2543

PROTECTED QUAD POWER DRIVER

UDN/UDQ2543B

Dwg. PP-017-1

Providing interface between low-level logic and power loads to 100 W, the UDx2543B and UDx2543EB quad power drivers combine AND logic gates and high-current bipolar outputs. Each of the four independent outputs can sink up to 700 mA in the ON state. The outputs have a minimum breakdown voltage (load dump) of 60 V and a sustaining voltage of 35 V. The inputs are compatible with most TTL, DTL, LSTTL, and 5 V CMOS and PMOS logic systems.

Over-current protection has been designed into each channel of the UDx2543B/EB and typically occurs at 1 A. It protects any one channel from output short circuits with supply voltages up to 25 V. When the maximum output current is reached, that output stage is driven linearly. If the over-current condition continues, that output's thermal limiting will operate, limiting that output's power dissipation to approximately 2.4 W. The outputs also include diodes for voltage clamping with inductive loads such as relays, solenoids, or dc stepper motors.

These devices are supplied in a 16-pin power DIP of batwing construction (suffix 'B') to provide for maximum package power dissipation. They are also available in a 28-lead PLCC (suffix 'EB') for surface-mount applications. All devices are rated for continuous operation over the temperature range of -20°C to +85°C (UDN2543B/EB) or for use in automotive applications over an extended temperature range as the UDQ2543B/EB.

FEATURES

- 700 mA Output Current per Channel
- Low Output-Saturation Voltage
- Integral Output Transient-Suppression Diodes
- TTL, CMOS, PMOS, NMOS Compatible Inputs
- Independent Over-Current Protection for Each Output

ABSOLUTE MAXIMUM RATINGS
at T_A = 25°C

Output Voltage, V_{OUT} . . . . **60 V**
Over-Current Protected Output Voltage,
    V_{OUT} . . . . **25 V**
Output Current, I_{OUT} . . . . **1.0 A***
Supply Voltage, V_{CC} . . . . **7.0 V**
Input Voltage, V_{IN} or V_{EN} . . . . **18 V**
Package Power Dissipation,
    P_D . . . . **See Graph**
Operating Temperature Range, T_A
    (UDN2543B/EB) . . . . **-20°C to +85°C**
    (UDQ2543B/EB) . . . . **-40°C to +85°C**
Storage Temperature Range,
    T_S . . . . **-55°C to +150°C**

*Outputs are peak current limited at approximately 1.0 A per driver. See Circuit Description and Applications for further information.

Always order by complete part number:

Part Number	Package	Operating Temperature
UDN2543B	16-Pin DIP	-20°C to +85°C
UDN2543EB	28-Lead PLCC	-20°C to +85°C
UDQ2543B	16-Pin DIP	-40°C to +85°C
UDQ2543EB	28-Lead PLCC	-40°C to +85°C

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2543
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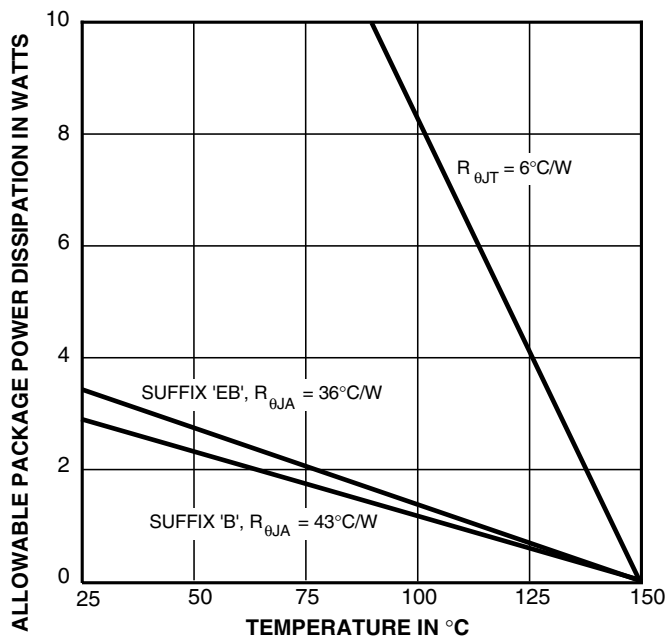# *QUAD POWER DRIVER*

