NTHS4111P

Power MOSFET

–30 V, –6.1 A, Single P–Channel, ChipFET™

ON Semiconductor®

http://onsemi.com

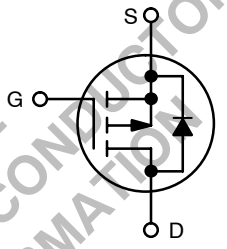
$V_{(BR)DSS}$	$R_{DS(on)}$ Typ	I_D Max
–30 V	33 mΩ @ –10 V	–6.1 A
	52 mΩ @ –4.5 V	

Features

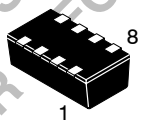
- Offers an Ultra Low $R_{DS(on)}$ Solution in the ChipFET Package
- ChipFET Package 40% Smaller Footprint than TSOP–6
- Low Profile (<1.1 mm) for Extremely Thin Environments
- Standard Logic Level Gate Drive
- Pb–Free Package is Available

Applications

- Notebook Computer Load Switch
- Battery and Load Management Applications in Portable Equipment
- Charge Control in Battery Chargers
- Buck and Boost Converters



P–Channel MOSFET



ChipFET
CASE 1206A
STYLE 1

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

Rating			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	–4.4	A
		T_A = 85°C		–3.2	
	t ≤ 10 s	T_A = 25°C		–6.1	
Power Dissipation (Note 1)	Steady State	T_A = 25°C	P_D	1.3	W
	t ≤ 10 s			2.5	
Continuous Drain Current (Note 2)	Steady State	T_A = 25°C	I_D	–3.3	A
		T_A = 85°C		–2.3	
Power Dissipation (Note 2)		T_A = 25°C	P_D	0.7	W
Pulsed Drain Current	tp = 10 μs		I_{DM}	–30	A
Operating Junction and Storage Temperature			T_J, T_{STG}	–55 to 150	°C
Source Current (Body Diode)			I_S	–2.1	A
Lead Temperature for Soldering Purposes (1/8″ from case for 10 s)			T_L	260	°C

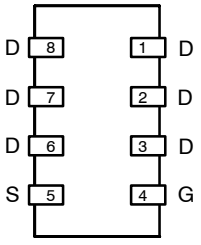
THERMAL RESISTANCE RATINGS

Rating	Symbol	Max	Unit
Junction–to–Ambient – Steady State (Note 1)	$R_{\theta JA}$	95	°C/W
Junction–to–Ambient – t ≤ 10 s (Note 1)	$R_{\theta JA}$	50	
Junction–to–Ambient – Steady State (Note 2)	$R_{\theta JA}$	175	

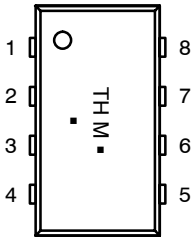
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Surface–mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).
2. Surface–mounted on FR4 board using the minimum recommended pad size (Cu area = 0.045 in sq).

PIN CONNECTIONS



MARKING DIAGRAM



TH = Specific Device Code
M = Date Code
▪ = Pb–Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
NTHS4111PT1	ChipFET	3000/Tape & Reel
NTHS4111PT1G	ChipFET (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.

