



6-Pin DIP Optoisolators Transistor Output

The 4N35, 4N36 and 4N37 devices consist of a gallium arsenide infrared emitting diode optically coupled to a monolithic silicon phototransistor detector.

- Current Transfer Ratio — 100% Minimum @ Specified Conditions
- Guaranteed Switching Speeds
- Meets or Exceeds all JEDEC Registered Specifications
- **To order devices that are tested and marked per VDE 0884 requirements, the suffix "V" must be included at end of part number. VDE 0884 is a test option.**

Applications

- General Purpose Switching Circuits
- Interfacing and coupling systems of different potentials and impedances
- Regulation Feedback Circuits
- Monitor & Detection Circuits
- Solid State Relays

MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
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INPUT LED

Reverse Voltage	V_R	6	Volts
Forward Current — Continuous	I_F	60	mA
LED Power Dissipation @ $T_A = 25^\circ\text{C}$ with Negligible Power in Output Detector Derate above 25°C	P_D	120 1.41	mW mW/ $^\circ\text{C}$

OUTPUT TRANSISTOR

Collector–Emitter Voltage	V_{CEO}	30	Volts
Emitter–Base Voltage	V_{EBO}	7	Volts
Collector–Base Voltage	V_{CBO}	70	Volts
Collector Current — Continuous	I_C	150	mA
Detector Power Dissipation @ $T_A = 25^\circ\text{C}$ with Negligible Power in Input LED Derate above 25°C	P_D	150 1.76	mW mW/ $^\circ\text{C}$

TOTAL DEVICE

Isolation Source Voltage ⁽¹⁾ (Peak ac Voltage, 60 Hz, 1 sec Duration)	V_{ISO}	7500	Vac(pk)
Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	250 2.94	mW mW/ $^\circ\text{C}$
Ambient Operating Temperature Range ⁽²⁾	T_A	–55 to +100	$^\circ\text{C}$
Storage Temperature Range ⁽²⁾	T_{stg}	–55 to +150	$^\circ\text{C}$
Soldering Temperature (10 sec, 1/16" from case)	T_L	260	$^\circ\text{C}$

1. Isolation surge voltage is an internal device dielectric breakdown rating.
For this test, Pins 1 and 2 are common, and Pins 4, 5 and 6 are common.
2. Refer to Quality and Reliability Section in Opto Data Book for information on test conditions.

Preferred devices are Motorola recommended choices for future use and best overall value.

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4N35*

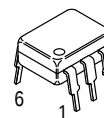
4N36

4N37

[CTR = 100% Min]

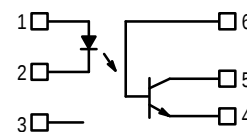
*Motorola Preferred Device

STYLE 1 PLASTIC



STANDARD THRU HOLE
CASE 730A-04

SCHEMATIC



- PIN 1. LED ANODE
2. LED CATHODE
3. N.C.
4. EMITTER
5. COLLECTOR
6. BASE

4N35 4N36 4N37

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)⁽¹⁾

Characteristic	Symbol	Min	Typ ⁽¹⁾	Max	Unit
INPUT LED					
Forward Voltage ($I_F = 10\text{ mA}$) $T_A = 25^\circ\text{C}$ $T_A = -55^\circ\text{C}$ $T_A = 100^\circ\text{C}$	V_F	0.8 0.9 0.7	1.15 1.3 1.05	1.5 1.7 1.4	V
Reverse Leakage Current ($V_R = 6\text{ V}$)	I_R	—	—	10	μA
Capacitance ($V = 0\text{ V}$, $f = 1\text{ MHz}$)	C_J	—	18	—	pF

