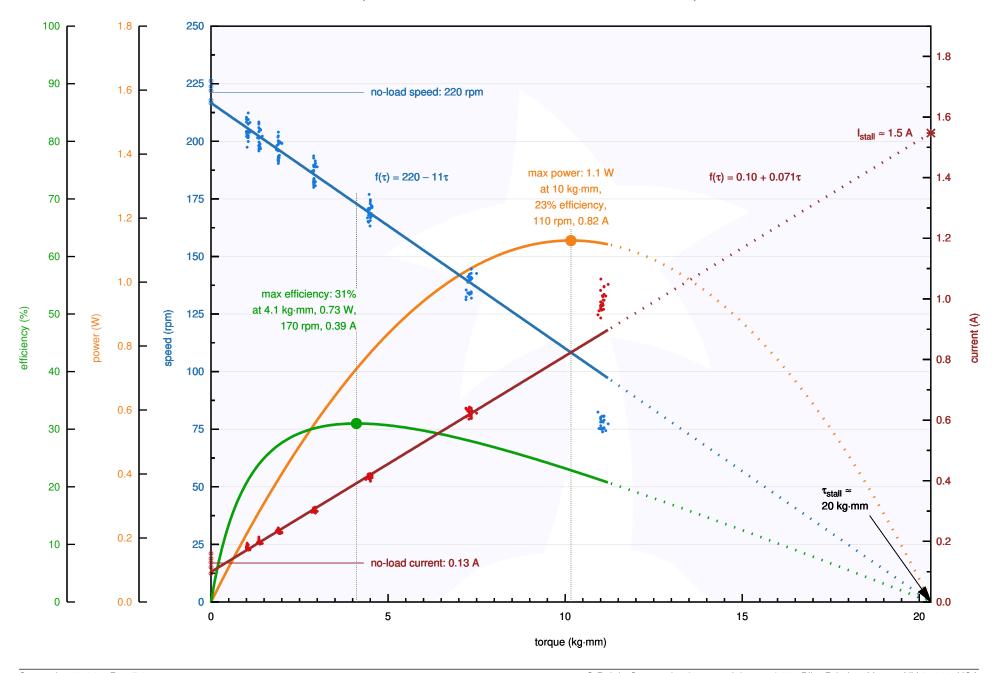
Pololu Items #3064, #3074 (75:1 Micro Metal Gearmotor HPCB 6V) Performance at 6 V



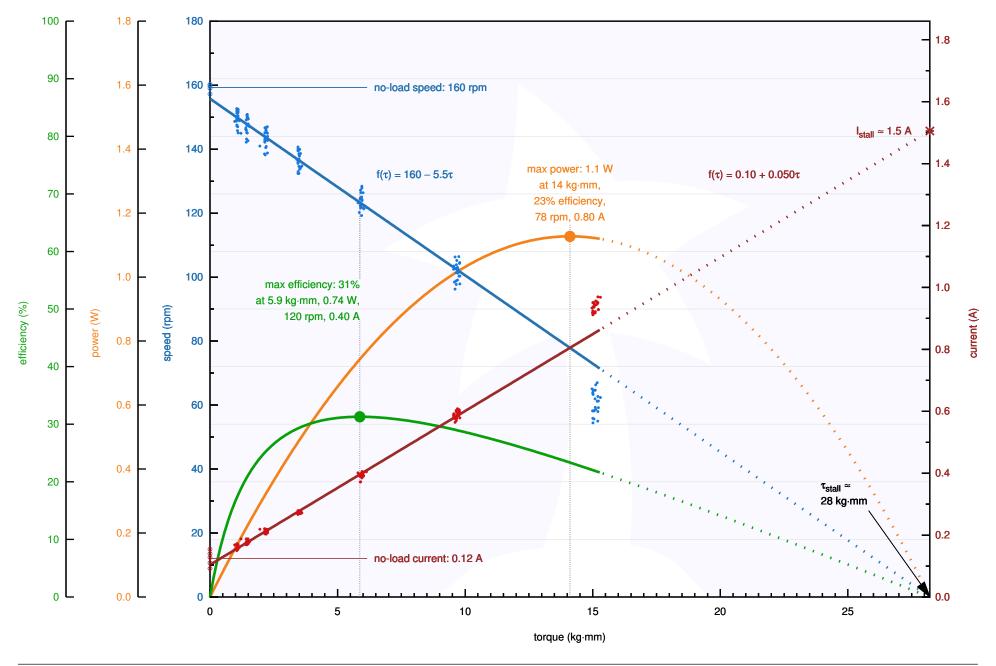
Pololu Items #3065, #3075 (100:1 Micro Metal Gearmotor HPCB 6V) Performance at 6 V



