

NTLJS1102P

Power MOSFET

–8 V, –8.1 A, μ COOL™ Single P-Channel, 2x2 mm, WDFN package

Features

- WDFN Package with Exposed Drain Pad for Excellent Thermal Conduction
- Lowest $R_{DS(on)}$ in 2 x 2 mm Package
- 1.2 V $R_{DS(on)}$ Rating for Operation at Low Voltage Logic Level Gate Drive
- 2 x 2 mm Footprint Same as SC-88 Package
- Low Profile (<0.8 mm) for Easy Fit in Thin Environments
- This is a Halide-Free Device
- This is a Pb-Free Device

Applications

- High Side Load Switch
- Li Ion Battery Linear Mode Charging
- Optimized for Battery and Load Management Applications in Portable Equipment

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

Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			V_{DS}	–8	V
Gate-to-Source Voltage			V_{GS}	± 6	V
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	I_D	–6.2	A
		$T_A = 85^\circ\text{C}$		–4.5	
	$t \leq 5 \text{ s}$	$T_A = 25^\circ\text{C}$		–8.1	
Power Dissipation (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	P_D	1.9	W
	$t \leq 5 \text{ s}$			3.3	
Continuous Drain Current (Note 2)	Steady State	$T_A = 25^\circ\text{C}$	I_D	–3.7	A
		$T_A = 85^\circ\text{C}$		–2.7	
Power Dissipation (Note 2)	Steady State	$T_A = 25^\circ\text{C}$	P_D	0.7	W
Pulsed Drain Current		$t_p = 10 \mu\text{s}$	I_{DM}	–30	A
Operating Junction and Storage Temperature			T_J, T_{STG}	–55 to 150	$^\circ\text{C}$
Source Current (Body Diode) (Note 2)			I_S	–5.5	A
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			T_L	260	$^\circ\text{C}$

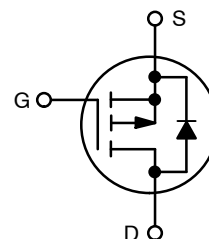
1. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces).
2. Surface-mounted on FR4 board using the minimum recommended pad size (Cu area = 30 mm² [2 oz] including traces).



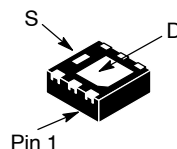
ON Semiconductor®

<http://onsemi.com>

$V_{(BR)DS}$	$R_{DS(on)}$ MAX	I_D MAX
–8.0 V	36 m Ω @ –4.5 V	–6.2 A
	45 m Ω @ –2.5 V	–5.5 A
	68 m Ω @ –1.8 V	–3.0 A
	90 m Ω @ –1.5 V	–1.0 A
	300 m Ω @ –1.2 V	–0.2 A

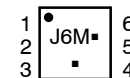


P-CHANNEL MOSFET



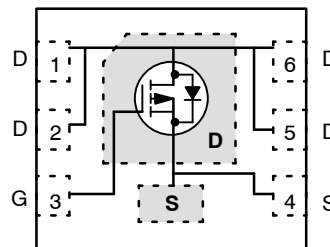
**WDFN6
CASE 506AP**

MARKING DIAGRAM



J6 = 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 3 of this data sheet.

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	65	°C/W
Junction-to-Ambient – $t \leq 5$ s (Note 3)	$R_{\theta JA}$	38	
Junction-to-Ambient – Steady State min Pad (Note 4)	$R_{\theta JA}$	180	

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 (Cu area = 30 mm² [2 oz] including traces).

