NTLUS4C12N

[MOSFET](#) – Power, Single, N-Channel, µCool, UDFN6, 2.0x2.0x0.55 mm
30 V, 10.7 A

ON Semiconductor®

Features

- Low Profile UDFN 2.0 x 2.0 x 0.55 mm for Board Space Saving with Exposed Drain Pads for Excellent Thermal Conduction
- Ultra Low $R_{DS(on)}$ to Reduce Conduction Losses
- Optimized Gate Charge to Reduce Switching Losses
- Low Capacitance to Minimize Driver Losses
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- Power Load Switch
- Synch DC−DC Converters
- Wireless Charging Circuit

MOSFET

$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
30 V	9 mΩ @ 10 V	10.7 A
	12 mΩ @ 4.5 V	
	15 mΩ @ 3.7 V	
	19 mΩ @ 3.3 V	

N−CHANNEL MOSFET

MAXIMUM RATINGS (T_J = 25°C unless otherwise stated)

Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			V_{DSS}	30	V
Gate-to-Source Voltage			V_{GS}	±20	V
Continuous Drain Current (Note 1)	Steady State	T_A = 25°C	I_D	10.7	A
		T_A = 85°C		7.7	
	t ≤ 5 s	T_A = 25°C		15.1	
Power Dissipation (Note 1)	Steady State	T_A = 25°C	P_D	1.54	W
	t ≤ 5 s	T_A = 25°C		3.1	
Continuous Drain Current (Note 2)	Steady State	T_A = 25°C	I_D	6.8	A
		T_A = 85°C		4.9	
Power Dissipation (Note 2)		T_A = 25°C	P_D	0.63	W
Pulsed Drain Current		t_p = 10 µs	I_{DM}	43	A
MOSFET Operating Junction and Storage Temperature			T_J, T_{STG}	-55 to 150	°C
Source Current (Body Diode) (Note 1)			I_S	1.55	A
Lead Temperature for Soldering Purposes (1/8″ from case for 10 s)			T_L	260	°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.
1. Surface Mounted on FR4 Board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces).
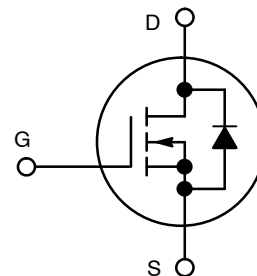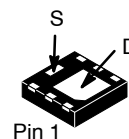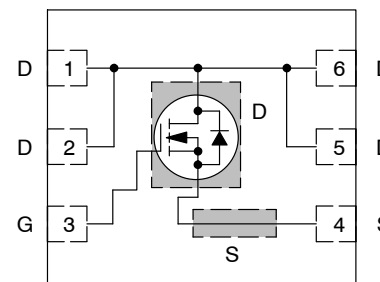2. Surface-mounted on FR4 board using the minimum recommended pad size, 2 oz. Cu.

MARKING DIAGRAM

UDFN6
(µCOOL™)
CASE 517BG

Pin 1

```
1 | o
  | AGM■
  |   ■
```

AG = Specific Device Code
M = Date Code
■ = Pb−Free Package

(Note: Microdot may be in either location)

PIN CONNECTIONS

D	1		6	D
D	2		5	D
G	3		4	S

(Top View)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

May, 2019 − Rev. 1

NTLUS4C12N

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient − Steady State (Note 3)	$R_{\theta JA}$	81	
Junction-to-Ambient − t ≤ 5 s (Note 3)	$R_{\theta JA}$	40.5	°C/W
Junction-to-Ambient − Steady State min Pad (Note 4)	$R_{\theta JA}$	200	

3. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces).
4. Surface-mounted on FR4 board using the minimum recommended pad size, 2 oz. Cu.

