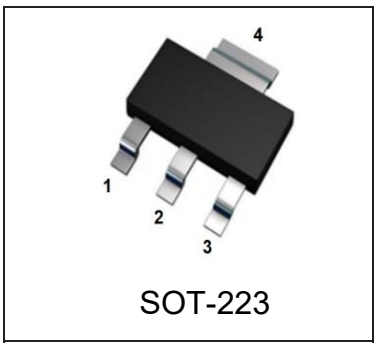
3-Terminal 1A Positive Voltage Regulator

LR78XXG

DESCRIPTION

The LRC LR78XXG family is monolithic fixed voltage regulator integrated circuit. They are suitable for applications that required supply current up to 1 A.



SOT-223

1. Input 2&4. GND 3. Output

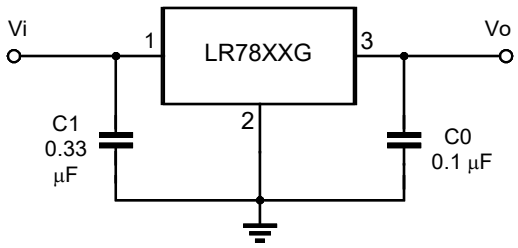
FEATURES

- Output current up to 1A
- Fixed output voltage of 5V, 6V, 7V, 8V,9V,10V, 12V, 15V ,18V and 24V available
- Thermal overload shutdown protection
- Short circuit current limiting
- We declare that the material of product complies with RoHS requirements.

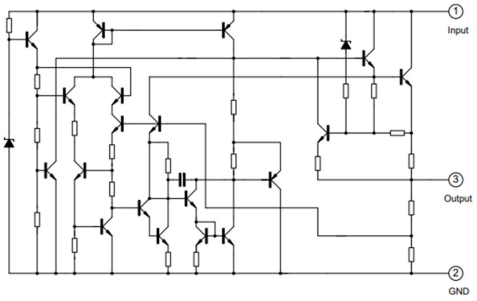
ORDERING INFORMATION

DEVICE	Package	XX Description	Packing Information
LR78XXG	SOT-223	Output Voltage e.g. 12.0V=12 5.0V=05	4000 Units/ Reel

APPLICATION CIRCUIT



BLOCK DIAGRAM



Note 1: To specify an output voltage, substitute voltage value for "XX".
Note 2: Bypass capacitors are recommended for optimum stability and transient response and should be located as close as possible to the regulators.

ABSOLUTE MAXIMUM RATINGS (Ta=25℃ unless otherwise specified.)

Parameters	Symbol	Value	Unit
Input Voltage (for V_{OUT} = 5~18V)	V_I	35	V
Output Current	I_O	1	A
Operating Junction Temperature Range	T_J	-40 ~ +150	°C
Operating Ambient Temperature	T_A	-40 ~ +125	°C
Storage Temperature Range	T_{STG}	-65 ~ +150	°C
Power Dissipation	P_D	0.93	W
Thermal Resistance - Junction to Air	$R_{\theta JA}$	134	°C/W
Thermal Resistance - Junction to Case	$R_{\theta JC}$	18	°C/W

Note 1. Thermal resistance test board size: 30.0mm×25.0mm×1.6mm (FR4); Copper foil thickness: 35um.
2. RθJC test point is at the center position directly above the plastic encapsulation.

ELECTRICAL CHARACTERISTICS (LR7805G)

(I_{OUT} = 0.5A, V_{IN} = 10V, Tj = -40℃~ 150℃, C_I = 0.33μF, C_O = 0.1μF, unless otherwise specified.)