MOSFET ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-8.0			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	$I_D = -250\text{ }\mu\text{A}$, Ref to 25°C		-7.2		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = -8\text{ V}$	$T_J = 25^\circ\text{C}$		-1.0	μA
			$T_J = 85^\circ\text{C}$		-10	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 6\text{ V}$			± 0.1	μA

ON CHARACTERISTICS (Note 5)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = -250\text{ }\mu\text{A}$	-0.29		-0.72	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			2.7		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -6.2\text{ A}$		25	36	m Ω
		$V_{GS} = -4.5\text{ V}, I_D = -3.0\text{ A}$		25	36	
		$V_{GS} = -2.5\text{ V}, I_D = -5.5\text{ A}$		34	45	
		$V_{GS} = -2.5\text{ V}, I_D = -3.0\text{ A}$		34	45	
		$V_{GS} = -1.8\text{ V}, I_D = -3.0\text{ A}$		45	68	
		$V_{GS} = -1.5\text{ V}, I_D = -1.0\text{ A}$		55	90	
		$V_{GS} = -1.2\text{ V}, I_D = -0.2\text{ A}$		80	300	
Forward Transconductance	g_{FS}	$V_{DS} = -4\text{ V}, I_D = -6.2\text{ A}$		14.3		S

CHARGES, CAPACITANCES AND GATE RESISTANCE

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = -4\text{ V}$		1585		pF
Output Capacitance	C_{OSS}			350		
Reverse Transfer Capacitance	C_{RSS}			185		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = -4.5\text{ V}, V_{DS} = -4\text{ V}; I_D = -6.2\text{ A}$		15.7	25	nC
Threshold Gate Charge	$Q_{G(TH)}$			0.8		
Gate-to-Source Charge	Q_{GS}			1.9		
Gate-to-Drain Charge	Q_{GD}			3.3		

SWITCHING CHARACTERISTICS, $V_{GS} = 4.5\text{ V}$ (Note 6)

Turn-On Delay Time	$t_{D(ON)}$	$V_{GS} = -4.5\text{ V}, V_{DS} = -4\text{ V}, I_D = -6.2\text{ A}, R_G = 1\text{ }\Omega$		8.0		ns
Rise Time	t_r			41		
Turn-Off Delay Time	$t_{d(OFF)}$			80		
Fall Time	t_f			70		

5. Pulse Test: pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$
6. Switching characteristics are independent of operating junction temperatures

NTLJS1102P

MOSFET ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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SWITCHING CHARACTERISTICS, $V_{GS} = 4.5\text{ V}$ (Note 6)

Turn-On Delay Time	$t_{D(ON)}$	$V_{GS} = -4.5\text{ V}, V_{DS} = -4\text{ V},$ $I_D = -8.1\text{ A}, R_G = 1\ \Omega$		8.0		ns
Rise Time	t_r			19		
Turn-Off Delay Time	$t_{d(OFF)}$			78		
Fall Time	t_f			50		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V _{SD}	V _{GS} = 0 V, I _S = -1.0 A	T _J = 25°C		-0.6	-1.0	V
			T _J = 85°C		-0.58		
Reverse Recovery Time	t _{RR}	V _{GS} = 0 V, dI _{SD} /d _t = 100 A/μs, I _S = -1.0 A			55	85	ns
Charge Time	t _a				18		
Discharge Time	t _b				37		
Reverse Recovery Charge	Q _{RR}				39		nC

5. Pulse Test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$

6. Switching characteristics are independent of operating junction temperatures

ORDERING INFORMATION

Device	Package	Shipping [†]
NTLJS1102PTBG	WDFN6 (Pb-Free)	3000 / Tape & Reel
NTLJS1102PTAG	WDFN6 (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.