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition		Min	Typ	Max	Units
OFF CHARACTERISTICS							
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 250 µA		30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	I_D = 250 µA, ref to 25°C			12		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 24 V	T_J = 25°C			1.0	µA
			T_J = 125°C			10	
Gate-to-Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 V				±100	nA
ON CHARACTERISTICS (Note 5)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 250 µA		1.3		2.1	V
Negative Threshold Temp. Coefficient	$V_{GS(TH)}/T_J$				4.8		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 9.0 A			7.2	9	mΩ
		V_{GS} = 4.5 V, I_D = 8.0 A			9.3	12	
		V_{GS} = 3.7 V, I_D = 5.0 A			10.9	15	
		V_{GS} = 3.3 V, I_D = 5.0 A			13	19	
Forward Transconductance	g_{FS}	V_{DS} = 15 V, I_D = 9.0 A			39		S
CHARGES, CAPACITANCES & GATE RESISTANCE							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1 MHz, V_{DS} = 15 V			1172		pF
Output Capacitance	C_{OSS}				546		
Reverse Transfer Capacitance	C_{RSS}				26		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 4.5 V, V_{DS} = 15 V; I_D = 8.0 A			8.4		nC
Threshold Gate Charge	$Q_{G(TH)}$				1.1		
Gate-to-Source Charge	Q_{GS}				3.0		
Gate-to-Drain Charge	Q_{GD}				2.2		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 10 V, V_{DS} = 15 V; I_D = 9.0 A			18		nC
SWITCHING CHARACTERISTICS, VGS = 4.5 V (Note 6)							
Turn-On Delay Time	$t_{d(ON)}$	V_{GS} = 4.5 V, V_{DD} = 15 V, I_D = 8.0 A, R_G = 3 Ω			9.4		ns
Rise Time	t_r				15		
Turn-Off Delay Time	$t_{d(OFF)}$				14		
Fall Time	t_f				3.5		
SWITCHING CHARACTERISTICS, VGS = 10 V (Note 6)							
Turn-On Delay Time	$t_{d(ON)}$	V_{GS} = 10 V, V_{DD} = 15 V, I_D = 9.0 A, R_G = 3 Ω			6.3		ns
Rise Time	t_r				14		
Turn-Off Delay Time	$t_{d(OFF)}$				18		
Fall Time	t_f				2.4		

5. Pulse Test: pulse width ≤ 300 µs, duty cycle ≤ 2%.
6. Switching characteristics are independent of operating junction temperatures.

NTLUS4C12N

Parameter	Symbol	Test Condition		Min	Typ	Max	Units
DRAIN-SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 1.5 A	T_J = 25°C		0.72	1.1	V
			T_J = 125°C		0.52		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dIs/dt = 100 A/µs, I_S = 1.5 A			29		ns
Charge Time	t_a				14.1		
Discharge Time	t_b				14.9		
Reverse Recovery Charge	Q_{RR}				20		nC

5. Pulse Test: pulse width ≤ 300 µs, duty cycle ≤ 2%.
6. Switching characteristics are independent of operating junction temperatures.

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.

