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# BD787G (NPN), BD788G (PNP)

## Complementary Plastic Silicon Power Transistors

These devices are designed for lower power audio amplifier and low current, high-speed switching applications.

### Features

- Low Collector–Emitter Sustaining Voltage
- High Current–Gain – Bandwidth Product
- These Devices are Pb–Free and are RoHS Compliant\*

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	$V_{CEO}$	60	Vdc
Collector–Base Voltage	$V_{CBO}$	80	Vdc
Emitter Base Voltage	$V_{EBO}$	6.0	Vdc
Collector Current – Continuous	$I_C$	4.0	Adc
Collector Current – Peak	$I_{CM}$	8.0	Adc
Base Current – Continuous	$I_B$	1.0	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	15 0.12	W mW/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	–65 to +150	$^\circ\text{C}$

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction–to–Case	$R_{\theta JC}$	8.34	$^\circ\text{C/W}$

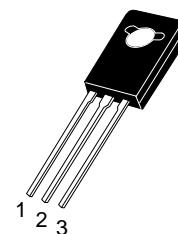
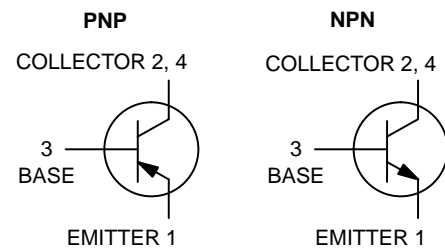
\*For additional information on our Pb–Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



**ON Semiconductor**<sup>®</sup>

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## 4 AMPERES POWER TRANSISTORS COMPLEMENTARY SILICON 60 VOLTS, 15 WATTS



TO-225  
CASE 77-09  
STYLE 1

### MARKING DIAGRAM



Y = Year  
WW = Work Week  
BD78x = Device Code  
x = 7 or 8  
G = Pb–Free Package

### ORDERING INFORMATION

Device	Package	Shipping
BD787G	TO-225 (Pb–Free)	500 Units/Box
BD788G	TO-225 (Pb–Free)	500 Units/Box

## BD787G (NPN), BD788G (PNP)

### ELECTRICAL CHARACTERISTICS\* ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector–Emitter Sustaining Voltage (Note 1) ( $I_C = 10\text{ mAdc}$ , $I_B = 0$ )	$V_{CEO(sus)}$	60	–	Vdc
Collector Cutoff Current ( $V_{CE} = 20\text{ Vdc}$ , $I_B = 0$ ) ( $V_{CE} = 30\text{ Vdc}$ , $I_B = 0$ )	$I_{CEO}$	–	100	$\mu\text{Adc}$
Collector Cutoff Current ( $V_{CE} = 80\text{ Vdc}$ , $V_{BE(off)} = 1.5\text{ Vdc}$ ) ( $V_{CE} = 40\text{ Vdc}$ , $V_{BE(off)} = 1.5\text{ Vdc}$ , $T_C = 125^\circ\text{C}$ )	$I_{CEX}$	– –	1.0 0.1	$\mu\text{Adc}$ mAdc
Emitter Cutoff Current ( $V_{EB} = 6.0\text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$	–	1.0	$\mu\text{Adc}$
<b>ON CHARACTERISTICS (Note 1)</b>				
DC Current Gain ( $I_C = 200\text{ mAdc}$ , $V_{CE} = 3.0\text{ Vdc}$ ) ( $I_C = 1.0\text{ Adc}$ , $V_{CE} = 3.0\text{ Vdc}$ ) ( $I_C = 2.0\text{ Adc}$ , $V_{CE} = 3.0\text{ Vdc}$ ) ( $I_C = 4.0\text{ Adc}$ , $V_{CE} = 3.0\text{ Vdc}$ )	$h_{FE}$	40 25 20 5.0	250 – – –	–
Collector–Emitter Saturation Voltage ( $I_C = 500\text{ mAdc}$ , $I_B = 50\text{ mAdc}$ ) ( $I_C = 1.0\text{ Adc}$ , $I_B = 100\text{ mAdc}$ ) ( $I_C = 2.0\text{ Adc}$ , $I_B = 200\text{ mAdc}$ ) ( $I_C = 4.0\text{ Adc}$ , $I_B = 800\text{ mAdc}$ )	$V_{CE(sat)}$	– – – –	0.4 0.6 0.8 2.5	Vdc
Base–Emitter Saturation Voltage ( $I_C = 2.0\text{ Adc}$ , $I_B = 200\text{ mAdc}$ )	$V_{BE(sat)}$	–	2.0	Vdc
Base–Emitter On Voltage ( $I_C = 2.0\text{ Adc}$ , $V_{CE} = 3.0\text{ Vdc}$ )	$V_{BE(on)}$	–	1.8	Vdc
<b>DYNAMIC CHARACTERISTICS</b>				
Current–Gain – Bandwidth Product ( $I_C = 100\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 10\text{ MHz}$ )	$f_T$	50	–	MHz
Output Capacitance ( $V_{CB} = 10\text{ Vdc}$ , $I_C = 0$ ) BD787G ( $f = 0.1\text{ MHz}$ ) BD788G	$C_{ob}$	– –	50 70	pF
Small–Signal Current Gain ( $I_C = 200\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )	$h_{fe}$	10	–	–

