

HD29413

Quadruple Differential Line Receivers With 3 State Outputs

REJ03D0306-0200Z
 (Previous ADE-205-582 (Z))
 Rev.2.00
 Jul.16.2004

Description

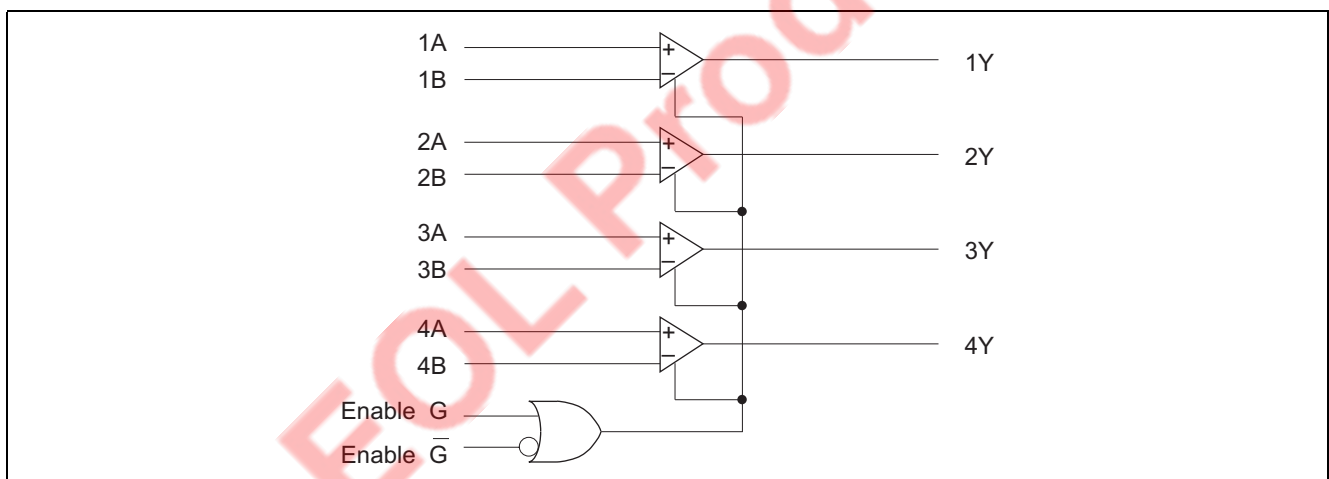
The HD29413 features quadruple differential line receivers designed to meet the spec of EIA RS-422A and RS-423A. The device operates from a single 5 V power supply. The enable function is common to all four receivers and offers a choice of active high or active low inputs. (Complementary output enable input.) Fail-safe circuit guarantees the outputs always at the high level when the inputs are open.