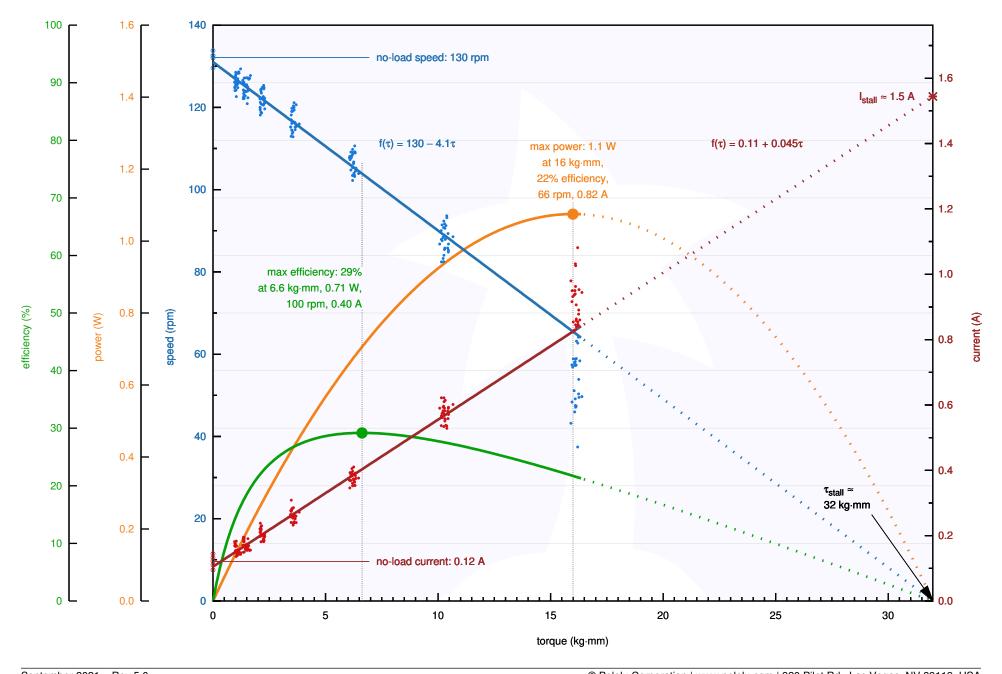
Pololu Items #3066, #3076 (150:1 Micro Metal Gearmotor HPCB 6V) Performance at 6 V



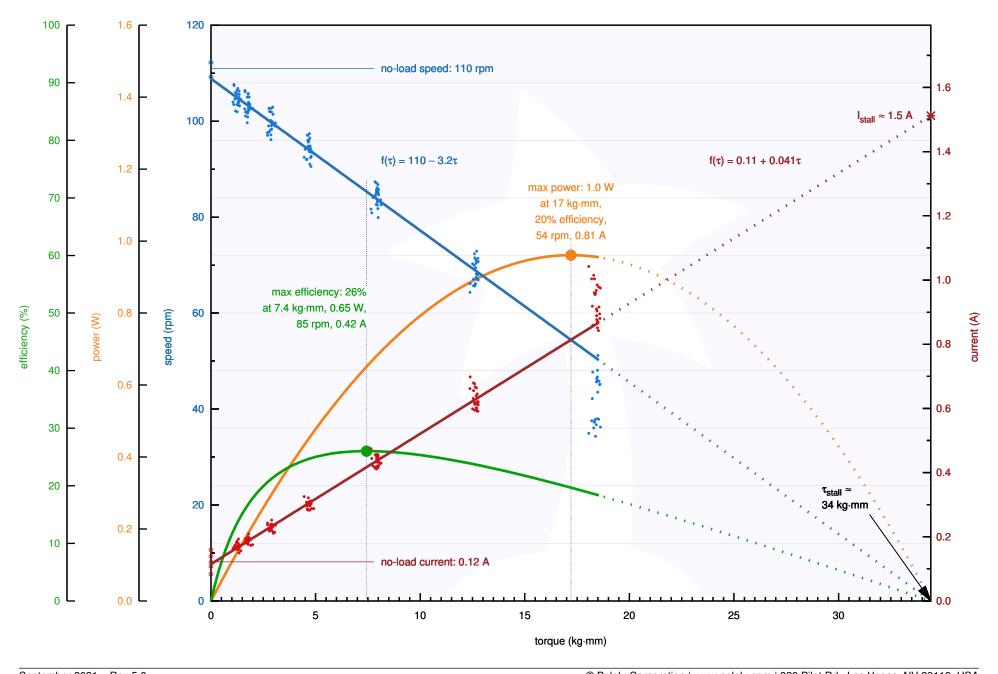
Pololu Items #3067, #3077 (210:1 Micro Metal Gearmotor HPCB 6V) Performance at 6 V