OUTPUT TRANSISTOR

Collector–Emitter Dark Current ($V_{CE} = 10\text{ V}$, $T_A = 25^\circ\text{C}$) ($V_{CE} = 30\text{ V}$, $T_A = 100^\circ\text{C}$)	I_{CEO}	— —	1 —	50 500	nA μA
Collector–Base Dark Current ($V_{CB} = 10\text{ V}$) $T_A = 25^\circ\text{C}$ $T_A = 100^\circ\text{C}$	I_{CBO}	—	0.2 100	20 —	nA
Collector–Emitter Breakdown Voltage ($I_C = 1\text{ mA}$)	$V_{(BR)CEO}$	30	45	—	V
Collector–Base Breakdown Voltage ($I_C = 100\text{ }\mu\text{A}$)	$V_{(BR)CBO}$	70	100	—	V
Emitter–Base Breakdown Voltage ($I_E = 100\text{ }\mu\text{A}$)	$V_{(BR)EBO}$	7	7.8	—	V
DC Current Gain ($I_C = 2\text{ mA}$, $V_{CE} = 5\text{ V}$)	h_{FE}	—	400	—	—
Collector–Emitter Capacitance ($f = 1\text{ MHz}$, $V_{CE} = 0$)	C_{CE}	—	7	—	pF
Collector–Base Capacitance ($f = 1\text{ MHz}$, $V_{CB} = 0$)	C_{CB}	—	19	—	pF
Emitter–Base Capacitance ($f = 1\text{ MHz}$, $V_{EB} = 0$)	C_{EB}	—	9	—	pF

COUPLED

Output Collector Current ($I_F = 10\text{ mA}$, $V_{CE} = 10\text{ V}$) $T_A = 25^\circ\text{C}$ $T_A = -55^\circ\text{C}$ $T_A = 100^\circ\text{C}$	I_C (CTR) ⁽²⁾	10 (100) 4 (40) 4 (40)	30 (300) — —	— — —	mA (%)
Collector–Emitter Saturation Voltage ($I_C = 0.5\text{ mA}$, $I_F = 10\text{ mA}$)	$V_{CE(sat)}$	—	0.14	0.3	V
Turn-On Time	t_{on}	—	7.5	10	μs
Turn-Off Time	t_{off}	—	5.7	10	
Rise Time	t_r	—	3.2	—	
Fall Time	t_f	—	4.7	—	
Isolation Voltage ($f = 60\text{ Hz}$, $t = 1\text{ sec}$)	V_{ISO}	7500	—	—	Vac(pk)
Isolation Current ⁽⁴⁾ ($V_{I-O} = 3550\text{ Vpk}$) ($V_{I-O} = 2500\text{ Vpk}$) ($V_{I-O} = 1500\text{ Vpk}$)	I_{ISO}	— — —	— — 8	100 100 100	μA
Isolation Resistance ($V = 500\text{ V}$) ⁽⁴⁾	R_{ISO}	10^{11}	—	—	Ω
Isolation Capacitance ($V = 0\text{ V}$, $f = 1\text{ MHz}$) ⁽⁴⁾	C_{ISO}	—	0.2	2	pF

