

Cypress Semiconductor Product Qualification Report

QTP# 022505 VERSION 2.0
June, 2003

PSoC™ Microcontrollers Family S4AD-5 Technology, Fab 2	
CY8C25122	4K Flash x 256 SRAM
CY8C26233	8K Flash x 256 SRAM
CY8C26443 CY8C26643	16K Flash x 256 SRAM

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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PRODUCT QUALIFICATION HISTORY

Qual Report	Description of Qualification Purpose	Date Comp
010702	New Technology S4AD-5 / New Product, Programmable Clock Generator, CY2414ZC, its product family and bond option.	Apr 01
003605	Technology Derivative S4D-5 /New Neuron Devices, CY7C53150 and CY7C53120	Jul 01
013507	New PSoC™ CY8C25xxx/26xxx device and its product family	Sept 01
022505	Three layer mask change to enhance functionality	Jul 02

PRODUCT DESCRIPTION (for qualification)			
Qualification Purpose: Qualify New device CY8C25xxx/CY8C26xxx and its product family in Technology S4D-5 in Fab 2			
Marketing Part #:	CY8C25122, CY8C26233, CY8C26443, CY8C26643		
Device Description:	3.3V and 5.5V, Industrial, available in 8/16/20/28/48 lead PDIP, 20/28/-lead SOIC, 20/28/48-lead SSOP and 44-lead TQFP package respectively.		
Cypress Division:	Cypress Microsystems Inc Subsidiary– (CMS) WA		
Overall Die (or Mask) REV Level (pre-requisite for qualification):			Rev. D
What ID markings on Die:	8C25001A		

TECHNOLOGY/FAB PROCESS DESCRIPTION S4AD-5			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 500A Ti/6,000A Al 0.5% Cu /1,200A TiW Metal 2: 500A Ti/8,000A Al 0.5% Cu/300A TiW
Passivation Type and Materials:	3,000A TeOs / 6,000A Si ₃ N ₄		
Free Phosphorus contents in top glass layer(%):	0%		
Number of Transistors in Device:	300,000		
Number of Gates in Device	50,000		
Generic Process Technology/Design Rule (□-drawn):	Single Poly, Double Metal, 0.35 □m		
Gate Oxide Material/Thickness (MOS):	SiO ₂ / 110A		
Name/Location of Die Fab (prime) Facility:	Cypress Semiconductor - Round Rock, TX		
Die Fab Line ID/Wafer Process ID:	Fab2, S4AD-5		

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY SITE FACILITY
8/20/28-lead PDIP	Omedata Indonesia
48-lead PDIP	Alphatec Thailand
20/28-lead SOIC	Omedata Indonesia
20/28-lead SSOP	OSE Taiwan
48-lead SSOP	Cypress CML-R
44-pin TQFP	ASE Taiwan

Note: Package Qualification details upon request.

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	P283
Package Outline, Type, or Name:	28-lead Plastic-Dual-In Line Plastic (PDIP)
Mold Compound Name/Manufacturer:	NITTO MP8000CH
Mold Compound Flammability Rating:	V-O per UL94
Oxygen Rating Index:	>28%
Lead Frame Material:	Copper
Lead Finish, Composition / Thickness:	Solder Plate, 85%Sn, 15%Pb
Die Backside Preparation Method/Metallization:	N/A
Die Separation Method:	Wafer Saw
Die Attach Supplier:	Ablestik
Die Attach Material:	8361H
Die Attach Method:	Epoxy
Bond Diagram Designation:	10-04020
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au, 1.3mil
Thermal Resistance Theta JA °C/W:	56.96°C/W
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	49-70027
Name/Location of Assembly (prime) facility:	OMEDATA Indonesia (INDNS-O)

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	OMEDATA Indonesia (INDNS-O)
Fault Coverage:	100%

Note: Please contact a Cypress Representative for other packages availability.