FUNCTIONAL BLOCK DIAGRAM
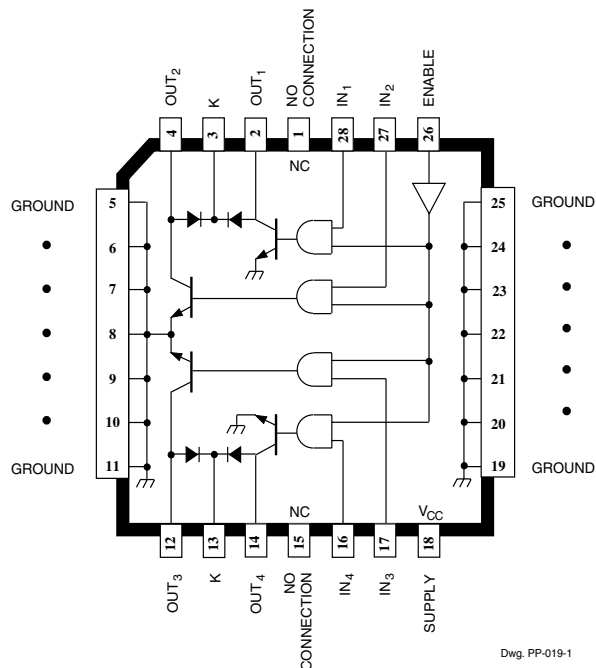### (1 OF 4 CHANNELS)
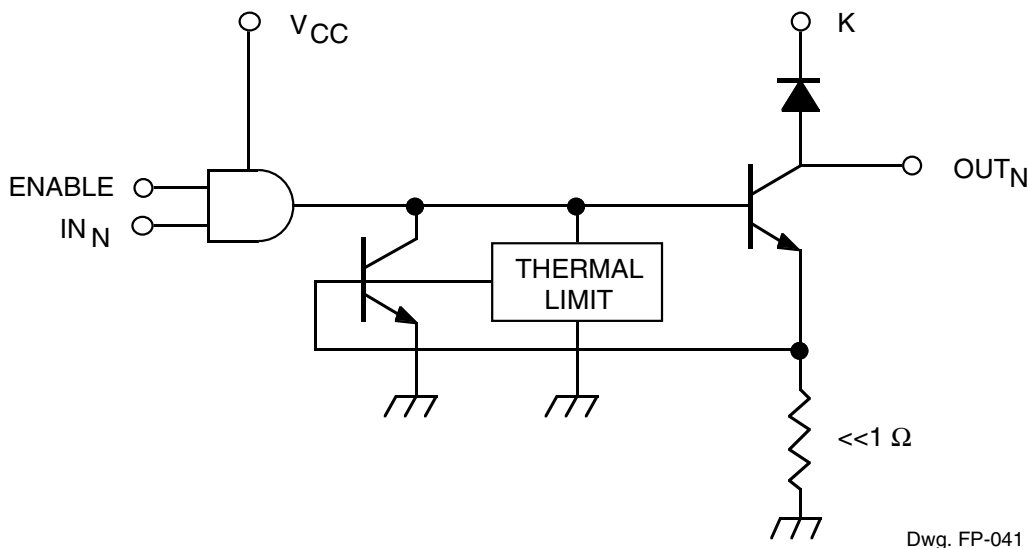
Dwg. FP-041

NOTE: These devices do not include an absolute thermal shutdown. Package power dissipation under fault conditions (2.4 W in the faulted channel) must therefore be evaluated at maximum operating temperature.

$R_{\theta JT} = 6°C/W$

SUFFIX 'EB', $R_{\theta JA} = 36°C/W$

SUFFIX 'B', $R_{\theta JA} = 43°C/W$

Dwg. GP-004-1A

UDN/UDQ2543EB

Dwg. PP-019-1

ELECTRICAL CHARACTERISTICS at T_A = +25°C (UDN2543B/EB) or over operating temperature range (UDQ2543B/EB only), V_{CC} = 4.75 V to 5.25 V