TYPICAL CHARACTERISTICS
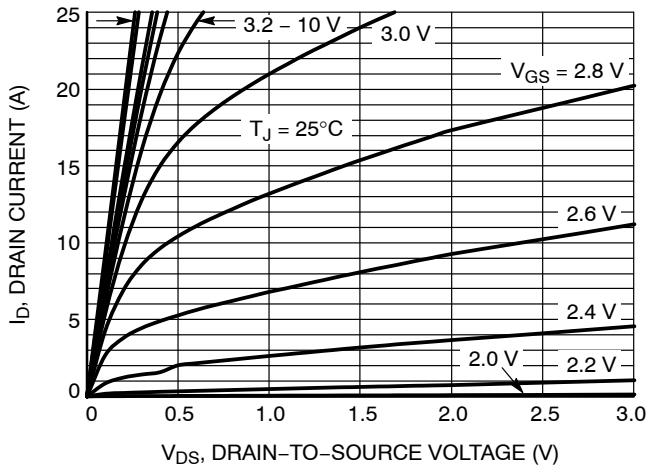
Figure 1. On–Region Characteristics
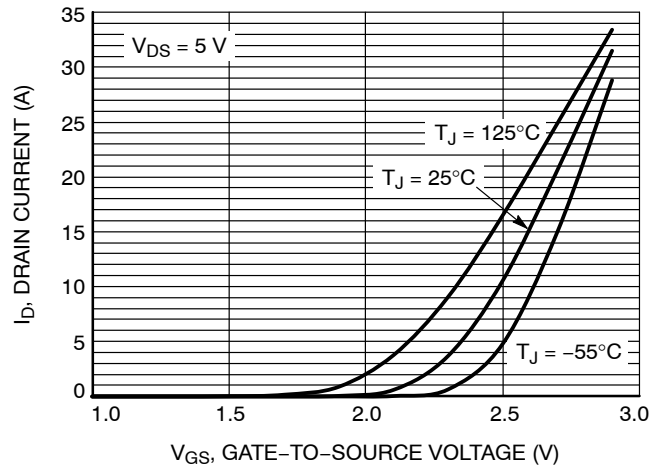
Figure 2. Transfer Characteristics
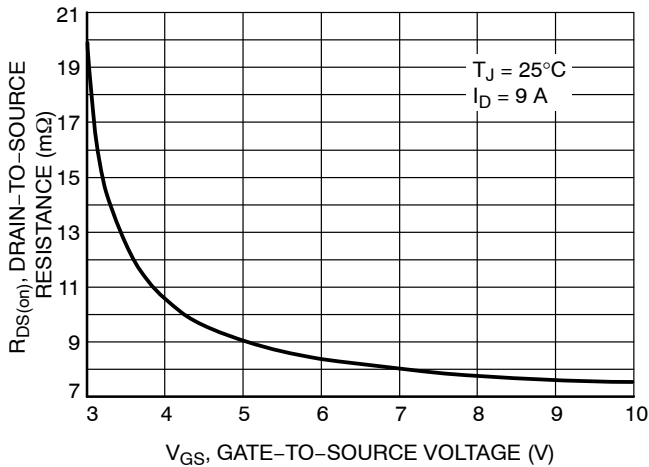
Figure 3. On–Resistance vs. Gate–to–Source Voltage
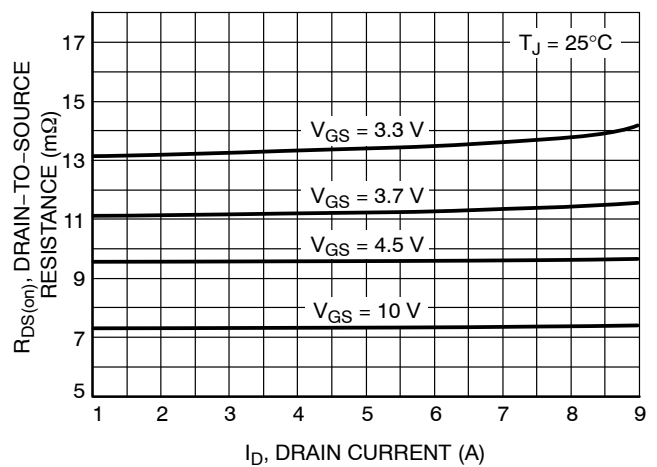
Figure 4. On–Resistance vs. Drain Current and Gate Voltage

TYPICAL CHARACTERISTICS
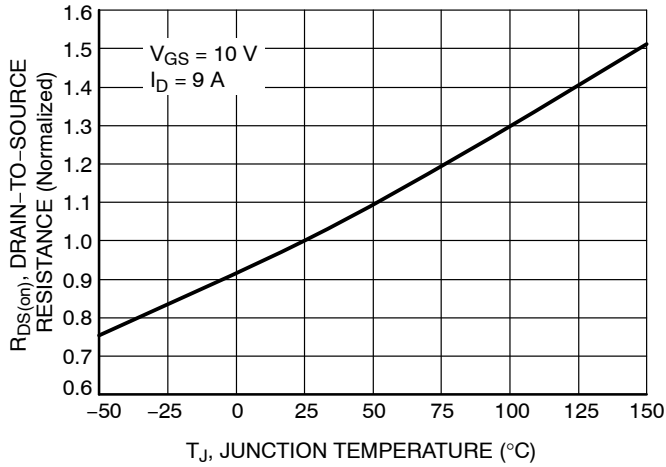
Figure 5. On−Resistance Variation with Temperature
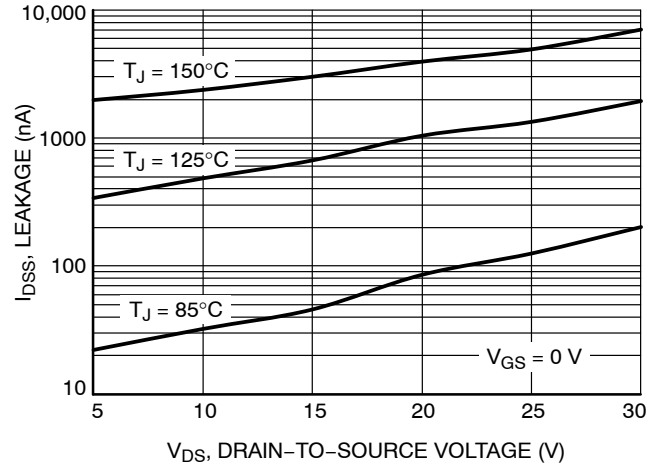
Figure 6. Drain−to−Source Leakage Current vs. Voltage
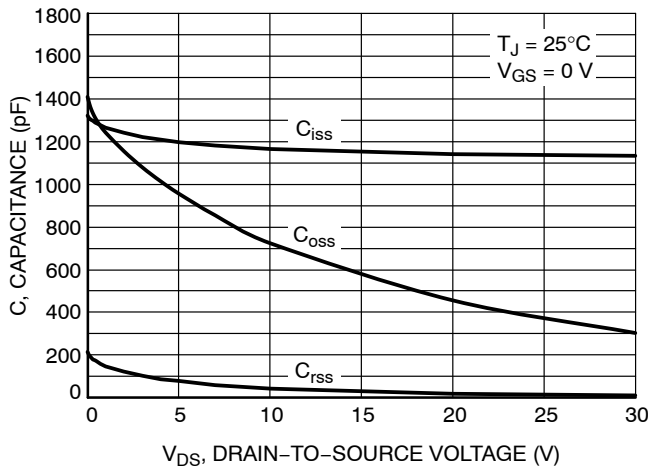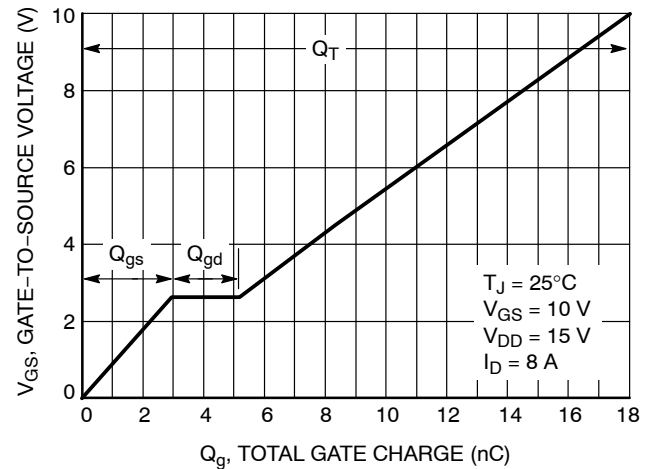

