NTMFD4901NF

MOSFET – Power, Dual, N-Channel with Integrated Schottky, SO8FL

30 V, High Side 18 A / Low Side 30 A

ON Semiconductor®

http://onsemi.com

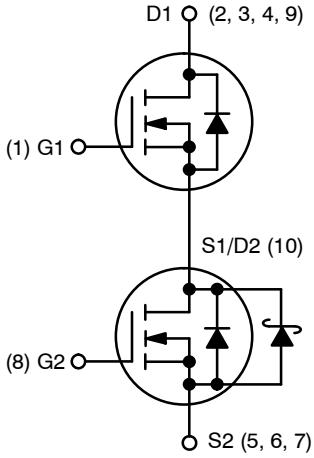
Features

- Co−Packaged Power Stage Solution to Minimize Board Space
- Low Side MOSFET with Integrated Schottky
- Minimized Parasitic Inductances
- Optimized Devices to Reduce Power Losses
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

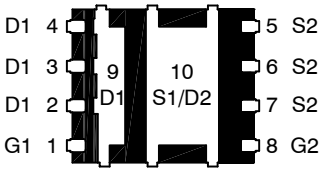
Applications

- DC−DC Converters
- System Voltage Rails
- Point of Load

$V_{(BR)DSS}$	$R_{DS(ON)}$ MAX	I_D MAX
Q1 Top FET 30 V	6.5 mΩ @ 10 V	18 A
	10 mΩ @ 4.5 V	
Q2 Bottom FET 30 V	2.35 mΩ @ 10 V	30 A
	3.5 mΩ @ 4.5 V	

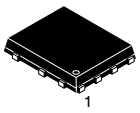


PIN CONNECTIONS

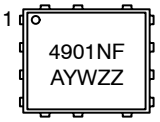


(Bottom View)

MARKING DIAGRAM



DFN8
CASE 506BX



4901NF = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

ORDERING INFORMATION

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

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

Parameter				Symbol	Value	Unit
Drain−to−Source Voltage			Q1	V_{DSS}	30	V
Drain−to−Source Voltage			Q2			
Gate−to−Source Voltage			Q1	V_{GS}	±20	V
Gate−to−Source Voltage			Q2			
Continuous Drain Current $R_{\theta JA}$ (Note 1)	Steady State	T_A = 25°C	Q1	I_D	13.5	A
		T_A = 85°C			9.7	
		T_A = 25°C	Q2		23.4	
		T_A = 85°C			16.9	
Power Dissipation $R_{\theta JA}$ (Note 1)		T_A = 25°C	Q1	P_D	1.90	W
			Q2		2.07	
Continuous Drain Current $R_{\theta JA} \le 10$ s (Note 1)		T_A = 25°C	Q1	I_D	18.2	A
		T_A = 85°C			13.1	
		T_A = 25°C	Q2		30.3	
		T_A = 85°C			21.8	
Power Dissipation $R_{\theta JA} \le 10$ s (Note 1)		T_A = 25°C	Q1	P_D	3.45	W
			Q2		3.45	
Continuous Drain Current $R_{\theta JA}$ (Note 2)		T_A = 25°C	Q1	I_D	10.3	A
		T_A = 85°C			7.4	
		T_A = 25°C	Q2		17.9	
		T_A = 85°C			12.9	
Power Dissipation $R_{\theta JA}$ (Note 2)		T_A = 25 °C	Q1	P_D	1.10	W
			Q2		1.20	
Pulsed Drain Current		T_A = 25°C, t_p = 10 μs	Q1	I_{DM}	60	A
			Q2		100	
Operating Junction and Storage Temperature			Q1	T_J, T_{STG}	−55 to +150	°C
			Q2			
Source Current (Body Diode)			Q1	I_S	3.4	A
			Q2		4.9	
Drain to Source dV/dt				dV/dt	6	V/ns
Single Pulse Drain−to−Source Avalanche Energy (T_J = 25C, V_{DD} = 50 V, V_{GS} = 10 V, I_L = XX A_{pk}, L = 0.1 mH, R_G = 25 Ω)		24 A	Q1	EAS	28.8	mJ
		48 A	Q2	EAS	115	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)				T_L	260	°C

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 sq−in pad, 2 oz Cu.
2. Surface−mounted on FR4 board using the minimum recommended pad size of 100 mm^2.

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	FET	Symbol	Value	Unit
Junction−to−Ambient − Steady State (Note 3)	Q1	$R_{\theta JA}$	65.9	°C/W
	Q2		60.5	
Junction−to−Ambient − Steady State (Note 4)	Q1	$R_{\theta JA}$	113.2	
	Q2		104	
Junction−to−Ambient − (t ≤ 10 s) (Note 3)	Q1	$R_{\theta JA}$	36.2	
	Q2		36.2	

3. Surface−mounted on FR4 board using 1 sq−in pad, 2 oz Cu.
4. Surface−mounted on FR4 board using the minimum recommended pad size of 100 mm^2.