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

Characteristic	Symbol	Test Condition		Min	Typ	Max	Unit
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	$V_{(BR)DSS}/T_J$				−19		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			−100	
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±20 V				±100	nA
ON CHARACTERISTICS (Note 3)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = −250 μA		−1.0	−1.7	−3.0	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$				5.0		mV/°C
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = −10 V, I_D = −4.4 A			33	45	mΩ
		V_{GS} = −4.5 V, I_D = −3.4 A			52	75	
Forward Transconductance	g_{FS}	V_{DS} = −15 V, I_D = −4.4 A			7.7		S
CHARGES, CAPACITANCES AND GATE RESISTANCE							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1.0 MHz, V_{DS} = −24 V			882	1500	pF
Output Capacitance	C_{OSS}				143		
Reverse Transfer Capacitance	C_{RSS}				105		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = −10 V, V_{DD} = −15 V, I_D = −4.4 A			18.2	28	nC
Gate−to−Source Charge	Q_{GS}				2.95		
Gate−to−Drain Charge	Q_{GD}				4.25		
SWITCHING CHARACTERISTICS, V_{GS} = −10 V (Note 4)							
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = −10 V, V_{DD} = −15 V, I_D = −1.0 A, R_G = 6.0 Ω			9.0	18	ns
Rise Time	t_r				8.0	16	
Turn−Off Delay Time	$t_{d(OFF)}$				45	90	
Fall Time	t_f				26	52	
SWITCHING CHARACTERISTICS, V_{GS} = −4.5 V (Note 4)							
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = −4.5 V, V_{DD} = −15 V, I_D = −1.0 A, R_G = 6.0 Ω			11		ns
Rise Time	t_r				14		
Turn−Off Delay Time	$t_{d(OFF)}$				32		
Fall Time	t_f				23		
DRAIN − SOURCE DIODE CHARACTERISTICS							
Characteristic	**Symbol**	**Test Condition**		**Min**	**Typ**	**Max**	**Unit**
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = −1.1 A	T_J = 25°C		−0.76	−1.2	V
			T_J = 125°C		−0.60		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dI_S/dt = 100 A/μs, I_S = −1.1 A			27	54	ns
Charge Time	t_a				10		
Discharge Time	t_b				17		
Reverse Recovery Charge	Q_{RR}				12		nC

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

TYPICAL PERFORMANCE CURVES (T_J = 25°C unless otherwise noted)