Features

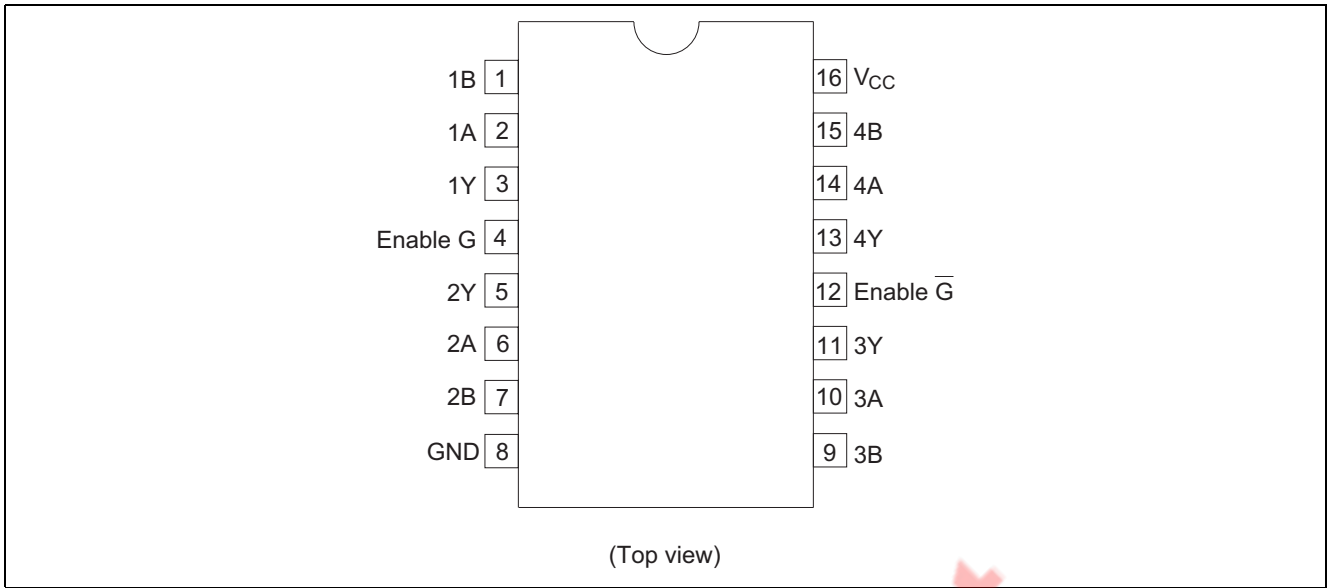
- Ordering Information

Part Name	Package Type	Package Code	Package Abbreviation	Taping Abbreviation (Quantity)
HD29413P	DILP-16 pin	DP-16E, -16FV	P	—

Logic Diagram



Pin Arrangement



Function Table

Differential Input $V_{IA} - V_{IB}$	Enable		Output Y
	G	\bar{G}	
+	H	X	H
+	X	L	H
—	H	X	L
—	X	L	L
X	L	H	Z

- H : High level
- L : Low level
- X : Irrelevant
- Z : High impedance

Absolute Maximum Ratings

Item	Symbol	Ratings	Unit
Supply Voltage	V_{CC}^{*1}	+7	V
In Phase Input Voltage	V_{IC}^{*2}	-25 to +25	V
Differential Input Voltage	V_{ID}^{*3}	0 to +25	V
Enable Input Voltage	V_{IN}	+7	V
Output Sink Current	I_O	+50	mA
Operating Temperature	T_{opr}	0 to +70	°C
Storage Temperature	T_{stg}	-65 to +150	°C

- Notes:
1. All voltage values except for differential input voltage are with respect to ground terminal.
 2. $V_{IC} = 1/2 (V_{IA} + V_{IB})$ $|V_{ID}| = |V_{IA} - V_{IB}|$
 3. Differential input voltage is measured at the noninverting input with respect to the corresponding inverting input.
 4. The absolute maximum ratings are values which must not individually be exceeded, and furthermore, no two of which may be realized at the same time.

Recommended Operating Conditions

Item	Symbol	Min	Typ	Max	Unit
Supply Voltage	V_{CC}	4.75	5.0	5.25	V
In Phase Input Voltage	V_{IC}	-7	—	+7	V
Differential Input Voltage	V_{ID}	+0.3	—	+6.0	V
Output Current	I_{OH}	—	—	-440	μ A
	I_{OL}	—	—	8	mA
Operating Temperature	Topr	0	—	70	$^{\circ}$ C

Electrical Characteristics (Ta = 0 to + 70 $^{\circ}$ C)