Parameters	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O	T_J = +25°C	4.8	5	5.2	V
		I_O = 5mA to 1.0A, Po<15W V_I = 8V to 20V	4.75	5	5.25	
Line Regulation (Note3)	ΔV_O	Tj=25°C, V_I = 7.5V to 20V	-	4	100	mV
		Tj=25°C, V_I = 8V to 12V	-	2	50	
Load Regulation (Note3)	ΔV_O	Tj=25°C, I_O = 5mA to 1.0A	-	9	100	mV
		Tj=25°C, I_O = 250mA to 750mA	-	4	50	
Quiescent Current	I_Q	T_J = 25°C	-	4.2	8	mA
Quiescent Current Change	ΔI_Q	I_O = 5mA to 1.0A	-	-	0.5	mA
		I_O = 500mA V_I = 8V to 25V	-	-	0.8	
Output Voltage Drift	$\Delta V/\Delta T$	I_O = 5mA	-	0.8	-	mV/°C
Output Noise Voltage	V_N	f = 10Hz to 100kHz	-	42	-	μV/Vo
Ripple Rejection	RR	f = 120Hz, V_I = 8V to 18V	62	73	-	dB
Dropout Voltage	V_D	T_J = 25°C, I_O = 1.0A	-	2	-	V
Output Resistance	R_O	f = 1KHz	-	15	-	mΩ
Short Circuit Current	I_{SC}	T_J = 25°C, V_I = 35V	-	200	-	mA

ELECTRICAL CHARACTERISTICS (LR7806G)

(I_{OUT} = 0.5A, V_{IN} = 11V, Tj = -40℃~ 150℃, C_I = 0.33μF, C_O = 0.1μF, unless otherwise specified.)

Parameters	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O	T_J = +25°C	5.75	6	6.25	V
		I_O = 5mA to 1.0A, Po<15W V_I = 9V to 21V	5.65	6	6.25	
Line Regulation (Note3)	ΔV_O	Tj=25°C, V_I = 8.5V to 25V	-	-	120	mV
		Tj=25°C, V_I = 9V to 13V	-	-	60	
Load Regulation (Note3)	ΔV_O	Tj=25°C, I_O = 5mA to 1.0A	-	-	120	mV
		Tj=25°C, I_O = 250mA to 750mA	-	-	60	
Quiescent Current	I_Q	T_J = 25°C	-	4.3	8	mA
Quiescent Current Change	ΔI_Q	I_O = 5mA to 1.0A	-	-	0.5	mA
		I_O = 500mA V_I = 9V to 25V	-	-	0.8	
Output Voltage Drift	$\Delta V/\Delta T$	I_O = 5mA	-	0.8	-	mV/°C
Output Noise Voltage	V_N	f = 10Hz to 100kHz	-	42	-	μV/Vo
Ripple Rejection	RR	f = 120Hz, V_I = 9V to 19V	-	68	-	dB
Dropout Voltage	V_D	T_J = 25°C, I_O = 1.0A	-	2	-	V
Output Resistance	R_O	f = 1KHz	-	17	-	mΩ
Short Circuit Current	I_{SC}	T_J = 25°C, V_I = 35V	-	200	-	mA

ELECTRICAL CHARACTERISTICS (LR7808G)

(I_{OUT} = 0.5A, V_{IN} = 14V, Tj = -40℃~ 150℃, C_I = 0.33μF, C_O = 0.1μF, unless otherwise specified.)

Parameters	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O	T_J = +25°C	7.84	8	8.16	V
		I_O = 5mA to 1.0A, Po<15W V_I = 11.5V to 23V	7.7	8	8.3	
Line Regulation (Note3)	ΔV_O	Tj=25°C, V_I = 10.5V to 25V	-	-	160	mV
		Tj=25°C, V_I = 11V to 17V	-	-	80	
Load Regulation (Note3)	ΔV_O	Tj=25°C, I_O = 5mA to 1.0A	-	-	160	mV
		Tj=25°C, I_O = 250mA to 750mA	-	-	80	
Quiescent Current	I_Q	T_J = 25°C	-	4.3	8	mA
Quiescent Current Change	ΔI_Q	I_O = 5mA to 1.0A	-	-	0.5	mA
		I_O = 500mA V_I = 11.5V to 25V	-	-	0.8	
Output Voltage Drift	$\Delta V/\Delta T$	I_O = 5mA	-	1.0	-	mV/°C
Output Noise Voltage	V_N	f = 10Hz to 100kHz	-	42	-	μV/Vo
Ripple Rejection	RR	f = 120Hz, V_I = 11.5V to 21.5V	-	62	-	dB
Dropout Voltage	V_D	T_J = 25°C, I_O = 1.0A	-	2	-	V
Output Resistance	R_O	f = 1KHz	-	18	-	mΩ
Short Circuit Current	I_{SC}	T_J = 25°C, V_I = 35V	-	200	-	mA

ELECTRICAL CHARACTERISTICS (LR7809G)

(I_{OUT} = 0.5A, V_{IN} = 15V, Tj = -40℃~ 150℃, C_I = 0.33μF, C_O = 0.1μF, unless otherwise specified.)

