

# MJE700, MJE702, MJE703 (PNP) - MJE800, MJE802, MJE803 (NPN)



ON Semiconductor®

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## Plastic Darlington Complementary Silicon Power Transistors

These devices are designed for general-purpose amplifier and low-speed switching applications.

### Features

- High DC Current Gain –  $h_{FE} = 2000$  (Typ) @  $I_C = 2.0$  Adc
- Monolithic Construction with Built-in Base-Emitter Resistors to Limit Leakage – Multiplication
- Choice of Packages – MJE700 and MJE800 Series
- Pb-Free Packages are Available\*

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage MJE700, MJE800 MJE702, MJE703, MJE802, MJE803	$V_{CEO}$	60 80	Vdc
Collector-Base Voltage MJE700, MJE800 MJE702, MJE703, MJE802, MJE803	$V_{CB}$	60 80	Vdc
Emitter-Base Voltage	$V_{EB}$	5.0	Vdc
Collector Current	$I_C$	4.0	Adc
Base Current	$I_B$	0.1	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	40 0.32	W mW/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

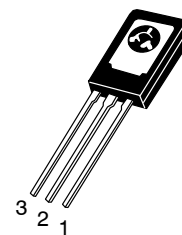
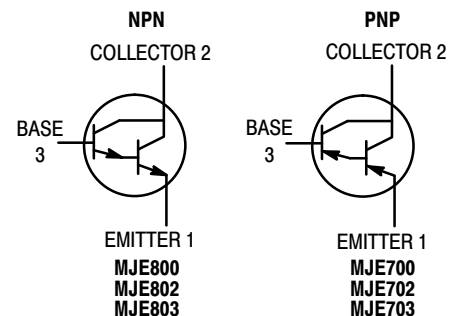
### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Case	$\theta_{JC}$	6.25	$^\circ\text{C}/\text{W}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

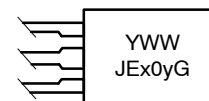
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

## 4.0 AMPERE DARLINGTON POWER TRANSISTORS COMPLEMENTARY SILICON 40 WATT 50 WATT



TO-225  
CASE 77  
STYLE 1

### MARKING DIAGRAM



- Y = Year
- WW = Work Week
- JEx0y = Device Code
  - x = 7 or 8
  - y = 0, 2, or 3
- G = Pb-Free Package

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

# MJE700, MJE702, MJE703 (PNP) – MJE800, MJE802, MJE803 (NPN)

## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit	
<b>OFF CHARACTERISTICS</b>					
Collector–Emitter Breakdown Voltage (Note 1) (I <sub>C</sub> = 50 mA <sub>dc</sub> , I <sub>B</sub> = 0)	MJE700, MJE800 MJE702, MJE703, MJE802, MJE803	V <sub>(BR)CEO</sub>	60 80	– –	V <sub>dc</sub>
Collector Cutoff Current (V <sub>CE</sub> = 60 V <sub>dc</sub> , I <sub>B</sub> = 0) (V <sub>CE</sub> = 80 V <sub>dc</sub> , I <sub>B</sub> = 0)	MJE700, MJE800 MJE702, MJE703, MJE802, MJE803	I <sub>CEO</sub>	– –	100 100	μA <sub>dc</sub>
Collector Cutoff Current (V <sub>CB</sub> = Rated BV <sub>CEO</sub> , I <sub>E</sub> = 0) (V <sub>CB</sub> = Rated BV <sub>CEO</sub> , I <sub>E</sub> = 0, T <sub>C</sub> = 100°C)		I <sub>CBO</sub>	– –	100 500	μA <sub>dc</sub>
Emitter Cutoff Current (V <sub>BE</sub> = 5.0 V <sub>dc</sub> , I <sub>C</sub> = 0)		I <sub>EBO</sub>	–	2.0	mA <sub>dc</sub>