TYPICAL CHARACTERISTICS

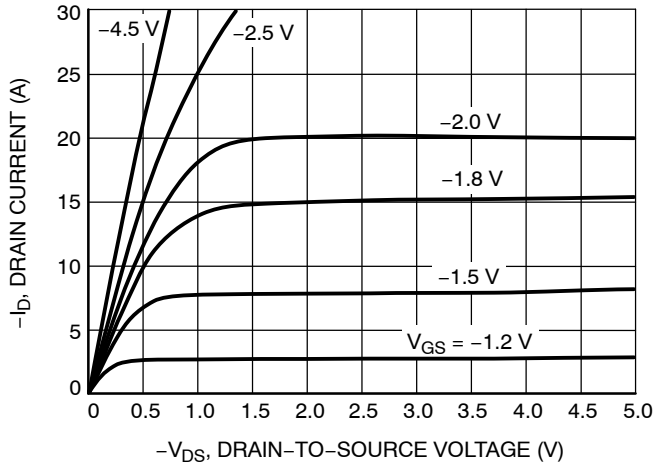


Figure 1. On-Region Characteristics

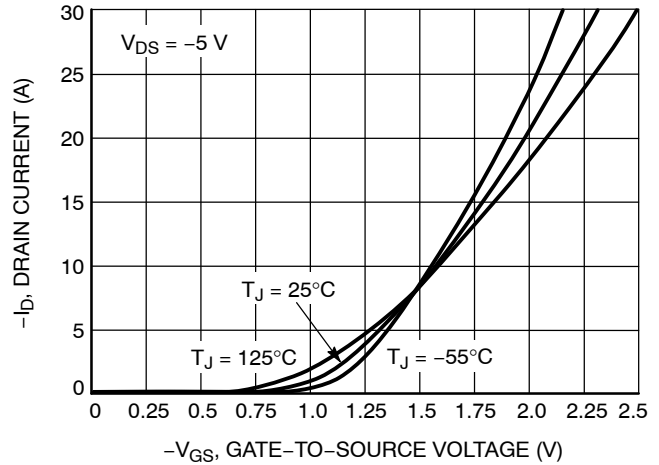


Figure 2. Transfer Characteristics

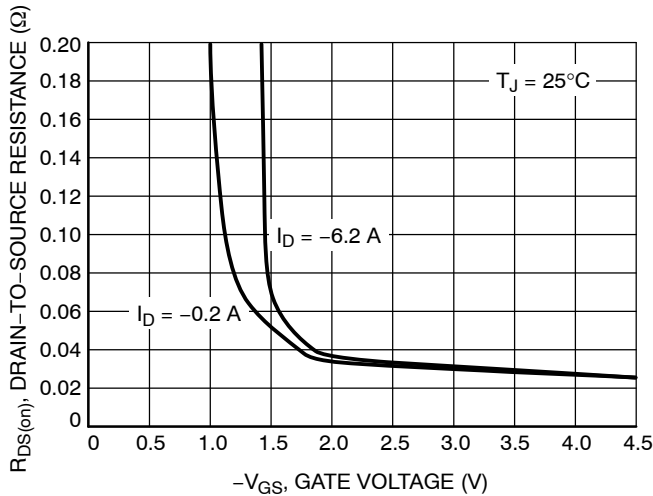


Figure 3. On-Resistance vs. Gate-to-Source Voltage

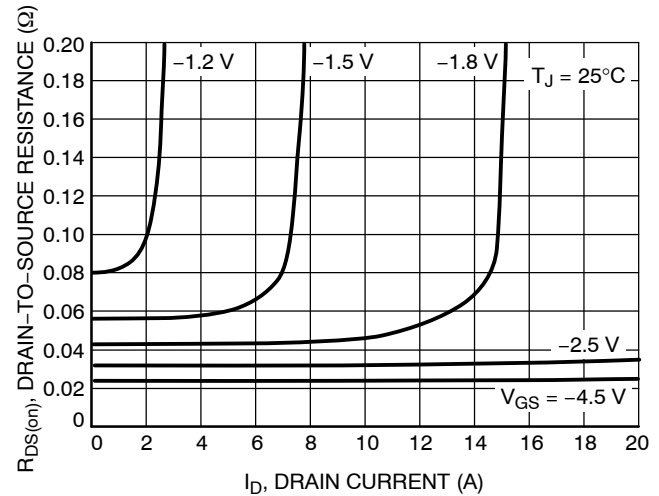