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

\*Indicates JEDEC Registered Data

1. Pulse Test; Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

# BD787G (NPN), BD788G (PNP)

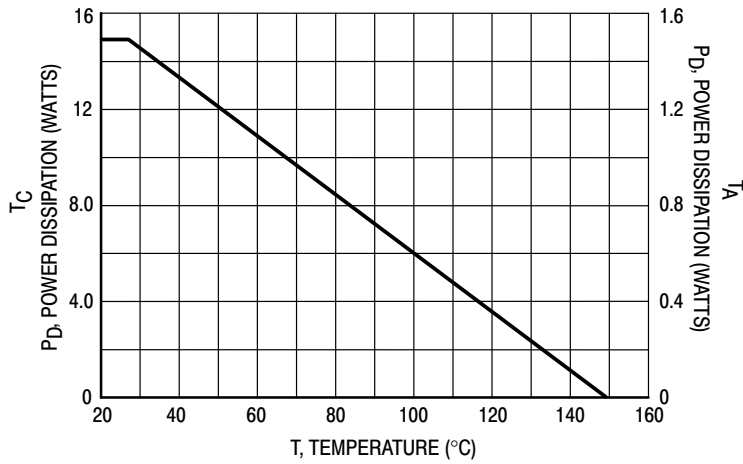


Figure 1. Power Derating

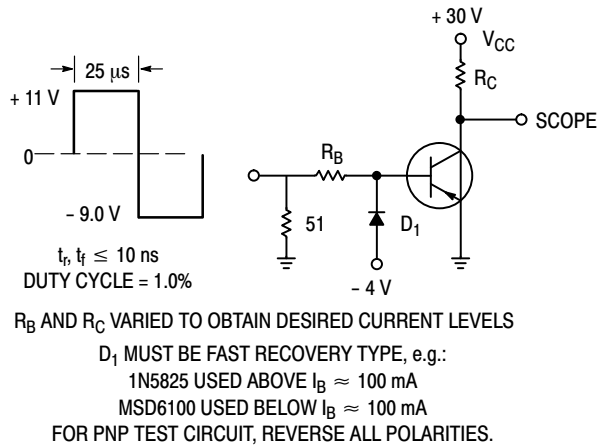


Figure 2. Switching Time Test Circuit

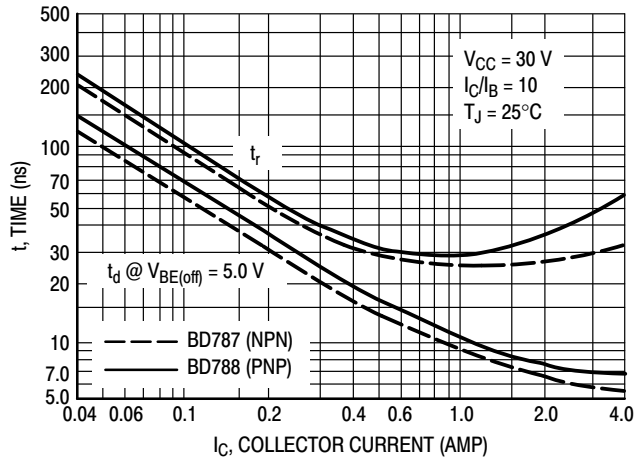


Figure 3. Turn-On Time