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

Parameter	FET	Symbol	Test Condition		Min	Typ	Max	Unit
OFF CHARACTERISTICS								
Drain−to−Source Breakdown Voltage	Q1	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 250 μA		30			V
	Q2		V_{GS} = 0 V, I_D = 1 mA		30			
Drain−to−Source Breakdown Voltage Temperature Coefficient	Q1	$V_{(BR)DSS}$ / T_J				18		mV / °C
	Q2					15		
Zero Gate Voltage Drain Current	Q1	I_{DSS}	V_{GS} = 0 V, V_{DS} = 24 V	T_J = 25°C			1	μA
				T_J = 125°C			10	
	Q2		V_{GS} = 0 V, V_{DS} = 24 V	T_J = 25°C			500	
Gate−to−Source Leakage Current	Q1	I_{GSS}	V_{GS} = 0 V, VDS = ±20 V				±100	nA
	Q2						±100	
ON CHARACTERISTICS (Note 5)								
Gate Threshold Voltage	Q1	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 250 μA		1.2		2.2	V
	Q2				1.2		2.2	
Negative Threshold Temperature Coefficient	Q1	$V_{GS(TH)}$ / T_J				4.5		mV / °C
	Q2					4.0		
Drain−to−Source On Resistance	Q1	$R_{DS(on)}$	V_{GS} = 10 V	I_D = 10 A		5.2	6.5	mΩ
			V_{GS} = 4.5 V	I_D = 10 A		8.0	10	
	Q2		V_{GS} = 10 V	I_D = 20 A		1.9	2.35	
			V_{GS} = 4.5 V	I_D = 20 A		2.8	3.5	
Forward Transconductance	Q1	g_{FS}	V_{DS} = 1.5 V, I_D = 10 A			28		S
	Q2					45		

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	FET	Symbol	Test Condition	Min	Typ	Max	Unit
CHARGES, CAPACITANCES & GATE RESISTANCE							
Input Capacitance	Q1	C_{ISS}	V_{GS} = 0 V, f = 1 MHz, V_{DS} = 15 V		1150		pF
	Q2				2950		
Output Capacitance	Q1	C_{OSS}			360		
	Q2				1100		
Reverse Capacitance	Q1	C_{RSS}			105		
	Q2				82		
Total Gate Charge	Q1	$Q_{G(TOT)}$	V_{GS} = 4.5 V, V_{DS} = 15 V; I_D = 10 A		9.7		nC
	Q2				20		
Threshold Gate Charge	Q1	$Q_{G(TH)}$			1.1		
	Q2				2.7		
Gate−to−Source Charge	Q1	Q_{GS}			3.3		
	Q2				7.3		
Gate−to−Drain Charge	Q1	Q_{GD}			3.7		
	Q2				5.3		
Total Gate Charge	Q1	$Q_{G(TOT)}$	V_{GS} = 10 V, V_{DS} = 15 V; I_D = 10 A		19.1		nC
	Q2				42.7		
SWITCHING CHARACTERISTICS (Note 6)							
Turn−On Delay Time	Q1	$t_{d(ON)}$	V_{GS} = 4.5 V, V_{DS} = 15 V, I_D = 10 A, R_G = 3.0 Ω		9.0		ns
	Q2				14		
Rise Time	Q1	t_r			15		
	Q2				16		
Turn−Off Delay Time	Q1	$t_{d(OFF)}$			14		
	Q2				25		
Fall Time	Q1	t_f			4.0		
	Q2				7.0		
SWITCHING CHARACTERISTICS (Note 6)							
Turn−On Delay Time	Q1	$t_{d(ON)}$	V_{GS} = 10 V, V_{DS} = 15 V, I_D = 10 A, R_G = 3.0 Ω		6.0		ns
	Q2				10		
Rise Time	Q1	t_r			14		
	Q2				15		
Turn−Off Delay Time	Q1	$t_{d(OFF)}$			17		
	Q2				32		
Fall Time	Q1	t_f			3.0		
	Q2				5.0		

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	FET	Symbol	Test Condition		Min	Typ	Max	Unit
DRAIN−SOURCE DIODE CHARACTERISTICS								
Forward Voltage	Q1	V_{SD}	V_{GS} = 0 V, I_S = 3 A	T_J = 25°C		0.75	1.0	V
				T_J = 125°C		0.62		
	Q2		V_{GS} = 0 V, I_S = 2 A	T_J = 25°C		0.45	0.70	
				T_J = 125°C		0.37		
Reverse Recovery Time	Q1	t_{RR}	V_{GS} = 0 V, d_{IS}/d_t = 100 A/μs, I_S = 3 A			23		ns
	Q2					40		
Charge Time	Q1	ta				12		
	Q2					21		
Discharge Time	Q1	tb				11		
	Q2					19		
Reverse Recovery Charge	Q1	Q_{RR}				12		nC
	Q2					40		
PACKAGE PARASITIC VALUES								
Source Inductance	Q1	L_S	T_A = 25°C			0.38		nH
	Q2					0.65		
Drain Inductance	Q1	L_D				0.054		nH
	Q2					0.007		
Gate Inductance	Q1	L_G				1.5		nH
	Q2					1.5		
Gate Resistance	Q1	R_G				0.8		Ω
	Q2					0.8		

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

ORDERING INFORMATION

Device	Package	Shipping†
NTMFD4901NFT1G	DFN8 (Pb−Free)	1500 / Tape & Reel
NTMFD4901NFT3G	DFN8 (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 Specifications Brochure, BRD8011/D.