Figure 7. Capacitance Variation

Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge
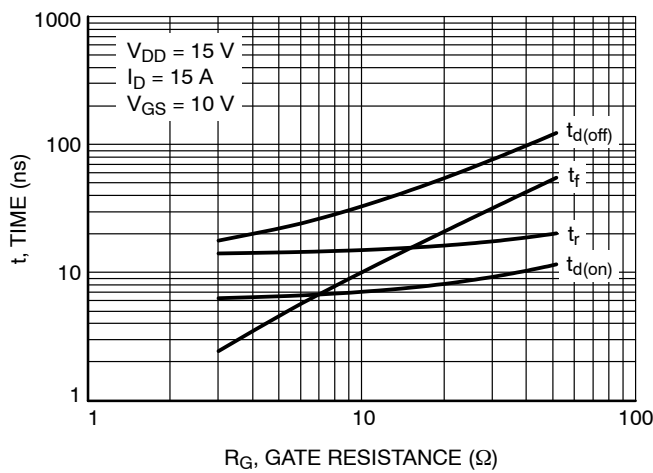

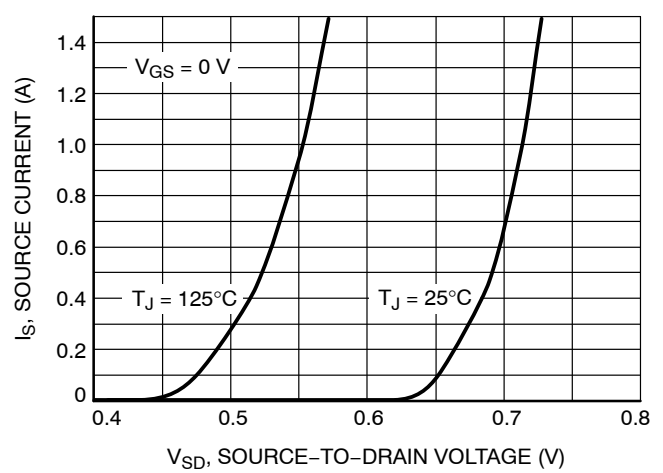
Figure 9. Resistive Switching Time Variation vs. Gate Resistance