Characteristic	Symbol	Test Conditions	Limits Min.	Limits Max.	Units
Output Leakage Current	I_{CEX}	V_{OUT} = 60 V, V_{IN} = 0.8 V, V_{EN} = 2.0 V	—	100	μA
		V_{OUT} = 60 V, V_{IN} = 2.0 V, V_{EN} = 0.8 V	—	100	μA
Output Sustaining Voltage	$V_{OUT(SUS)}$	I_{OUT} = 100 mA, V_{IN} = V_{EN} = 0.8 V	35	—	V
Output Saturation Voltage	$V_{OUT(SAT)}$	I_{OUT} = 100 mA, V_{IN} = V_{EN} = 2.0 V	—	200	mV
		I_{OUT} = 400 mA, V_{IN} = V_{EN} = 2.0 V	—	400	mV
		I_{OUT} = 700 mA, V_{IN} = V_{EN} = 2.0 V	—	600	mV
Input Voltage	Logic 1	$V_{IN(1)}$ or $V_{EN(1)}$	2.0	—	V
	Logic 0	$V_{IN(0)}$ or $V_{EN(0)}$	—	0.8	V
Input Current	Logic 1	$V_{IN(1)}$ or $V_{EN(1)}$ = 2.0 V	—	20	μA
	Logic 0	$V_{IN(0)}$ or $V_{EN(0)}$ = 0.8 V	—	-10	μA
Total Supply Current	I_{CC}	I_{OUT} = 700 mA*, V_{IN}† = V_{EN} = 2.0 V	—	65	mA
		Outputs Open, V_{IN}† = 0.8 V, V_{EN} = 2.0 V	—	15	mA
Clamp Diode Forward Voltage	V_F	I_F = 1.0 A	—	1.6	V
		I_F = 1.5 A	—	2.0	V
Clamp Diode Leakage Current	I_R	V_R = 60 V, V_{IN} = V_{EN} = 2.0 V, $D_1 + D_2$ or $D_3 + D_4$	—	50	μA

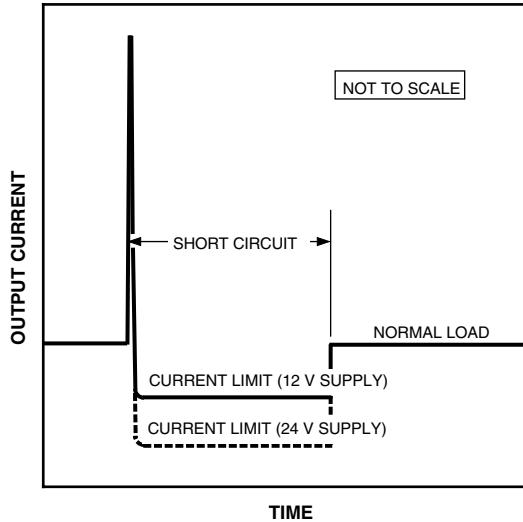Negative current is defined as coming out of (sourcing) the specified terminal.

As used here, -100 is defined as greater than +10 (absolute magnitude convention) and the minimum is implicitly zero.

* Pulse test, allowable package power dissipation will be exceeded at increased ambient temperatures.

† All inputs simultaneously, all other tests are performed with each input tested separately.

2543
PROTECTED
QUAD POWER DRIVER

TYPICAL OUTPUT BEHAVIOR

NOT TO SCALE

OUTPUT CURRENT

SHORT CIRCUIT

NORMAL LOAD

CURRENT LIMIT (12 V SUPPLY)

CURRENT LIMIT (24 V SUPPLY)

TIME

Dwg. WP-013-1

CIRCUIT DESCRIPTION AND APPLICATION

INCANDESCENT LAMP DRIVER

For incandescent lamp applications, the UDx2549B/EB or UDx2559B/EB, with improved shortcircuit protection and thermal limiting, are recommended.