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

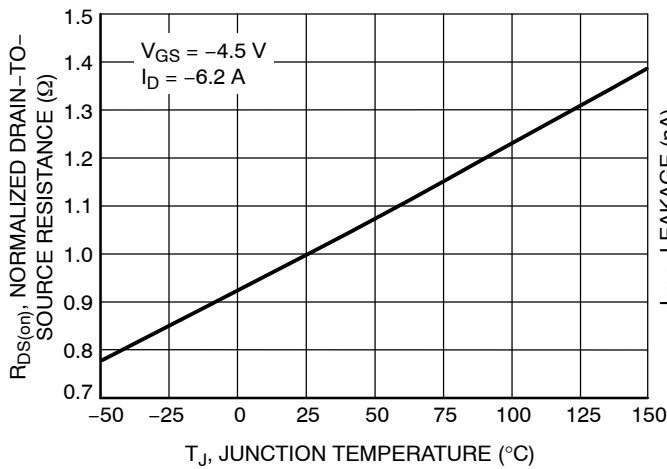


Figure 5. On-Resistance Variation with Temperature

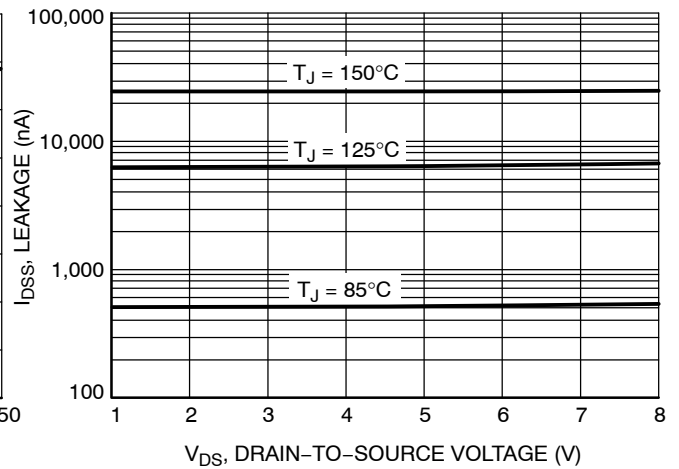


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

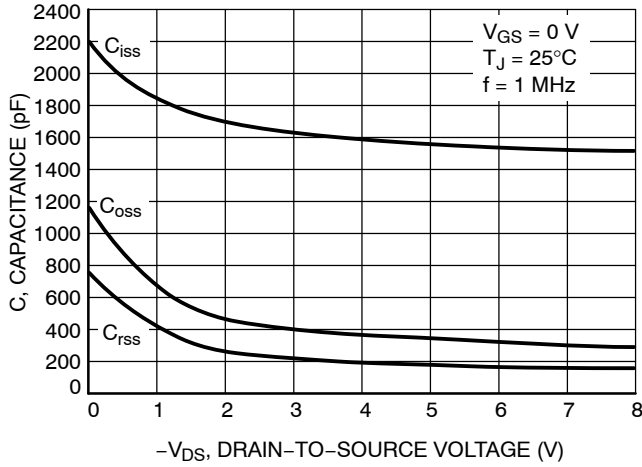


Figure 7. Capacitance Variation