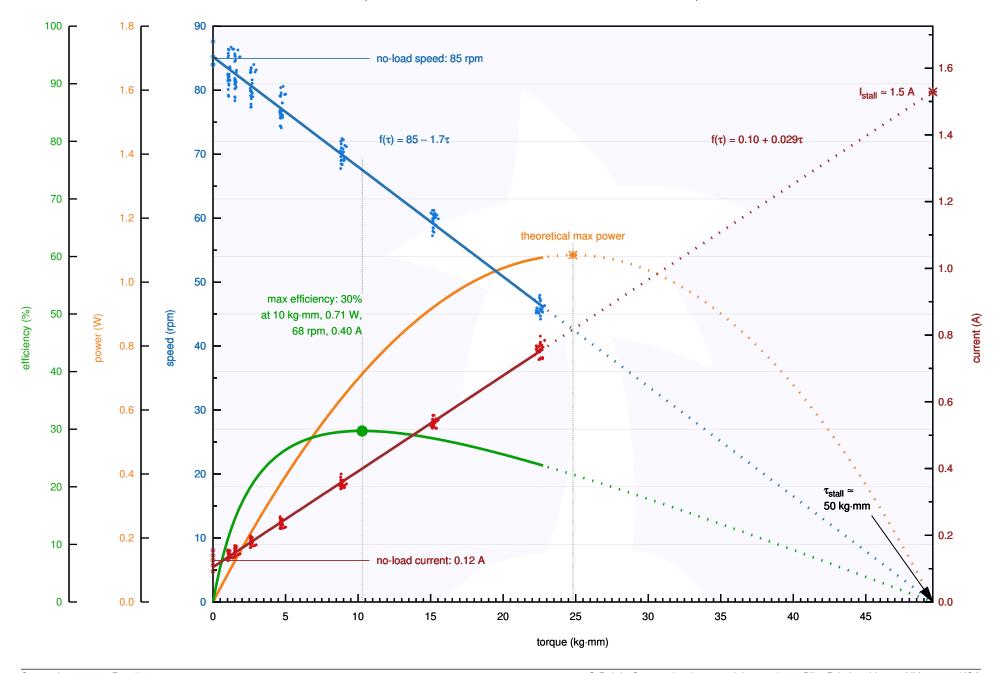
Pololu Items #3068, #3078 (250:1 Micro Metal Gearmotor HPCB 6V) Performance at 6 V



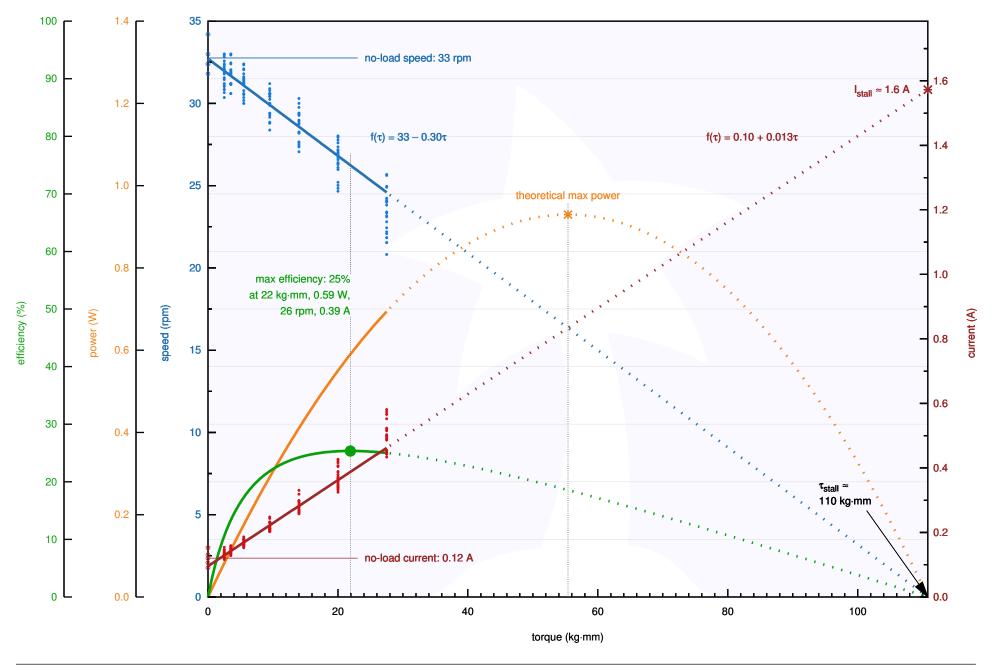
Pololu Items #3069, #3079 (298:1 Micro Metal Gearmotor HPCB 6V) Performance at 6 V