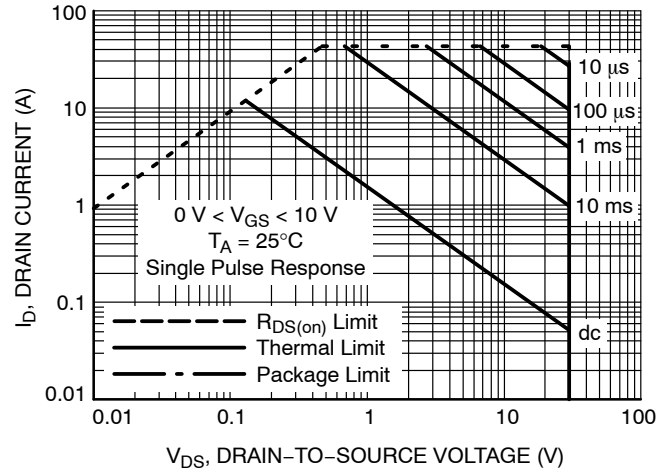**Figure 10. Diode Forward Voltage vs. Current**

TYPICAL CHARACTERISTICS
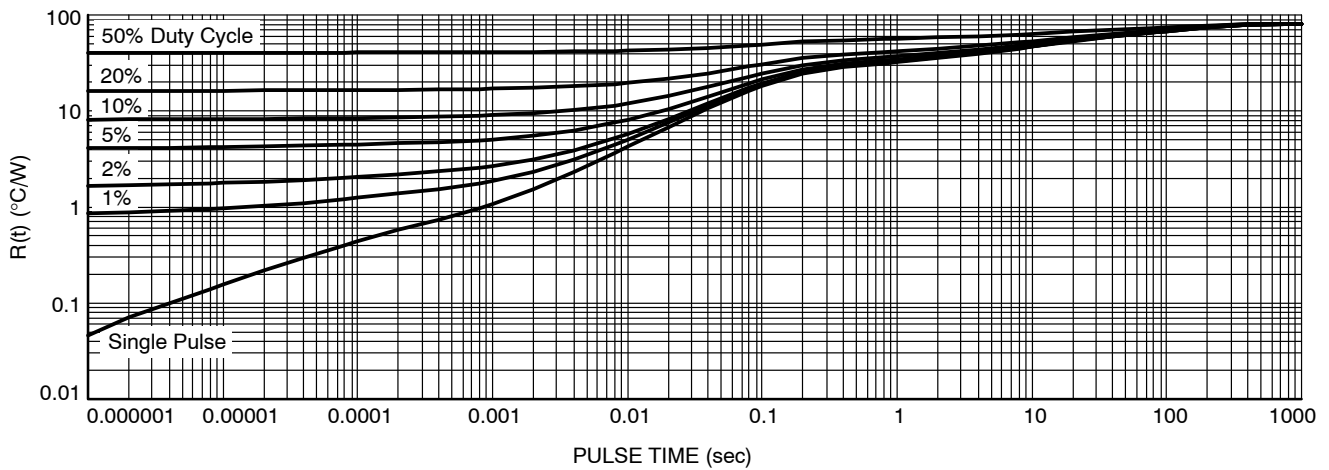

Figure 11. Maximum Rated Forward Biased Safe Operating Area

Figure 12. Thermal Response

DEVICE ORDERING INFORMATION

Device	Package	Shipping[†]
NTLUS4C12NTAG	UDFN6 (Pb−Free)	3000 / Tape & Reel
NTLUS4C12NTBG	UDFN6 (Pb−Free)	3000 / 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.

μCool is a trademark of Semiconductor Components Industries, LLC (SCILLC).
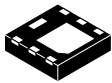
UDFN6 2x2, 0.65P
CASE 517BG
ISSUE A

