NTMFS4854NS

Power MOSFET
25 V, 149 A, Single N−Channel, SO−8 FL

Features
- Accurate, Lossless Current Sensing
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Optimized Gate Charge to Minimize Switching Losses
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

Applications
- CPU Power Delivery
- DC−DC Converters
- Low Side Switching

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

Parameter			Symbol	Value	Unit
Drain−to−Source Voltage			V_{DSS}	25	V
Gate−to−Source Voltage			V_{GS}	±16	V
Continuous Drain Current $R_{\theta JA}$ (Note 1)	Steady State	T_A = 25°C	I_D	24.4	A
		T_A = 85°C		17.6	
Power Dissipation $R_{\theta JA}$ (Note 1)		T_A = 25°C	P_D	2.31	W
Continuous Drain Current $R_{\theta JA}$ (Note 2)		T_A = 25°C	ID	15.2	A
		T_A = 85°C		11	
Power Dissipation $R_{\theta JA}$ (Note 2)		T_A = 25°C	P_D	0.9	W
Continuous Drain Current $R_{\theta JC}$ (Note 1)		T_C = 25°C	I_D	149	A
		T_C = 85°C		107.5	
Power Dissipation $R_{\theta JC}$ (Note 1)		T_C = 25°C	P_D	86.2	W
Pulsed Drain Current	T_A = 25°C, t_p = 10 μs		I_{DM}	298	A
Operating Junction and Storage Temperature			T_J, T_{STG}	−55 to +150	°C
Source Current (Body Diode)			I_S	71	A
Drain to Source DV/DT			dV/dt	6	V/ns
Single Pulse Drain−to−Source Avalanche Energy (T_J = 25°C, V_{DD} = 30 V, V_{GS} = 10 V, I_L = 20 A_{pk}, L = 1.0 mH, R_G = 25 Ω)			EAS	200	mJ
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 sq−in pad, 1 oz Cu.
2. Surface−mounted on FR4 board using the minimum recommended pad size.

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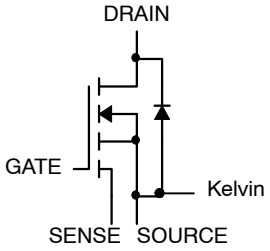
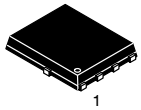
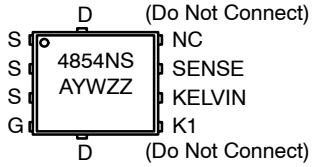
$V_{(BR)DSS}$	$R_{DS(ON)}$ MAX	I_D MAX
25 V	2.5 mΩ @ 10 V	149 A
	3.9 mΩ @ 4.5 V	119 A





SO−8 FLAT LEAD CASE 506BQ

MARKING DIAGRAM



A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

ORDERING INFORMATION

Device	Package	Shipping†
NTMFS4854NST1G	SO−8 FL (Pb−Free)	1500 Tape / Reel
NTMFS4854NST3G	SO−8 FL (Pb−Free)	5000 Tape / Reel

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

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction−to−Case (Drain)	$R_{\theta JC}$	1.45	°C/W
Junction−to−Ambient − Steady State (Note 3)	$R_{\theta JA}$	54	
Junction−to−Ambient − Steady State (Note)	$R_{\theta JA}$	138.7	

3. Surface−mounted on FR4 board using 1 sq−in pad, 1 oz Cu.
4. Surface−mounted on FR4 board using the minimum recommended pad size.