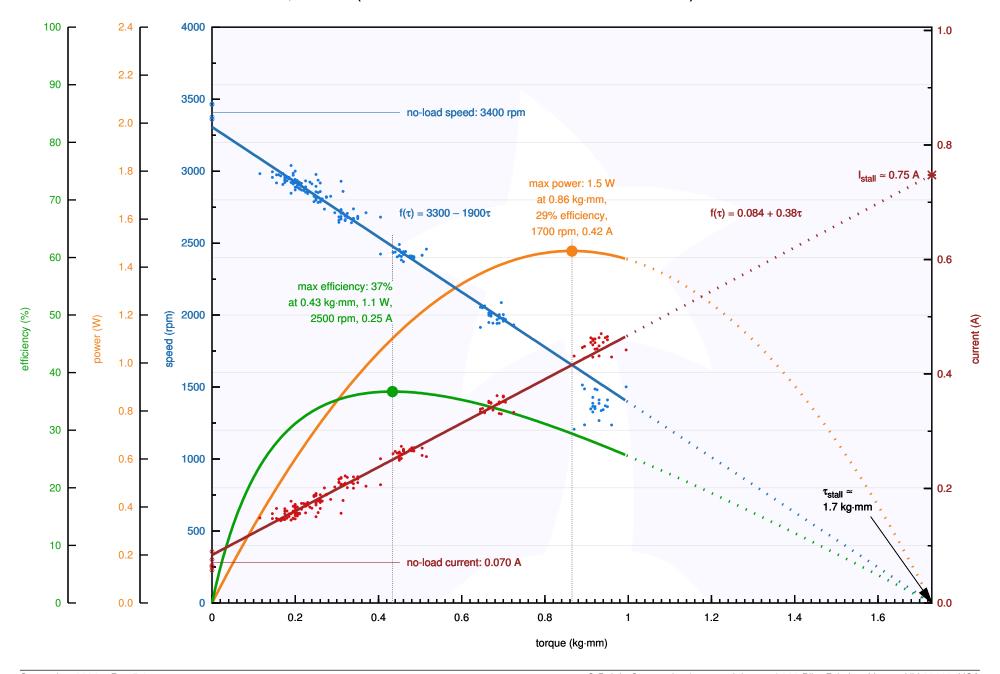
Pololu Items #4796, #4797 (380:1 Micro Metal Gearmotor HPCB 6V) Performance at 6 V



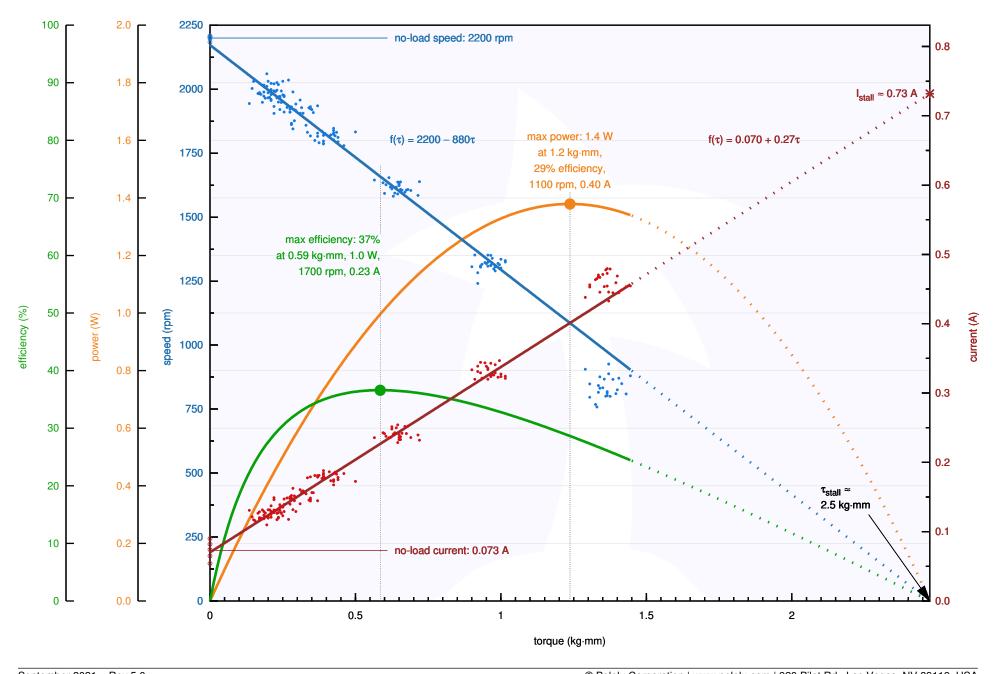
Pololu Items #3070, #3080 (1000:1 Micro Metal Gearmotor HPCB 6V) Performance at 6 V



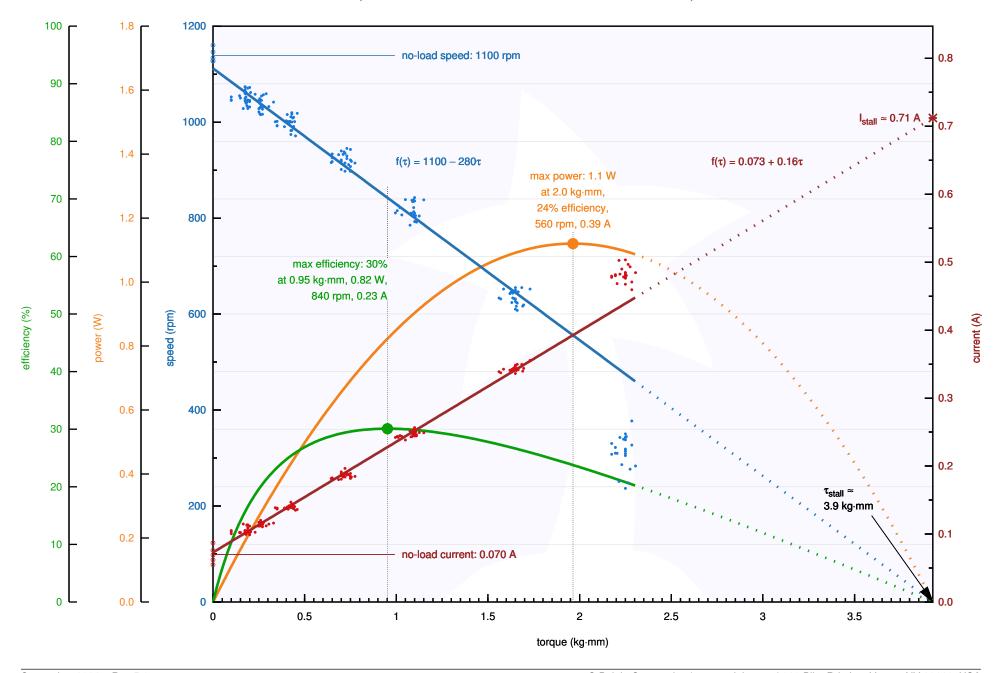
Pololu Items #3037, #3048 (10:1 Micro Metal Gearmotor HPCB 12V) Performance at 12 V