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENT

Stress/Test	Test Condition (Temp/Bias)	Result P/F
High Temperature Operating Life Early Failure Rate	Dynamic Operating Condition, Vcc Max=5.75V, 125°C Dynamic Operating Condition, Vcc Max=5.75V, 150°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max=5.75V, 125°C	P
Temperature Cycle	MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs., 30°C/60%RH+3IR-Reflow, 235°C+5, -0°C Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85C/85%RH+3IR-Reflow, 235°C+5, 0°C	P
Pressure Cooker	121°C, 100%RH MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs., 30°C/60%RH+3IR-Reflow, 235°C+5, -0°C Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85C/85%RH+3IR-Reflow, 235°C+5, 0°C	P
High Accelerated Saturation Test (HAST)	130°C, 5.5V, 85%RH Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs., 30°C/60%RH+3IR-Reflow, 235°C+5, -0°C 130°C, 3.63V, 85%RH Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85C/85%RH+3IR-Reflow, 235°C+5, 0°C	P
Data Retention	150°C ± 5°C no bias	P
High Temperature Steady State Life	150°C, 363V, Vcc Max	P
Electrostatic Discharge Human Body Model (ESD-HMB)	2,200V 2,000V MIL-STD-883, Method 3015.7	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	500V Cypress Spec. 25-00020	P

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENT (continuation)

Stress/Test	Test Condition (Temp/Bias)	Result P/F
Age Bond Strength	MIL-STD-883C, Method 2011	P
Acoustic Microscopy , MSL1, MSL3	Cypress Spec. 25-00104	P
Current Density	Cypress Spec. 22-00029	P
Low Temperature Operating Life	-30C, 4.3V, 8MHZ	P
Sem X-Section	MIL-STD-883C, Method 2018-2	P
Endurance Test	MIL-STD-883C, Method 1033	P
Dynamic Latchup Sensitivity	Cypress Spec. 01-00081	P
Static Latchup Sensitivity	125°C, ± 300mA In accordance with JEDEC 17. Cypress Spec. 01-00081	P

RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Thermal ³ A.F	Failure Rate ⁴
High Temperature Operating Life Early Failure Rate	9,107 Devices	3	N/A	N/A	329 PPM
High Temperature Operating Life ^{1,2} Long Term Failure Rate	676,799 DHRs	1	0.7	170	9 FITs

¹ Assuming an ambient temperature of 55°C and a junction temperature rise of 15°C.

² Chi-squared 60% estimations used to calculate the failure rate.

³ Thermal Acceleration Factor is calculated from the Arrhenius equation

$$AF = \exp \left[\frac{E_A}{k} \left[\frac{1}{T_2} - \frac{1}{T_1} \right] \right]$$

where:

E_A = The Activation Energy of the defect mechanism.

k = Boltzmann's constant = 8.62×10^{-5} eV/Kelvin.

T_1 is the junction temperature of the device under stress and T_2 is the junction temperature of the device at use conditions.

⁴ EFR Failure Rate based on QTP #022505, QTP #013507, QTP #003605 and QTP #010702.

⁴ LFR FIT Rate based on QTP #013507, QTP #003605 and QTP #010702.

Reliability Test Data

QTP #: 010702

<i>Device</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Assy Loc</i>	<i>Duration</i>	<i>Samp</i>	<i>Rej</i>	<i>Failure Mechanism</i>
STRESS: ACOUSTIC-MSL1							
CY2414ZC (7C841400A)	2101502	610106170/1/2	TAIWN-T	COMP	15	0	
CY2414ZC (7C841400A)	2052404	610106173/4/5	TAIWN-T	COMP	15	0	
CY2414ZC (7C841400A)	2103764	610106176/7/8	TAIWN-T	COMP	15	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 150C, 3.8V, Vcc Max							
CY2414ZC (7C841400A)	2101502	610106170/1/2	TAIWN-T	48	1005	0	
CY2414ZC (7C841400A)	2052404	610106173/4/5	TAIWN-T	48	1004	1	NON VISUAL
CY2414ZC (7C841400A)	2103764	610106176/7/8	TAIWN-T	48	1005	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, 3.8V, Vcc Max							
CY2414ZC (7C841400A)	2101502	610106170/1/2	TAIWN-T	80	120	0	
CY2414ZC (7C841400A)	2101502	610106170/1/2	TAIWN-T	500	120	0	
CY2414ZC (7C841400A)	2052404	610106173/4/5	TAIWN-T	80	120	0	
CY2414ZC (7C841400A)	2052404	610106173/4/5	TAIWN-T	500	120	0	
CY2414ZC (7C841400A)	2103764	610106176/7/8	TAIWN-T	80	120	0	
CY2414ZC (7C841400A)	2103764	610106176/7/8	TAIWN-T	500	120	0	
STRESS: AGE BOND STRENGTH							
CY2414ZC (7C841400A)	2101502	610106170/1/2	TAIWN-T	COMP	15	0	
CY2414ZC (7C841400A)	2052404	610106173/4/5	TAIWN-T	COMP	15	0	
CY2414ZC (7C841400A)	2103764	610106176/7/8	TAIWN-T	COMP	15	0	
STRESS: DYNAMIC LATCH-UP TESTING, 11.5V							
CY2414ZC (7C841400A)	2101502	610106170/1/2	TAIWN-T	COMP	3	0	
STRESS: LOW TEMPERATURE OPERATING LIFE, -30C, 4.3V							
CY2414ZC (7C841400A)	2101502	610106170/1/2	TAIWN-T	500	48	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY2414ZC (7C841400A)	2101502	610106170/1/2	TAIWN-T	COMP	9	0	
CY2414ZC (7C841400A)	2052404	610106173/4/5	TAIWN-T	COMP	9	0	
CY2414ZC (7C841400A)	2103764	610106176/7/8	TAIWN-T	COMP	9	0	