TYPICAL CHARACTERISTICS – Q1

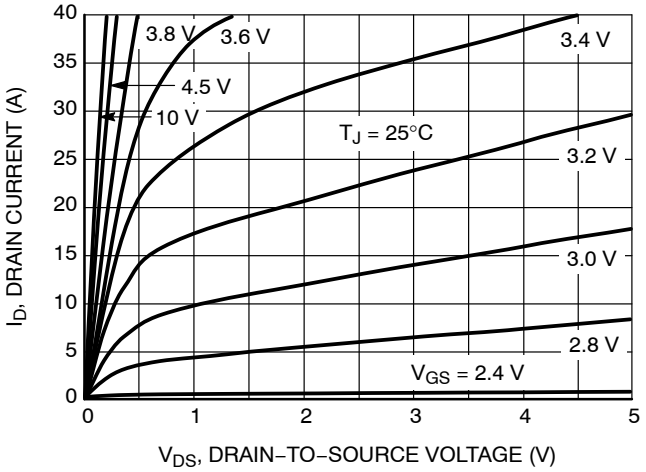


Figure 1. On−Region Characteristics

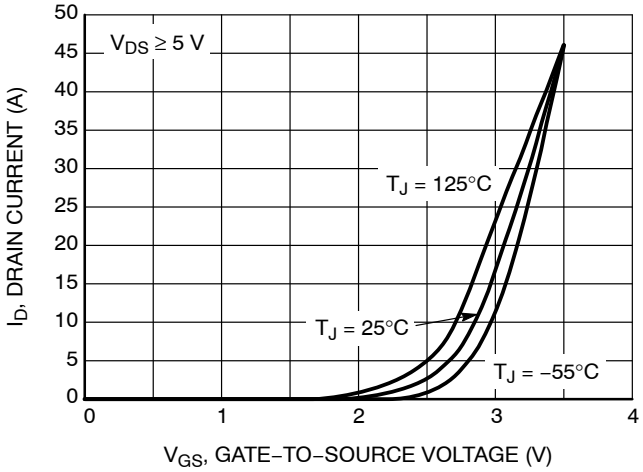


Figure 2. Transfer Characteristics

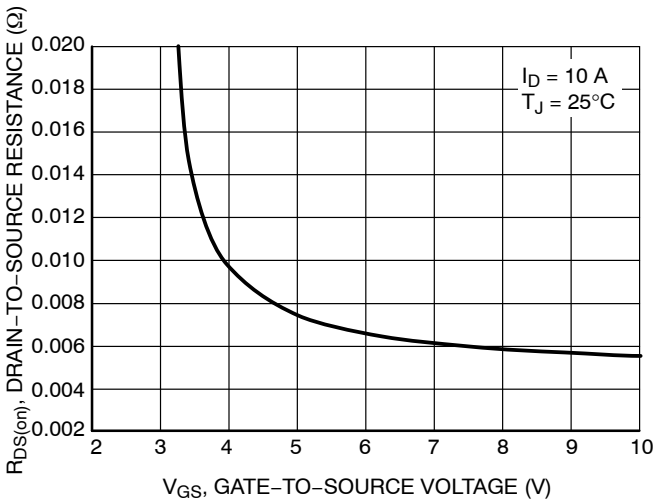


Figure 3. On−Resistance vs. Gate−to−Source Resistance

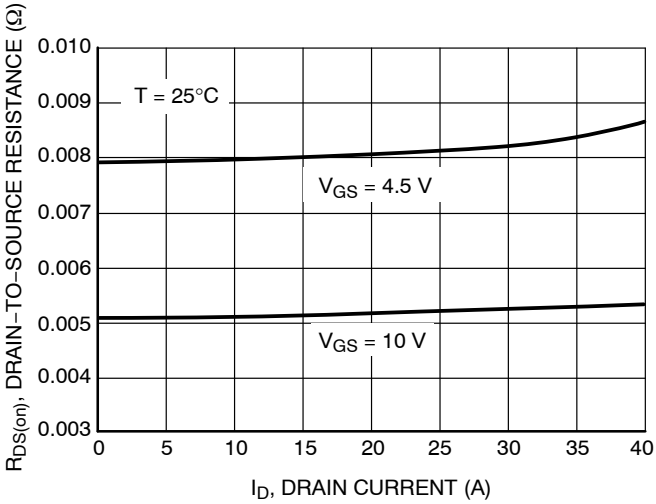


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

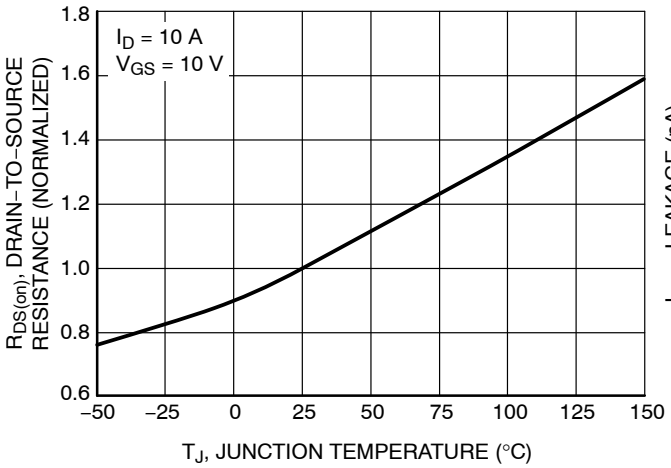


Figure 5. On−Resistance Variation with Temperature

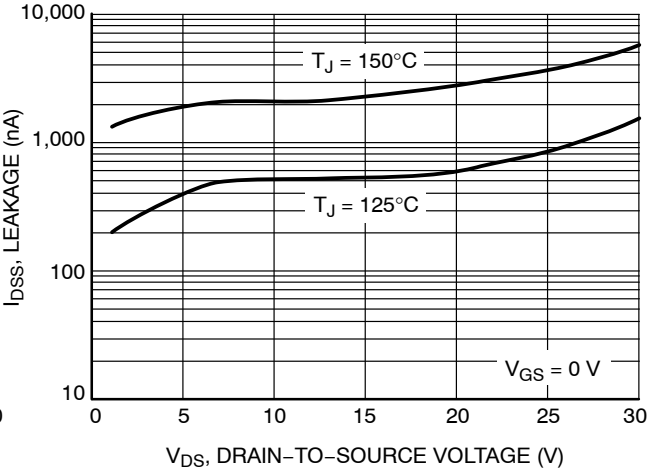


Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS – Q1

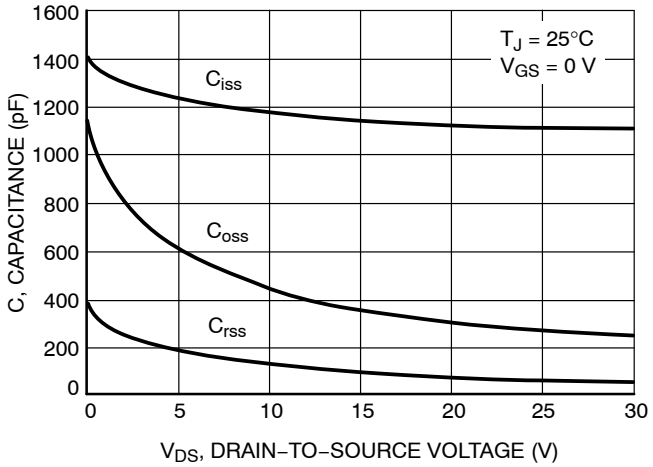