1. Always design to the specified minimum/maximum electrical limits (where applicable).

2. Current Transfer Ratio (CTR) = $I_C/I_F \times 100\%$.

3. For test circuit setup and waveforms, refer to Figure 11.

4. For this test, Pins 1 and 2 are common, and Pins 4, 5 and 6 are common.

TYPICAL CHARACTERISTICS

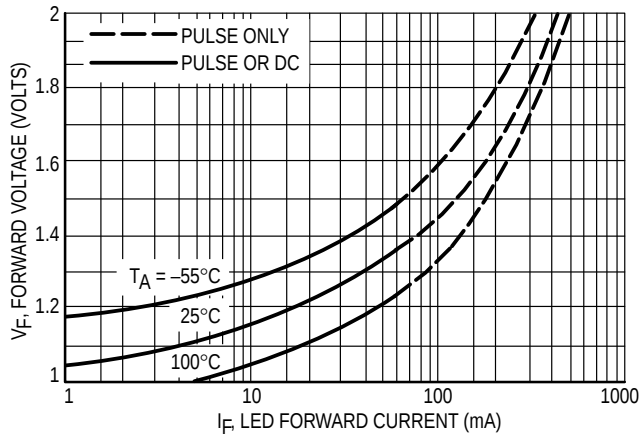


Figure 1. LED Forward Voltage versus Forward Current

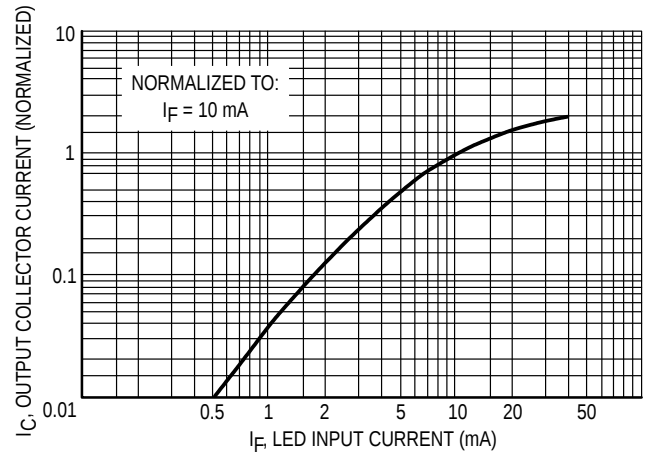


Figure 2. Output Current versus Input Current

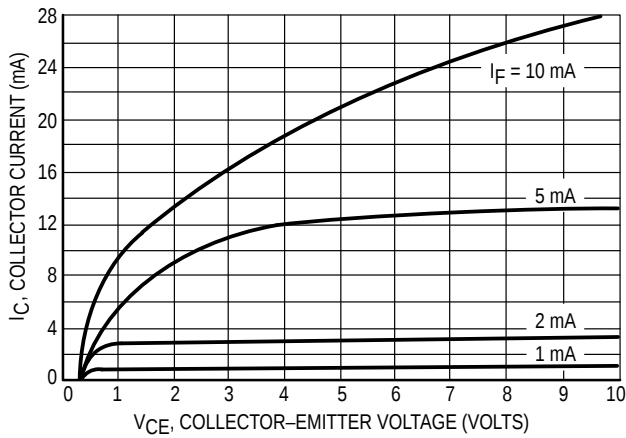


