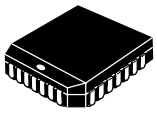
MC10E141, MC100E141

5V ECL 8-Bit Shift Register

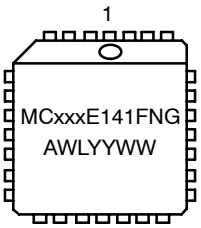
ON Semiconductor®

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PLCC−28
FN SUFFIX
CASE 776

MARKING DIAGRAM*



xxx	= 10 or 100
A	= Assembly Location
WL	= Wafer Lot
YY	= Year
WW	= Work Week
G	= Pb−Free Package

*For additional marking information, refer to Application Note AND8002/D.

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

Description

The MC10E/100E141 is an 8-bit full-function shift register. The E141 performs serial/parallel in and serial/parallel out, shifting in either direction. The eight inputs $D_0 - D_7$ accept parallel input data, while DL/DR accept serial input data for left/right shifting. The Qn outputs do not need to be terminated for the shift operation to function. To minimize noise and power, any Q output not used should be left unterminated.

The select pins, SEL0 and SEL1, select one of four modes of operation: Load, Hold, Shift Left, Shift Right, according to the Function Table.

Input data is accepted a set-up time before the positive clock edge. A HIGH on the Master Reset (MR) pin asynchronously resets all the registers to zero.

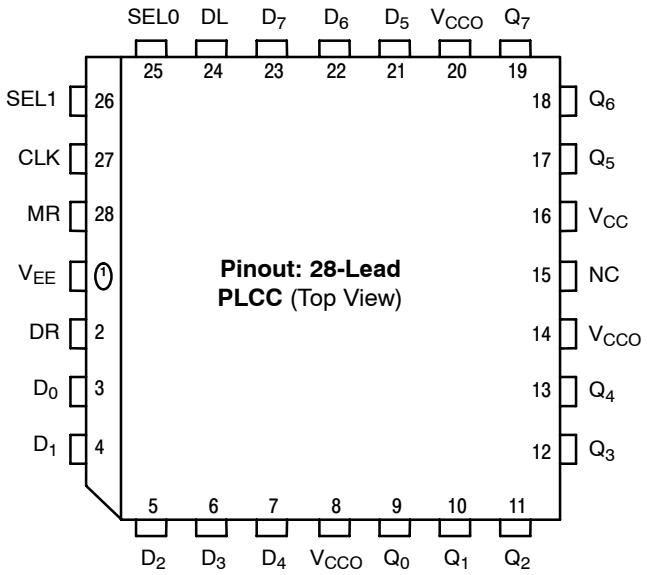
The 100 Series contains temperature compensation.

Features

- 700 MHz Min. Shift Frequency
- 8-Bit
- Full-Function, Bi-Directional
- Asynchronous Master Reset
- Pin-Compatible with E241
- PECL Mode Operating Range: V_{CC} = 4.2 V to 5.7 V with V_{EE} = 0 V
- NECL Mode Operating Range: V_{CC} = 0 V with V_{EE} = −4.2 V to −5.7 V
- Internal Input 50 kΩ Pulldown Resistors
- ESD Protection: Human Body Model; > 2 kV, Machine Model; > 200 V
- Meets or Exceeds JEDEC Standard EIA/JESD78 IC Latchup Test
- Moisture Sensitivity Level:
  Pb = 1
  Pb−Free = 3
  For Additional Information, see Application Note AND8003/D
- Flammability Rating: UL 94 V−0 @ 0.125 in, Oxygen Index: 28 to 34
- Transistor Count = 565 devices
- Pb−Free Packages are Available*

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

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* All V_{CC} and V_{CCO} pins are tied together on the die.

Warning: All V_{CC}, V_{CCO}, and V_{EE} pins must be externally connected to Power Supply to guarantee proper operation.

Figure 1. 28-Lead Pinout

Table 1. PIN DESCRIPTION

PIN	FUNCTION
$D_0 - D_7$	ECL Parallel Data Inputs
DL, DR	ECL Serial Data Inputs
SEL0, SEL1	ECL Mode Select In Inputs
CLK	ECL Clock
$Q_0 - Q_7$	ECL Data Outputs
MR	ECL Master Reset
V_{CC}, V_{CCO}	Positive Supply*
V_{EE}	Negative Supply
NC	No Connect

*From V_{CC} pin to each V_{CCO} pin is an internal 100 Ω resistor.