INDUCTIVE LOAD DRIVER

Bifilar (unipolar) stepper motors, relays, or solenoids can be driven directly. The internal flyback diodes prevent damage to the output transistors by suppressing the high-voltage spikes that occur when turning OFF an inductive load. For rapid current decay (fast turn-OFF speeds), the use of Zener diodes will raise the flyback voltage and improve performance. However, the peak voltage must not exceed the specified minimum sustaining voltage ($V_{SUPPLY} + V_Z + V_F \leq V_{OUT(SUS)}$).
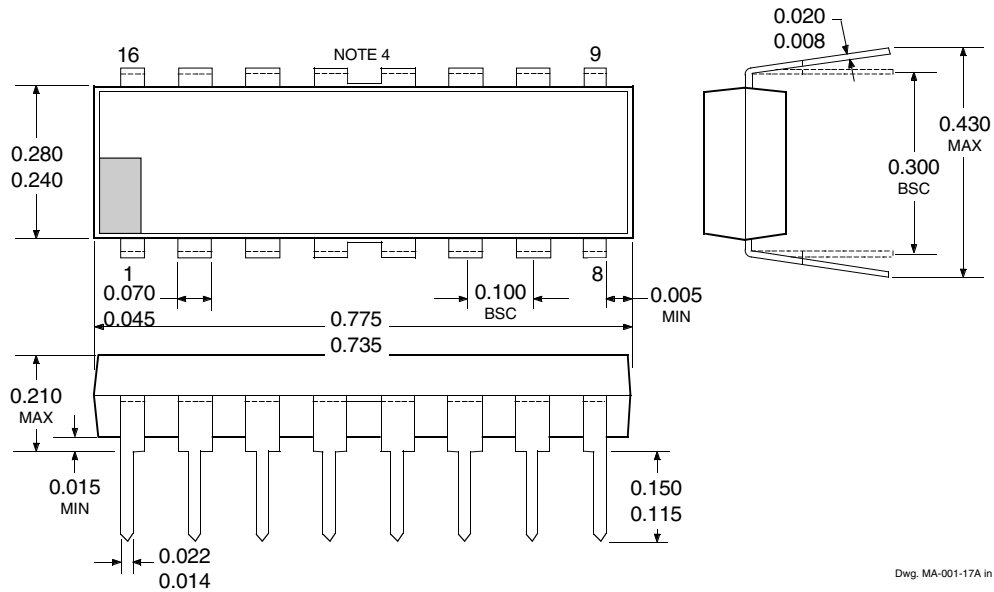
FAULT CONDITIONS

In the event of a shorted load, the load current will attempt to increase. As described above, the drive current to the affected output stage is diverted, causing the output stage to go linear, limiting the peak output current to approximately 1 A. As the power dissipation of that output stage increases, a thermal gradient sensing circuit will become operational, further decreasing the drive current to the affected output stage and reducing the output current to a value dependent on supply voltage ($I_{OUT} \approx 2.4/V_{SUPPLY}$). If the fault condition is corrected, the output stage will return to its normal saturated condition.

Due to the independent operation of the four channels, only a single channel should be shorted at a time. Multiple overload conditions may be tolerated provided rated package power dissipation is not exceeded.

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UDN2543B and UDQ2543B
Dimensions in Inches
(controlling dimensions)

16   NOTE 4   9

0.280
0.240

1
0.070
0.045

0.100
BSC

8
0.005
MIN

0.775
0.735

0.210
MAX

0.015
MIN

0.150
0.115

0.022
0.014

0.020
0.008

0.430
MAX

0.300
BSC

Dwg. MA-001-17A in

Dimensions in Millimeters
(for reference only)

16   NOTE 4   9

7.11
6.10

1
1.77
1.15

2.54
BSC

8
0.13
MIN

19.68
18.67

5.33
MAX

0.39
MIN

3.81
2.93

0.558
0.356

0.508
0.204

10.92
MAX

7.62
BSC

Dwg. MA-001-17A mm
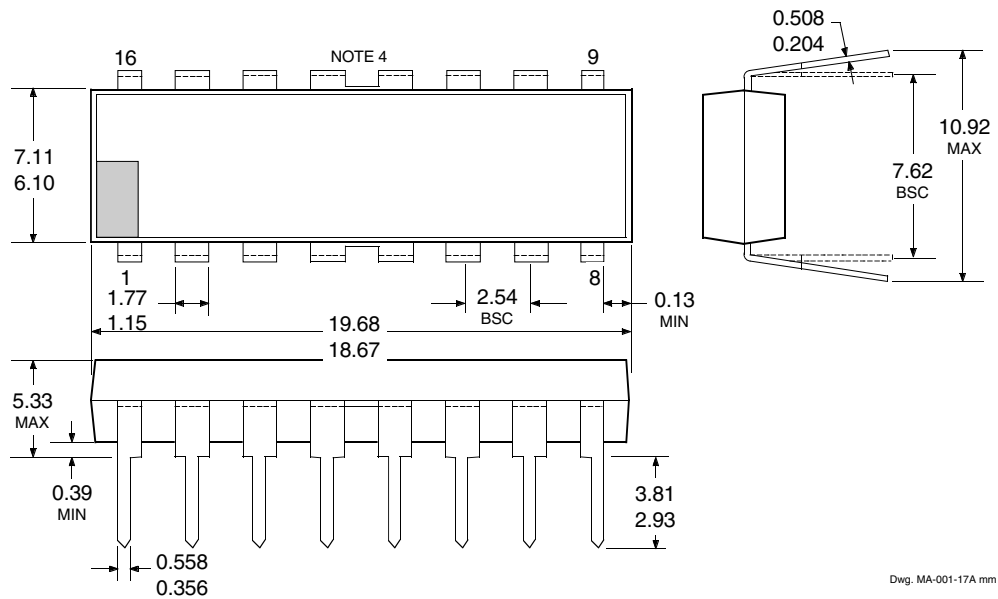
NOTES: 1. Exact body and lead configuration at vendor's option within limits shown.
2. Lead spacing tolerance is non-cumulative.
3. Lead thickness is measured at seating plane or below.
4. Webbed lead frame. Leads 4, 5, 12, and 13 are internally one piece.