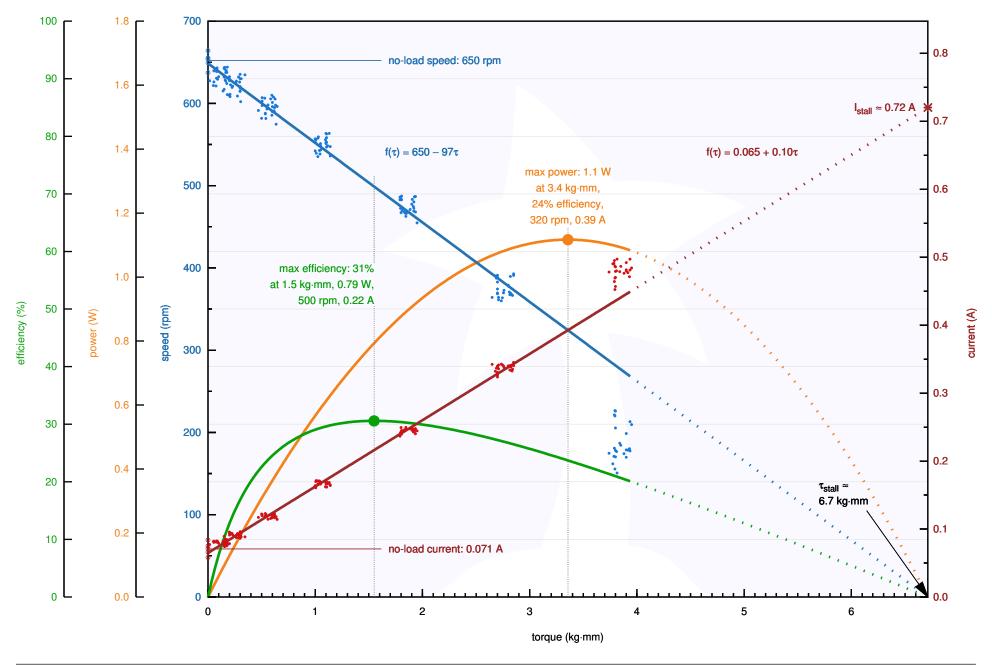
Pololu Items #4788, #4789 (15:1 Micro Metal Gearmotor HPCB 12V) Performance at 12 V



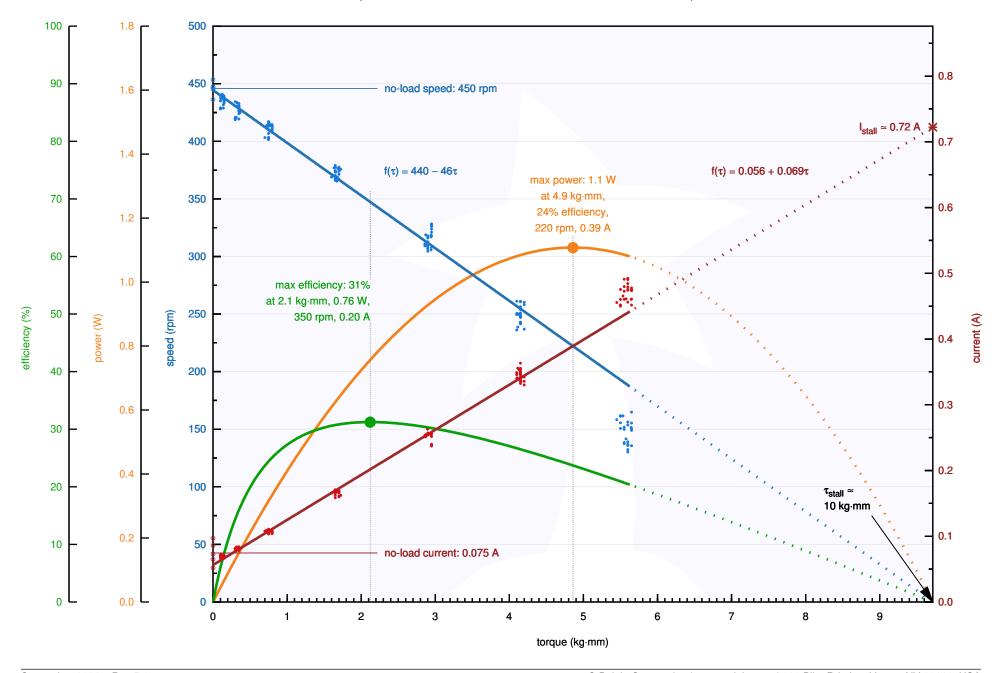
Pololu Items #3038, #3049 (30:1 Micro Metal Gearmotor HPCB 12V) Performance at 12 V