Item	Symbol	Min	Typ*1	Max	Unit	Conditions			
Differential Input High Threshold Voltage	V_{TH}	—	—	0.3	V	$V_{CC} = 5\text{ V} \pm 5\%$, $V_{IC} = -7\text{ to }+7\text{ V}$	$V_{OH} \geq 2.7\text{ V}$, $I_{OH} = -440\ \mu\text{A}$		
	V_{TL}	—	—	-0.3	V		$V_{OL} \leq 0.4\text{ V}$, $I_{OL} = 4\text{ mA}$		
Enable Input Voltage	V_{IH}	2.0	—	—	V				
	V_{IL}	—	—	0.8	V				
Enable Input Clamp Voltage	V_{IK}	—	—	-1.5	V	$V_{CC} = 4.75\text{ V}$, $I_{IN} = -18\text{ mA}$			
Output Voltage	V_{OH}	2.7	—	—	V	$V_{CC} = 4.75\text{ V}$	$V_{ID} = 0.3\text{ to }6\text{ V}$	$I_{OH} = -440\ \mu\text{A}$	
	V_{OL}	—	—	0.4	V	$V_{IL}(\bar{G}) = 0.8\text{ V}$	$V_{ID} = -0.3\text{ to }-6\text{ V}$	$I_{OL} = 4\text{ mA}$	
		—	—	0.45	V	$V_{IH}(G) = 2\text{ V}$		$I_{OL} = 8\text{ mA}$	
Off State (High impedance) Output Current	I_{OZ}	—	—	20	μ A	$V_{CC} = 5.25\text{ V}$			
		—	—	-20	μ A	$V_{IL}(G) = 0.8\text{ V}$, $V_{IH}(\bar{G}) = 2\text{ V}$			
Line Input Current	I_{IN}	—	—	2.2	mA	$V_{CC} = 5.25\text{ V}$ or $V_{CC} = 0\text{ V}$			
		0	—	1.0	mA	$V_I = -10\text{ V}$			
		0	—	-1.0	mA	$V_I = 3\text{ V}$			
		—	—	-2.2	mA	$V_I = -3\text{ V}$			
Enable Input Current	$I_{I(EN)}$	—	—	100	μ A	$V_{CC} = 5.25\text{ V}$			
		—	—	20	μ A	$V_I = 5.5\text{ V}$			
		—	—	-0.36	mA	$V_I = 2.7\text{ V}$			
Short Circuit Output Current	I_{OS}^{*2}	-15	—	-85	mA	$V_{CC} = 5.25\text{ V}$, $V_O = 0\text{ V}$			
		—	—	70	mA	$V_{CC} = 5.25\text{ V}$, $V_I = 0\text{ V}$ (All Output Disable)			

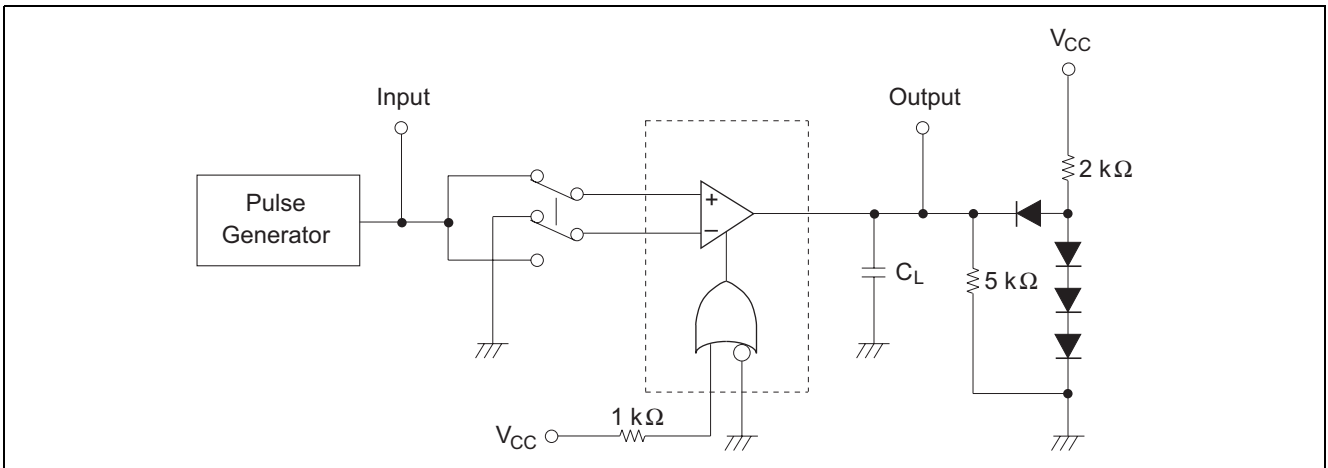
- Notes: 1. All typical values are at $V_{CC} = 5\text{ V}$, $T_a = 25^{\circ}\text{C}$, $V_{IC} = 0$
 2. Not more than one output should be shorted at a time.