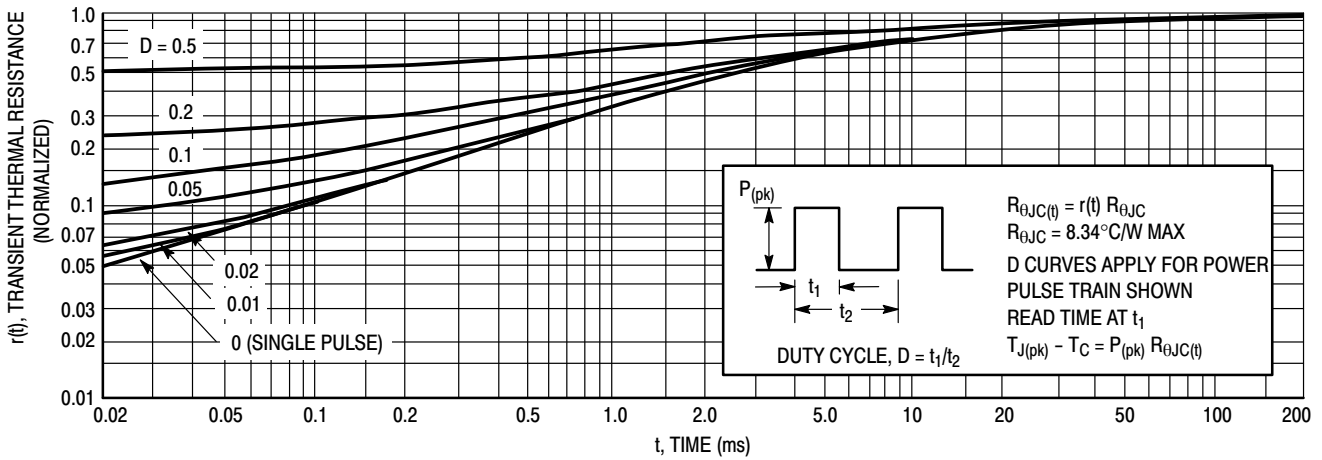


Figure 4. Thermal Response

# BD787G (NPN), BD788G (PNP)

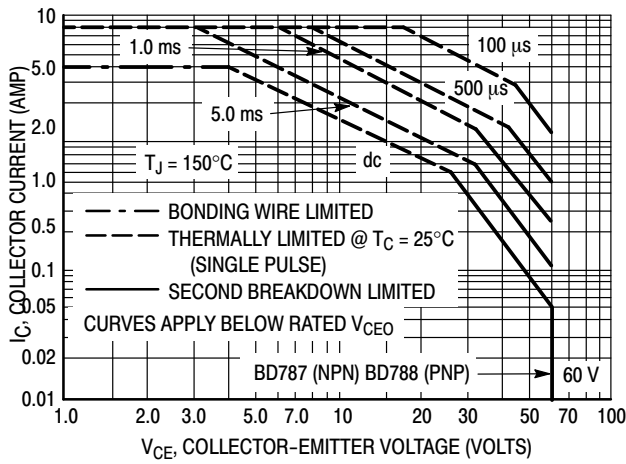


Figure 5. Active Region Safe Operating Area

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 Figure 5 is 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  $T_{J(pk)} \leq 150^\circ\text{C}$ ,  $T_{J(pk)}$  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.

