NTMFD4902NF

Dual N-Channel Power MOSFET with Integrated Schottky

30 V, High Side 18 A / Low Side 23 A, Dual N−Channel SO8FL

ON Semiconductor®

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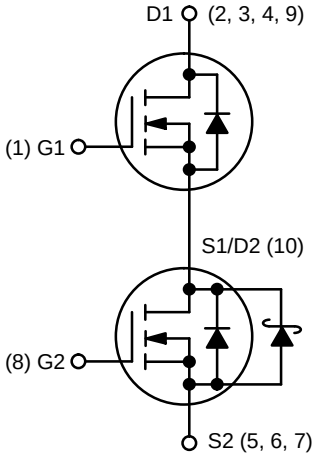
Features

- 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

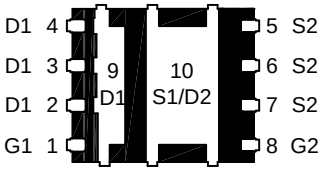
Applications

- 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	4.1 mΩ @ 10 V	23 A
	6.2 mΩ @ 4.5 V	

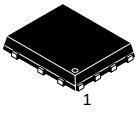


PIN CONNECTIONS



(Bottom View)

MARKING DIAGRAM



DFN8
CASE 506BX

4902NF = 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		17.5	
		T_A = 85°C			12.6	
Power Dissipation RθJA (Note 1)		T_A = 25°C	Q1	P_D	1.90	W
			Q2		1.99	
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		23	
		T_A = 85°C			16.6	
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		13.3	
		T_A = 85°C			9.6	
Power Dissipation $R_{\theta JA}$ (Note 2)		T_A = 25 °C	Q1	P_D	1.10	W
			Q2		1.16	
Pulsed Drain Current		TA = 25°C tp = 10 μs	Q1	I_{DM}	60	A
			Q2		80	
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	6.0	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
		27 A	Q2	EAS	36.5	
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, 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		62.8	
Junction−to−Ambient – Steady State (Note 4)	Q1	$R_{\theta JA}$	113.2	
	Q2		108	
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 = 1.0 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} = VDS, 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 = 15 A		3.3	4.1	
			V_{GS} = 4.5 V	I_D = 15 A		5.0	6.2	
Forward Transconductance	Q1	g_{FS}	V_{DS} = 1.5 V, I_D = 10 A			28		S
	Q2					35		
CHARGES, CAPACITANCES & GATE RESISTANCE								
Input Capacitance	Q1	C_{ISS}	V_{GS} = 0 V, f = 1 MHz, V_{DS} = 15 V			1150		pF
	Q2					1590		
Output Capacitance	Q1	C_{OSS}				360		
	Q2					813		
Reverse Capacitance	Q1	C_{RSS}				105		
	Q2					83		

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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							
Total Gate Charge	Q1	$Q_{G(TOT)}$	V_{GS} = 4.5 V, V_{DS} = 15 V; I_D = 10 A		9.7		nC
	Q2				11.5		
Threshold Gate Charge	Q1	$Q_{G(TH)}$			1.1		
	Q2				1.4		
Gate−to−Source Charge	Q1	Q_{GS}			3.3		
	Q2				4.2		
Gate−to−Drain Charge	Q1	Q_{GD}			3.7		
	Q2				3.4		
Total Gate Charge	Q1	$Q_{G(TOT)}$	V_{GS} = 10 V, V_{DS} = 15 V; I_D = 10 A		19.1		nC
	Q2				24.9		
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				10.5		
Rise Time	Q1	t_r			15		
	Q2				15.2		
Turn−Off Delay Time	Q1	$t_{d(OFF)}$			14		
	Q2				17.7		
Fall Time	Q1	t_f			4.0		
	Q2				4.7		
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				7.0		
Rise Time	Q1	t_r			14		
	Q2				14		
Turn−Off Delay Time	Q1	$t_{d(OFF)}$			17		
	Q2				22		
Fall Time	Q1	t_f			3.0		
	Q2				3.3		
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
			V_{GS} = 0 V, I_S = 3 A; T_J = 125°C		0.62		
	Q2		V_{GS} = 0 V, I_S = 2 A; T_J = 25°C		0.37	0.70	
			V_{GS} = 0 V, I_S = 2 A; T_J = 125°C		0.31		