Reliability Test Data

QTP #: 010702

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,000V							
CY2414ZC (7C841400A)	2101502	610106170/1/2	TAIWN-T	COMP	9	0	
CY2414ZC (7C841400A)	2052404	610106173/4/5	TAIWN-T	COMP	9	0	
CY2414ZC (7C841400A)	2103764	610106177	TAIWN-T	COMP	10	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 10V, ±300mA							
CY2414ZC (7C841400A)	2101502	610106170/1/2	TAIWN-T	COMP	3	0	
CY2414ZC (7C841400A)	2052404	610106173/4/5	TAIWN-T	COMP	3	0	
CY2414ZC (7C841400A)	2103764	610106176/7/8	TAIWN-T	COMP	3	0	
STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 3.63V, PRE COND 168 HR 85C/85%RH, MSL1							
CY2414ZC (7C841400A)	2101502	610106170/1/2	TAIWN-T	128	50	0	
CY2414ZC (7C841400A)	2101502	610106170/1/2	TAIWN-T	256	50	0	
CY2414ZC (7C841400A)	2052404	610106173/4/5	TAIWN-T	128	48	0	
CY2414ZC (7C841400A)	2103764	610106176/7/8	TAIWN-T	128	48	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST, 150C, 3.63V							
CY2414ZC (7C841400A)	2101502	610106170/1/2	TAIWN-T	80	80	0	
CY2414ZC (7C841400A)	2101502	610106170/1/2	TAIWN-T	168	80	0	
STRESS: ENDURANCE TEST							
CY2414ZC (7C841400A)	2101502	610106170/1/2	TAIWN-T	COMP	45	0	
STRESS: DATA RETENTION, PLASTIC, 150C							
CY2414ZC (7C841400A)	2101502	610106170/1/2	TAIWN-T	168	80	0	
CY2414ZC (7C841400A)	2101502	610106170/1/2	TAIWN-T	552	80	0	
CY2414ZC (7C841400A)	2052404	610106173/4/5	TAIWN-T	168	80	0	
CY2414ZC (7C841400A)	2052404	610106173/4/5	TAIWN-T	552	80	0	
CY2414ZC (7C841400A)	2103764	610106176/7/8	TAIWN-T	168	80	0	
CY2414ZC (7C841400A)	2103764	610106176/7/8	TAIWN-T	552	80	0	