Switching Characteristics ($V_{CC} = 5\text{ V}$, $T_a = 25^{\circ}\text{C}$)

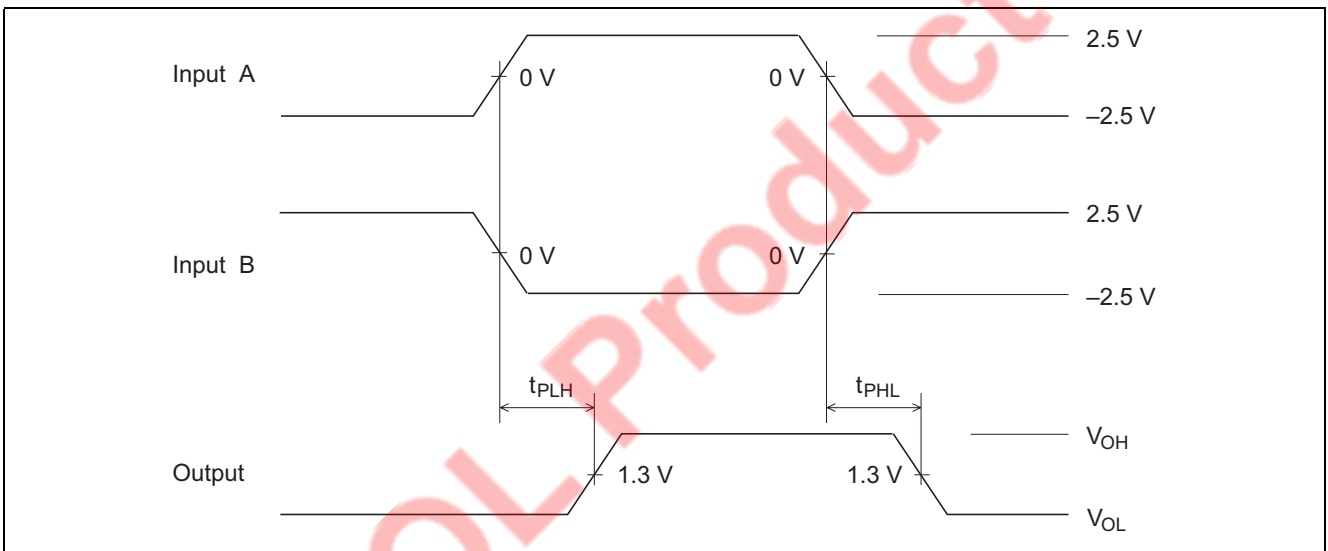
Item	Symbol	Min	Typ	Max	Unit	Conditions
Propagation Delay Time	t_{PLH} , t_{PHL}	—	17	25	ns	$C_L = 15\text{ pF}$
Output Enable Time	t_{ZH} , t_{ZL}	—	15	22	ns	
Output Disable Time	t_{HZ}	—	15	22	ns	$C_L = 5\text{ pF}$
	t_{LZ}	—	20	30	ns	