Parameters	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O	T_J = +25°C	8.82	9	9.18	V
		I_O = 5mA to 1.0A, Po<15W V_I = 12.5V to 24V	8.65	9	9.35	
Line Regulation (Note3)	ΔV_O	Tj=25°C, V_I = 11.5V to 26V	-	-	180	mV
		Tj=25°C, V_I = 12V to 18V	-	-	90	
Load Regulation (Note3)	ΔV_O	Tj=25°C, I_O = 5mA to 1.0A	-	-	190	mV
		Tj=25°C, I_O = 250mA to 750mA	-	-	80	
Quiescent Current	I_Q	T_J = 25°C	-	4.3	8	mA
Quiescent Current Change	ΔI_Q	I_O = 5mA to 1.0A	-	-	0.5	mA
		I_O = 500mA V_I = 12.5V to 25V	-	-	0.8	
Output Voltage Drift	$\Delta V/\Delta T$	I_O = 5mA	-	1.2	-	mV/°C
Output Noise Voltage	V_N	f = 10Hz to 100kHz	-	42	-	μV/Vo
Ripple Rejection	RR	f = 120Hz, V_I = 12.5V to 22.5V	-	61	-	dB
Dropout Voltage	V_D	T_J = 25°C, I_O = 1.0A	-	2	-	V
Output Resistance	R_O	f = 1KHz	-	18	-	mΩ
Short Circuit Current	I_{SC}	T_J = 25°C, V_I = 35V	-	200	-	mA

ELECTRICAL CHARACTERISTICS (LR7810G)

(I_{OUT} = 0.5A, V_{IN} = 16V, Tj = -40℃~ 150℃, C_I = 0.33μF, C_O = 0.1μF, unless otherwise specified.)

Parameters	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O	T_J = +25°C	9.7	10	10.3	V
		I_O = 5mA to 1.0A, Po<15W V_I = 13.5V to 25V	9.6	10	10.4	
Line Regulation (Note3)	ΔV_O	Tj=25°C, V_I = 12.5V to 28V	-	8	200	mV
		Tj=25°C, V_I = 14V to 20V	-	4	100	
Load Regulation (Note3)	ΔV_O	Tj=25°C, I_O = 5mA to 1.0A	-	18	200	mV
		Tj=25°C, I_O = 250mA to 750mA	-	8	100	
Quiescent Current	I_Q	T_J = 25°C	-	4.3	8	mA
Quiescent Current Change	ΔI_Q	I_O = 5mA to 1.0A	-	-	0.5	mA
		I_O = 500mA V_I = 13V to 28V	-	-	0.8	
Output Voltage Drift	$\Delta V/\Delta T$	I_O = 5mA	-	1.3	-	mV/°C
Output Noise Voltage	V_N	f = 10Hz to 100kHz	-	42	-	μV/Vo
Ripple Rejection	RR	f = 120Hz, V_I = 13V to 23V	-	61	-	dB
Dropout Voltage	V_D	T_J = 25°C, I_O = 1.0A	-	2	-	V
Output Resistance	R_O	f = 1KHz	-	18	-	mΩ
Short Circuit Current	I_{SC}	T_J = 25°C, V_I = 35V	-	200	-	mA

ELECTRICAL CHARACTERISTICS (LR7812G)

(I_{OUT} = 0.5A, V_{IN} = 19V, Tj = -40℃~ 150℃, C_I = 0.33μF, C_O = 0.1μF, unless otherwise specified.)