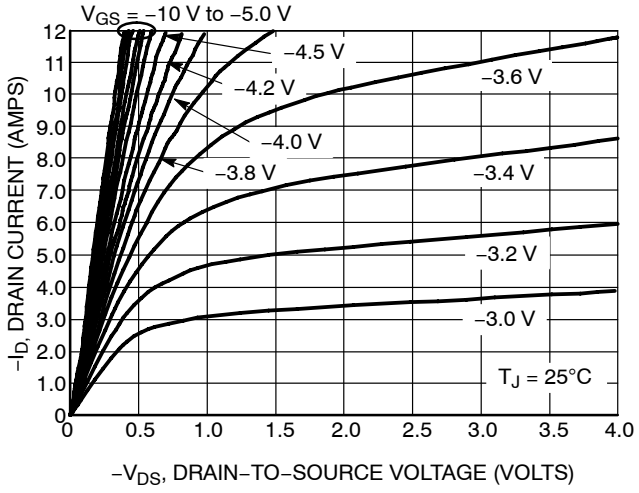


Figure 1. On−Region Characteristics

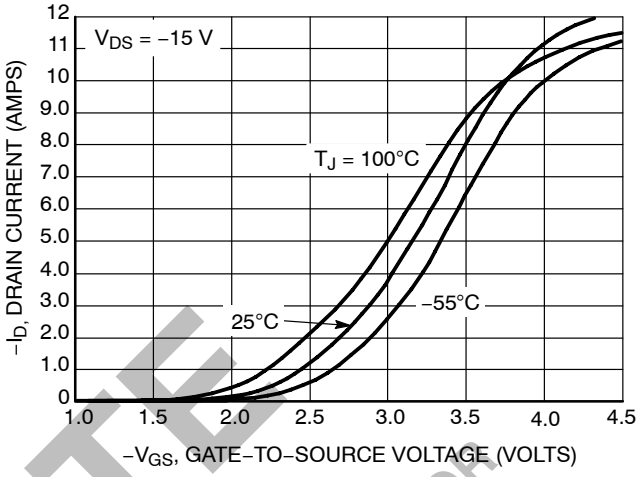


Figure 2. Transfer Characteristics

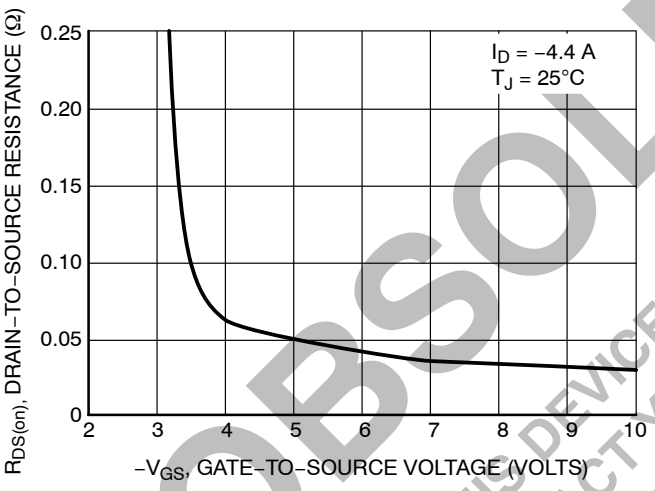


Figure 3. $R_{DS(on)}$ vs. V_{GS}

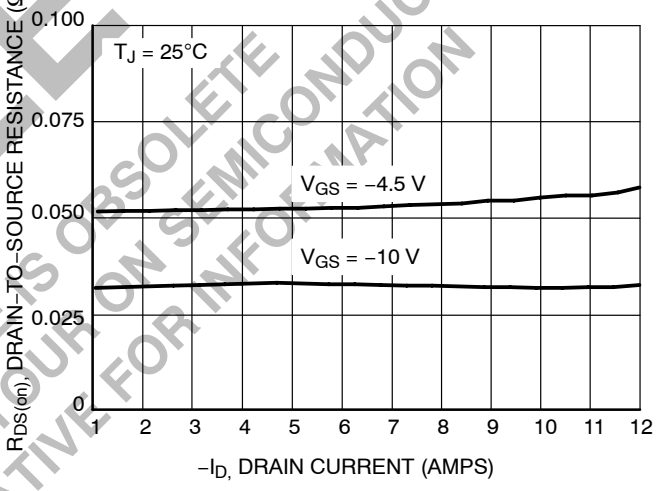


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

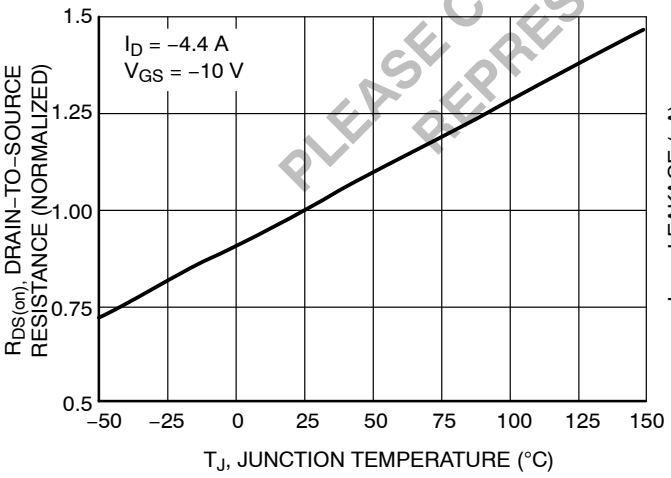


Figure 5. On−Resistance Variation with Temperature

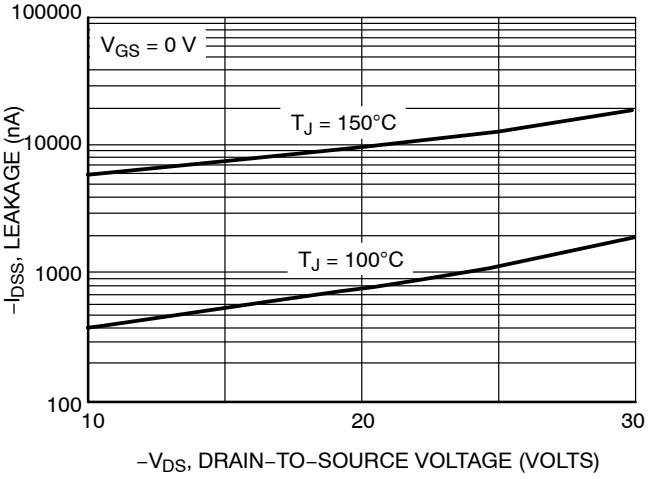


Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL PERFORMANCE CURVES (T_J = 25°C unless otherwise noted)

