NTLUS020N03C

MOSFET – Power, Single, N-Channel, μCool, UDFN6, 1.6x1.6x0.55 mm
30 V, 13 mΩ, 8.2 A

ON Semiconductor®

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Features

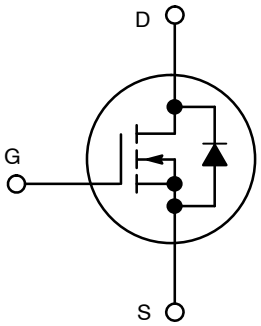
- UDFN Package with Exposed Drain Pads for Excellent Thermal Conduction
- Low Profile UDFN 1.6 x 1.6 x 0.55 mm for Board Space Saving
- Ultra Low $R_{DS(on)}$
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- Power Load Switch
- Wireless Charging
- DC−DC Converters
- Motor Drive

MOSFET

$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
30 V	13 mΩ @ 10 V	8.2 A
	18 mΩ @ 4.5 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 $R_{\theta JA}$ (Note 1, 3)	Steady State	T_A = 25°C	I_D	8.2	A
		T_A = 85°C		5.9	
Power Dissipation $R_{\theta JA}$ (Note 1, 3)		T_A = 25°C	P_D	1.52	W
Continuous Drain Current $R_{\theta JA}$ (Note 2, 3)	Steady State	T_A = 25°C	I_D	5.3	A
		T_A = 85°C		3.8	
Power Dissipation $R_{\theta JA}$ (Note 2, 3)		T_A = 25°C	P_D	0.65	W
Pulsed Drain Current		t_p = 10 μs	I_{DM}	24	A
Operating Junction and Storage Temperature			T_J, T_{STG}	-55 to 150	°C
Lead Temperature for Soldering Purposes (1/8″ from case for 10 s)			T_L	260	°C

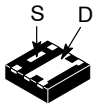
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient – Steady State (Note 1, 3)	$R_{\theta JA}$	82.5	°C/W
Junction-to-Ambient – Steady State min Pad (Note 2, 3)	$R_{\theta JA}$	194.8	

1. Surface−mounted on FR4 board using 1 in^2 pad size, 2 oz Cu pad.

MARKING DIAGRAM

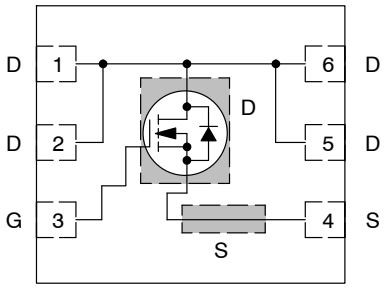


UDFN6 (μCOOL) CASE 517AU

AL = Specific Device Code
M = Date Code
▪ = Pb−Free Package

(Note: Microdot may be in either location)

PIN CONNECTIONS



(Top View)

ORDERING INFORMATION

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

2. Surface-mounted on FR4 board using the min pad size, 2 oz Cu pad.
3. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
4. This device does not have ESD protection diode.

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			13.4		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		1.2		2.2	V
Negative Threshold Temp. Coefficient	$V_{GS(TH)}/T_J$	I_D = 250 μA, ref to 25°C			–4.2		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 8.0 A			10	13	mΩ
		V_{GS} = 4.5 V, I_D = 8 A			14	18	
Forward Transconductance	g_{FS}	V_{DS} = 1.5 V, I_D = 8 A			24		S
CHARGES & CAPACITANCES							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1 MHz, V_{DS} = 15 V			620		pF
Output Capacitance	C_{OSS}				280		
Reverse Transfer Capacitance	C_{RSS}				15		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 4.5 V, V_{DS} = 15 V; I_D = 8 A			5		nC
Threshold Gate Charge	$Q_{G(TH)}$				0.8		
Gate-to-Source Charge	Q_{GS}				1.8		
Gate-to-Drain Charge	Q_{GD}				1.6		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 10 V, V_{DS} = 15 V; I_D = 8 A			11		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 A, R_G = 6 Ω			9		ns
Rise Time	t_r				26		
Turn-Off Delay Time	$t_{d(OFF)}$				13		
Fall Time	t_f				3		
SWITCHING CHARACTERISTICS, VGS = 10 V (Note 6)							
Turn-On Delay Time	$t_{d(ON)}$	V_{GS} = 10 V, V_{DD} = 15 V, I_D = 8 A, R_G = 6 Ω			6		ns
Rise Time	t_r				24		
Turn-Off Delay Time	$t_{d(OFF)}$				16		
Fall Time	t_f				2.3		
DRAIN-SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 8 A	T_J = 25°C		0.8	1	V
			T_J = 125°C		0.7		