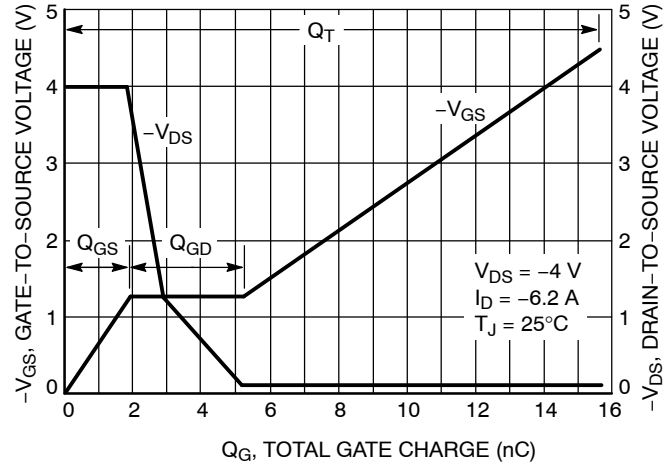


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

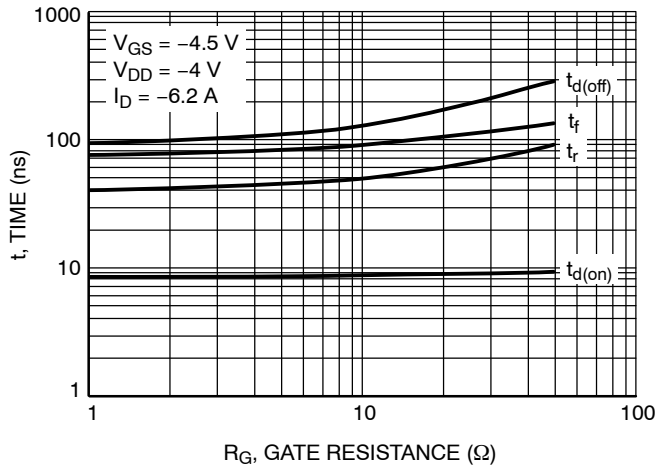


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

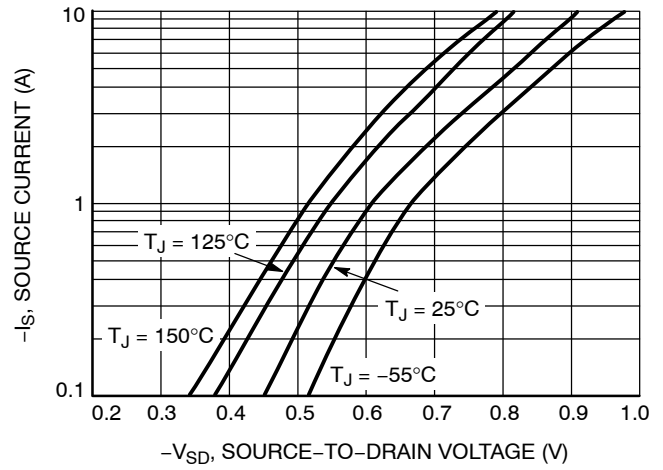


Figure 10. Diode Forward Voltage vs. Current

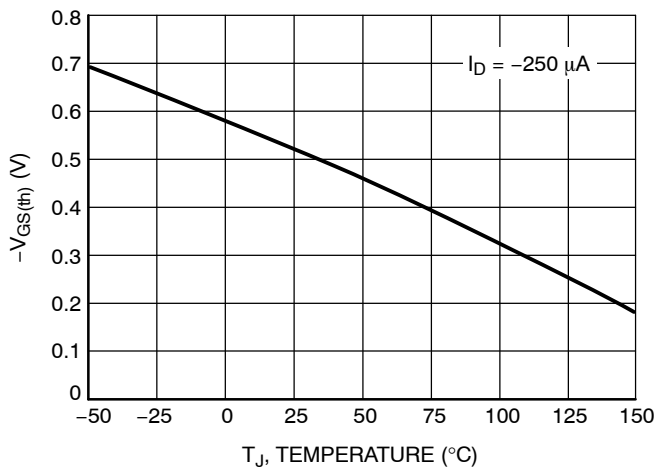