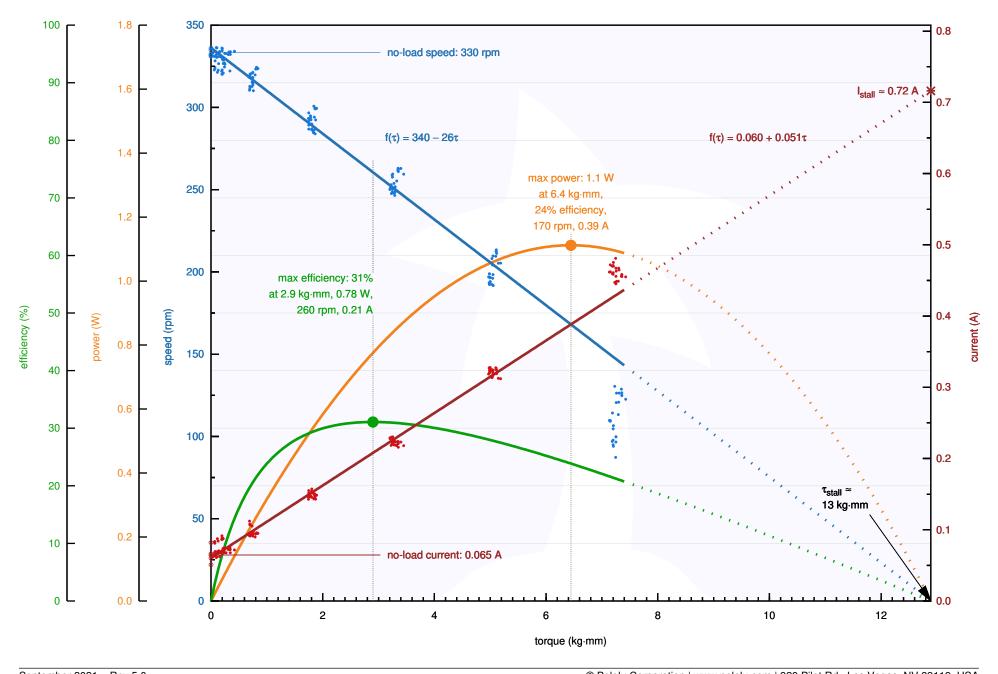
Pololu Items #3039, #3050 (50:1 Micro Metal Gearmotor HPCB 12V) Performance at 12 V



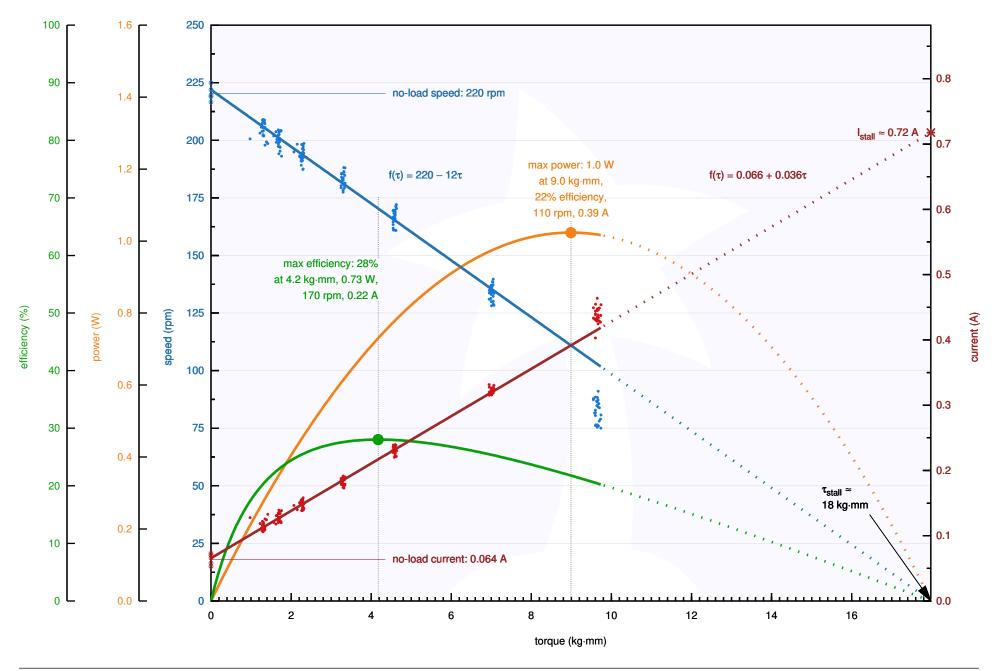
Pololu Items #3040, #3051 (75:1 Micro Metal Gearmotor HPCB 12V) Performance at 12 V