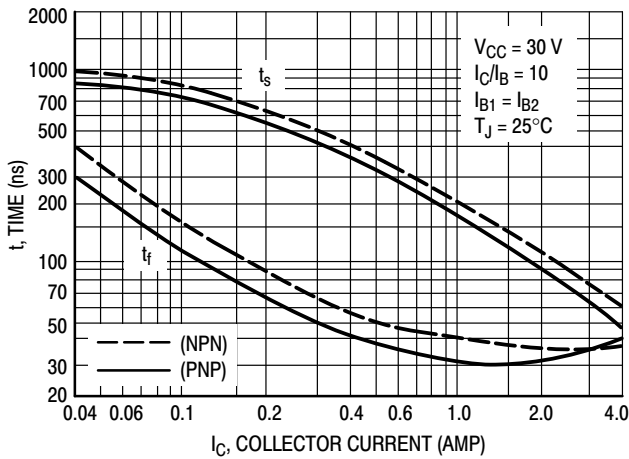


Figure 6. Turn-Off Time

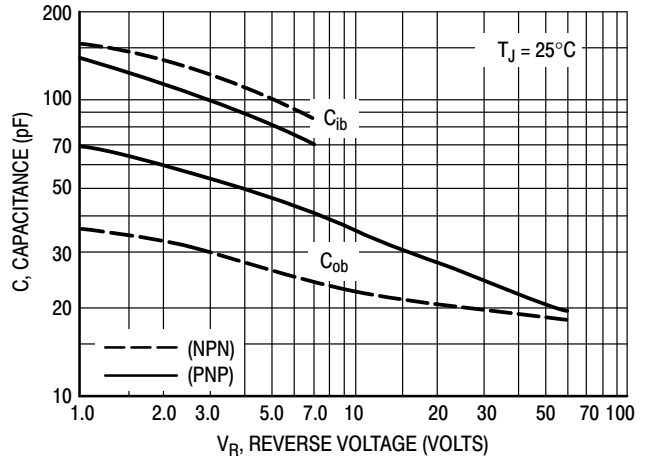


Figure 7. Capacitance

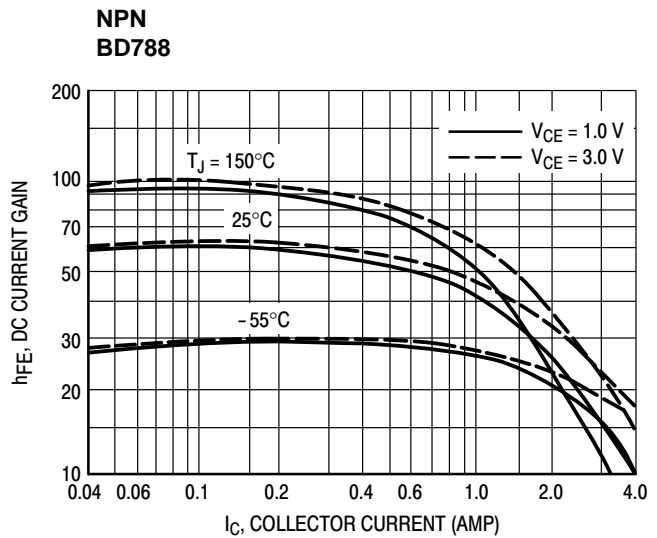
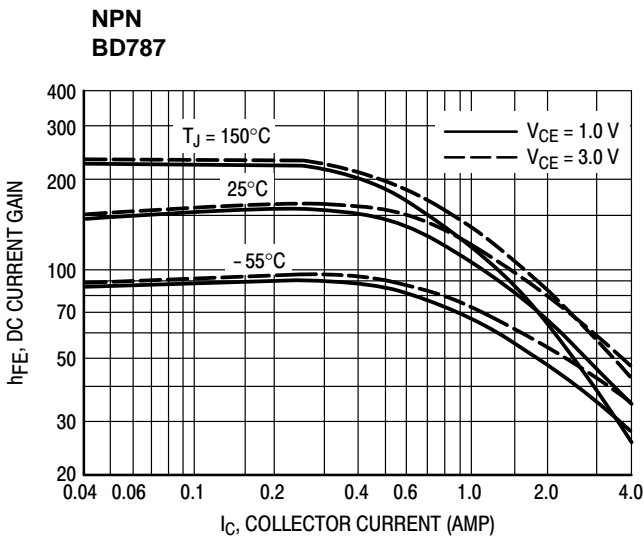