Parameters	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O	T_J = +25°C	11.5	12	12.5	V
		I_O = 5mA to 1.0A, Po<15W V_I = 15.5V to 27V	11.4	12	12.6	
Line Regulation (Note3)	ΔV_O	Tj=25°C, V_I = 14.5V to 30V	-	-	240	mV
		Tj=25°C, V_I = 16V to 22V	-	-	120	
Load Regulation (Note3)	ΔV_O	Tj=25°C, I_O = 5mA to 1.0A	-	-	240	mV
		Tj=25°C, I_O = 250mA to 750mA	-	-	120	
Quiescent Current	I_Q	T_J = 25°C	-	4.4	8	mA
Quiescent Current Change	ΔI_Q	I_O = 5mA to 1.0A	-	-	0.5	mA
		I_O = 500mA V_I = 15V to 30V	-	-	0.8	
Output Voltage Drift	$\Delta V/\Delta T$	I_O = 5mA	-	1.5	-	mV/°C
Output Noise Voltage	V_N	f = 10Hz to 100kHz	-	42	-	μV/Vo
Ripple Rejection	RR	f = 120Hz, V_I = 15V to 25V	-	60	-	dB
Dropout Voltage	V_D	T_J = 25°C, I_O = 1.0A	-	2	-	V
Output Resistance	R_O	f = 1KHz	-	18	-	mΩ
Short Circuit Current	I_{SC}	T_J = 25°C, V_I = 35V	-	200	-	mA

ELECTRICAL CHARACTERISTICS (LR7815G)

(I_{OUT} = 0.5A, V_{IN} = 23V, Tj = -40℃~ 150℃, C_I = 0.33μF, C_O = 0.1μF, unless otherwise specified.)

Parameters	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O	T_J = +25°C	14.4	15	15.6	V
		I_O = 5mA to 1.0A, Po<15W V_I = 17.5V to 30V	14.25	15	15.75	
Line Regulation (Note3)	ΔV_O	Tj=25°C, V_I = 17.5V to 30V	-	15	300	mV
		Tj=25°C, V_I = 20V to 26V	-	7	150	
Load Regulation (Note3)	ΔV_O	Tj=25°C, I_O = 5mA to 1.0A	-	25	300	mV
		Tj=25°C, I_O = 250mA to 750mA	-	10	150	
Quiescent Current	I_Q	T_J = 25°C	-	5	8	mA
Quiescent Current Change	ΔI_Q	I_O = 5mA to 1.0A	-	-	0.5	mA
		I_O = 500mA V_I = 18V to 30V	-	-	0.8	
Output Voltage Drift	$\Delta V/\Delta T$	I_O = 5mA	-	1.8	-	mV/°C
Output Noise Voltage	V_N	f = 10Hz to 100kHz	-	42	-	μV/Vo
Ripple Rejection	RR	f = 120Hz, V_I = 18V to 28V	-	60	-	dB
Dropout Voltage	V_D	T_J = 25°C, I_O = 1.0A	-	2	-	V
Output Resistance	R_O	f = 1KHz	-	18	-	mΩ
Short Circuit Current	I_{SC}	T_J = 25°C, V_I = 35V	-	200	-	mA

ELECTRICAL CHARACTERISTICS (LR7818G)

(I_{OUT} = 0.5A, V_{IN} = 26V, Tj = -40℃~ 150℃, C_I = 0.33μF, C_O = 0.1μF, unless otherwise specified.)

Parameters	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O	T_J = +25°C	17.3	18	18.7	V
		I_O = 5mA to 1.0A, Po<15W V_I = 17.5V to 33V	17.1	18	18.9	
Line Regulation (Note3)	ΔV_O	Tj=25°C, V_I = 21V to 33V	-	-	360	mV
		Tj=25°C, V_I = 24V to 30V	-	-	180	
Load Regulation (Note3)	ΔV_O	Tj=25°C, I_O = 5mA to 1.0A	-	-	360	mV
		Tj=25°C, I_O = 250mA to 750mA	-	-	180	
Quiescent Current	I_Q	T_J = 25°C	-	5	8	mA
Quiescent Current Change	ΔI_Q	I_O = 5mA to 1.0A	-	-	0.5	mA
		I_O = 500mA V_I = 21V to 33V	-	-	0.8	
Output Voltage Drift	$\Delta V/\Delta T$	I_O = 5mA	-	2.1	-	mV/°C
Output Noise Voltage	V_N	f = 10Hz to 100kHz	-	42	-	μV/Vo
Ripple Rejection	RR	f = 120Hz, V_I = 22V to 32V	-	57	-	dB
Dropout Voltage	V_D	T_J = 25°C, I_O = 1.0A	-	2	-	V
Output Resistance	R_O	f = 1KHz	-	18	-	mΩ
Short Circuit Current	I_{SC}	T_J = 25°C, V_I = 35V	-	200	-	mA

ELECTRICAL CHARACTERISTICS (LR7824G)

(I_{OUT} = 0.5A, V_{IN} = 33V, Tj = -40℃~ 150℃, C_I = 0.33μF, C_O = 0.1μF, unless otherwise specified.)