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

Parameter	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		25			V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$				30		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 20 V	T_J = 25°C			10	μA
			T_J = 125°C			200	
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±16 V				±100	nA
ON CHARACTERISTICS (Note 5)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 250 μA		1.0		2.5	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$				6.8		mV/°C
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 V	I_D = 15 A		1.5	2.5	mΩ
		V_{GS} = 4.5 V	I_D = 15 A		2.5	3.9	
		V_{GS} = 3.2 V, I_D = 10 A	T_J = 75°C		6.0	10	
			T_J = 25°C		5.1	8.8	
Forward Transconductance	g_{FS}	V_{DS} = 15 V, I_D = 15 A			28		S
CHARGES, CAPACITANCES & GATE RESISTANCE							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1 MHz, V_{DS} = 12 V			4830		pF
Output Capacitance	C_{OSS}				1130		
Reverse Transfer Capacitance	C_{RSS}				550		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 4.5 V, V_{DS} = 15 V; I_D = 30 A			36	66	nC
Threshold Gate Charge	$Q_{G(TH)}$				4.7		
Gate−to−Source Charge	Q_{GS}				13		
Gate−to−Drain Charge	Q_{GD}				15		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 11.5 V, V_{DS} = 15 V; I_D = 30 A			85		nC
SWITCHING CHARACTERISTICS (Note 6)							
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = 4.5 V, V_{DS} = 15 V, I_D = 15 A, R_G = 3.0 Ω			20		ns
Rise Time	t_r				54		
Turn−Off Delay Time	$t_{d(OFF)}$				38		
Fall Time	t_f				45		

5. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
6. Switching characteristics are independent of operating junction temperatures.
7. With 0V potential from sense lead to source lead, i.e. using a virtual ground.

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

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS (Note 6)							
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = 11.5 V, V_{DS} = 15 V, I_D = 15 A, R_G = 3.0 Ω			11		ns
Rise Time	t_r				32		
Turn−Off Delay Time	$t_{d(OFF)}$				54		
Fall Time	t_f				34		
DRAIN−SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 30 A	T_J = 25°C		0.80	1.2	V
			T_J = 125°C		0.65		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dIS/dt = 100 A/μs, I_S = 30 A			36		ns
Charge Time	t_a				17		
Discharge Time	t_b				19		
Reverse Recovery Charge	Q_{RR}				33		nC
PACKAGE PARASITIC VALUES							
Source Inductance	L_S	T_A = 25°C			0.65		nH
Drain Inductance	L_D				0.005		nH
Gate Inductance	L_G				1.84		nH
Gate Resistance	R_G				1.4		Ω
CURRENT SENSE CHARACTERISTICS							
Current Sensing Ratio	I_{ratio}	V_{GS} = 5 V, 0-70°C, 5-20 A		374	399	424	
Current Sensing Ratio	I_{ratio}	V_{GS} = 5 V, 0-70°C, 1−5 A		362	399	436	
Current Sense Temperature Coefficient (Note 7)					0.006		%/°C

5. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
6. Switching characteristics are independent of operating junction temperatures.
7. With 0V potential from sense lead to source lead, i.e. using a virtual ground.