Figure 7. Capacitance Variation

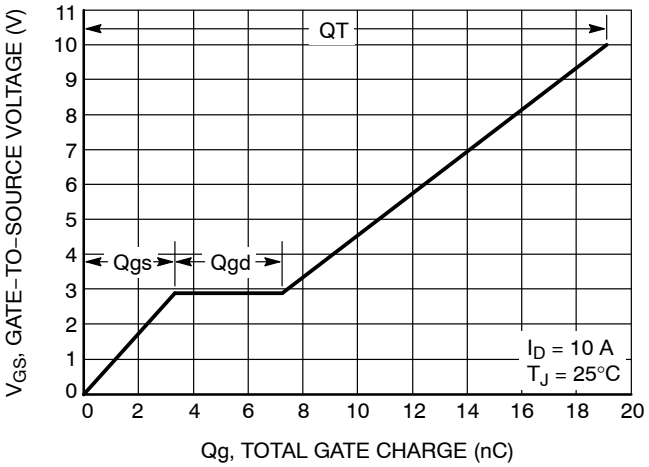


Figure 8. Gate–to–Source and Drain–to–Source Voltage vs. Total Charge

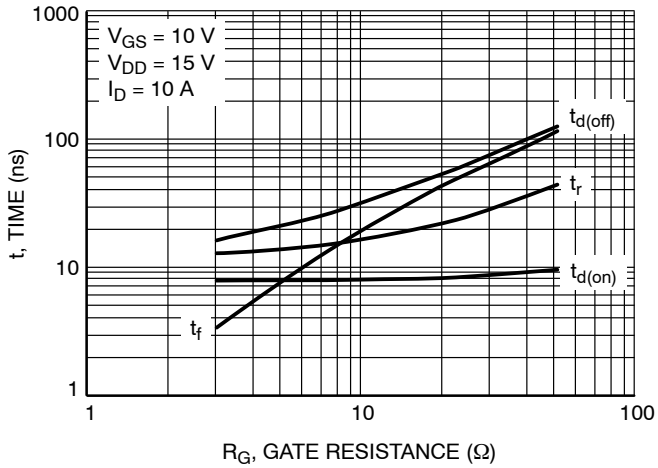


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

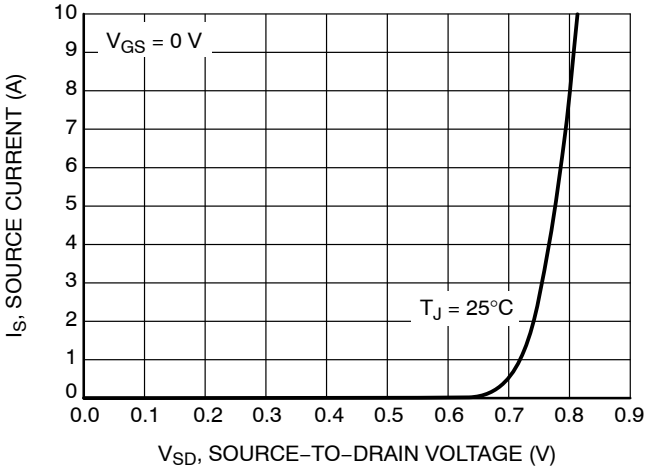


Figure 10. Diode Forward Voltage vs. Current

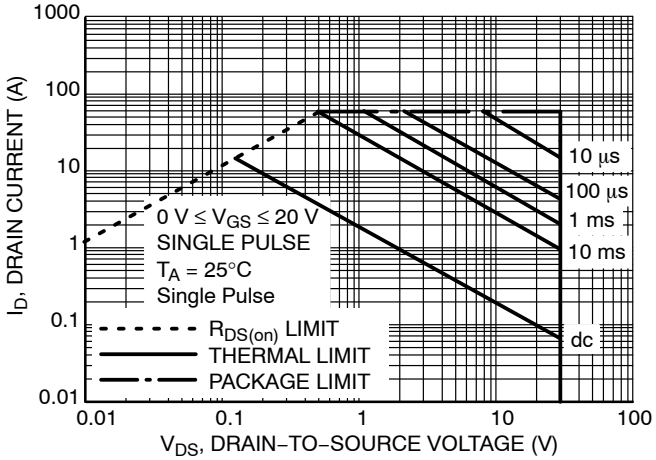


Figure 11. Maximum Rated Forward Biased Safe Operating Area

TYPICAL CHARACTERISTICS – Q1

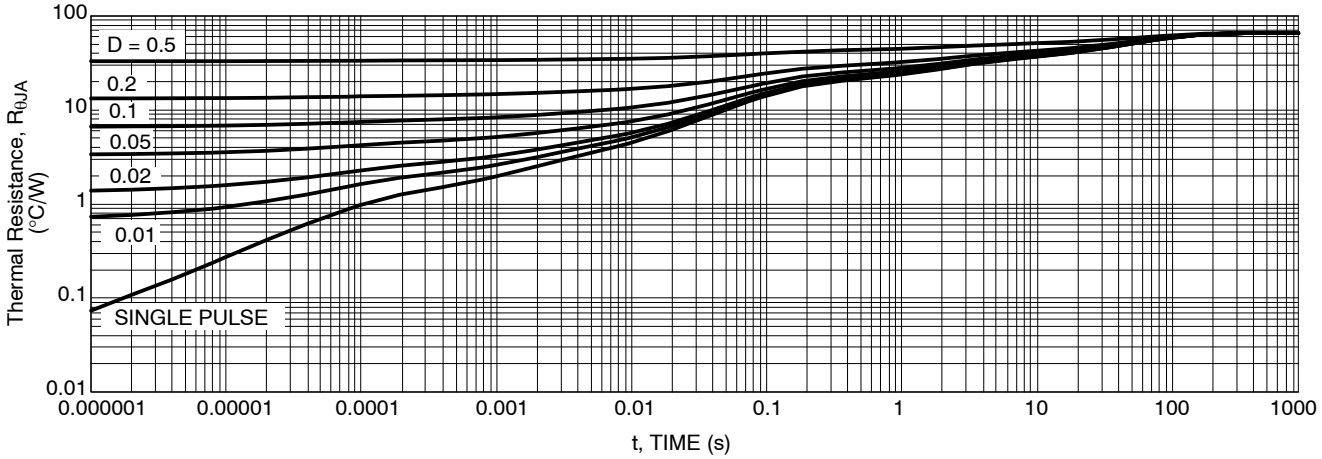


Figure 12. Thermal Response

TYPICAL CHARACTERISTICS – Q2

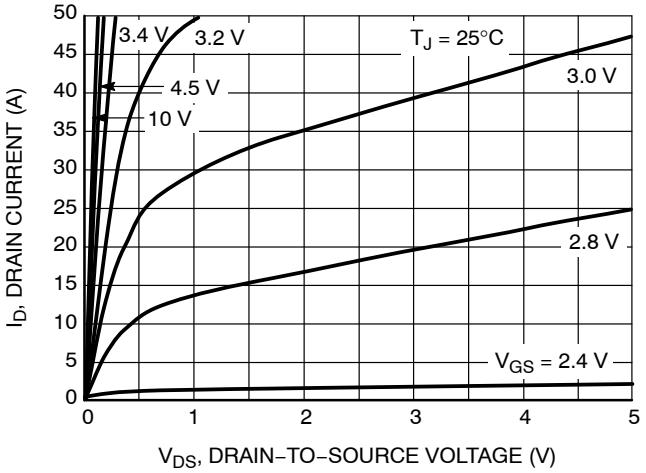