Parameters	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O	T_J = +25°C	23	24	25	V
		I_O = 5mA to 1.0A, Po<15W V_I = 27V to 38V	22.8	24	25.2	
Line Regulation (Note3)	ΔV_O	Tj=25°C, V_I = 27V to 38V	-	-	480	mV
		Tj=25°C, V_I = 30V to 36V	-	-	240	
Load Regulation (Note3)	ΔV_O	Tj=25°C, I_O = 5mA to 1.0A	-	-	480	mV
		Tj=25°C, I_O = 250mA to 750mA	-	-	240	
Quiescent Current	I_Q	T_J = 25°C	-	5	8	mA
Quiescent Current Change	ΔI_Q	I_O = 5mA to 1.0A	-	-	0.5	mA
		I_O = 500mA V_I = 27V to 38V	-	-	0.8	
Output Voltage Drift	$\Delta V/\Delta T$	I_O = 5mA	-	2.1	-	mV/°C
Output Noise Voltage	V_N	f = 10Hz to 100kHz	-	42	-	μV/Vo
Ripple Rejection	RR	f = 120Hz, V_I = 28V to 38V	-	57	-	dB
Dropout Voltage	V_D	T_J = 25°C, I_O = 1.0A	-	2	-	V
Output Resistance	R_O	f = 1KHz	-	18	-	mΩ
Short Circuit Current	I_{SC}	T_J = 25°C, V_I = 35V	-	200	-	mA

Note: 3. Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

ELECTRICAL CHARACTERISTICS CURVES (Ta = 25°C unless otherwise specified.)

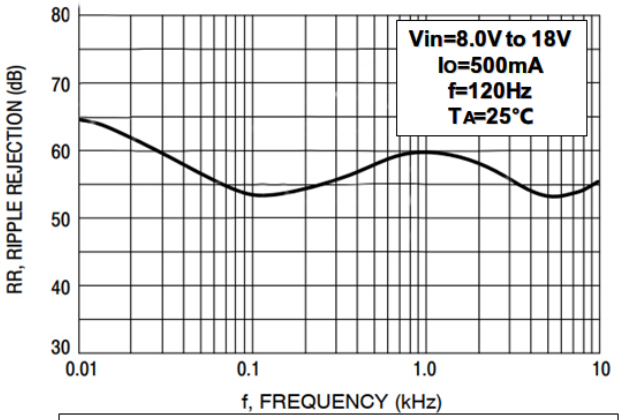


Figure 1. Ripple Rejection as a Function of Frequency (LR78XX Series)