TYPICAL PERFORMANCE CURVES

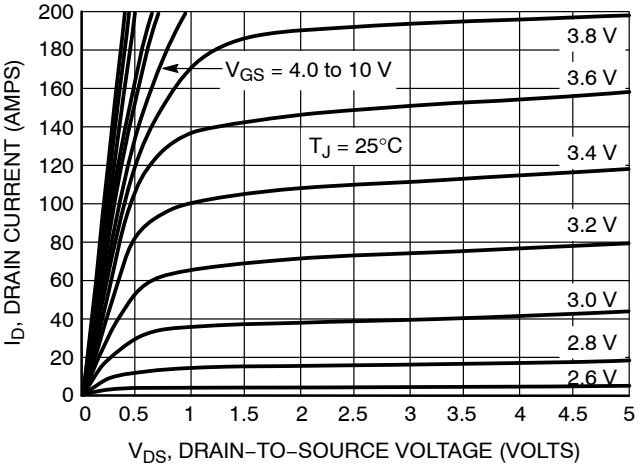


Figure 1. On−Region Characteristics

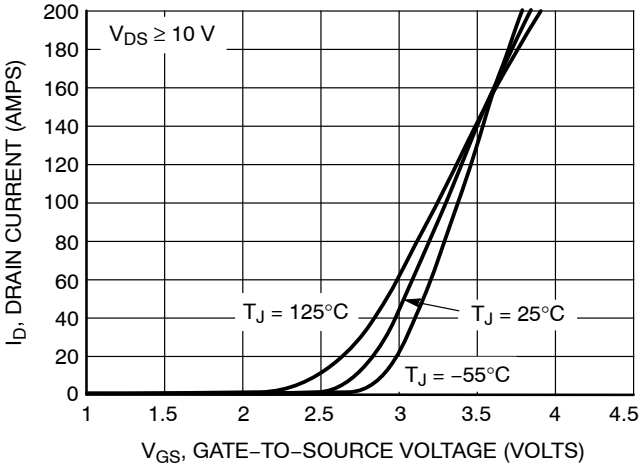


Figure 2. Transfer Characteristics

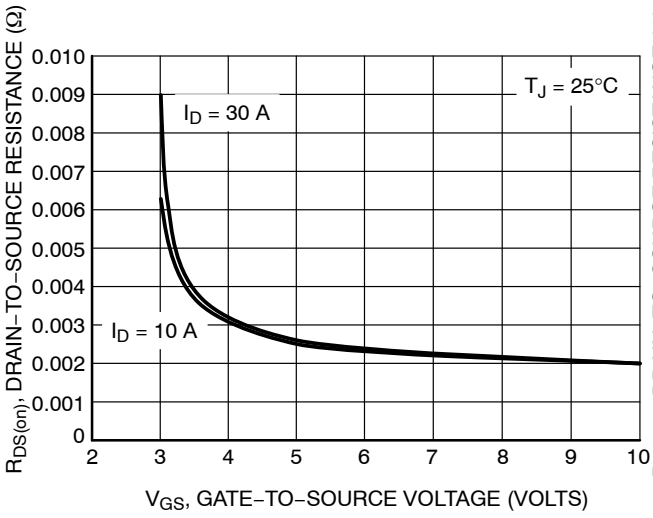


Figure 3. On−Resistance vs. Gate−to−Source Voltage

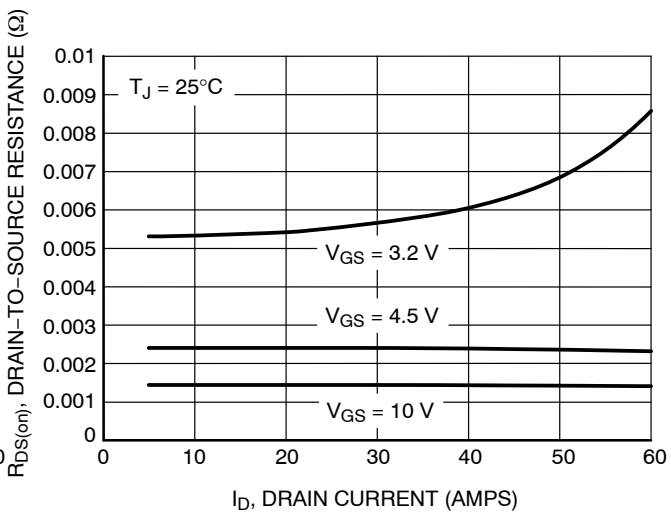


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