Figure 13. On−Region Characteristics

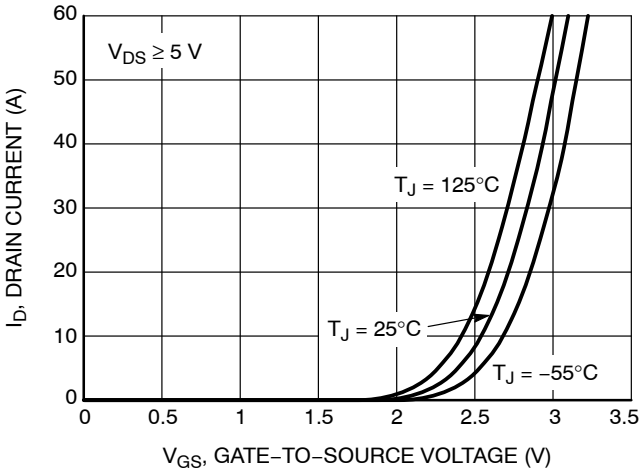


Figure 14. Transfer Characteristics

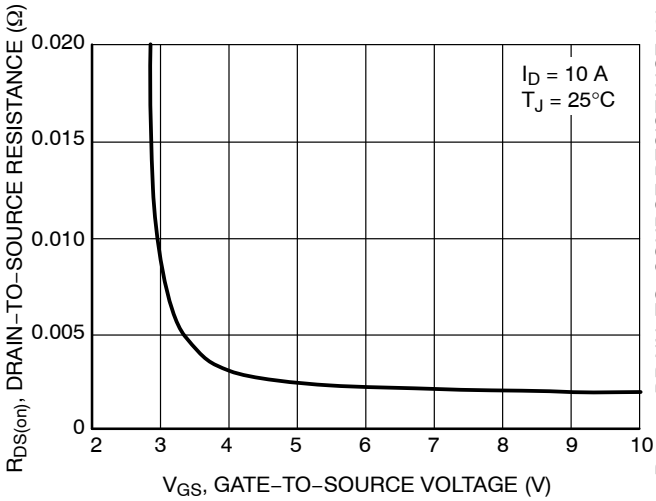


Figure 15. On−Resistance vs. Gate−to−Source Resistance

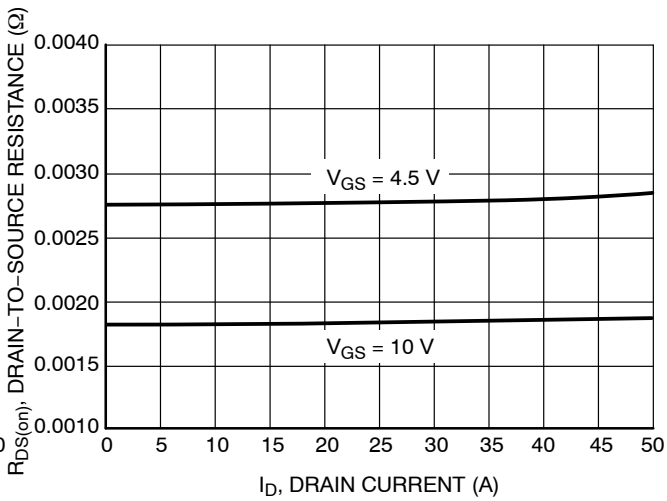


Figure 16. On−Resistance vs. Drain Current and Gate Voltage

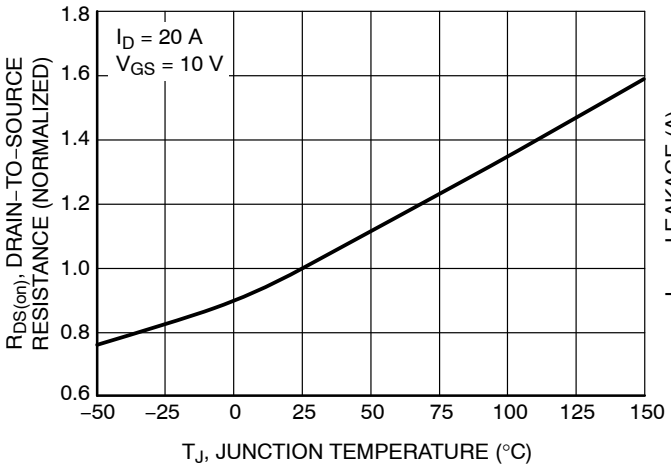


Figure 17. On−Resistance Variation with Temperature

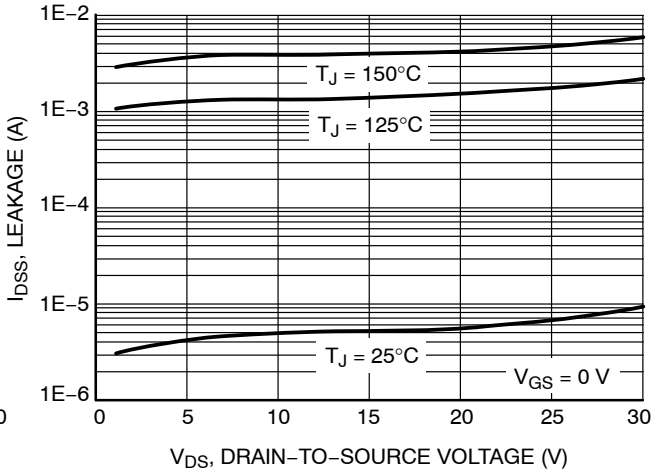


Figure 18. Drain−to−Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS – Q2

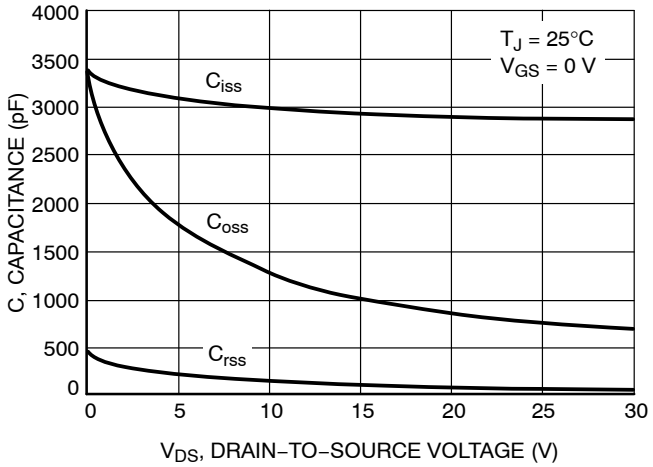