Table 2. FUNCTION TABLE

SEL0	SEL1	FUNCTION
L	L	Load
L	H	Shift Right (D_n to D_{n+1})
H	L	Shift Left (D_n to D_{n-1})
H	H	Hold

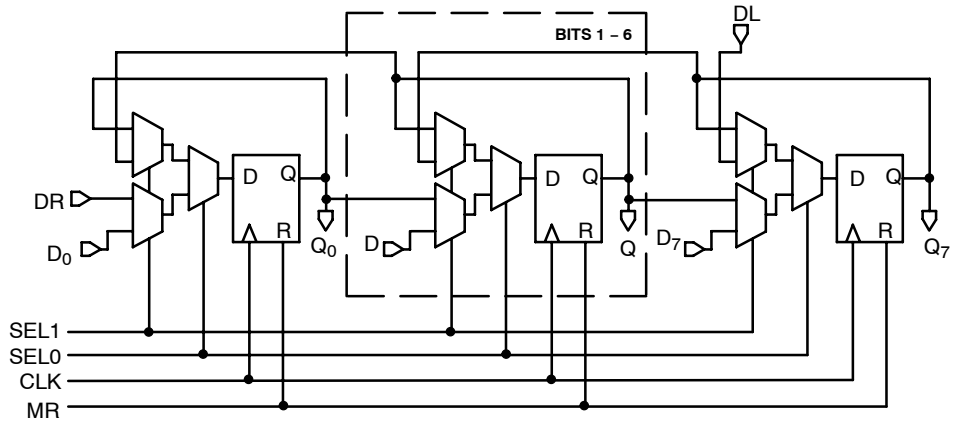


Figure 2. Logic Diagram

Table 3. EXPANDED FUNCTION TABLE

Function	DL	DR	SEL0	SEL1	MR	CLK	Q0	Q1	Q2	Q3	Q4	Q5	Q6	Q7
Load	X	X	L	L	L	Z	D0	D1	D2	D3	D4	D5	D6	D7
Shift Right	X	L	L	H	L	Z	L	Q0	Q1	Q2	Q3	Q4	Q5	Q6
	X	H	L	H	L	Z	H	L	Q0	Q1	Q2	Q3	Q4	Q5
Shift Left	L	X	H	L	L	Z	L	Q0	Q1	Q2	Q3	Q4	Q5	L
	H	X	H	L	L	Z	Q0	Q1	Q2	Q3	Q4	Q5	L	H
Hold	X	X	H	H	L	Z	Q0	Q1	Q2	Q3	Q4	Q5	L	H
	X	X	H	H	L	Z	Q0	Q1	Q2	Q3	Q4	Q5	L	H
Reset	X	X	X	X	H	X	L	L	L	L	L	L	L	L

Table 4. MAXIMUM RATINGS

Symbol	Parameter	Condition 1	Condition 2	Rating	Unit
V_{CC}	PECL Mode Power Supply	V_{EE} = 0 V		8	V
V_{EE}	NECL Mode Power Supply	V_{CC} = 0 V		−8	V
V_I	PECL Mode Input Voltage NECL Mode Input Voltage	V_{EE} = 0 V V_{CC} = 0 V	$V_I \le V_{CC}$ $V_I \ge V_{EE}$	6 −6	V V
I_{out}	Output Current	Continuous Surge		50 100	mA mA
T_A	Operating Temperature Range			0 to +85	°C
T_{stg}	Storage Temperature Range			−65 to +150	°C
θ_{JA}	Thermal Resistance (Junction−to−Ambient)	0 lfpm 500 lfpm	PLCC−28 PLCC−28	63.5 43.5	°C/W °C/W
θ_{JC}	Thermal Resistance (Junction−to−Case)	Standard Board	PLCC−28	22 to 26	°C/W
V_{EE}	PECL Operating Range NECL Operating Range			4.2 to 5.7 −5.7 to −4.2	V V
T_{sol}	Wave Solder Pb Pb−Free			265 265	°C

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.

Table 5. 10E SERIES PECL DC CHARACTERISTICS V_{CCx} = 5.0 V; V_{EE} = 0.0 V (Note 1)

		0°C			25°C			85°C			
Symbol	Characteristic	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Unit
I_{EE}	Power Supply Current		131	181		131	181		131	181	mA
V_{OH}	Output HIGH Voltage (Note 2)	3980	4070	4160	4020	4105	4190	4090	4185	4280	mV
V_{OL}	Output LOW Voltage (Note 2)	3050	3210	3370	3050	3210	3370	3050	3227	3405	mV
V_{IH}	Input HIGH Voltage	3830	3995	4160	3870	4030	4190	3940	4110	4280	mV
V_{IL}	Input LOW Voltage	3050	3285	3520	3050	3285	3520	3050	3302	3555	mV
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	0.5	0.3		0.5	0.25		0.3	0.2		μA

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

1. Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary −0.46 V / +0.06 V.
2. Outputs are terminated through a 50 Ω resistor to V_{CC} − 2.0 V.