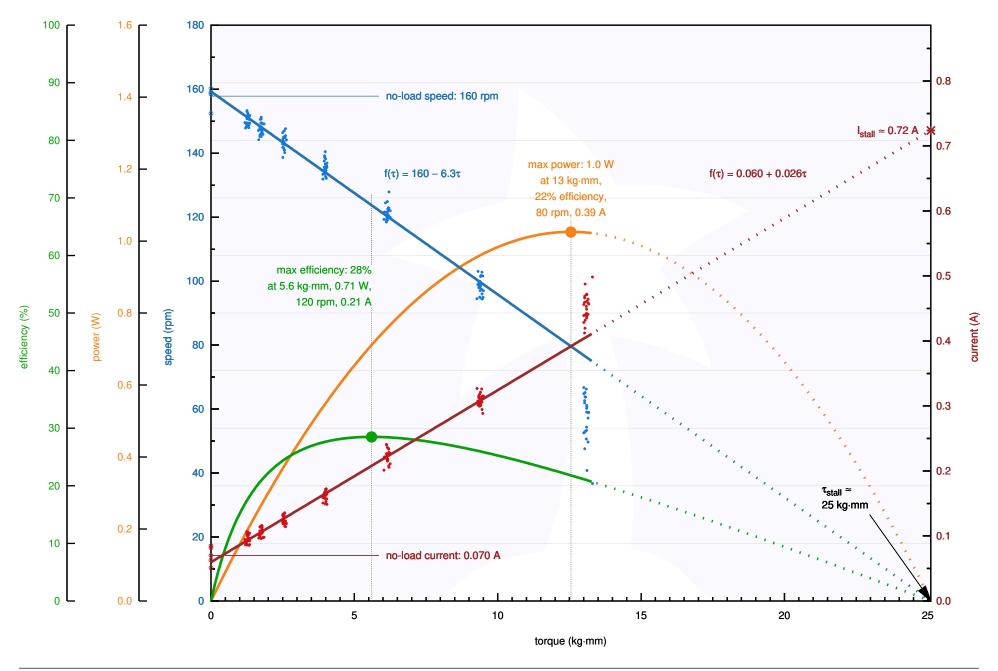
Pololu Items #3041, #3052 (100:1 Micro Metal Gearmotor HPCB 12V) Performance at 12 V



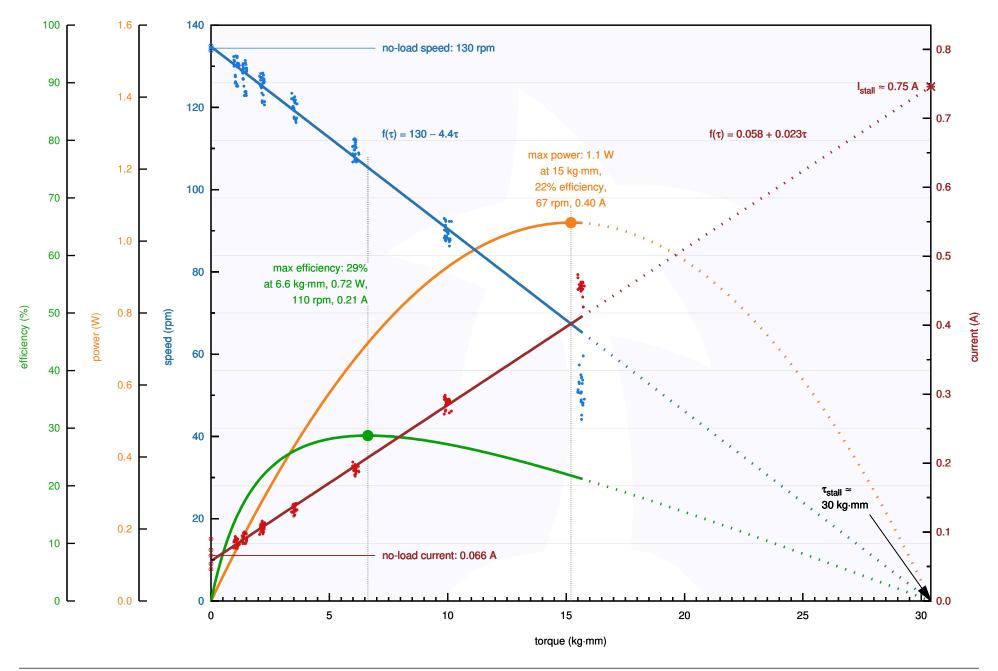
Pololu Items #3042, #3053 (150:1 Micro Metal Gearmotor HPCB 12V) Performance at 12 V