SCALE 4:1

DATE 04 FEB 2010
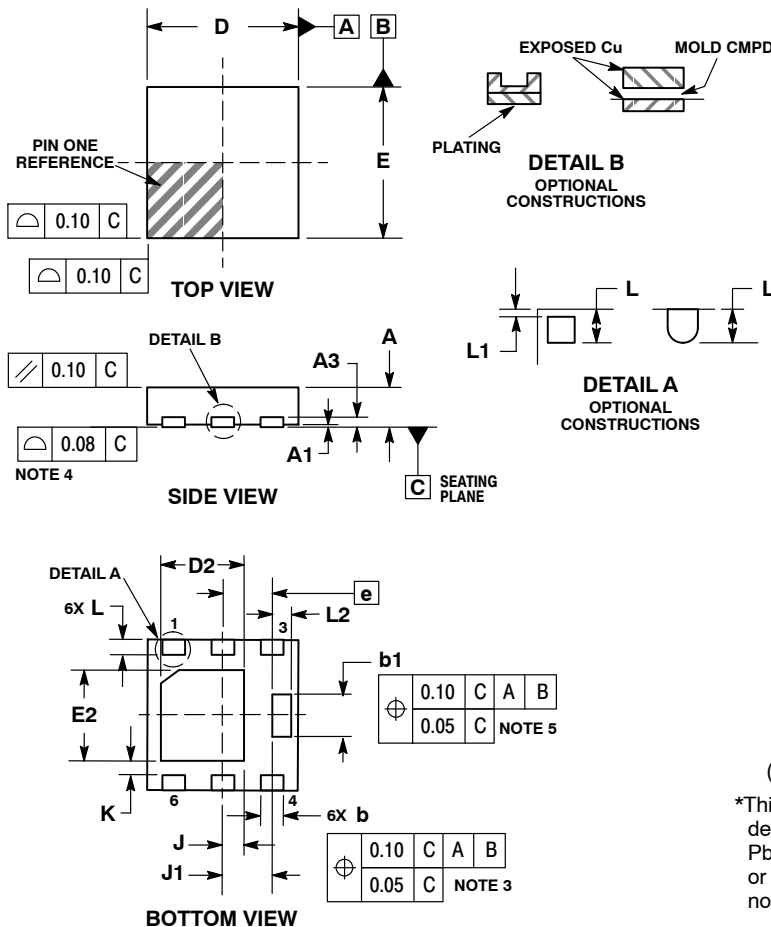
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.
1. CENTER TERMINAL LEAD IS OPTIONAL. CENTER TERMINAL IS CONNECTED TO TERMINAL LEAD # 4.
2. LEADS 1, 2, 5 AND 6 ARE TIED TO THE FLAG.

TOP VIEW

PIN ONE REFERENCE

| 0.10 | C |
| 0.10 | C |

DETAIL B
OPTIONAL CONSTRUCTIONS
EXPOSED Cu — MOLD CMPD — PLATING

SIDE VIEW
DETAIL B — NOTE 4 — SEATING PLANE

| 0.10 | C |
| 0.08 | C |

DETAIL A
OPTIONAL CONSTRUCTIONS

BOTTOM VIEW
DETAIL A — 6X L — 6X b — E2 — K — J — J1 — D2 — e — L2 — b1

| 0.10 | C | A | B |
| 0.05 | C | | NOTE 5 |

| 0.10 | C | A | B |
| 0.05 | C | | NOTE 3 |

DIM	MILLIMETERS	
	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A3	0.13 REF	
b	0.25	0.35
b1	0.51	0.61
D	2.00 BSC	
D2	1.00	1.20
E	2.00 BSC	
E2	1.10	1.30
e	0.65 BSC	
K	0.15 REF	
J	0.27 BSC	
J1	0.65 BSC	
L	0.20	0.30
L1	---	0.10
L2	0.20	0.30

GENERIC MARKING DIAGRAM*

1
XXM■

XX = Specific Device Code
M = Date Code

(Note: Microdot may be in either location)

*This information is generic. Please refer to device data sheet for actual part marking. Pb–Free indicator, "G" or microdot "■", may or may not be present. Some products may not follow the Generic Marking.

RECOMMENDED MOUNTING FOOTPRINT

2.30
1.10
6X 0.43
6X 0.35
1.25
1
0.60
0.34
0.35
0.65 PITCH
PACKAGE OUTLINE
0.66

DIMENSIONS: MILLIMETERS
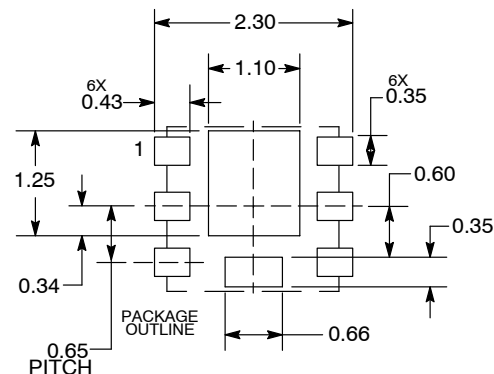
| DOCUMENT NUMBER: | 98AON48158E | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. | |
| DESCRIPTION: | UDFN6 2x2, 0.65P | | PAGE 1 OF 1 |

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:
Technical Library: www.onsemi.com/design/resources/technical–documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support
For additional information, please contact your local Sales Representative at
www.onsemi.com/support/sales

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