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

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
DRAIN-SOURCE DIODE CHARACTERISTICS						
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dIs/dt = 100 A/μs, I_S = 8 A		23		ns
Charge Time	t_a			12		
Discharge Time	t_b			11		
Reverse Recovery Charge	Q_{RR}			10		nC

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

TYPICAL CHARACTERISTICS

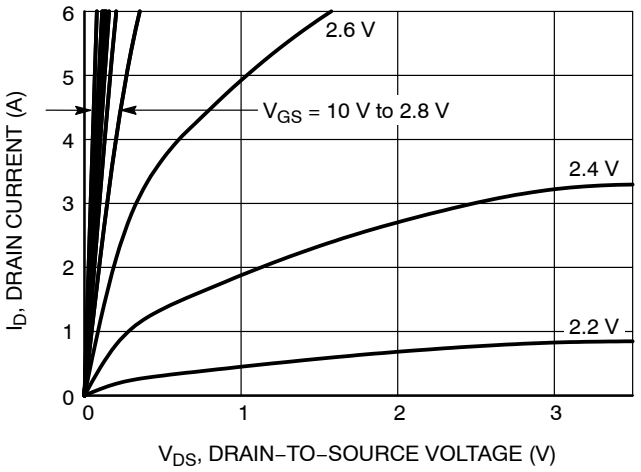


Figure 1. On−Region Characteristics

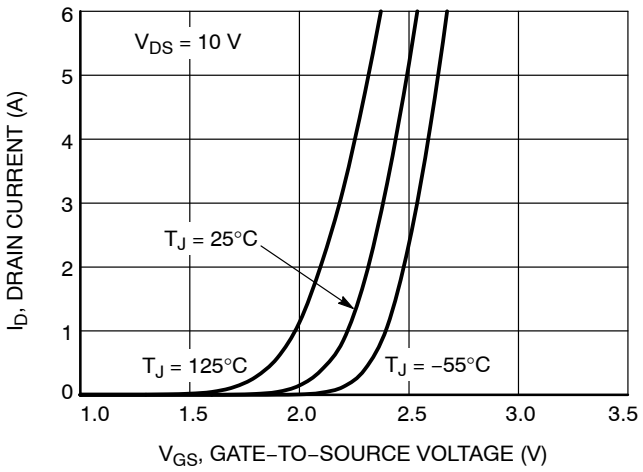


Figure 2. Transfer Characteristics

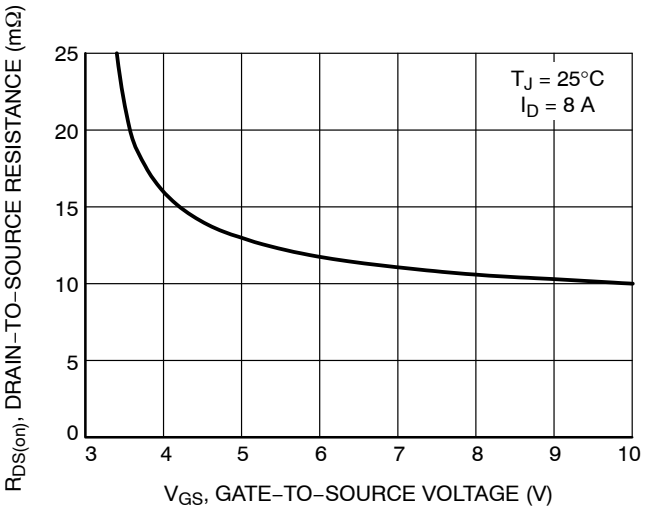


Figure 3. On−Resistance vs. Gate−to−Source Voltage

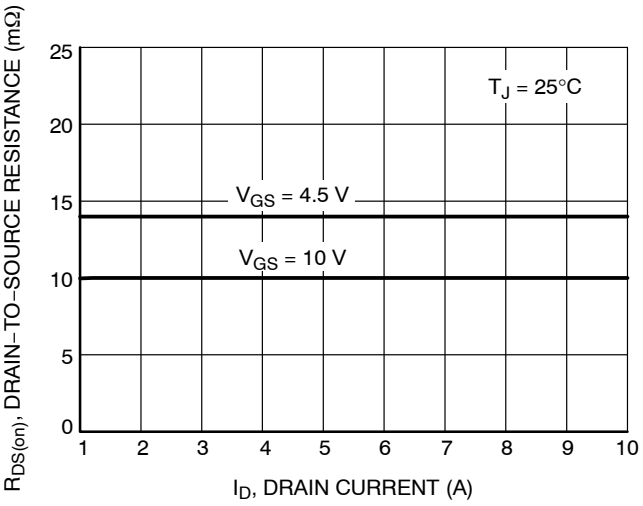


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