1. t_{PLH} , t_{PHL}

Test Circuit

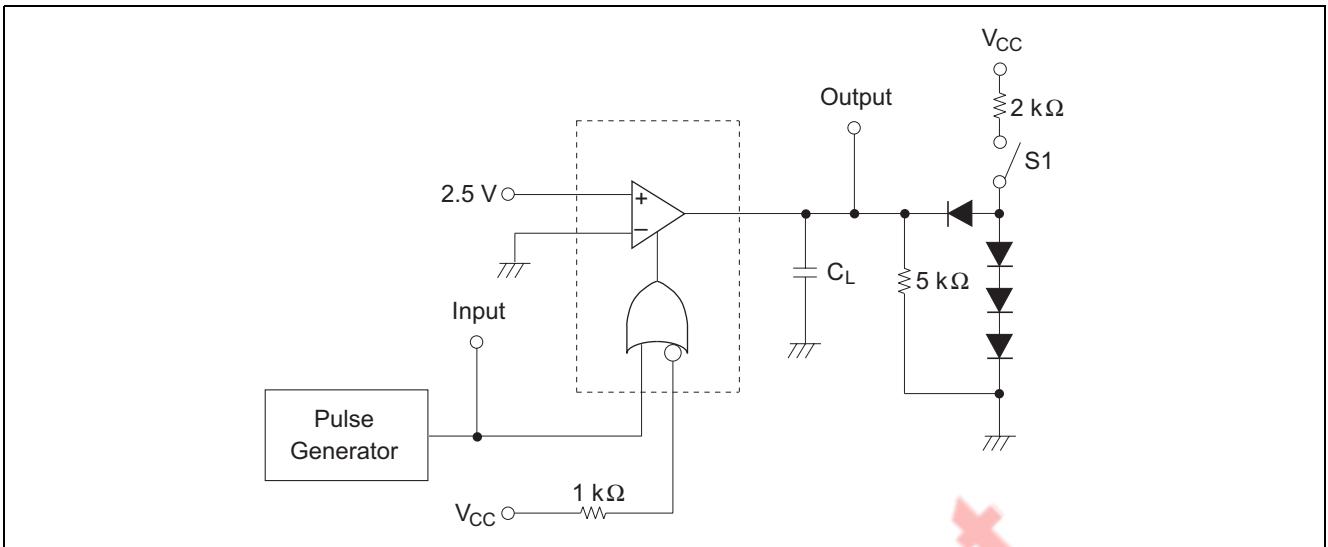


Waveforms

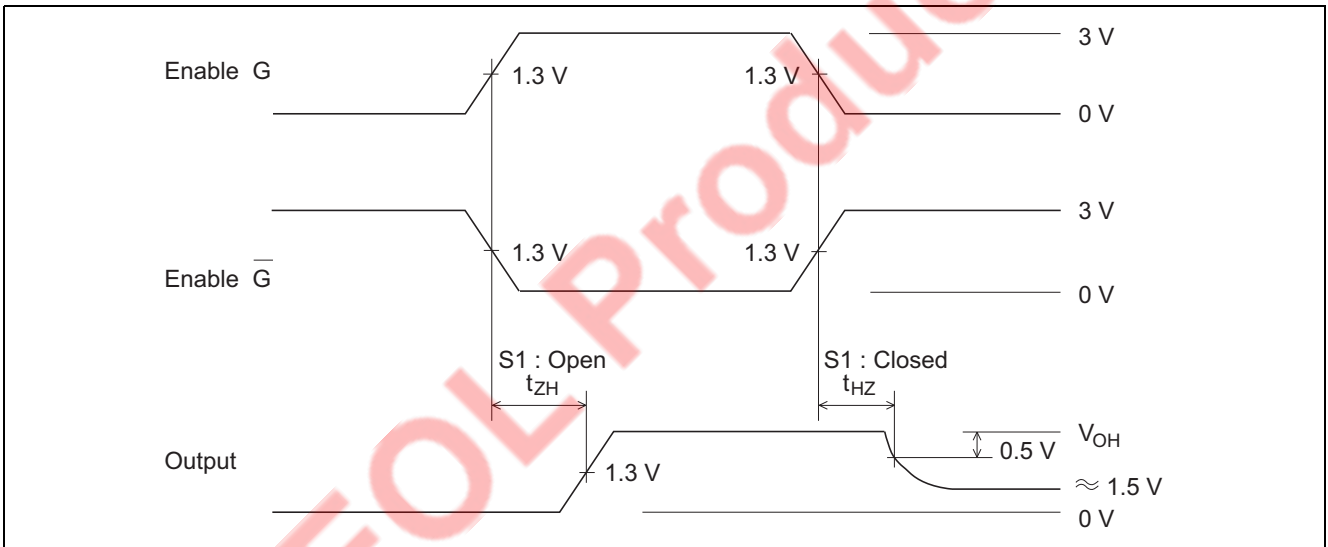


2. t_{HZ} , t_{ZH}

Test Circuit



Waveforms

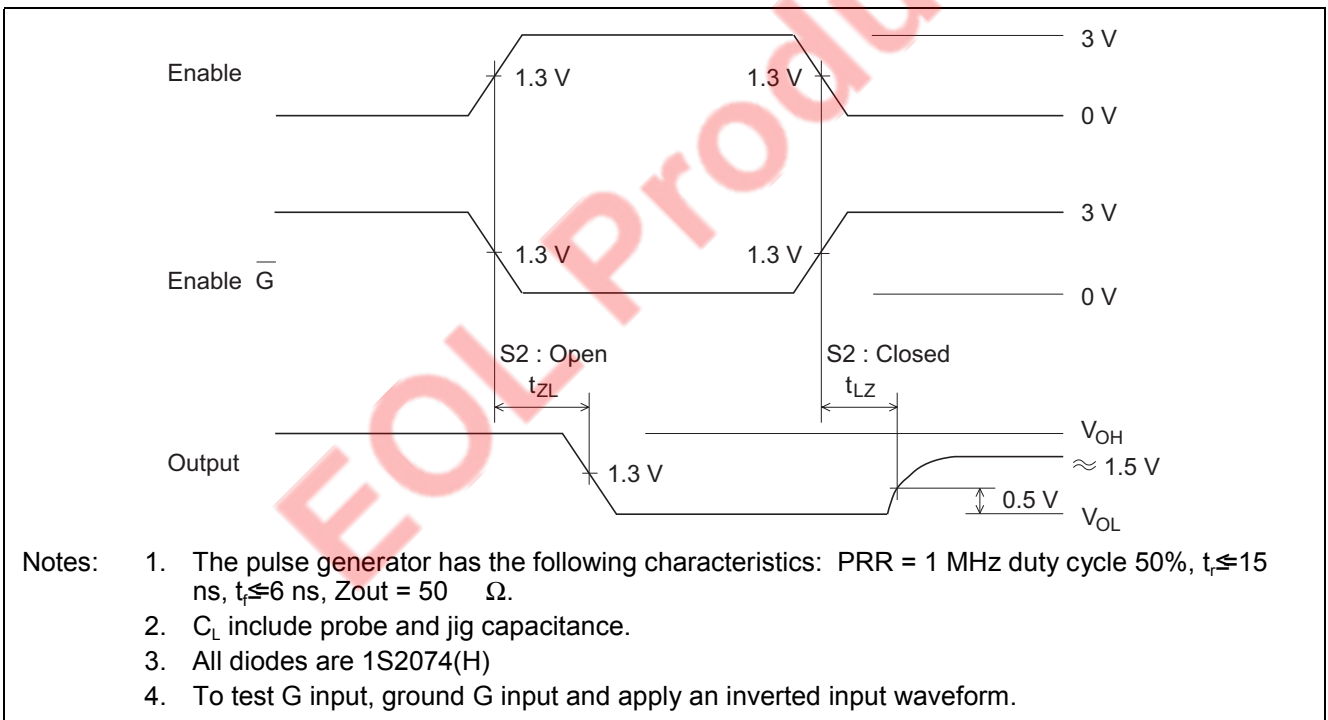


3. t_{LZ} , t_{ZL}

Test Circuit

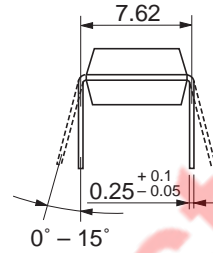
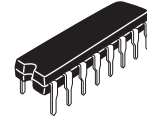
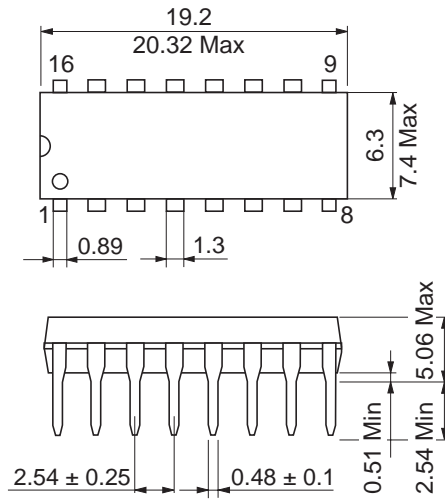


Waveforms