Reliability Test Data

QTP #: 010702

<i>Device</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Assy Loc</i>	<i>Duration</i>	<i>Samp</i>	<i>Rej</i>	<i>Failure Mechanism</i>
STRESS: PRESSURE COOKER TEST, 121C, 100%RH, PRE COND 168 HR 85C/85%RH, MSL1							
CY2414ZC (7C841400A)	2101502	610106170/1/2	TAIWN-T	168	50	0	
CY2414ZC (7C841400A)	2052404	610106173/4/5	TAIWN-T	168	49	0	
CY2414ZC (7C841400A)	2103764	610106176/7/8	TAIWN-T	168	51	0	
STRESS: TC COND. C -65C TO 150C, PRECONDITION 168 HRS 85C/85%RH, MSL1							
CY2414ZC (7C841400A)	2101502	610106170/1/2	TAIWN-T	300	50	0	
CY2414ZC (7C841400A)	2101502	610106170/1/2	TAIWN-T	500	50	0	
CY2414ZC (7C841400A)	2101502	610106170/1/2	TAIWN-T	1000	50	0	
CY2414ZC (7C841400A)	2052404	610106173/4/5	TAIWN-T	300	50	0	
CY2414ZC (7C841400A)	2052404	610106173/4/5	TAIWN-T	500	50	0	
CY2414ZC (7C841400A)	2052404	610106173/4/5	TAIWN-T	1000	50	0	
CY2414ZC (7C841400A)	2103764	610106176/7/8	TAIWN-T	300	50	0	
CY2414ZC (7C841400A)	2103764	610106176/7/8	TAIWN-T	500	50	0	
CY2414ZC (7C841400A)	2103764	610106176/7/8	TAIWN-T	1000	49	0	

Reliability Test Data

QTP #: 003605

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC-MSL3							
CY7C53150-AI (7C53150A)	2104858	610109389/90	TAIWN-G	COMP	15	0	
CY7C53150-AI(7C53150B)	2110601	610115306	TAIWN-G	COMP	15	0	
CY7C53150-AI (7C53150B)	2113874	340100160/1	TAIWN-G	COMP	15	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 150C, 5.75V, Vcc Max							
CY7C53120-SI (7C53120B)	2110601	610119962	CSPI-R	80	394	0	
CY7C53120-SI (7C53120B)	2113874	610119334	CSPI-R	80	591	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 5.75V, Vcc Max							
CY7C53120-SI (7C53120B)	2110601	610119962	CSPI-R	96	609	1	MISSING LICON
CY7C53120-SI (7C53120B)	2113874	610119334/7707	CSPI-R	96	414	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, 5.75V, Vcc Max							
CY7C53120-SI (7C53120B)	2110601	610119962	CSPI-R	197	393	0	
CY7C53120-SI (7C53120B)	2110601	610119962	CSPI-R	500	393	0	
CY7C53120-SI (7C53120B)	2113874	610119334	CSPI-R	197	400	1	UNKNOWN
CY7C53120-SI (7C53120B)	2113874	610119334	CSPI-R	500	399	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY7C53150-AI (7C53150B)	2110601	610115306	TAIWN-G	COMP	9	0	
STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 5.5V, PRE COND 192 Hrs., 30°C/60%RH, MSL3							
CY7C53150-AI (7C53150A)	2104858	610109389/90	TAIWN-G	128	48	0	
CY7C53150-AI (7C53150B)	2110601	610115306	TAIWN-G	128	46	0	
CY7C53150-AI (7C53150B)	2110601	610115306	TAIWN-G	256	46	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,000V							
CY7C53150-AI (7C53150B)	2110601	610115306	TAIWN-G	COMP	9	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 12V, ±300mA							
CY7C53150-AI (7C53150A)	2104858	610109389/90	TAIWN-G	COMP	3	0	
CY7C53150-AI (7C53150B)	2110601	610115306	TAIWN-G	COMP	3	0	
STRESS: ENDURANCE TEST, -25C/+85							
CY7C53150-AI (7C53150B)	2110601	610115306	TAIWN-G	1000	48	0	