Figure 3. Collector Current versus Collector-Emitter Voltage

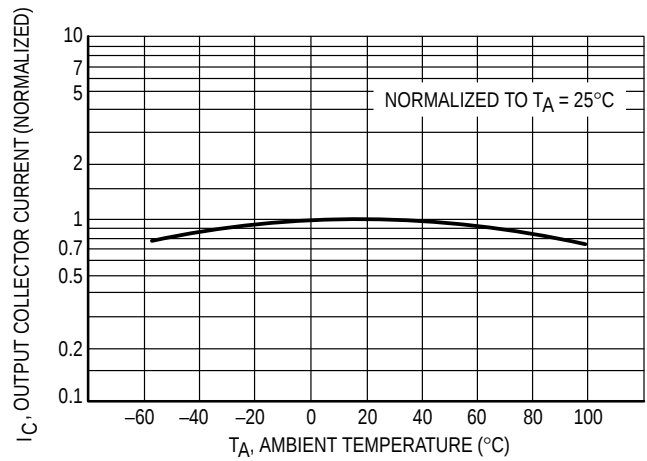


Figure 4. Output Current versus Ambient Temperature

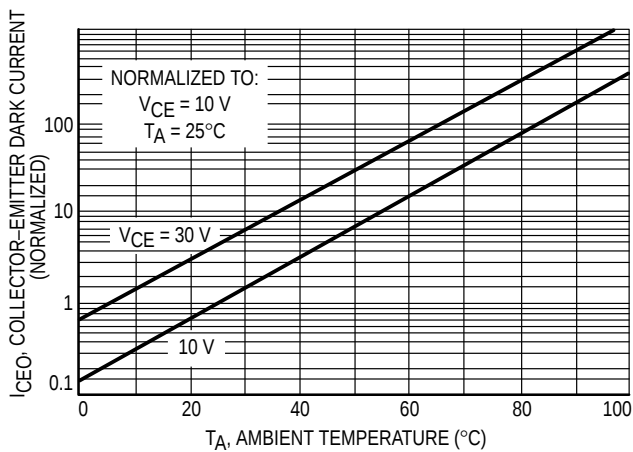


Figure 5. Dark Current versus Ambient Temperature

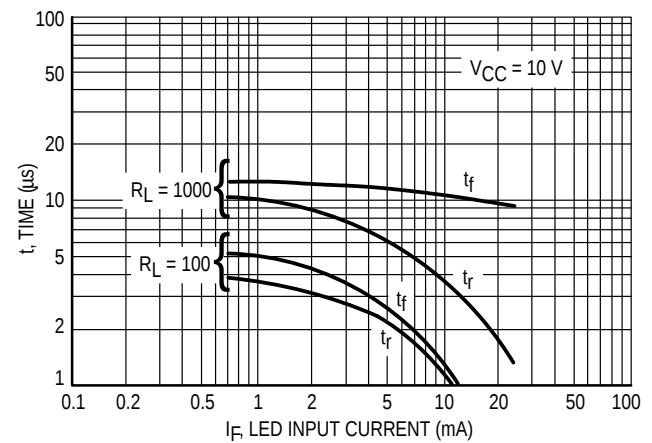


Figure 6. Rise and Fall Times (Typical Values)

4N35 4N36 4N37

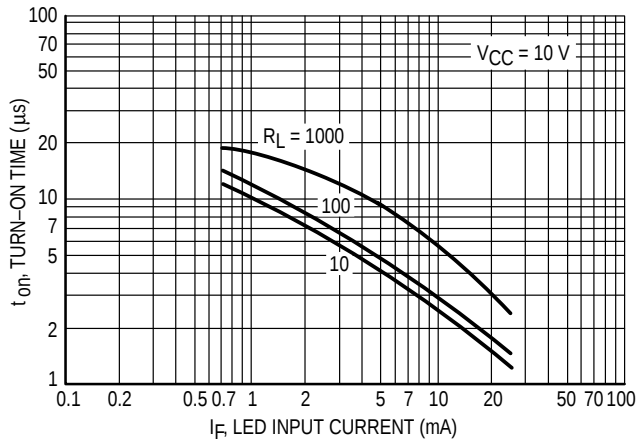


Figure 7. Turn-On Switching Times

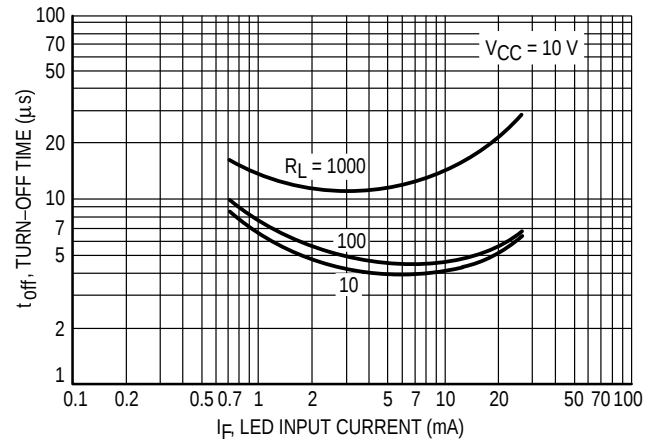


Figure 8. Turn-Off Switching Times

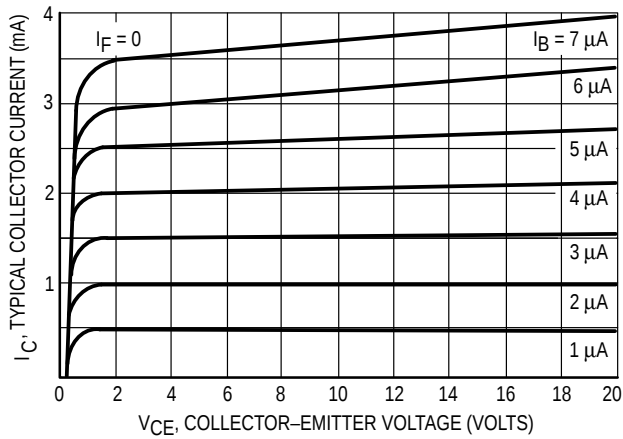


Figure 9. DC Current Gain (Detector Only)