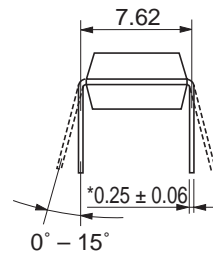
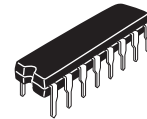
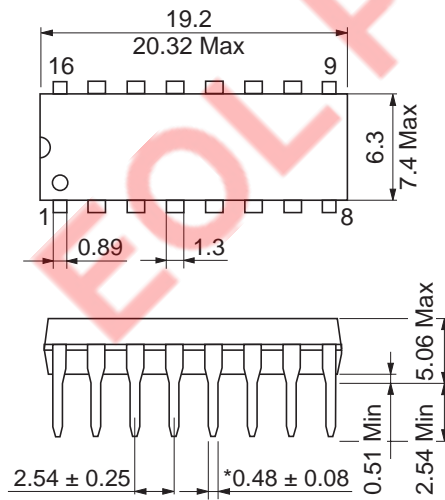
Package Dimensions

As of January, 2003
Unit: mm



Package Code	DP-16E
JEDEC	Conforms
JEITA	Conforms
Mass (reference value)	1.05 g

Unit: mm



*Ni/Pd/AU Plating

Package Code	DP-16FV
JEDEC	Conforms
JEITA	Conforms
Mass (reference value)	1.05 g

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