Figure 19. Capacitance Variation

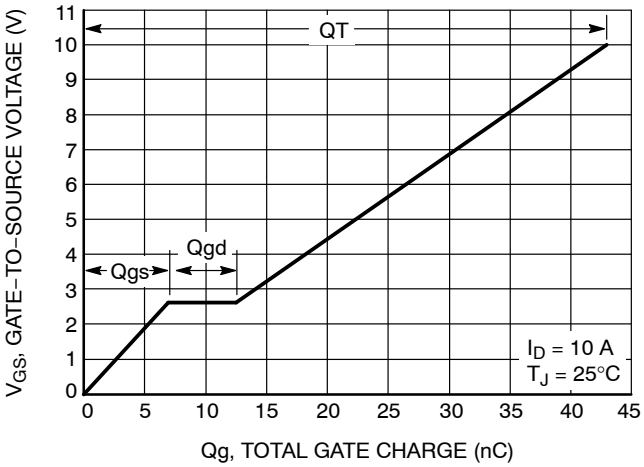


Figure 20. Gate–to–Source and Drain–to–Source Voltage vs. Total Charge

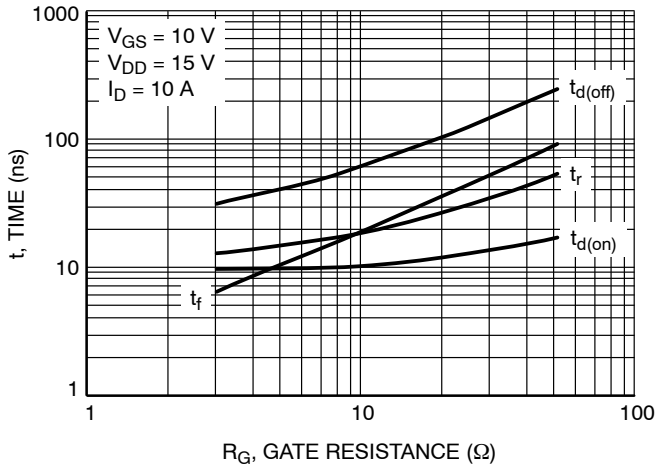


Figure 21. Resistive Switching Time Variation vs. Gate Resistance

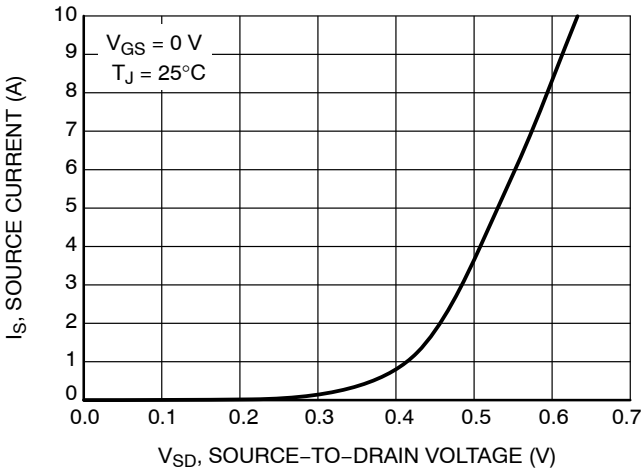


Figure 22. Diode Forward Voltage vs. Current

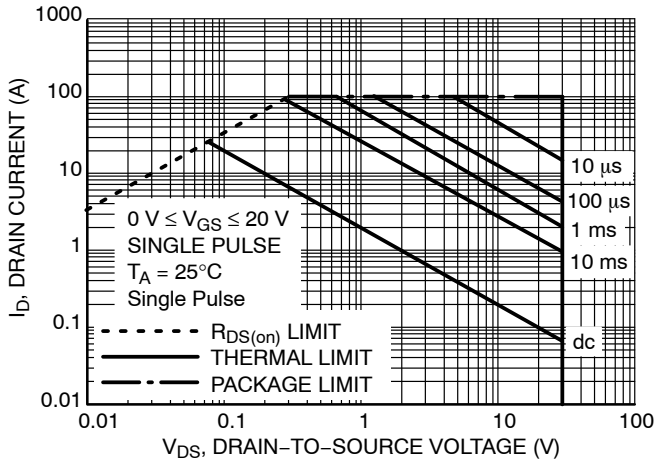


Figure 23. Maximum Rated Forward Biased Safe Operating Area

TYPICAL CHARACTERISTICS – Q2

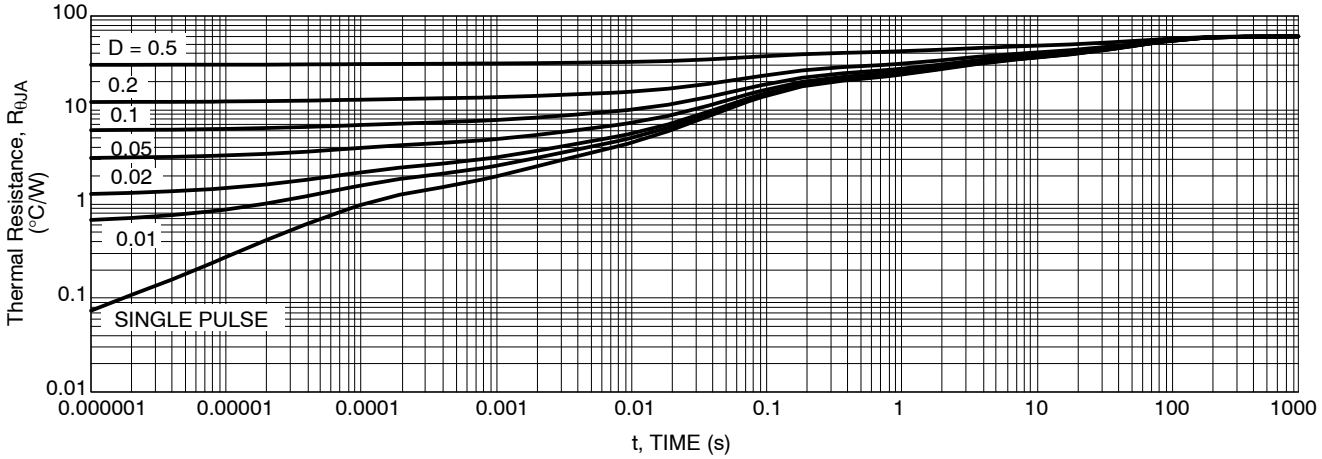
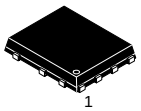


Figure 24. Thermal Response