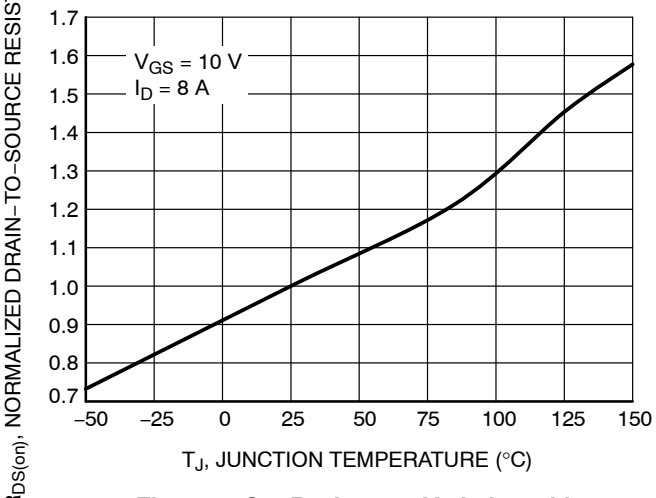


Figure 5. On−Resistance Variation with Temperature

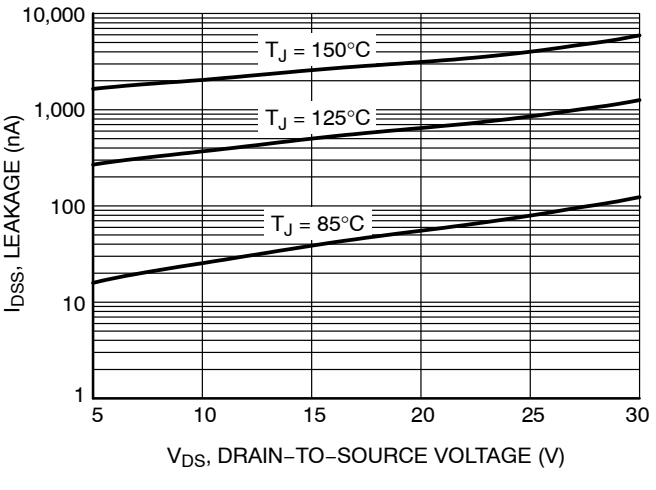


Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

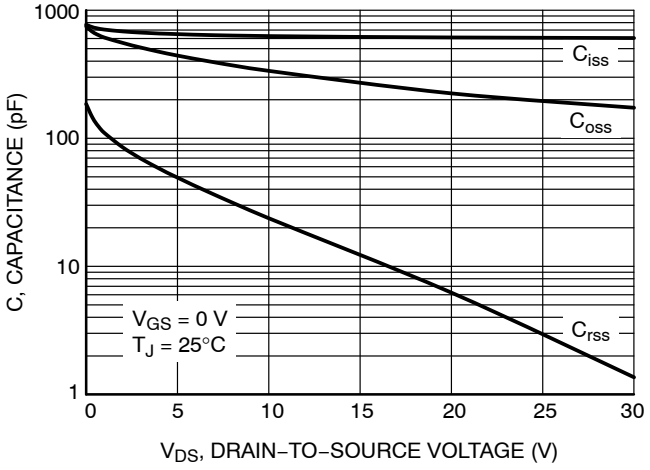


Figure 7. Capacitance Variation

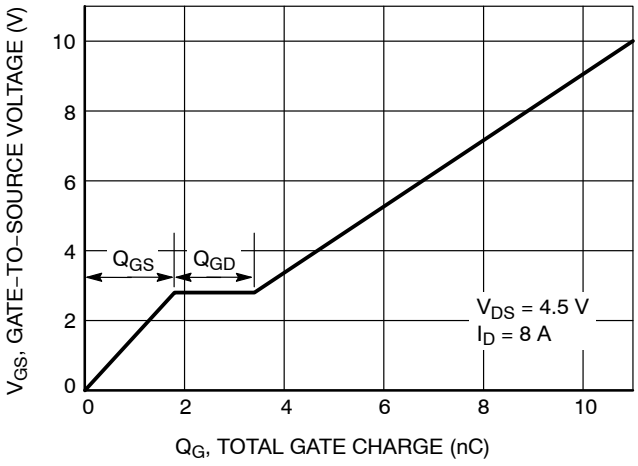


Figure 8. Gate−to−Source vs. Total Charge

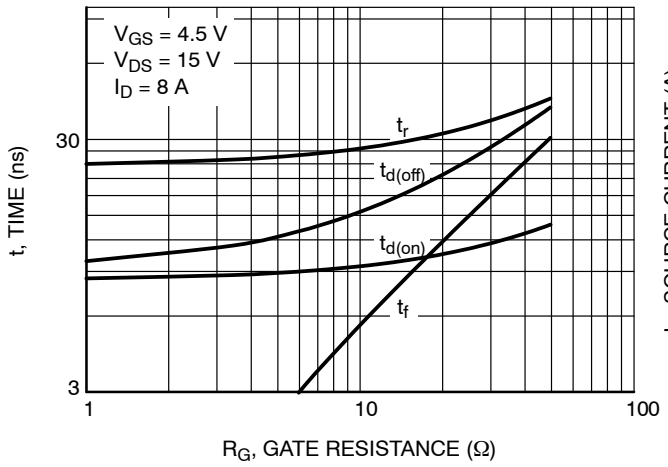


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

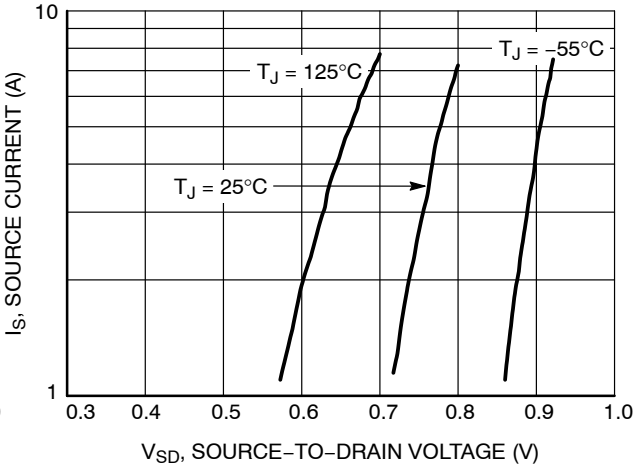


Figure 10. Diode Forward Voltage vs. Current

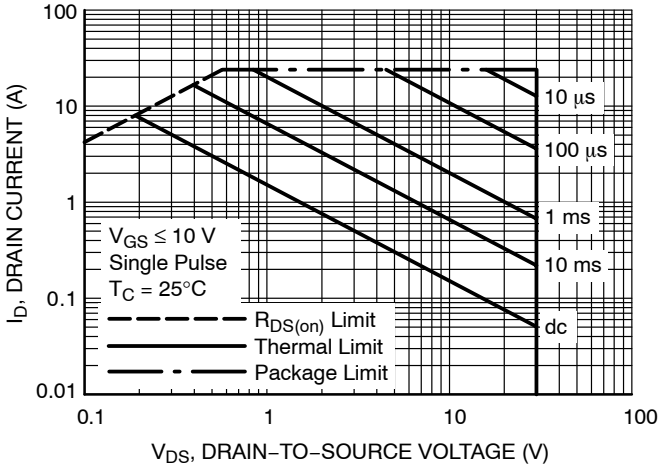


Figure 11. Maximum Rated Forward Biased Safe Operating Area

TYPICAL CHARACTERISTICS

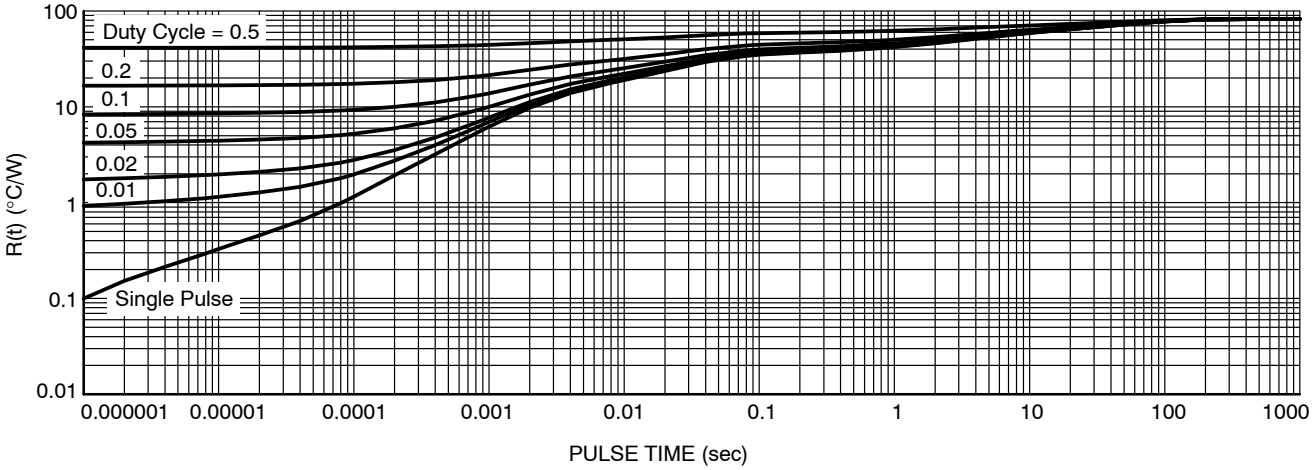


Figure 12. Thermal Response