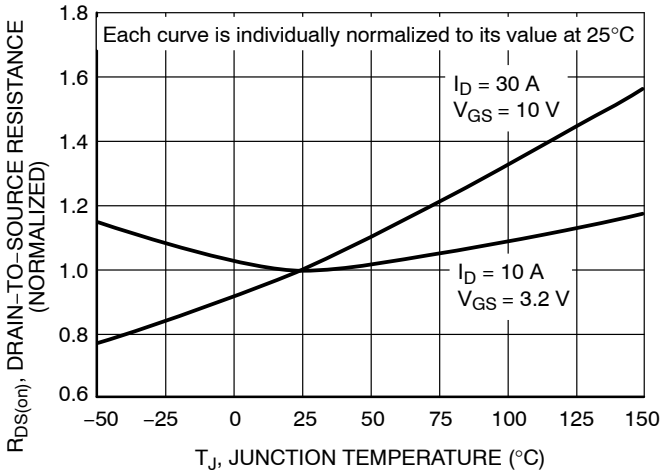


Figure 5. On−Resistance Variation with Temperature

TYPICAL PERFORMANCE CURVES

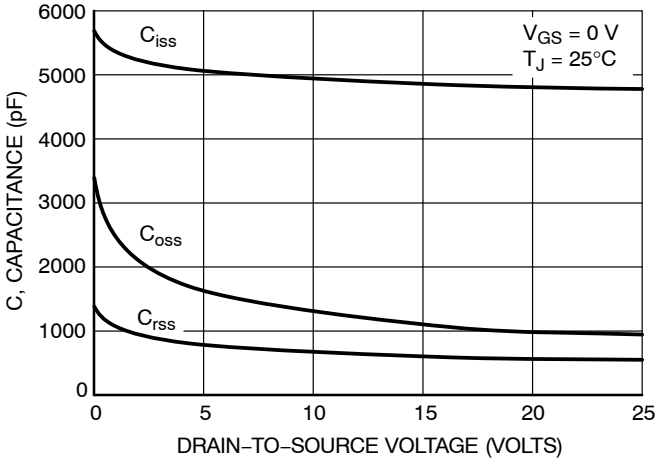


Figure 6. Capacitance Variation

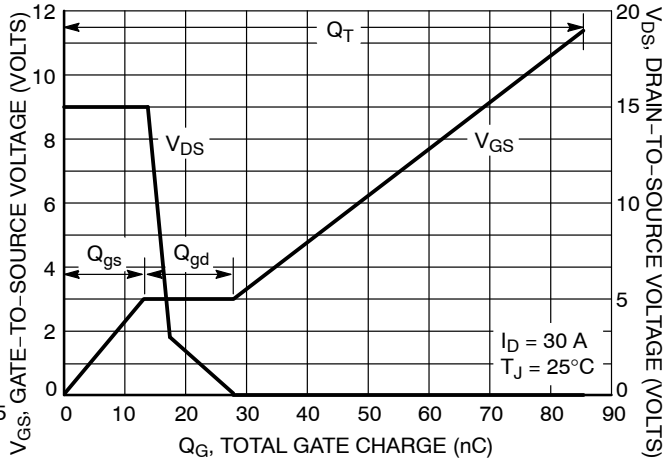


Figure 7. Gate−To−Source and Drain−To−Source Voltage vs. Total Charge

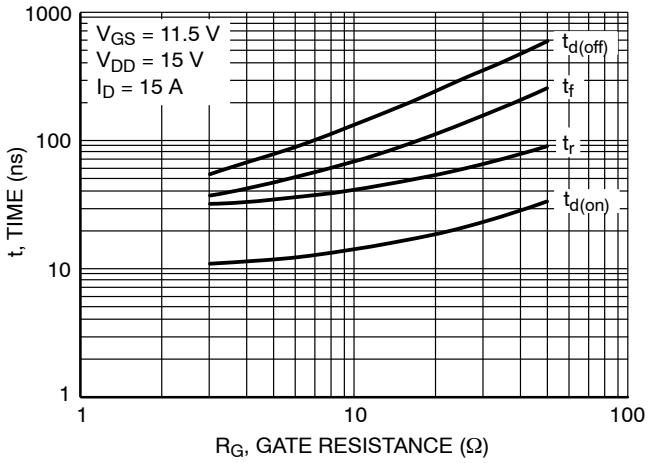


Figure 8. Resistive Switching Time Variation vs. Gate Resistance