## ON CHARACTERISTICS

DC Current Gain (Note 1) (I <sub>C</sub> = 1.5 A <sub>dc</sub> , V <sub>CE</sub> = 3.0 V <sub>dc</sub> ) (I <sub>C</sub> = 2.0 A <sub>dc</sub> , V <sub>CE</sub> = 3.0 V <sub>dc</sub> ) (I <sub>C</sub> = 4.0 A <sub>dc</sub> , V <sub>CE</sub> = 3.0 V <sub>dc</sub> )	MJE700, MJE702, MJE800, MJE802 MJE703, MJE803 All devices	h <sub>FE</sub>	750 750 100	– – –	–
Collector–Emitter Saturation Voltage (Note 1) (I <sub>C</sub> = 1.5 A <sub>dc</sub> , I <sub>B</sub> = 30 mA <sub>dc</sub> ) (I <sub>C</sub> = 2.0 A <sub>dc</sub> , I <sub>B</sub> = 40 mA <sub>dc</sub> ) (I <sub>C</sub> = 4.0 A <sub>dc</sub> , I <sub>B</sub> = 40 mA <sub>dc</sub> )	MJE700, MJE702, MJE800, MJE802 MJE703, MJE803 All devices	V <sub>CE(sat)</sub>	– – –	2.5 2.8 3.0	V <sub>dc</sub>
Base–Emitter On Voltage (Note 1) (I <sub>C</sub> = 1.5 A <sub>dc</sub> , V <sub>CE</sub> = 3.0 V <sub>dc</sub> ) (I <sub>C</sub> = 2.0 A <sub>dc</sub> , V <sub>CE</sub> = 3.0 V <sub>dc</sub> ) (I <sub>C</sub> = 4.0 A <sub>dc</sub> , V <sub>CE</sub> = 3.0 V <sub>dc</sub> )	MJE700, MJE702, MJE800, MJE802 MJE703, MJE803 All devices	V <sub>BE(on)</sub>	– – –	2.5 2.5 3.0	V <sub>dc</sub>

## DYNAMIC CHARACTERISTICS

Small–Signal Current Gain (I <sub>C</sub> = 1.5 A <sub>dc</sub> , V <sub>CE</sub> = 3.0 V <sub>dc</sub> , f = 1.0 MHz)	h <sub>fe</sub>	1.0	–	–
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1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

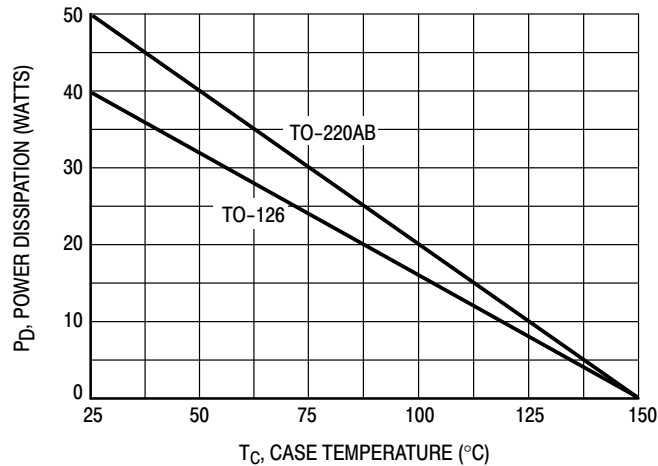


Figure 1. Power Derating

# MJE700, MJE702, MJE703 (PNP) – MJE800, MJE802, MJE803 (NPN)

$R_B$  &  $R_C$  VARIED TO OBTAIN DESIRED CURRENT LEVELS  
 $D_1$ , MUST BE FAST RECOVERY TYPE, e.g.:  
 1N5825 USED ABOVE  $I_B \approx 100$  mA  
 MSD6100 USED BELOW  $I_B \approx 100$  mA