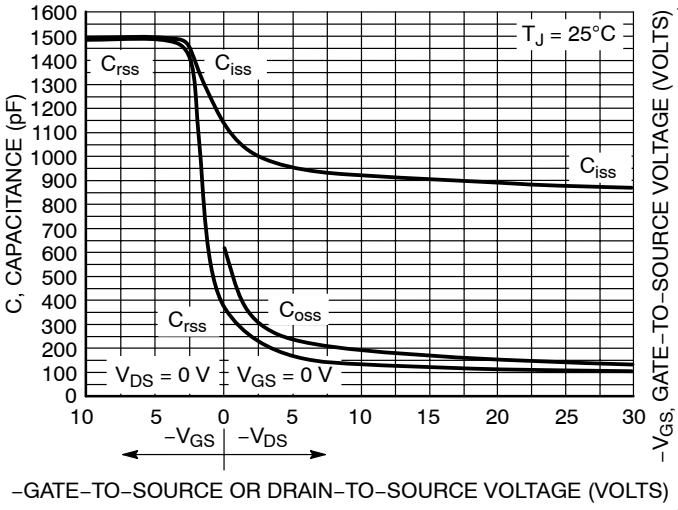


Figure 7. Capacitance Variation

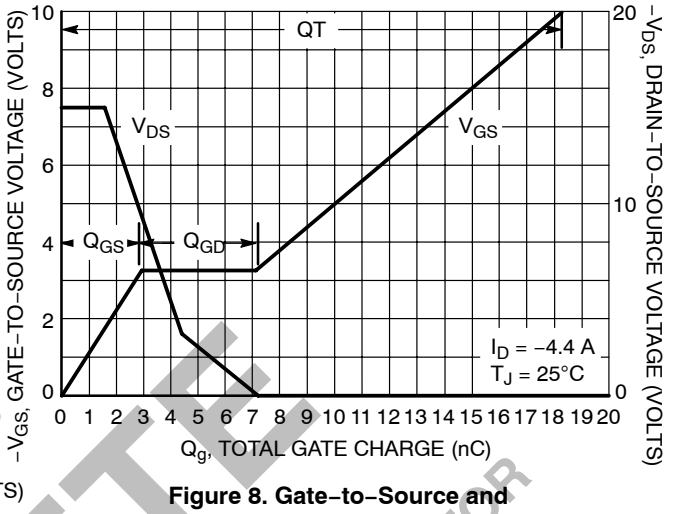


Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

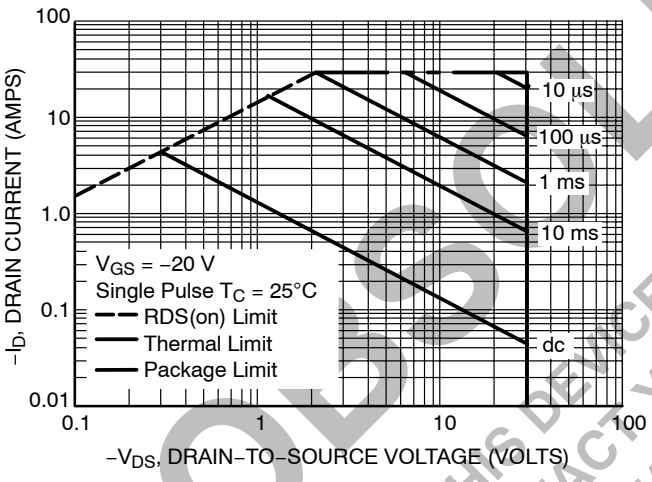


Figure 9. Maximum Rated Forward Biased Safe Operating Area