Figure 11. Threshold Voltage

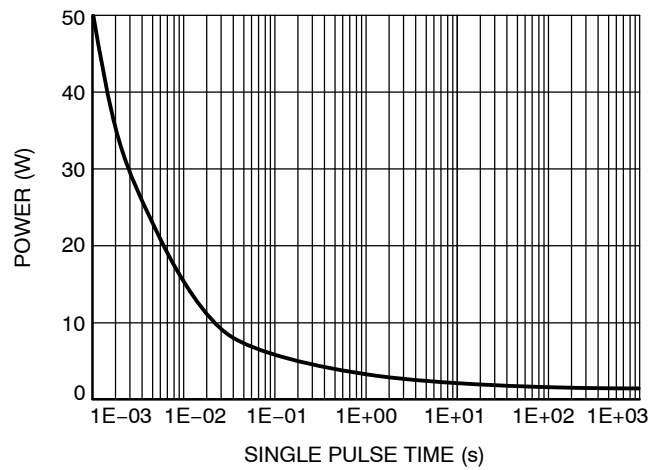


Figure 12. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS

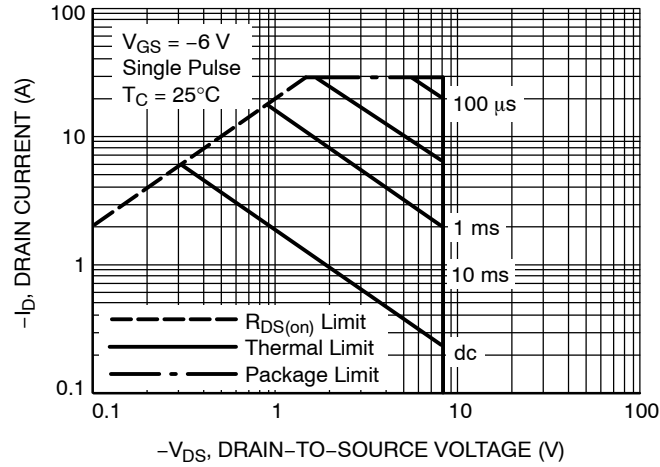


Figure 13. Maximum Rated Forward Biased Safe Operating Area

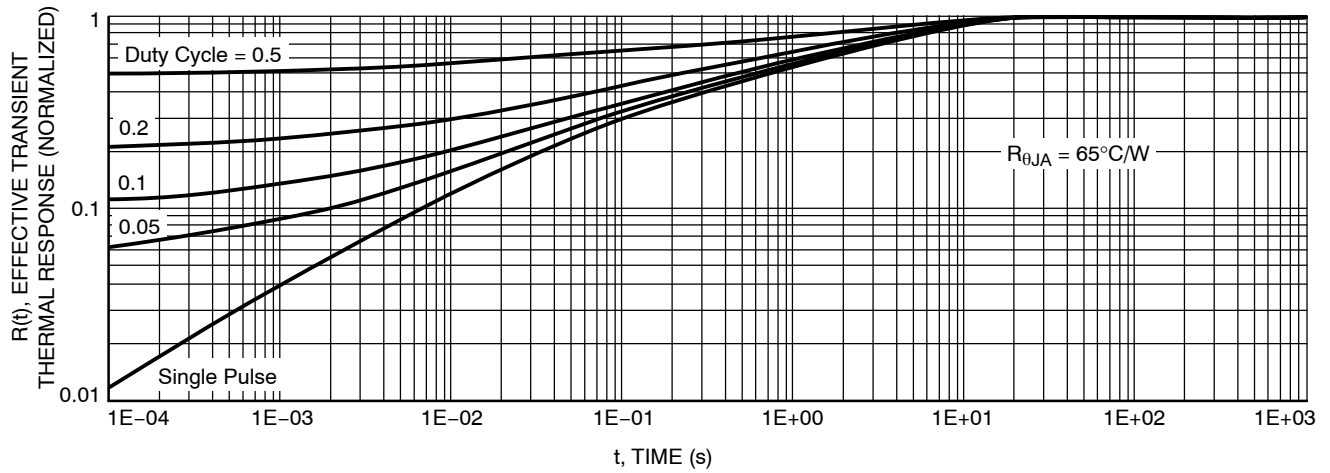
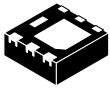