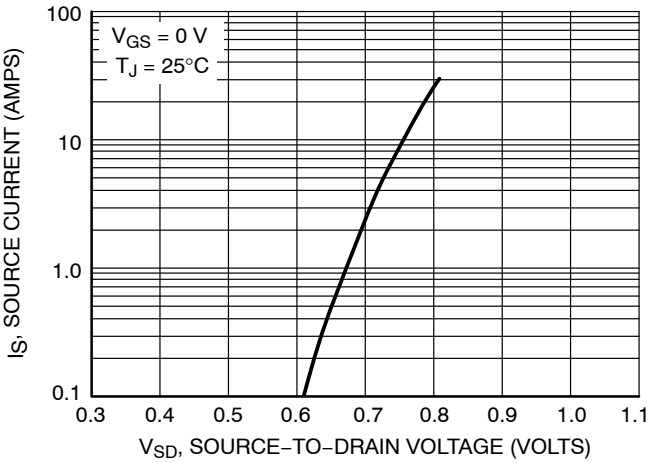


Figure 9. Diode Forward Voltage vs. Current

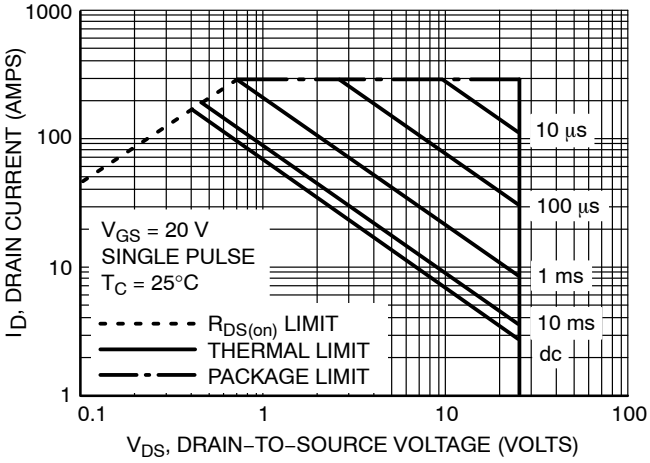


Figure 10. Maximum Rated Forward Biased Safe Operating Area

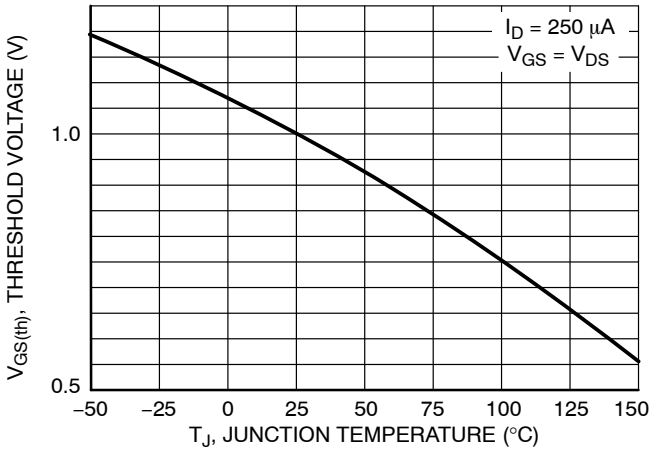


Figure 11. Threshold Voltage

TYPICAL CHARACTERISTICS

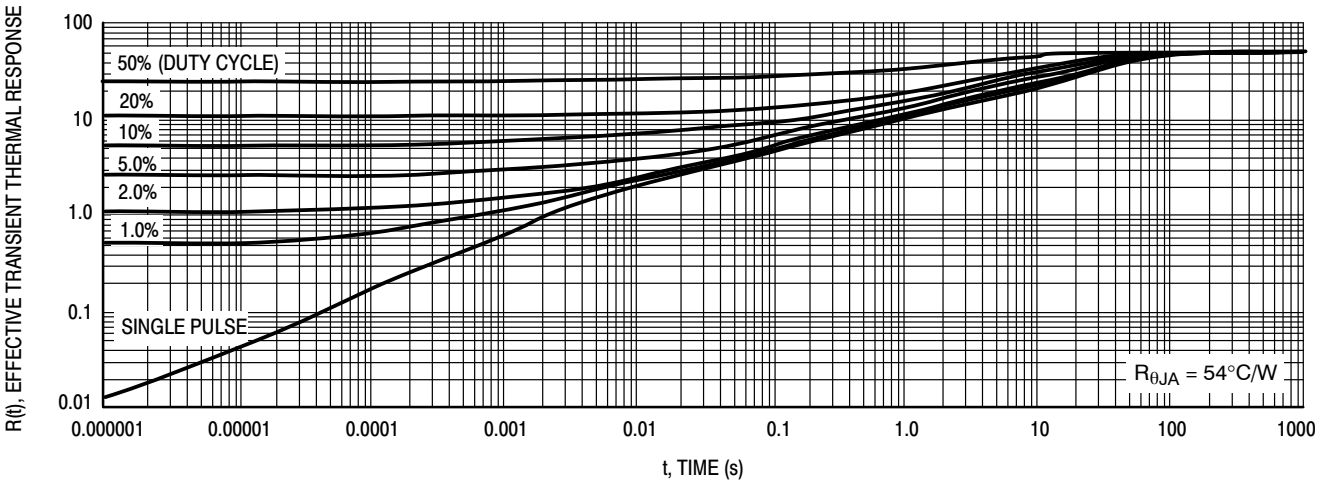
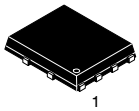


