

SCOPE: Dual Mode, +5V/Programmable Micropower Voltage Regulator

<u>Device Type</u>	<u>Generic Number</u>	<u>SMD Ordering Information</u>
01	MAX663M(x)/883B	5962-9212601MPA
02	MAX664M(x)/883B	5962-9212602MPA
03	MAX666M(x)/883B	5962-9212603MPA

Case Outline(s). The case outlines shall be designated in Mil-Std-1835 and as follows:

<u>Outline Letter</u>	<u>Mil-Std-1835</u>	<u>Case Outline</u>	<u>Package Code</u>
MAXIM SMD			
JA P	GDIP1-T8 or CDIP2-T8	8 LEAD CERDIP	J8

Absolute Maximum Ratings

Input Supply Voltage Device 01 & 03	+18V
Input Supply Voltage Device 02	-18V
Terminal Voltage Range:	
Device 01 (Sense, V_{OUT1} , Shutdown, V_{SET} , V_{TC}).....	GND -0.3V to ($V_{IN}+0.3V$)
Device 01 (V_{OUT2}).....	GND -0.3V to ($V_{OUT1}+0.3V$)
Device 02 (V_{OUT} , Shutdown1, Shutdown2, V_{SET} , V_{OUT1})	V_{IN} -0.3V to (GND+0.3V)
Device 02 (SENSE).....	V_{IN} -0.3V to ($V_{OUT1}+0.3V$)
Device 03 (Sense, V_{OUT} , LBI, Shutdown, V_{SET}).....	(GND -0.3V) to $V_{IN}+0.3V$
Device 03 (LBO).....	(GND -0.3V) to +16.5V

Output Source Current:

Device 01 (V_{OUT2})	50mA
Device 01 (V_{OUT1})	25mA
Device 03 (V_{OUT})	50mA

Output Sink Current:

Device 01 (V_{TC})	-20mA
Device 02 (V_{OUT1} , V_{OUT2})	-25mA
Device 03 (LBO)	-20mA

Lead Temperature (soldering, 10 seconds)	+300°C
Storage Temperature	-65°C to +150°C
Continuous Power Dissipation	$T_A=+70^\circ\text{C}$
8 lead CERDIP(derate 8.0mW/°C above +70°C)	640mW
Junction Temperature T_J	+150°C
Thermal Resistance, Junction to Case, θ_{JC} :	55°C/W
Thermal Resistance, Junction to Ambient, θ_{JA} :	125°C/W

Recommended Operating Conditions.

Ambient Operating Range (T_A)	-55°C to +125°C
Input Voltage Range:	
Device 01 & 03	+2.2V to +16.5V
Device 02	-2.2V to -16.5V

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

TABLE 1 ELECTRICAL TESTS

PARAMETER	Symbol	CONDITIONS -55 °C ≤ T _A ≤ +125 °C <u>1</u> / Unless otherwise specified	Group A Subgroup	Device type	Limits Min <u>2</u> / Max	Limits Max	Units
Quiescent Current	I _Q	V _{IN} =16.5V, no external load	1 2,3	01,03		12 20	μA
		V _{IN} =-16.5V, no external load	1 2,3	02		12 20	
Output Voltage	V _{OUT}	V _{SET} =GND, I _{OUT} =1mA	1 2,3	01,03	4.75 4.50	5.25 5.50	V
			1 2,3	02	-5.25 -5.50	-4.75 -4.50	
Line Regulation	V _{RLINE}	+2.0V ≤ V _{IN} ≤ +15.0V, V _{OUT} =V _{SET}	1	01,03		.35	% / V
		+2.2V ≤ V _{IN} ≤ +15.0V, V _{OUT} =V _{SET}	2,3	01,03		.60	
		-15.0V ≤ V _{IN} ≤ -2.0V, V _{OUT} =V _{SET}	1	02		.35	
		-15.0V ≤ V _{IN} ≤ -2.2V, V _{OUT} =V _{SET}	2,3	02		.60	
Load Regulation	V _{RLOAD}	50μA ≤ I _{OUT1} ≤ 5.0mA	1 2,3	01	-25 -50	+25 +50	mV
		1mA ≤ I _{OUT2} ≤ 20.0mA	1 2,3	01	-135 -285	+135 +285	
		1mA ≤ I _{OUT1} ≤ 15.0mA, V _{OUT2} connected to V _{OUT1}	1 2,3	02	-70 -140	+70 +140	
		1mA ≤ I _{OUT} ≤ 20.0mA	1 2,3	03	-135 -285	+135 +285	
Reference Voltage	V _{SET}	V _{OUT} =V _{SET} , I _{OUT} =1mA	1 2,3	01,03	1.27 1.21	1.33 1.39	V
			1 2,3	02	-1.33 -1.39	-1.27 -1.21	
V _{SET} Input Current	I _{SET}	V _{SET} =0V, 2V	1 2,3	01,03	-10 -25	+10 +25	nA
		V _{SET} =0V, -2V	1 2,3	02	-10 -25	+10 +25	
Shutdown Input Voltage	V _{SHDN}	V _{SHDN} HI= Output OFF	1 2,3	01,03	1.4 1.5		V
		V _{SHDN} HI=Output OFF	1 2,3	02		-1.4 -1.5	
Shutdown Input Voltage	V _{SHDN}	V _{SHDN} LO= Output ON	1 2,3	01,03		0.3 0.2	V
		V _{SHDN} LO=Output ON	1 2,3	02	-0.3 -0.2		