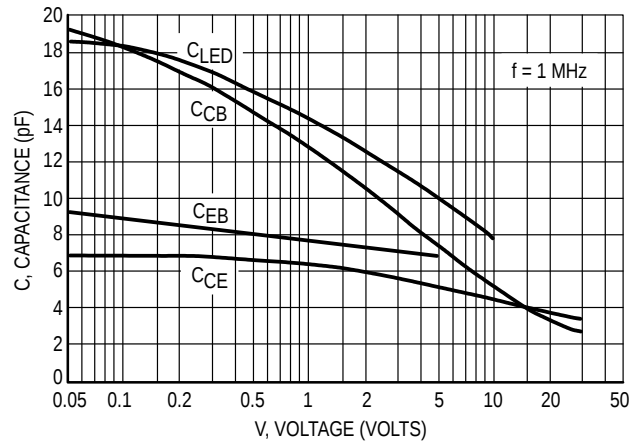


Figure 10. Capacitances versus Voltage

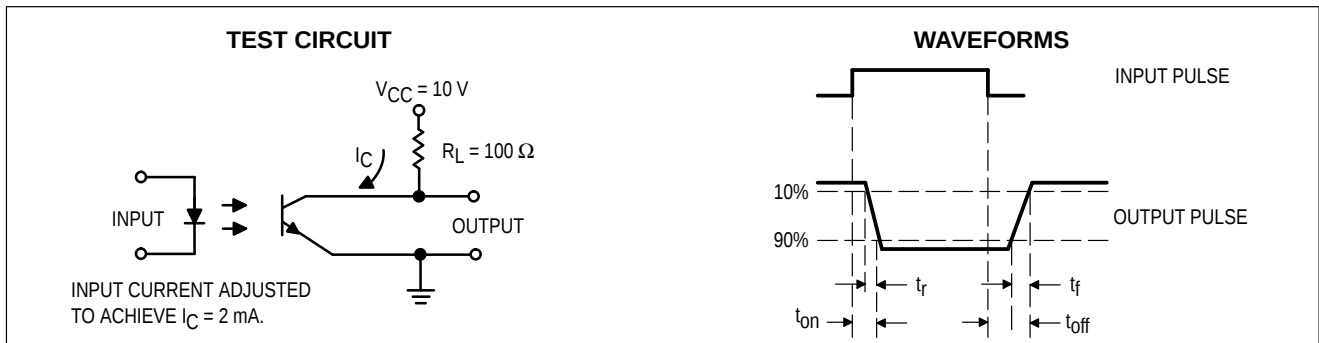
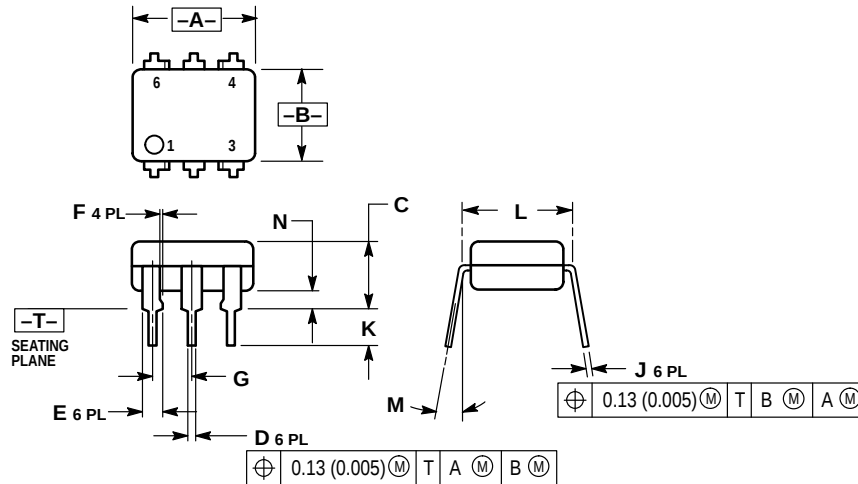