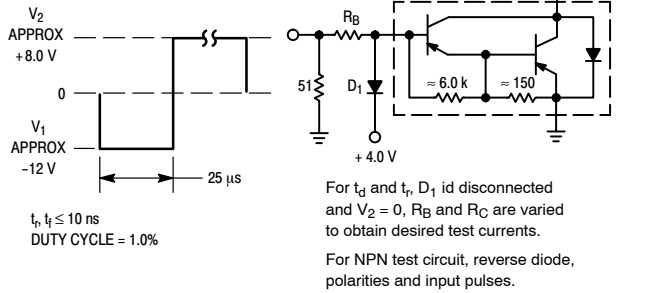


Figure 2. Switching Times Test Circuit

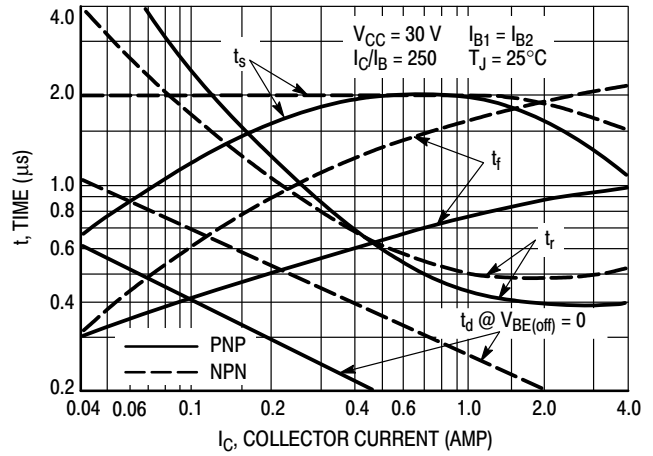


Figure 3. Switching Times

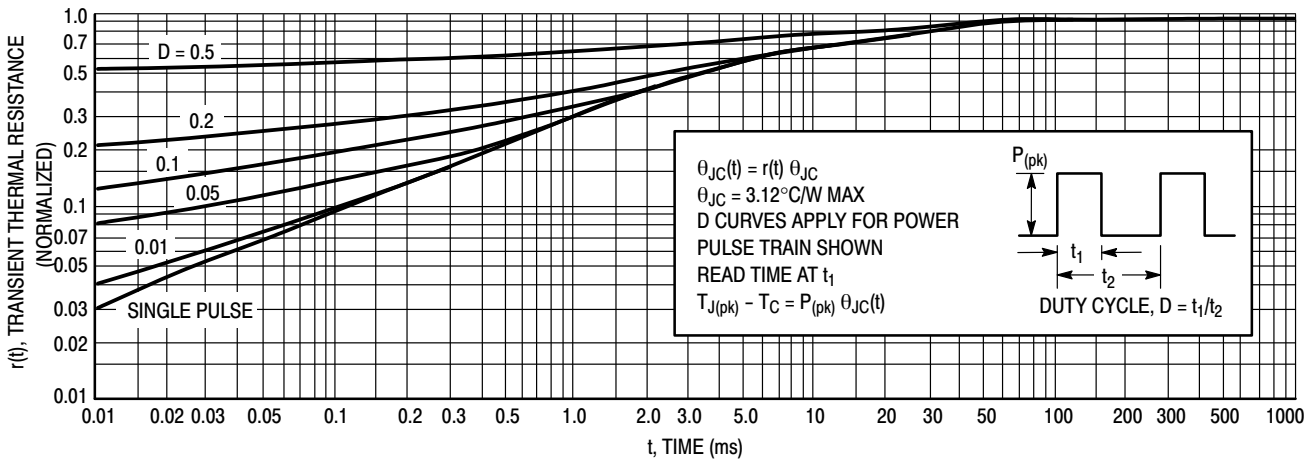


Figure 4. Thermal Response (MJE700, 800 Series)