Table 6. 10E SERIES NECL DC CHARACTERISTICS V_{CCx} = 0.0 V; V_{EE} = −5.0 V (Note 3)

		0°C			25°C			85°C			
Symbol	Characteristic	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Unit
I_{EE}	Power Supply Current		131	181		131	181		131	181	mA
V_{OH}	Output HIGH Voltage (Note 4)	−1020	−930	−840	−980	−895	−810	−910	−815	−720	mV
V_{OL}	Output LOW Voltage (Note 4)	−1950	−1790	−1630	−1950	−1790	−1630	−1950	−1773	−1595	mV
V_{IH}	Input HIGH Voltage	−1170	−1005	−840	−1130	−970	−810	−1060	−890	−720	mV
V_{IL}	Input LOW Voltage	−1950	−1715	−1480	−1950	−1715	−1480	−1950	−1698	−1445	mV
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	0.5	0.3		0.5	0.065		0.3	0.2		μA

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

3. Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary −0.46 V / +0.06 V.
4. Outputs are terminated through a 50 Ω resistor to V_{CC} − 2.0 V.

Table 7. 100E SERIES PECL DC CHARACTERISTICS V_{CCx} = 5.0 V; V_{EE} = 0.0 V (Note 5)

		0°C			25°C			85°C			
Symbol	Characteristic	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Unit
I_{EE}	Power Supply Current		131	181		131	181		151	181	mA
V_{OH}	Output HIGH Voltage (Note 6)	3975	4050	4120	3975	4050	4120	3975	4050	4120	mV
V_{OL}	Output LOW Voltage (Note 6)	3190	3295	3380	3190	3255	3380	3190	3260	3380	mV
V_{IH}	Input HIGH Voltage	3835	3975	4120	3835	3975	4120	3835	3975	4120	mV
V_{IL}	Input LOW Voltage	3190	3355	3525	3190	3355	3525	3190	3355	3525	mV
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	0.5	0.3		0.5	0.25		0.5	0.2		μA

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

5. Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary −0.46 V / +0.8 V.
6. Outputs are terminated through a 50 Ω resistor to V_{CC} − 2.0 V.

Table 8. 100E SERIES NECL DC CHARACTERISTICS V_{CCx} = 0.0 V; V_{EE} = −5.0 V (Note 7)

		0°C			25°C			85°C			
Symbol	Characteristic	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Unit
I_{EE}	Power Supply Current		131	181		131	181		151	181	mA
V_{OH}	Output HIGH Voltage (Note 8)	−1025	−950	−880	−1025	−950	−880	−1025	−950	−880	mV
V_{OL}	Output LOW Voltage (Note 8)	−1810	−1705	−1620	−1810	−1745	−1620	−1810	−1740	−1620	mV
V_{IH}	Input HIGH Voltage	−1165	−1025	−880	−1165	−1025	−880	−1165	−880	−1025	mV
V_{IL}	Input LOW Voltage	−1810	−1645	−1475	−1810	−1645	−1475	−1810	−1475	−1645	mV
I_{IH}	Input HIGH Current			150			150			150	μA
I_{IL}	Input LOW Current	0.5	0.3		0.5	0.25		0.5	0.2		μA

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

7. Input and output parameters vary 1:1 with V_{CC}. V_{EE} can vary −0.46 V / +0.8 V.
8. Outputs are terminated through a 50 Ω resistor to V_{CC} − 2.0 V.

Table 9. AC CHARACTERISTICS V_{CCx} = 5.0 V; V_{EE} = 0.0 V or V_{CCx} = 0.0 V; V_{EE} = −5.0 V (Note 9)