Reliability Test Data

QTP #: 003605

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: DATA RETENTION, PLASTIC, 150C							
CY7C53150-AI (7C53150B)	2110601	610115306	TAIWN-G	500	266	0	
CY7C53150-AI (7C53150B)	2113874	340100160/1	TAIWN-G	500	266	0	
STRESS: PRESSURE COOKER TEST, 121C, 100%RH, PRE COND 192 HR 30°C/60%RH, MSL3							
CY7C53150-AI (7C53150A)	2104858	610109389/90	TAIWN-G	168	50	0	
CY7C53150-AI (7C53150B)	2110601	610115306	TAIWN-G	168	48	0	
STRESS: TC COND. C -65C TO 150C, PRECONDITION 192 HR 30°C/60%RH, MSL3							
CY7C53150-AI (7C53150A)	2104858	610109389/90	TAIWN-G	300	50	0	
CY7C53150-AI (7C53150A)	2104858	610109389/90	TAIWN-G	500	50	0	
CY7C53150-AI (7C53150A)	2104858	610109389/90	TAIWN-G	1000	50	0	
CY7C53150-AI (7C53150B)	2110601	610115306	TAIWN-G	300	48	0	
CY7C53150-AI (7C53150B)	2110601	610115306	TAIWN-G	500	47	0	
CY7C53150-AI (7C53150B)	2110601	610115306	TAIWN-G	1000	47	0	
CY7C53150-AI (7C53150B)	2113874	340100180/1	TAIWN-G	300	48	0	
CY7C53150-AI (7C53150B)	2113874	340100180/1	TAIWN-G	500	48	0	
CY7C53150-AI (7C53150B)	2113874	340100180/1	TAIWN-G	1000	48	0	

Reliability Test Data

QTP #: 013507

Device	Fab Lot #	Assembly Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 5.75V, Vcc Max							
CY8C26443 (8C26443A)	2115002	510105093	INDNS-0	96	1050	0	
CY8C26443 (8C26443A)	2117164	510105252	INDNS-0	96	1075	1	ISB Failure
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 125C, 5.75V, Vcc Max							
CY8C26443 (8C26443A)	2115002	510105093	INDNS-0	168	267	0	
CY8C26443 (8C26443A)	2115002	510105093	INDNS-0	500	267	0	
CY8C26443 (8C26443A)	2115002	510105093	INDNS-0	1000	267	0	
CY8C26443 (8C26443A)	2117164	510105252	INDNS-0	168	267	0	
STRESS: AGE BOND STRENGTH							
CY8C26443 (8C26443A)	2111640	510104779	INDNS-0	COMP	15	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY8C26443 (8C26443A)	2117164	610121060	CSPI-R	COMP	9	0	
CY8C26443 (8C26443A)	2111640	510104779	INDNS-0	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V							
CY8C26443 (8C26443A)	2117164	610121060	CSPI-R	COMP	9	0	
CY8C26443 (8C26443A)	2111640	510104779	INDNS-0	COMP	9	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 12V, ±300mA							
CY8C26443 (8C26443A)	2111640	510104779	INDNS-0	COMP	3	0	
STRESS: DATA RETENTION, PLASTIC, 150C							
CY8C26443 (8C26443A)	2115002	510105093	INDNS-0	168	46	0	
CY8C26443 (8C26443A)	2117164	510105252	INDNS-0	168	46	0	
STRESS: ENDURANCE TEST							
CY8C26443 (8C26443A)	2115002	510105093	INDNS-0	COMP	48	0	
CY8C26443 (8C26443A)	2117164	510105252	INDNS-0	COMP	46	0	
STRESS: PRESSURE COOKER TEST 121C, 100%RH							
CY8C26443 (8C26443A)	2111640	510104779	INDNS-0	168	47	0	
STRESS: TC COND. C -65C TO 150C							
CY8C26443 (8C26443A)	2111640	510104779	INDNS-0	300	78	0	
CY8C26443 (8C26443A)	2111640	510104779	INDNS-0	500	77	0	
CY8C26443 (8C26443A)	2111640	510104779	INDNS-0	1000	78	0	

Reliability Test Data

QTP #: 022505

Device	Fab Lot #	Assembly Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 5.75V, Vcc Max							
CY8C26443 (8C26443D)	2215932	510205367	INDNS-0	96	890	0	
CY8C26443 (8C26443D)	2215932	510205368	INDNS-0	96	900	0	
CY8C26443 (8C26443D)	2215932	510205407	INDNS-0	96	200	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY8C26443 (8C26443D)	2215932	510205367/8	INDNS-0	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V							
CY8C26443 (8C26443D)	2215932	510205367/8	INDNS-0	COMP	9	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 12V, ±300mA							
CY8C26443 (8C26443D)	2215932	510205367/8	INDNS-0	COMP	3	0	
STRESS: TC COND. C -65C TO 150C							
CY8C26443 (8C26443D)	2215932	510205367/8	INDNS-0	300	48	0	
CY8C26443 (8C26443D)	2215932	510205367/8	INDNS-0	500	48	0	