## ACTIVE-REGION SAFE-OPERATING AREA

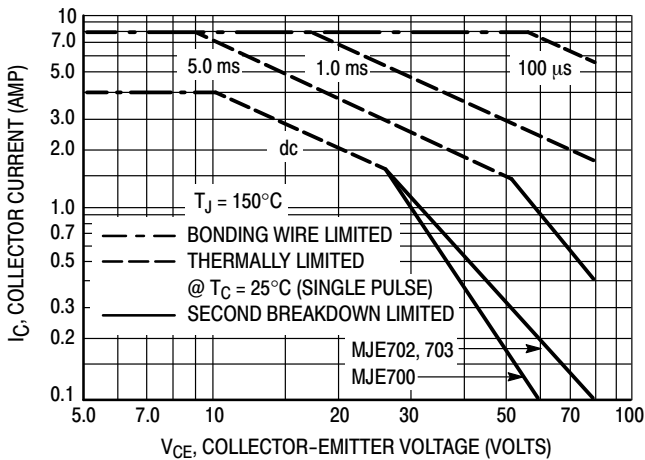


Figure 5. MJE700 Series

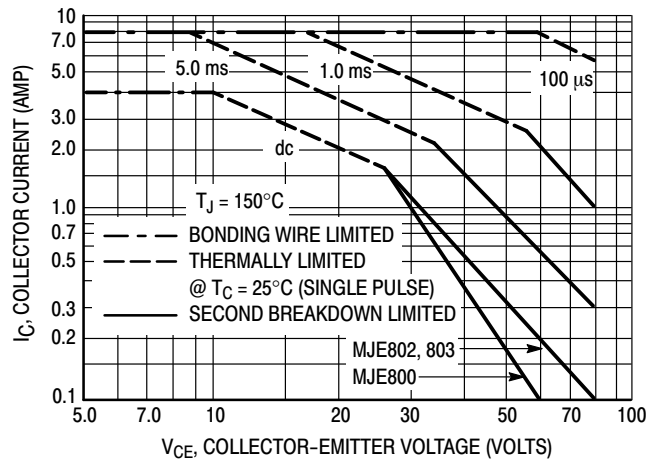


Figure 6. MJE800 Series

There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate  $I_C - V_{CE}$  limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figures 5 and 6 are based on  $T_{J(pk)} = 150^\circ\text{C}$ ;  $T_C$  is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided  $T_{J(pk)} < 150^\circ\text{C}$ .  $T_{J(pk)}$  may be calculated from the data in Figure 4. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