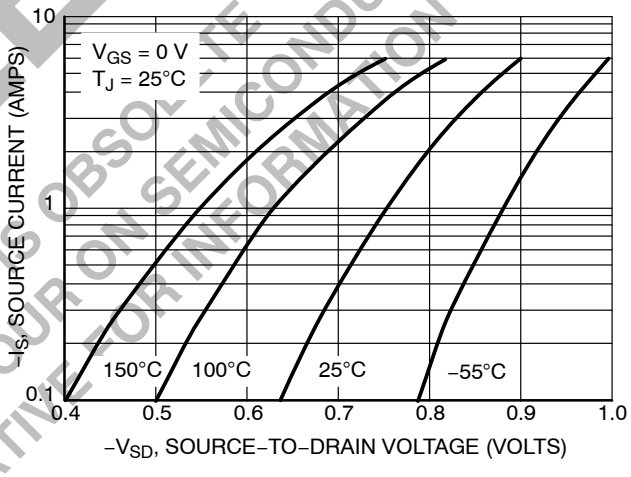


Figure 10. Diode Forward Voltage vs. Current

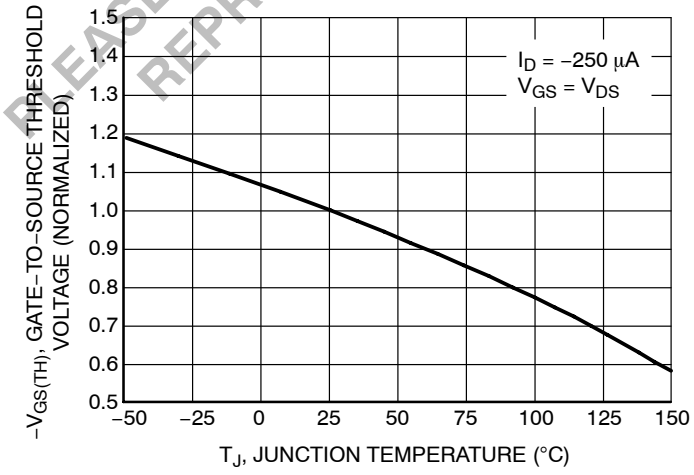


Figure 11. $V_{GS(TH)}$ Variation with Temperature

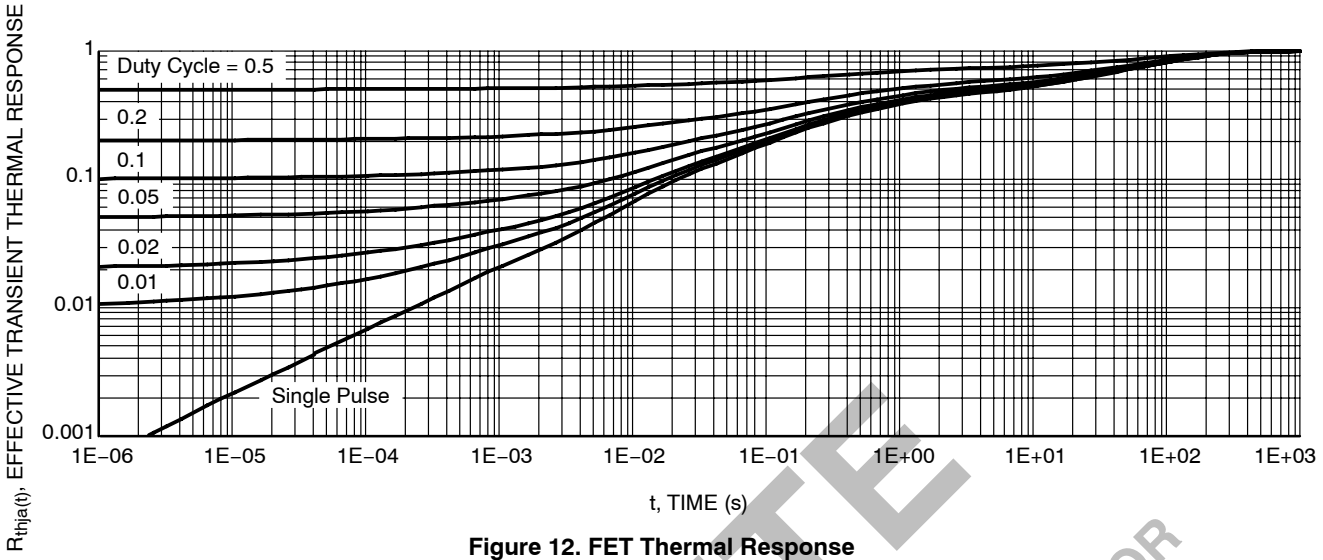
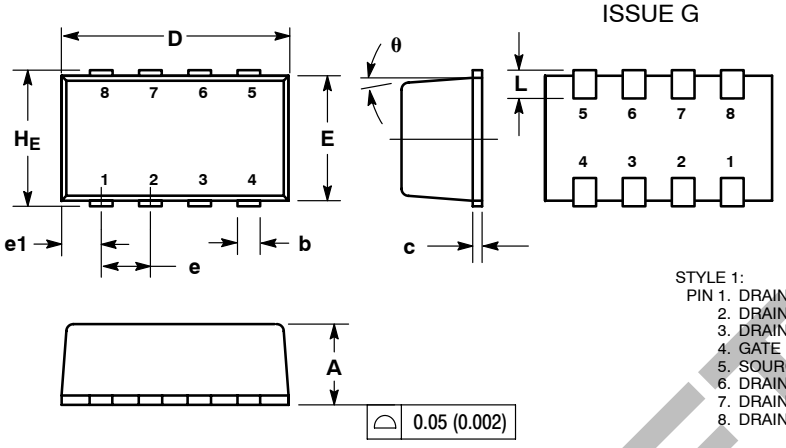