DEVICE ORDERING INFORMATION

Device	Package	Shipping†
NTLUS020N03CTAG	UDFN6 (Pb−Free)	3000 / Tape & Reel

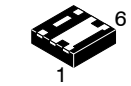
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

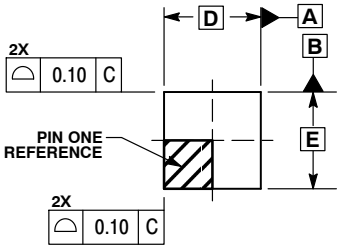
ON Semiconductor®

UDFN6 1.6x1.6, 0.5P
CASE 517AU−01
ISSUE O

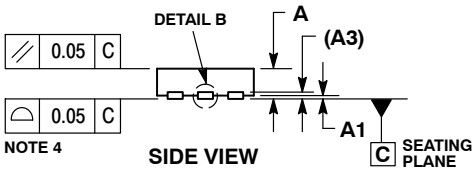
DATE 16 OCT 2008



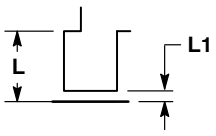
SCALE 4:1



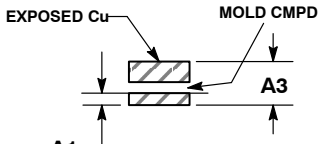
TOP VIEW



SIDE VIEW



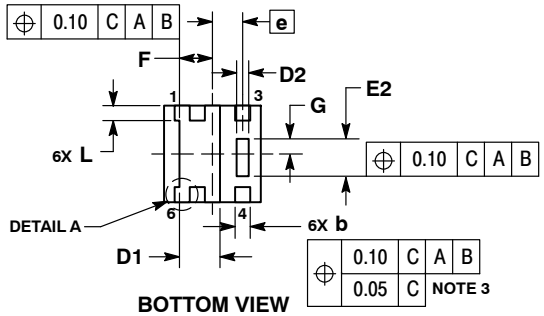
DETAIL A
OPTIONAL CONSTRUCTION



DETAIL B
OPTIONAL CONSTRUCTION

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.

	MILLIMETERS	
DIM	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A3	0.13 REF	
b	0.20	0.30
D	1.60 BSC	
E	1.60 BSC	