# MJE700, MJE702, MJE703 (PNP) – MJE800, MJE802, MJE803 (NPN)

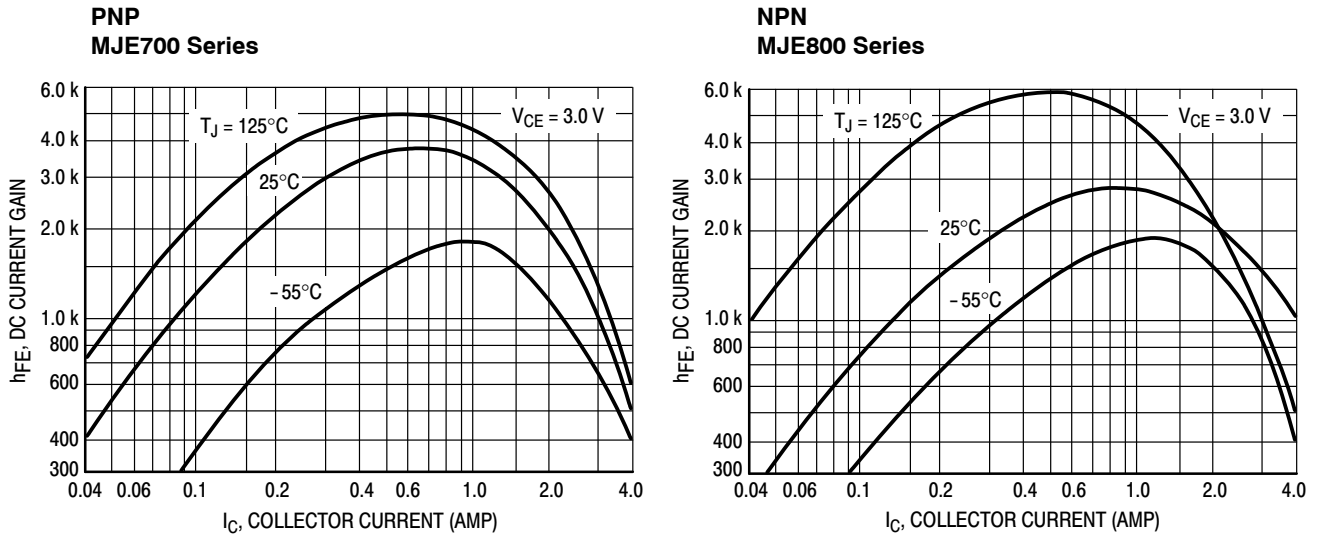


Figure 7. DC Current Gain

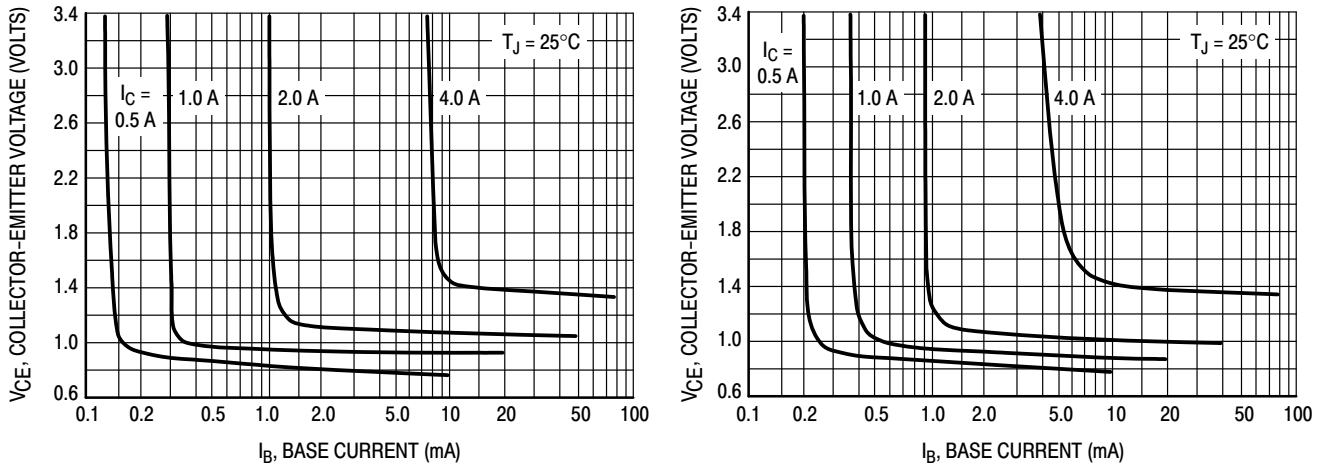


Figure 8. Collector Saturation Region

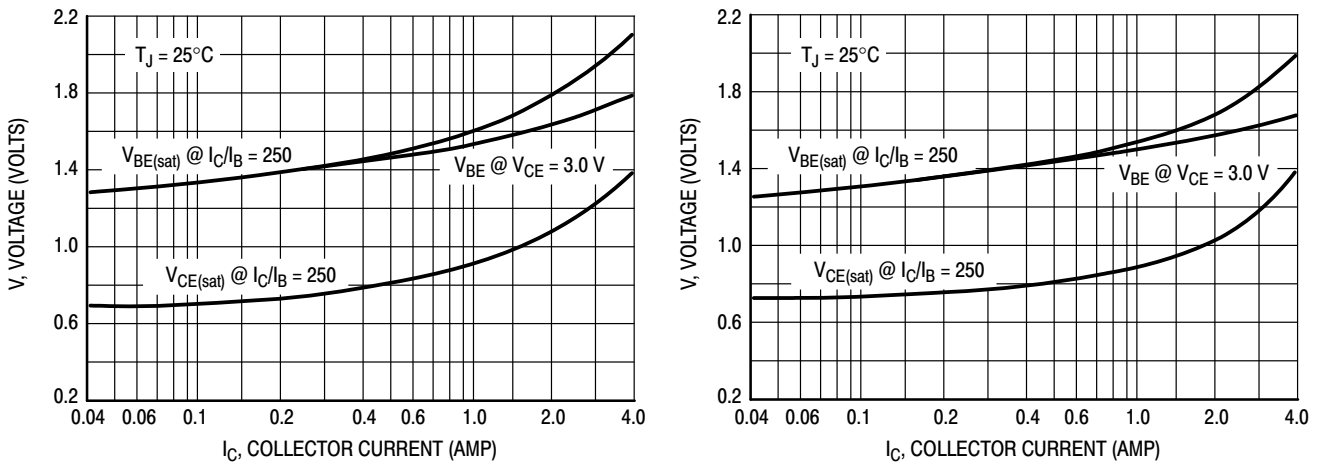


Figure 9. "On" Voltages

**MJE700, MJE702, MJE703 (PNP) – MJE800, MJE802, MJE803 (NPN)**

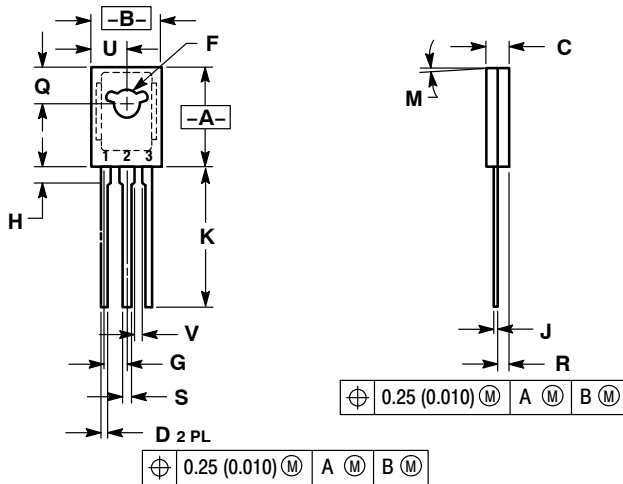
**ORDERING INFORMATION**

Device	Package	Shipping
MJE700	TO-225	50 Units / Bulk
MJE700G	TO-225 (Pb-Free)	
MJE702	TO-225	
MJE702G	TO-225 (Pb-Free)	
MJE703	TO-225	
MJE703G	TO-225 (Pb-Free)	
MJE800	TO-225	
MJE800G	TO-225 (Pb-Free)	
MJE802	TO-225	
MJE802G	TO-225 (Pb-Free)	
MJE803	TO-225	
MJE803G	TO-225 (Pb-Free)	

# MJE700, MJE702, MJE703 (PNP) – MJE800, MJE802, MJE803 (NPN)

## PACKAGE DIMENSIONS

TO-225  
CASE 77-09  
ISSUE Z



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 077-01 THRU -08 OBSOLETE, NEW STANDARD 077-09.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.425	0.435	10.80	11.04
B	0.295	0.305	7.50	7.74
C	0.095	0.105	2.42	2.66
D	0.020	0.026	0.51	0.66
F	0.115	0.130	2.93	3.30
G	0.094 BSC		2.39 BSC	
H	0.050	0.095	1.27	2.41
J	0.015	0.025	0.39	0.63
K	0.575	0.655	14.61	16.63
M	5° TYP		5° TYP	
Q	0.148	0.158	3.76	4.01
R	0.045	0.065	1.15	1.65
S	0.025	0.035	0.64	0.88
U	0.145	0.155	3.69	3.93
V	0.040	---	1.02	---

STYLE 1:

1. EMITTER
2. COLLECTOR
3. BASE

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Тел: +7 (812) 336 43 04 (многоканальный)  
Email: [org@lifeelectronics.ru](mailto:org@lifeelectronics.ru)