Figure 11. Switching Time Test Circuit and Waveforms

PACKAGE DIMENSIONS

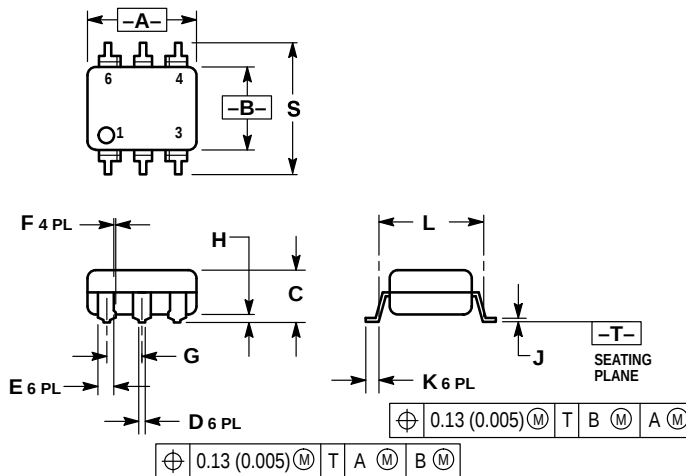


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.320	0.350	8.13	8.89
B	0.240	0.260	6.10	6.60
C	0.115	0.200	2.93	5.08
D	0.016	0.020	0.41	0.50
E	0.040	0.070	1.02	1.77
F	0.010	0.014	0.25	0.36
G	0.100 BSC		2.54 BSC	
J	0.008	0.012	0.21	0.30
K	0.100	0.150	2.54	3.81
L	0.300 BSC		7.62 BSC	
M	0°	15°	0°	15°
N	0.015	0.100	0.38	2.54

- STYLE 1:
- PIN 1: ANODE
2. CATHODE
3. NC
4. EMITTER
5. COLLECTOR
6. BASE

CASE 730A-04
ISSUE G



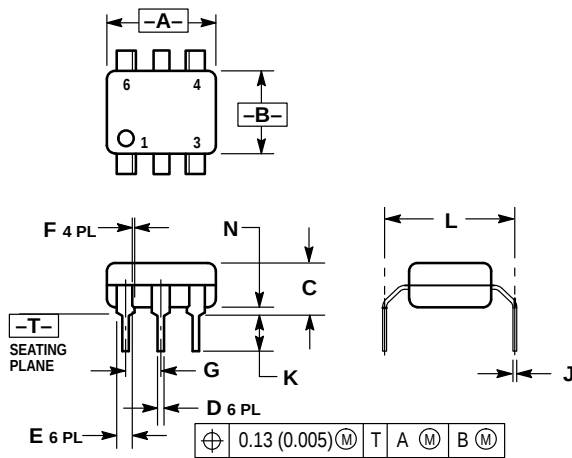
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 2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
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B	0.240	0.260	6.10	6.60
C	0.115	0.200	2.93	5.08
D	0.016	0.020	0.41	0.50
E	0.040	0.070	1.02	1.77
F	0.010	0.014	0.25	0.36
G	0.100 BSC		2.54 BSC	
H	0.020	0.025	0.51	0.63
J	0.008	0.012	0.20	0.30
K	0.006	0.035	0.16	0.88
L	0.320 BSC		8.13 BSC	
S	0.332	0.390	8.43	9.90

*Consult factory for leadform option availability

CASE 730C-04
ISSUE D

4N35 4N36 4N37



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.320	0.350	8.13	8.89
B	0.240	0.260	6.10	6.60
C	0.115	0.200	2.93	5.08
D	0.016	0.020	0.41	0.50
E	0.040	0.070	1.02	1.77
F	0.010	0.014	0.25	0.36
G	0.100 BSC		2.54 BSC	
J	0.008	0.012	0.21	0.30
K	0.100	0.150	2.54	3.81
L	0.400	0.425	10.16	10.80
N	0.015	0.040	0.38	1.02

*Consult factory for leadform option availability

CASE 730D-05
ISSUE D

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4N35/D