		0°C			25°C			85°C			
Symbol	**Characteristic**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**	**Unit**
f_{SHIFT}	Max. Shift Frequency	700	900		700	900		700	900		MHz
t_{PLH} t_{PHL}	Propagation Delay To Output										ps
	Clk	625	750	975	625	750	975	625	750	975	
	MR	600	725	975	600	725	975	600	725	975	
t_s	Setup Time										ps
	D	175	25		175	25		175	25		
	SEL0	350	200		350	200		350	200		
	SEL1	300	150		300	150		300	150		
t_h	Hold Time										ps
	D	200	– 25		200	– 25		200	– 25		
	SEL0	100	– 200		100	– 200		100	– 200		
	SEL1	100	–150		100	–150		100	–150		
t_{RR}	Reset Recovery Time	900	700		900	700		900	700		ps
t_{PW}	Minimum Pulse Width										ps
	Clk, MR	400			400			400			
t_{SKEW}	Within-Device Skew (Note 10)		60			60			60		ps
t_{JITTER}	Random Clock Jitter (RMS)		< 1			< 1			< 1		ps
t_r t_f	Rise/Fall Times (20 - 80%)	300	525	800	300	525	800	300	525	800	ps

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

9. 10 Series: V_{EE} can vary −0.46 V / +0.06 V.
   100 Series: V_{EE} can vary −0.46 V / +0.8 V.
10. Within-device skew is defined as identical transitions on similar paths through a device.

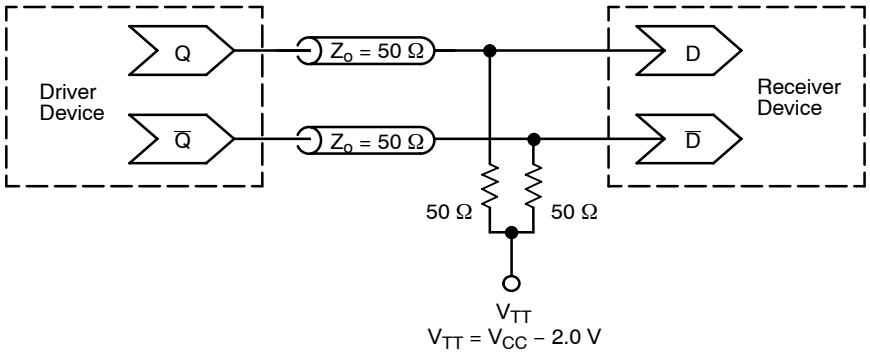


Figure 3. Typical Termination for Output Driver and Device Evaluation (See Application Note AND8020/D – Termination of ECL Logic Devices.)

ORDERING INFORMATION

Device	Package	Shipping†
MC10E141FN	PLCC−28	37 Units / Rail
MC10E141FNG	PLCC−28 (Pb−Free)	37 Units / Rail
MC10E141FNR2	PLCC−28	500 / Tape & Reel
MC10E141FNR2G	PLCC−28 (Pb−Free)	500 / Tape & Reel
MC100E141FN	PLCC−28	37 Units / Rail
MC100E141FNG	PLCC−28 (Pb−Free)	37 Units / Rail
MC100E141FNR2	PLCC−28	500 / Tape & Reel
MC100E141FNR2G	PLCC−28 (Pb−Free)	500 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

Resource Reference of Application Notes

AN1405/D – ECL Clock Distribution Techniques

AN1406/D – Designing with PECL (ECL at +5.0 V)