PARAMETER	Symbol	CONDITIONS -55 °C ≤ T _A ≤ +125 °C 1/ Unless otherwise specified	Group A Subgroup	Device type	Limits Min 2/	Limits Max	Units
Shutdown Input Current	I _{SHDN}	V _{SHDN} = 0V, 9V	1 2,3	01,03	-10 -25	+10 +25	nA
		V _{SET} =0V, -9V	1 2,3	02	-10 -25	+10 +25	
Output Current NOTE 3	I _{OUT}	V _{IN} =2.5V, V _{IN} -V _{OUT} =1.5V	1	01,03	40		mA
		V _{IN} =3.0V, V _{IN} -V _{OUT} =2.0V	2,3		20		
LBI Input Threshold Voltage	V _{LBI}		1 2,3	03	1.21 1.20	1.37 1.38	V
LBI Input Current	I _{LBI}	V _{LBI} =0V, 9V	1 2,3	03	-10 -25	+10 +25	nA
Input/Output Saturation Resistance	R _{SAT}	V _{IN} =2.0V, I _{OUT1} =1.0mA	1	01		500	Ω
		V _{IN} =2.2V, I _{OUT1} =1.0mA	2,3			1000	
		V _{IN} =9.0V, I _{OUT1} =2.0mA	1 2,3			150 300	
		V _{IN} =15.0V, I _{OUT1} =5.0mA	1 2,3			150 300	
Input/Output Saturation Resistance	R _{SAT}	V _{IN} =-2.0V, I _{OUT1} =-1.0mA, V _{OUT1} connected to V _{OUT2}	1	02		500	Ω
		V _{IN} =-2.2V, I _{OUT1} =-1.0mA, V _{OUT1} connected to V _{OUT2}	2,3			1000	
		V _{IN} =-9.0V, I _{OUT1} =-2.0mA V _{OUT2} connected to V _{OUT1}	1 2,3			80 150	
		V _{IN} =-15.0V, I _{OUT1} =-5.0mA V _{OUT2} connected to V _{OUT1}	1 2,3			60 150	
Minimum Load Current	I _L (min)		1	01,03 02	-1	1	μA
			2,3	01,03 02	-10	10	
LBO Output Saturation Resistance	RO _{SAT}	I _{SAT} =2mA, V _{LBI} =0V	1 2,3	03		100 200	Ω
V _{CT} Sink Current	I _{TC}	NOTE 4	1,2,3	01		2	mA
V _{CT} Voltage	V _{TC}	NOTE 4, I _{TC} =50μA	1 2,3	01	0.6 0.2	1.0 1.4	V
LBO Output Leakage Current	I _{LBO}	VLBI=1.4V, VLBO=9V	1,2,3	03		2	μA

NOTE 1: Unless otherwise specified: V_{IN}=+9V and V_{OUT}=+5.0V for device types 01 and 03.
V_{IN}=-9V and V_{OUT}=-5.0V for device type 02.

NOTE 2: The algebraic convention, whereby the most negative value is a minimum and the most positive a maximum, is used in this table. Negative current shall be defined as conventional current flow out of a device terminal.

NOTE 3: $V_{IN}-V_{OUT}$ is given as a maximum differential voltage under specified output current conditions. For device type 01, output current is from V_{OUT2} .

NOTE 4: Output has a positive temperature coefficient. Using it in conjunction with the input of the regulator at V_{SET} , a negative coefficient results in the output voltage. The V_{TC} pin will not source current.

TERMINAL NUMBER	01 MAX663	02 MAX664	03 MAX666
1	Sense	V_{OUT2}	Sense
2	V_{OUT2}	Sense	V_{OUT}
3	V_{OUT1}	SHDN	LBI
4	GND	$V_{IN} (-)$	GND
5	SHDN	SHDN	SHDN
6	V_{SET}	V_{SET}	V_{SET}
7	V_{TC}	V_{OUT1}	LBO
8	$V_{IN} (+)$	GND	$V_{IN}(+)$

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BLOCK DIAGRAMS:

DEVICE TYPE 01: See New Release Data Book 1992 4-128.

DEVICE TYPE 02: See New Release Data Book 1992 4-129.

DEVICE TYPE 03: See New Release Data Book 1992 4-129.

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QUALITY ASSURANCE

Sampling and inspection procedures shall be in accordance with MIL-Prf-38535, Appendix A as specified in Mil-Std-883.

Screening shall be in accordance with Method 5004 of Mil-Std-883. Burn-in test Method 1015:

1. Test Condition, A, B, C, or D.
2. TA = +125°C minimum.
3. Interim and final electrical test requirements shall be specified in Table 2.

Quality conformance inspection shall be in accordance with Method 5005 of Mil-Std-883, including Groups A, B, C, and D inspection.

Group A inspection:

1. Tests as specified in Table 2.
2. Selected subgroups in Table 1, Method 5005 of Mil-Std-883 shall be omitted.

Group C and D inspections:

- a. End-point electrical parameters shall be specified in Table 1.
- b. Steady-state life test, Method 1005 of Mil-Std-883:
 1. Test condition A, B, C, D.
 2. TA = +125°C, minimum.
 3. Test duration, 1000 hours, except as permitted by Method 1005 of Mil-Std-883.

TABLE 2. ELECTRICAL TEST REQUIREMENTS

Mil-Std-883 Test Requirements	Subgroups per Method 5005, Table 1
Interim Electric Parameters Method 5004	1
Final Electrical Parameters Method 5005	1*, 2, 3
Group A Test Requirements Method 5005	1, 2, 3
Group C and D End-Point Electrical Parameters Method 5005	1

* PDA applies to Subgroup 1 only.