Figure 8. DC Current Gain

# BD787G (NPN), BD788G (PNP)

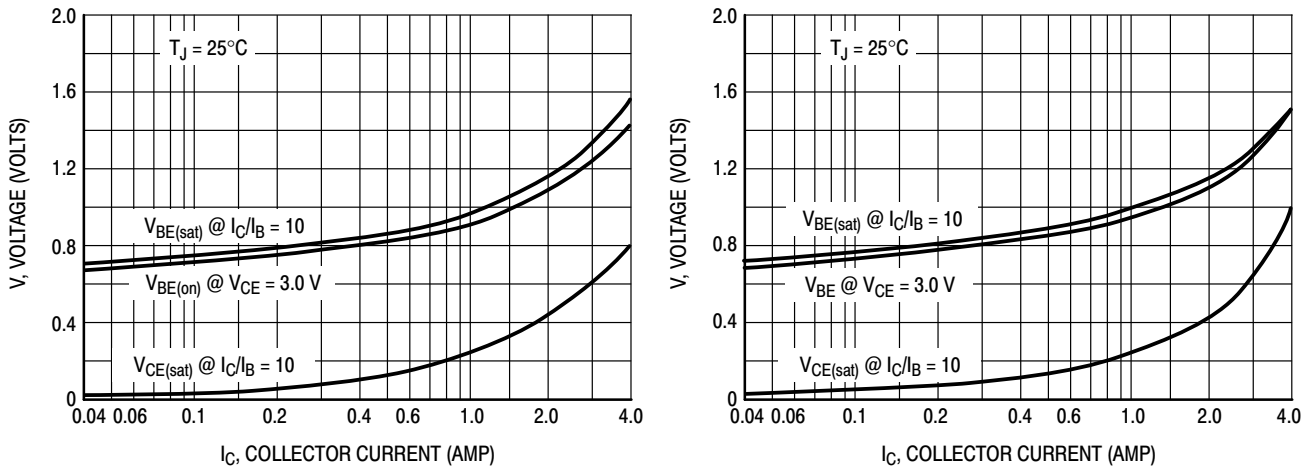


Figure 9. "On" Voltages

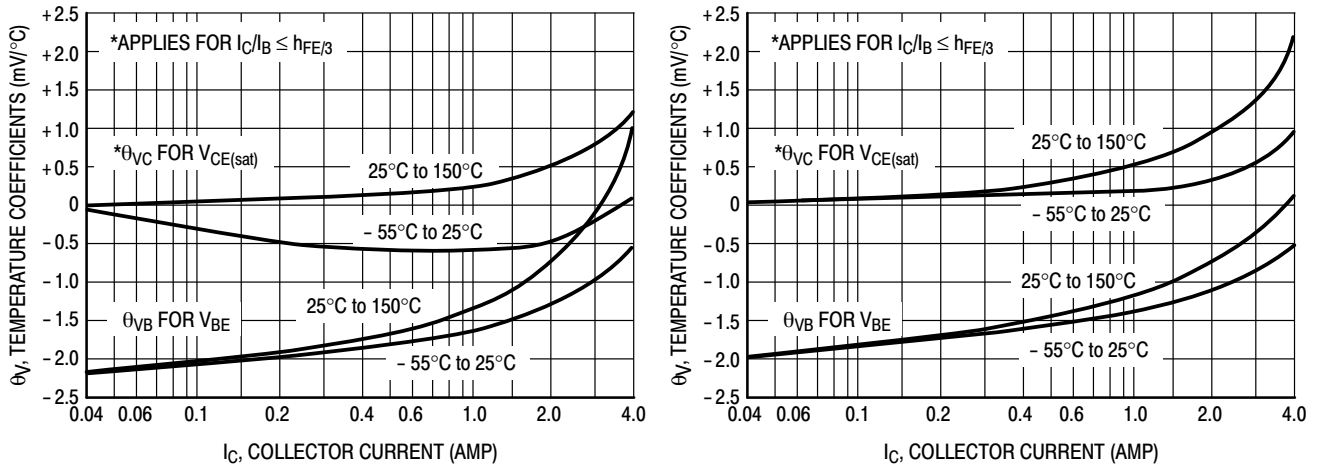
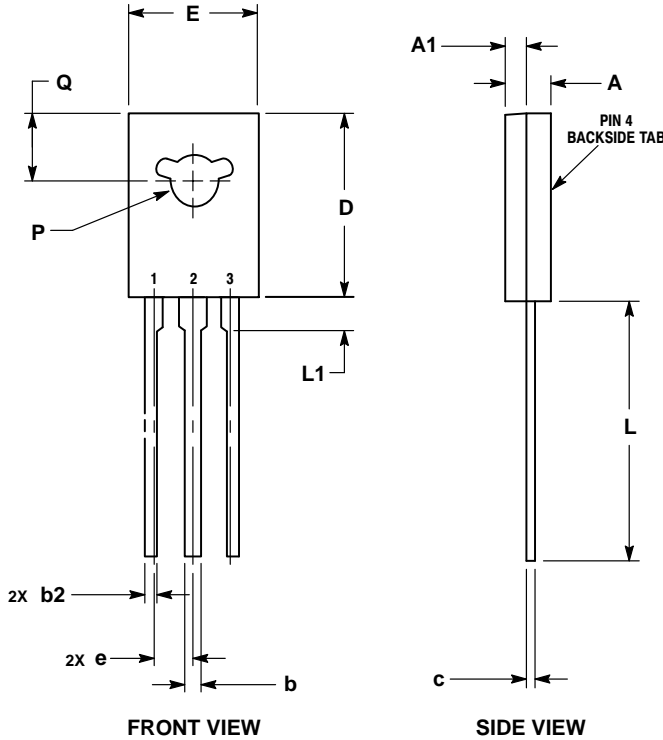
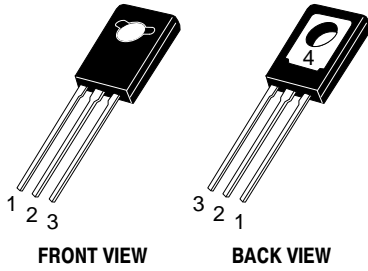


Figure 10. Temperature Coefficients

# BD787G (NPN), BD788G (PNP)

## PACKAGE DIMENSIONS

TO-225  
CASE 77-09  
ISSUE AC



- NOTES:  
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.  
2. CONTROLLING DIMENSION: MILLIMETERS.  
3. NUMBER AND SHAPE OF LUGS OPTIONAL.

DIM	MILLIMETERS	
	MIN	MAX
A	2.40	3.00
A1	1.00	1.50
b	0.60	0.90
b2	0.51	0.88
c	0.39	0.63
D	10.60	11.10
E	7.40	7.80
e	2.04	2.54
L	14.50	16.63
L1	1.27	2.54
P	2.90	3.30
Q	3.80	4.20

- STYLE 1:  
PIN 1. EMITTER  
2., 4. COLLECTOR  
3. BASE

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