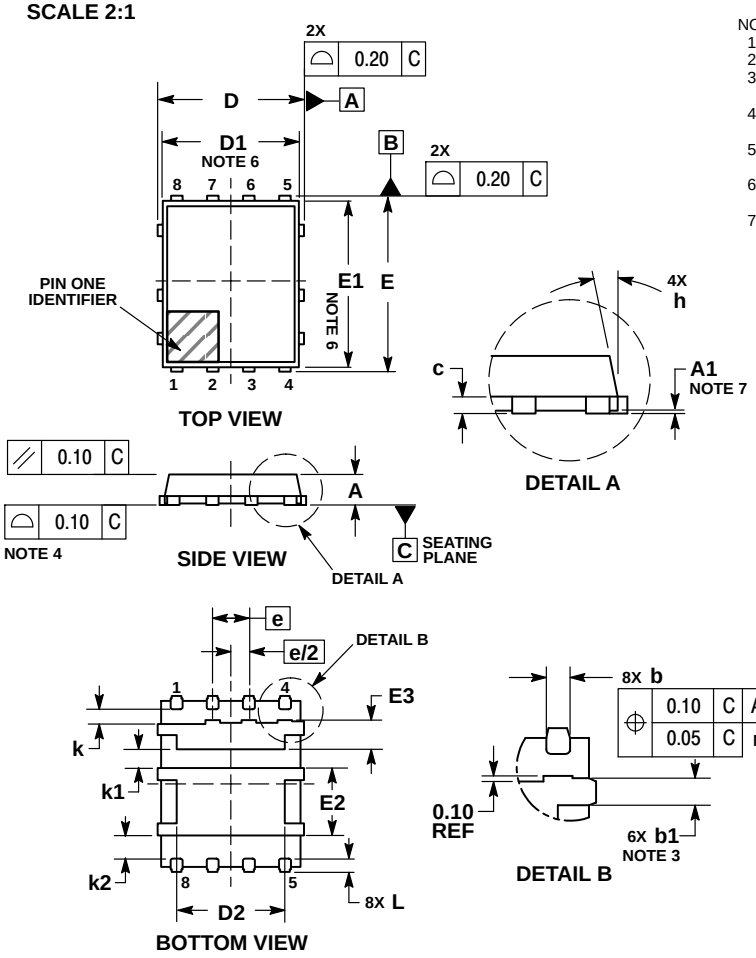
DFN8 5x6, 1.27P Dual Flag (SO8FL−Dual−Asymmetrical)

CASE 506BX
ISSUE D

DATE 24 JUN 2014



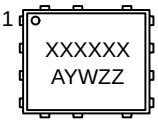
SCALE 2:1



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 0.25 MM FROM THE TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
5. DIMENSIONS b AND L ARE MEASURED AT THE PACKAGE SURFACE
6. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
7. 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.

	MILLIMETERS	
DIM	MIN	MAX
A	0.90	1.10
A1	0.00	0.05
b	0.41	0.61
b1	0.41	0.61
c	0.23	0.33
D	5.00	5.30
D1	4.50	5.10
D2	3.50	4.22
E	6.00	6.30
E1	5.50	6.10
E2	2.27	2.67
E3	0.82	1.22
e	1.27 BSC	
h	−−−	12 °
k	0.39	0.59
k1	0.56	0.76
k2	0.73	0.93
L	0.35	0.55

GENERIC MARKING DIAGRAM*

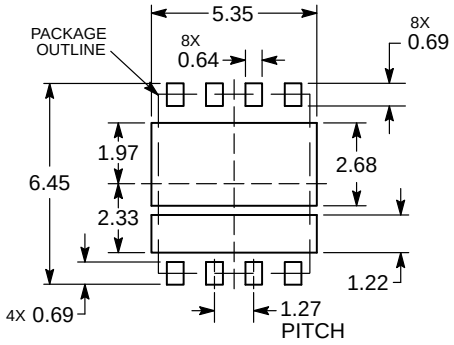


XXXXXX = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

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

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

RECOMMENDED 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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DESCRIPTION:	**DFN8 5X6, 1.27P DUAL FLAG (SO8FL−DUAL−ASYMMETRICAL)**	**PAGE 1 OF 1**

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