Figure 12. FET Thermal Response



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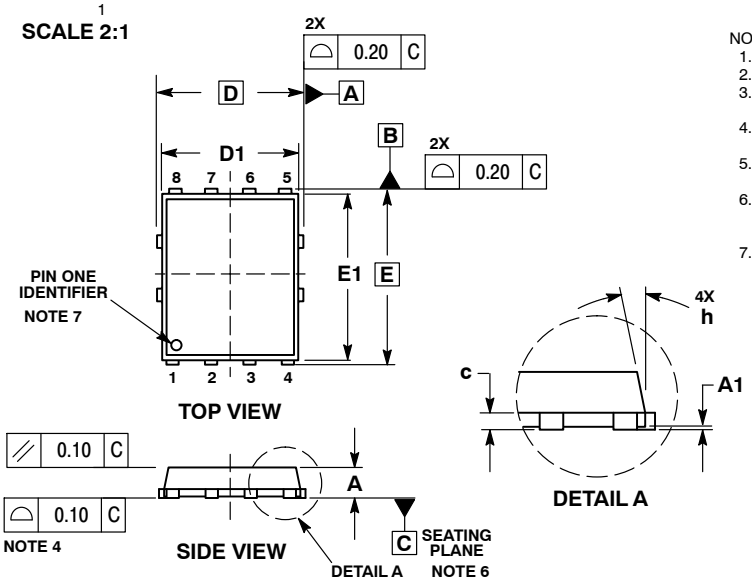
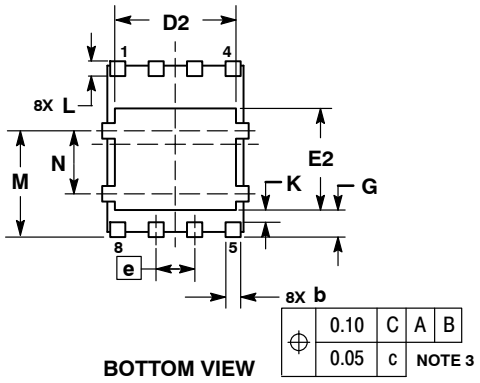
CASE 506BQ
ISSUE C

DATE 12 APR 2012

SCALE 2:1



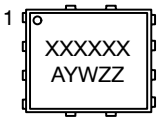


BOTTOM VIEW

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 THE TERMINAL TIP.
4. PROFILE TOLERANCE APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINAL.
5. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
6. SEATING PLANE IS DEFINED BY THE TERMINALS. A1 IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.
7. A VISUAL INDICATOR FOR PIN 1 MUST BE LOCATED IN THIS AREA.

DIM	MILLIMETERS MIN	MAX
A	0.90	1.10
A1	---	0.05
b	0.33	0.51
c	0.20	0.33
D	5.15 BSC	
D1	4.50	5.10
D2	3.90	4.30
E	6.15 BSC	
E1	5.50	6.10
E2	3.00	3.50
e	1.27 BSC	
G	0.80	1.20
h	---	12 °
K	0.20	---
L	0.51	0.71
M	3.25	3.75
N	1.80	2.20

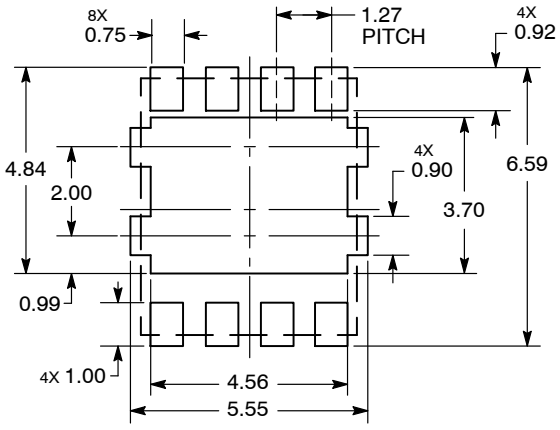
GENERIC MARKING DIAGRAM*



XXXXXX = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

*This information is generic. Please refer to device data sheet for actual part marking.

SOLDERING FOOTPRINT*



DIMENSION: MILLIMETERS

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

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