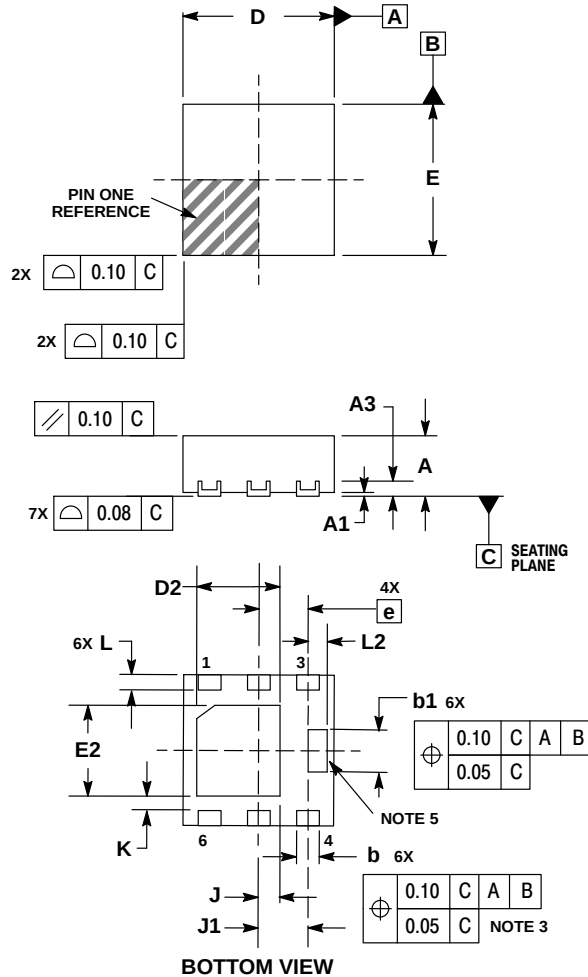
Figure 14. FET Thermal Response



WDFN6 2x2
CASE 506AP
ISSUE B

DATE 26 APR 2006

SCALE 4:1



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

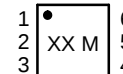
STYLE 2:
PIN 1. COLLECTOR
2. COLLECTOR
3. BASE
4. EMITTER
5. COLLECTOR
6. COLLECTOR

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 0.20mm FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.
1. CENTER TERMINAL LEAD IS OPTIONAL. TERMINAL LEAD IS CONNECTED TO TERMINAL LEAD # 4.
2. PINS 1, 2, 5 AND 6 ARE TIED TO THE FLAG.

DIM	MILLIMETERS	
	MIN	MAX
A	0.70	0.80
A1	0.00	0.05
A3	0.20 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	
L	0.20	0.30
L2	0.20	0.30
J	0.27 REF	
J1	0.65 REF	

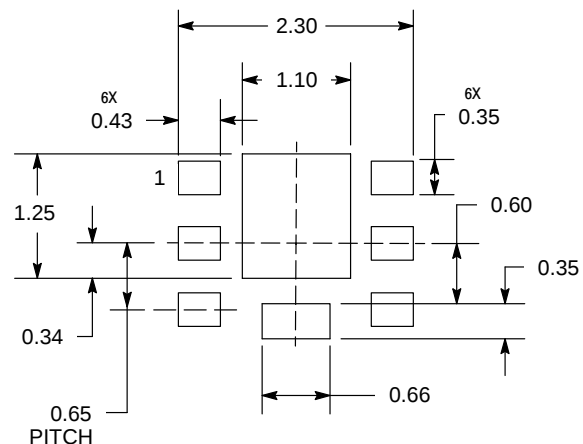
GENERIC MARKING DIAGRAM*



XX = Specific Device Code
M = Date Code

*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

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DESCRIPTION:	6 PIN WDFN 2X2, 0.65P	PAGE 1 OF 1

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