2543
PROTECTED
QUAD POWER DRIVER

UDN2543EB and UDQ2543EB
Dimensions in Inches
(controlling dimensions)

0.013
0.021

0.219
0.191

0.456
0.450

0.495
0.485

0.026
0.032

0.050
BSC

0.219
0.191

INDEX AREA

0.020
MIN

0.165
0.180

18   12

19   11

25   5

26   28   1   4

0.456
0.450

0.495
0.485
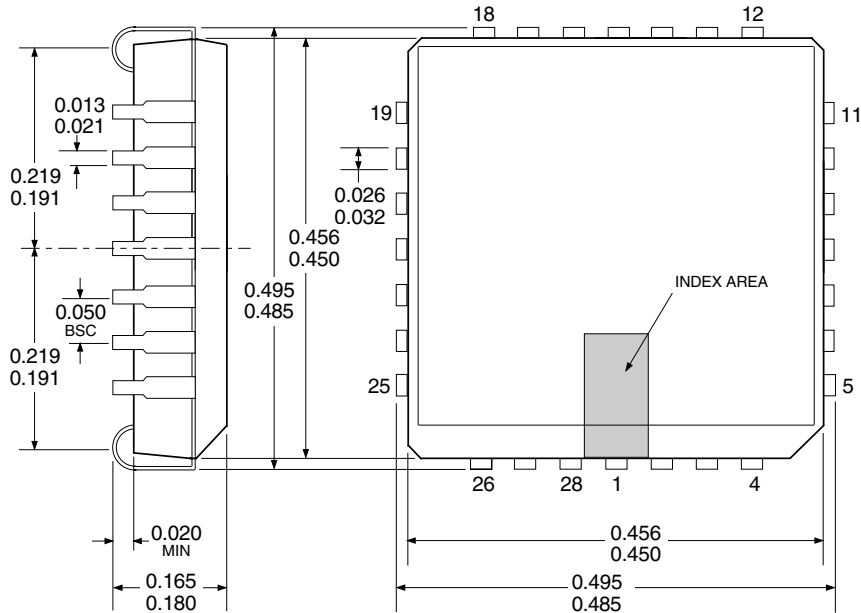
Dwg. MA-005-28A in

Dimensions in Millimeters
(for reference only)