e	0.50 BSC	
D1	0.62	0.72
D2	0.15	0.25
E2	0.57	0.67
F	0.55 BSC	
G	0.25 BSC	
L	0.20	0.30
L1	−−−	0.15



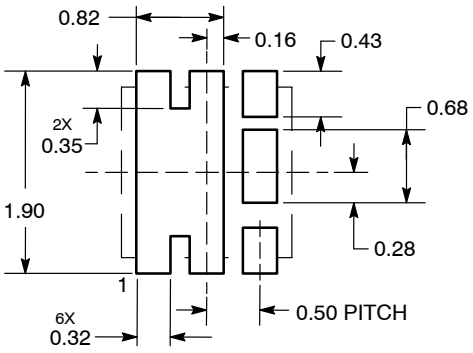
BOTTOM VIEW

GENERIC MARKING DIAGRAM*

XX = Specific Device Code
M = Date Code
▪ = Pb−Free Package
(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.

SOLDERMASK DEFINED MOUNTING FOOTPRINT*



DIMENSIONS: MILLIMETERS

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

DOCUMENT NUMBER:	**98AON35147E**	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, 1.6X1.6, 0.5P**		**PAGE 1 OF 1**

PUBLICATION ORDERING INFORMATION

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For additional information, please contact your local Sales Representative

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