Figure 12. FET Thermal Response

PACKAGE DIMENSIONS

ChipFET™
CASE 1206A−03
ISSUE G

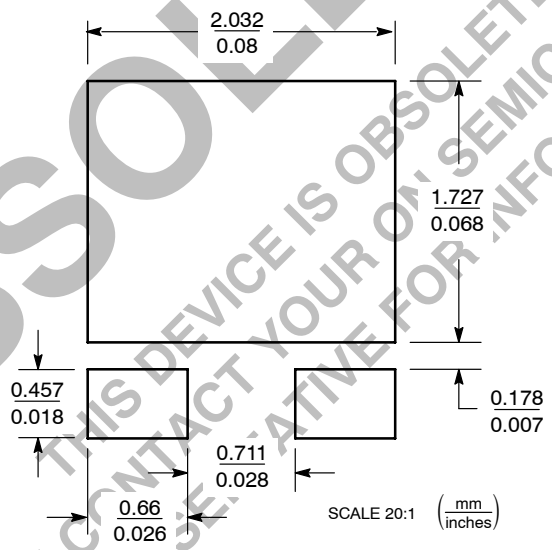


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. MOLD GATE BURRS SHALL NOT EXCEED 0.13 MM PER SIDE.
4. LEADFRAME TO MOLDED BODY OFFSET IN HORIZONTAL AND VERTICAL SHALL NOT EXCEED 0.08 MM.
5. DIMENSIONS A AND B EXCLUSIVE OF MOLD GATE BURRS.
6. NO MOLD FLASH ALLOWED ON THE TOP AND BOTTOM LEAD SURFACE.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	1.00	1.05	1.10	0.039	0.041	0.043
b	0.25	0.30	0.35	0.010	0.012	0.014
c	0.10	0.15	0.20	0.004	0.006	0.008
D	2.95	3.05	3.10	0.116	0.120	0.122
E	1.55	1.65	1.70	0.061	0.065	0.067
e	0.65 BSC			0.025 BSC		
e1	0.55 BSC			0.022 BSC		
L	0.28	0.35	0.42	0.011	0.014	0.017
H_E	1.80	1.90	2.00	0.071	0.075	0.079
θ	5° NOM			5° NOM		

STYLE 1:
PIN 1. DRAIN
2. DRAIN
3. DRAIN
4. GATE
5. SOURCE
6. DRAIN
7. DRAIN
8. DRAIN

SOLDERING FOOTPRINT*



*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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