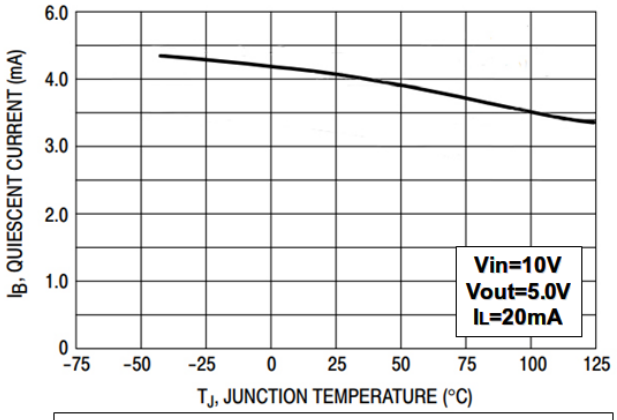
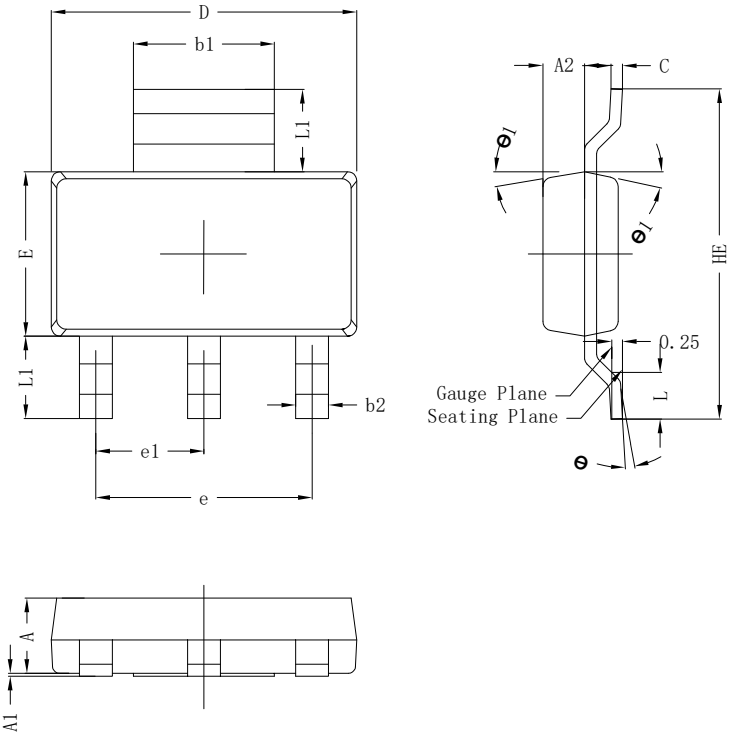


Figure 2. Quiescent Current as a Function of Temperature (LR78XX Series)

PACKAGE DIMENSIONS

(All dimensions in millimeters)

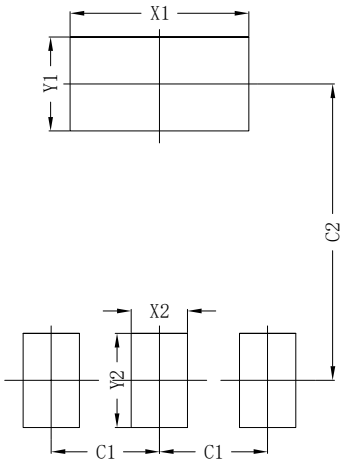


SOT223			
DIM	MIN	NOR	MAX
A	1.50	1.60	1.70
A1	0.00	0.05	0.10
A2	0.80	0.90	1.00
b1	2.90	3.02	3.10
b2	0.60	0.72	0.80
c	0.20	0.27	0.35
D	6.30	6.50	6.70
E	3.30	3.50	3.70
e	4.60BSC		
e1	2.30BSC		
HE	6.80	7.00	7.20
L	0.80	1.00	1.20
L1	1.75(REF)		
θ	0°~8°		
θ1	8°	10°	12°
All Dimensions in mm			

GENERAL NOTES

1. Top package surface finish Ra0.4±0.2um
2. Bottom package surface finish Ra0.7±0.2um
3. Side package surface finish Ra0.4±0.2um
4. Protrusion or Gate Burrs shall not exc d 0.10mm per side.

RECOMMENDED PAD LAYOUT



SOT223	
DIM	(mm)
X1	3.80
Y1	2.00
X2	1.20
Y2	2.00
C1	2.30
C2	6.30

REVISION HISTORY

Version	Description	Update by	Update Date
1.0	LRC ORIGINAL RELEASE.	Chen S	2023-07-17
1.1	Correct pin configuration.	Chen S	2023-07-24
1.2	Delete notes about thermal test conditions.	Chen S	2023-08-03
1.3	Add thermal resistance, power dissipation and test conditions.	Chen S	2024-03-18
1.4	Change the reel information from 1k/reel to 4k/reel.	Chen S	2024-08-19
1.5	Update LR7810G test conditions.	Chen S	2024-10-25

DISCLAIMER

- Curve guarantee in the specification. The curve of test items with electric parameter is used as quality guarantee. The curve of test items without electric parameter is used as reference only.

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