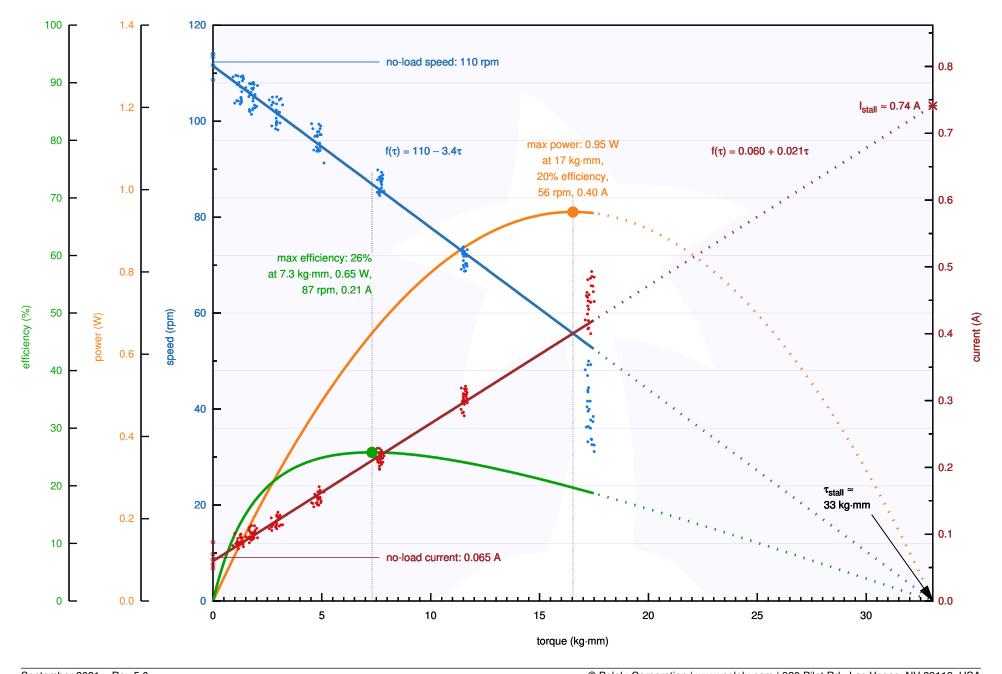
Pololu Items #3043, #3054 (210:1 Micro Metal Gearmotor HPCB 12V) Performance at 12 V



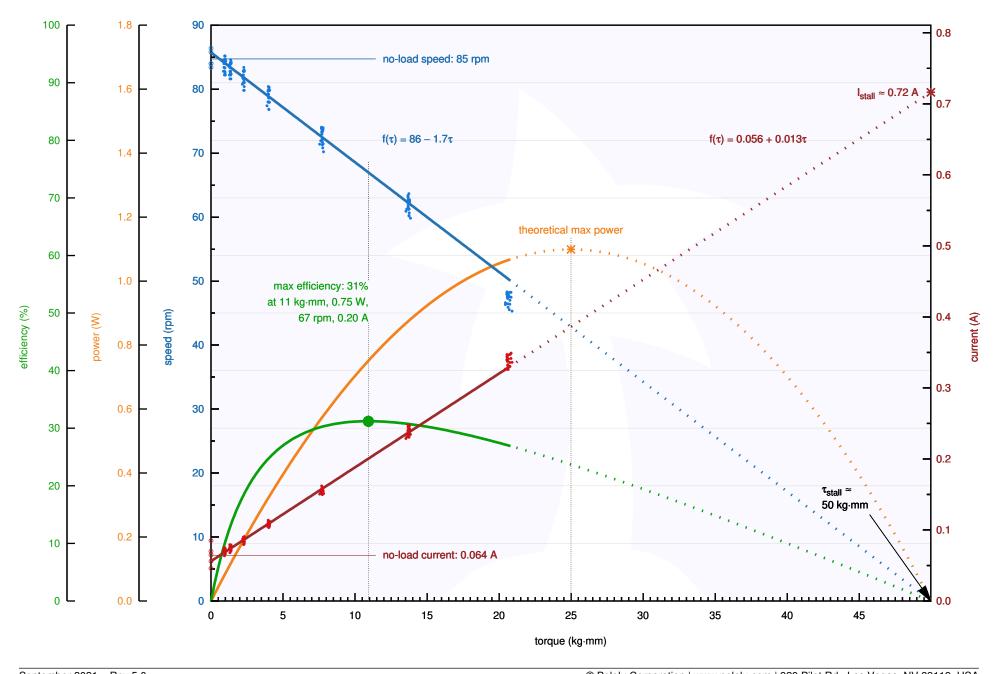
Pololu Items #3044, #3055 (250:1 Micro Metal Gearmotor HPCB 12V) Performance at 12 V



Pololu Items #3045, #3056 (298:1 Micro Metal Gearmotor HPCB 12V) Performance at 12 V



Pololu Items #4798, #4799 (380:1 Micro Metal Gearmotor HPCB 12V) Performance at 12 V



Pololu Items #3046, #3057 (1000:1 Micro Metal Gearmotor HPCB 12V) Performance at 12 V