AN1503/D – ECLinPS™ I/O SPiCE Modeling Kit

AN1504/D – Metastability and the ECLinPS Family

AN1568/D – Interfacing Between LVDS and ECL

AN1672/D – The ECL Translator Guide

AND8001/D – Odd Number Counters Design

AND8002/D – Marking and Date Codes

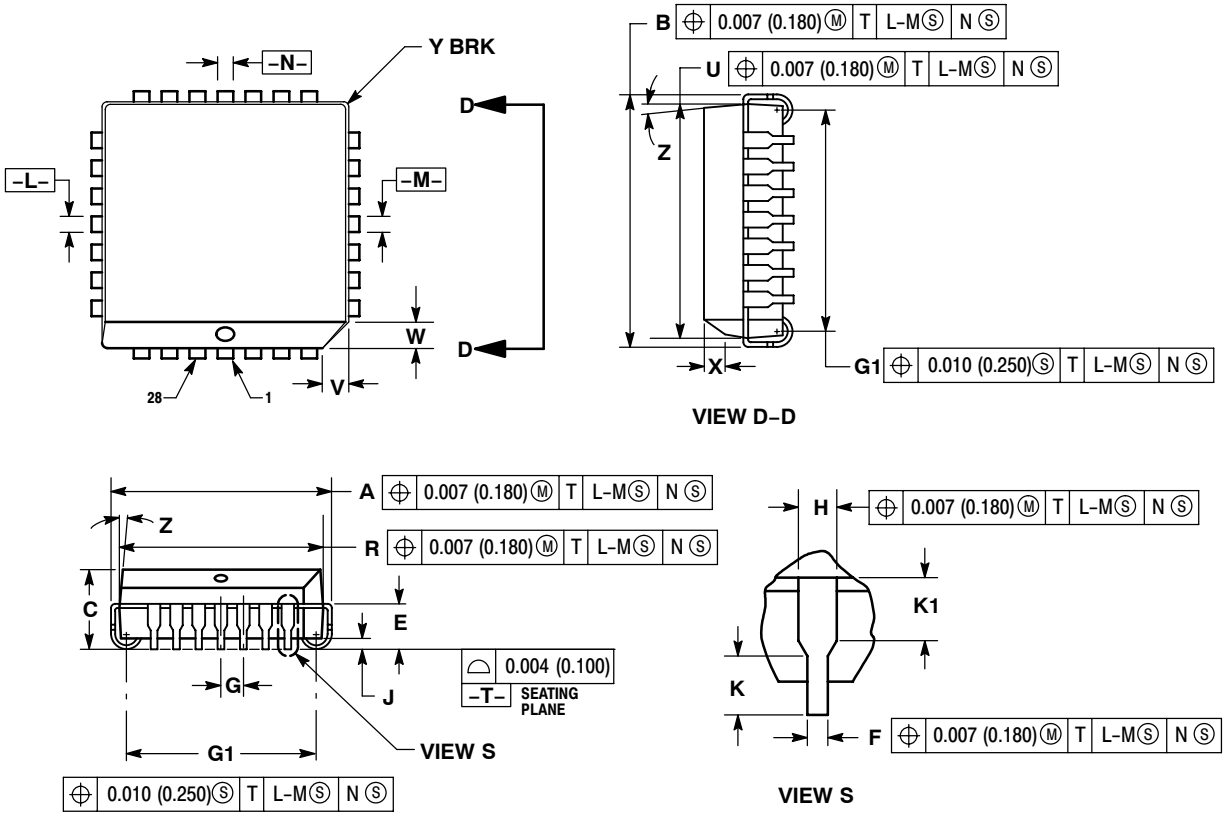
AND8020/D – Termination of ECL Logic Devices

AND8066/D – Interfacing with ECLinPS

AND8090/D – AC Characteristics of ECL Devices

PACKAGE DIMENSIONS

PLCC−28
FN SUFFIX
PLASTIC PLCC PACKAGE
CASE 776−02
ISSUE E



NOTES:
1. DATUMS –L–, –M–, AND –N– DETERMINED WHERE TOP OF LEAD SHOULDER EXITS PLASTIC BODY AT MOLD PARTING LINE.
2. DIMENSION G1, TRUE POSITION TO BE MEASURED AT DATUM –T–, SEATING PLANE.
3. DIMENSIONS R AND U DO NOT INCLUDE MOLD FLASH. ALLOWABLE MOLD FLASH IS 0.010 (0.250) PER SIDE.
4. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
5. CONTROLLING DIMENSION: INCH.
6. THE PACKAGE TOP MAY BE SMALLER THAN THE PACKAGE BOTTOM BY UP TO 0.012 (0.300). DIMENSIONS R AND U ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY EXCLUSIVE OF MOLD FLASH, TIE BAR BURRS, GATE BURRS AND INTERLEAD FLASH, BUT INCLUDING ANY MISMATCH BETWEEN THE TOP AND BOTTOM OF THE PLASTIC BODY.
7. DIMENSION H DOES NOT INCLUDE DAMBAR PROTRUSION OR INTRUSION. THE DAMBAR PROTRUSION(S) SHALL NOT CAUSE THE H DIMENSION TO BE GREATER THAN 0.037 (0.940). THE DAMBAR INTRUSION(S) SHALL NOT CAUSE THE H DIMENSION TO BE SMALLER THAN 0.025 (0.635).

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.485	0.495	12.32	12.57
B	0.485	0.495	12.32	12.57
C	0.165	0.180	4.20	4.57
E	0.090	0.110	2.29	2.79
F	0.013	0.019	0.33	0.48
G	0.050 BSC		1.27 BSC	
H	0.026	0.032	0.66	0.81
J	0.020	---	0.51	---
K	0.025	---	0.64	---
R	0.450	0.456	11.43	11.58
U	0.450	0.456	11.43	11.58
V	0.042	0.048	1.07	1.21
W	0.042	0.048	1.07	1.21
X	0.042	0.056	1.07	1.42
Y	---	0.020	---	0.50
Z	2°	10°	2°	10°
G1	0.410	0.430	10.42	10.92
K1	0.040	---	1.02	---

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MC10E141/D