0.331
0.533

5.56
4.85

11.58
11.43

12.57
12.32

0.812
0.661

1.27
BSC

5.56
4.85

INDEX AREA

0.51
MIN

4.57
4.20

18   12

19   11

25   5

26   28   1   4

11.582
11.430

12.57
12.32
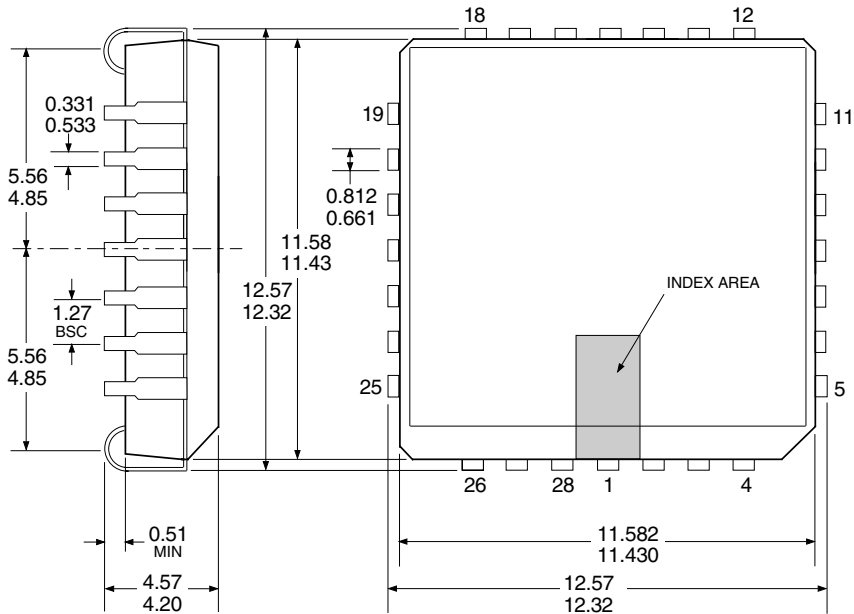
Dwg. MA-005-28A mm

NOTES: 1. Exact body and lead configuration at vendor's option within limits shown.
       2. Lead spacing tolerance is non-cumulative
       3. Webbed lead frame. Leads 5 through 11 and 19 through 25 are internally one piece.

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2543
PROTECTED
QUAD POWER DRIVER

POWER SINK DRIVERS

IN ORDER OF 1) OUTPUT CURRENT, 2) OUTPUT VOLTAGE, 3) NUMBER OF DRIVERS

| Output Ratings * | | | Features | | | | | Part Number[†] |
mA	V	#	Serial Input	Latched Drivers	Diode Clamp	Outputs	Internal Protection	
75	17	8	X	X	–	constant current	–	6275
	17	16	X	X	–	constant current	–	6276
100	20	8	–	–	–	saturated	–	2595
	30	32	X	X	–	–	–	5833
	40	32	X	X	–	saturated	–	5832
	50	8	addressable decoder/driver			DMOS	–	6B259
	50	8	–	X	–	DMOS	–	6B273
	50	8	X	X	–	DMOS	–	6B595
250	50	8	addressable decoder/driver			DMOS	–	6259
	50	8	–	X	–	DMOS	–	6273
	50	8	X	X	–	DMOS	–	6595
	135	7	–	–	X	–	–	7003
300	45	1	–	Hall sensor/driver	X	–	X	5140
	50	7	–	–	X	–	–	2003
	50	8	–	–	X	–	–	2803
	50	8	–	–	X	saturated	–	2596
	60	4	–	–	X	saturated	X	2557
	95	7	–	–	X	–	–	2023
	95	8	–	–	X	–	–	2823
350	50	4	–	X	X	–	–	5800
	50	7	–	–	X	–	–	2004
	50	8	–	–	X	–	–	2804
	50	8	–	X	X	–	–	5801
	50	8	X	X	–	–	–	5821
	50	8	X	X	X	–	–	5841
	50	8	addressable decoder/driver			DMOS	–	6A259
	50	8	X	X	–	DMOS	–	6A595
	80	8	X	X	–	–	–	5822
	80	8	X	X	X	–	–	5842
	95	7	–	–	X	–	–	2024
	95	8	–	–	X	–	–	2824
450	30	28	dual 4- to 14-line decoder/driver			–	–	6817
600	60	4	–	–	–	saturated	X	2547
	60	4	–	–	X	saturated	X	2549
700	60	4	–	–	X	saturated	X	2543 and 2559
750	50	8	–	–	X	saturated	–	2597
900	14	2	–	Hall sensor/driver	X	saturated	X	3625
	26	2	–	Hall sensor/driver	X	saturated	X	3626
1000	46	4	stepper motor controller/driver			MOS	–	7024 and 7029
1200	46	4	microstepping controller/driver			MOS	–	7042
1250	50	4	stepper motor translator/driver			–	X	5804
	50	4	–	–	X	–	–	2064 and 2068
1500	80	4	–	–	X	–	–	2065 and 2069
1800	50	4	–	–	X	–	–	2544
	50	4	–	–	X	–	–	2540
3000	46	4	stepper motor controller/driver			MOS	–	7026
	46	4	microstepping controller/driver			MOS	–	7044
4000	50	4	–	–	X	–	–	2878
	80	4	–	–	X	–	–	2879

* Current is maximum specified test condition, voltage is maximum rating. See specification for sustaining voltage limits or over-current protection voltage limits.

† Complete part number includes additional characters to indicate operating temperature range and package style.

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