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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							
Reverse Recovery Time	Q1	t_{RR}	V_{GS} = 0 V, d_{IS}/d_t = 100 A/μs, I_S = 3 A		23		ns
	Q2				24.5		
Charge Time	Q1	ta			12		
	Q2				13		
Discharge Time	Q1	tb			11		
	Q2				11.5		
Reverse Recovery Charge	Q1	Q_{RR}			12		nC
	Q2				24		
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		

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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

ORDERING INFORMATION

Device	Package	Shipping†
NTMFD4902NFT1G	DFN8 (Pb−Free)	1500 / Tape & Reel
NTMFD4902NFT3G	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

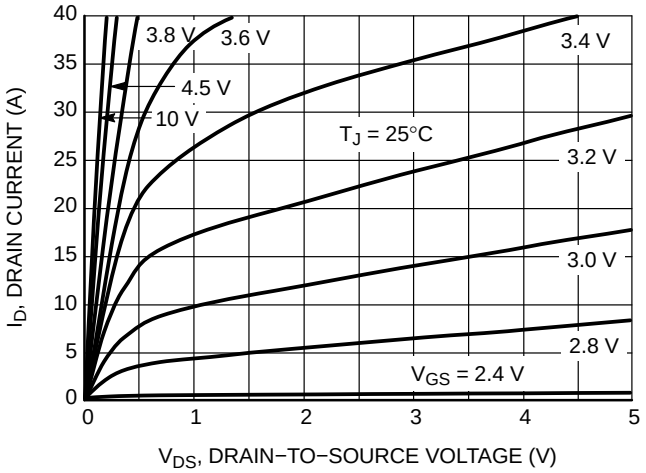


Figure 1. On−Region Characteristics

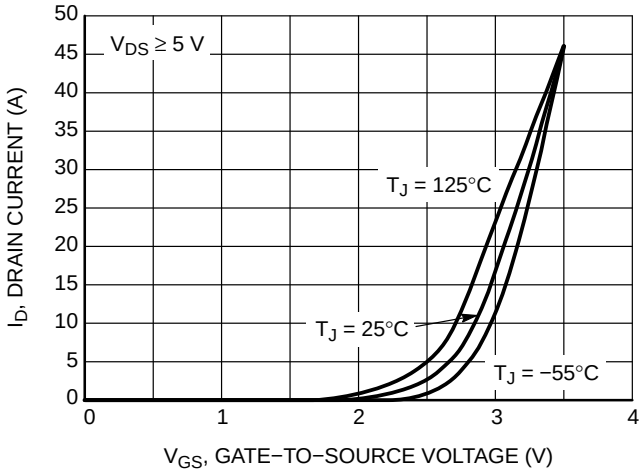


Figure 2. Transfer Characteristics

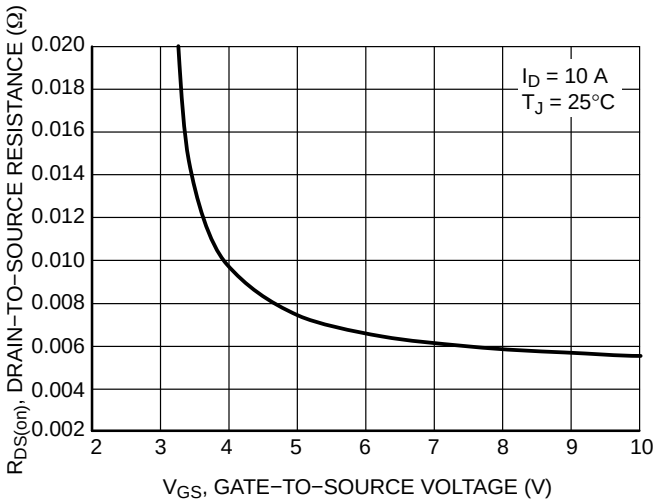


Figure 3. On−Resistance vs. Gate−to−Source Resistance

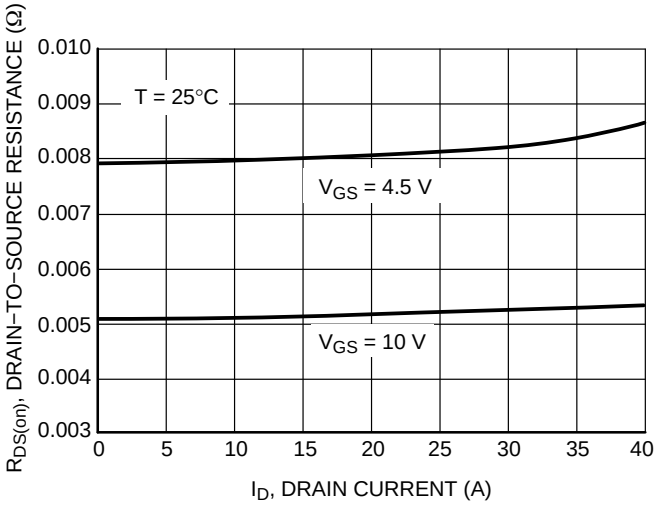


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

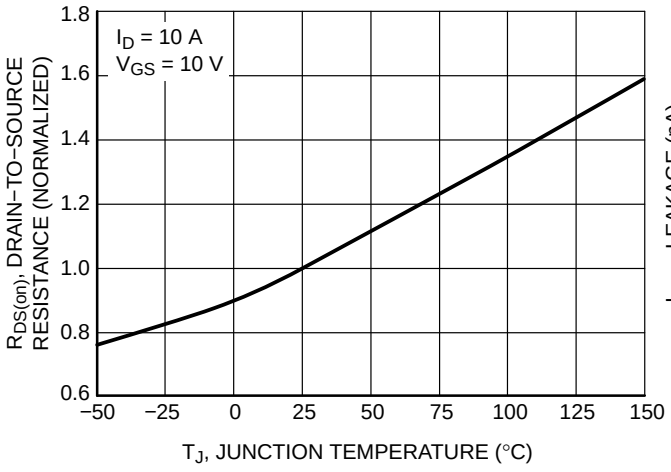


Figure 5. On−Resistance Variation with Temperature

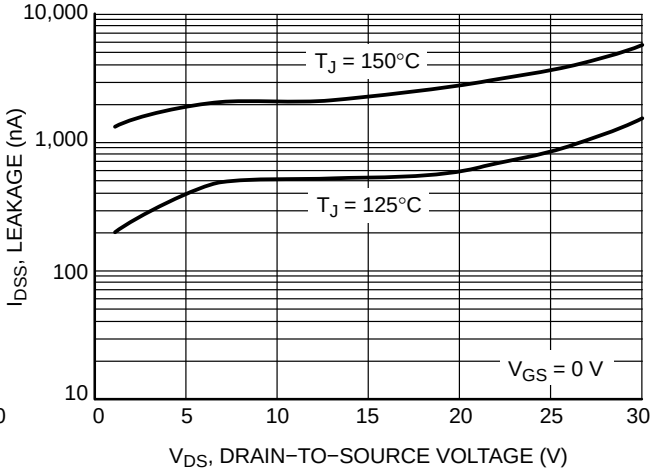


Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS − Q1

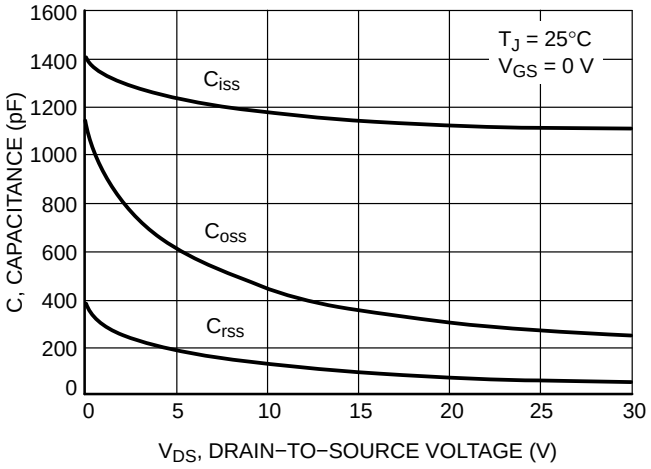


Figure 7. Capacitance Variation

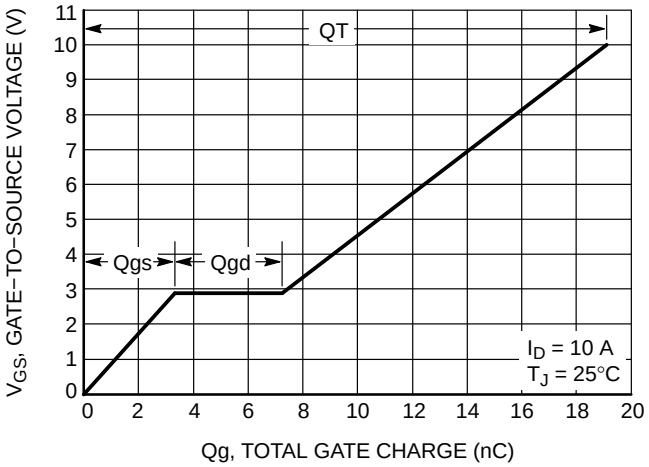


Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

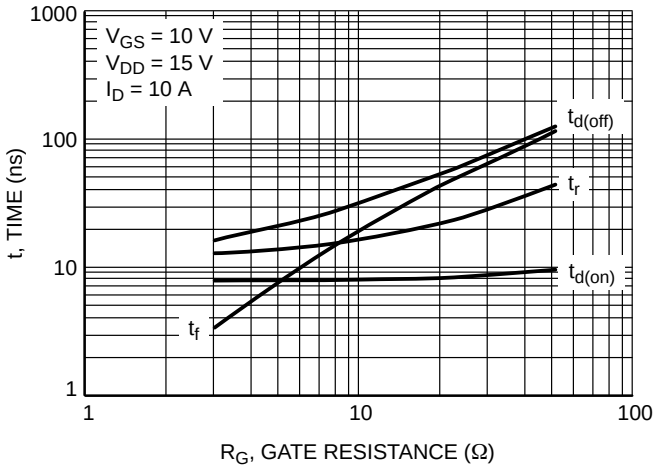


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

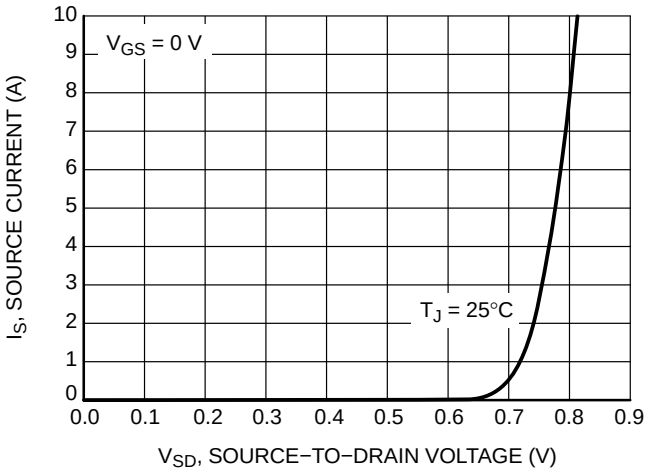


Figure 10. Diode Forward Voltage vs. Current

TYPICAL CHARACTERISTICS − Q2

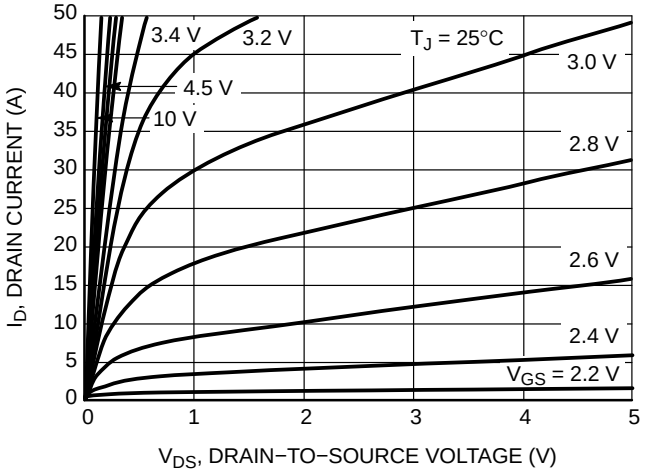


Figure 11. On−Region Characteristics

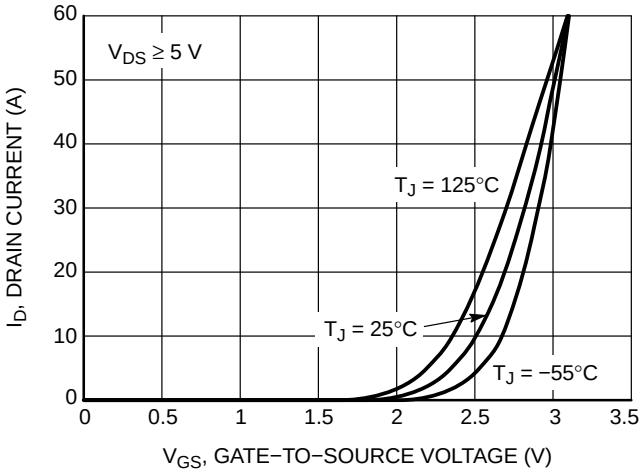


Figure 12. Transfer Characteristics

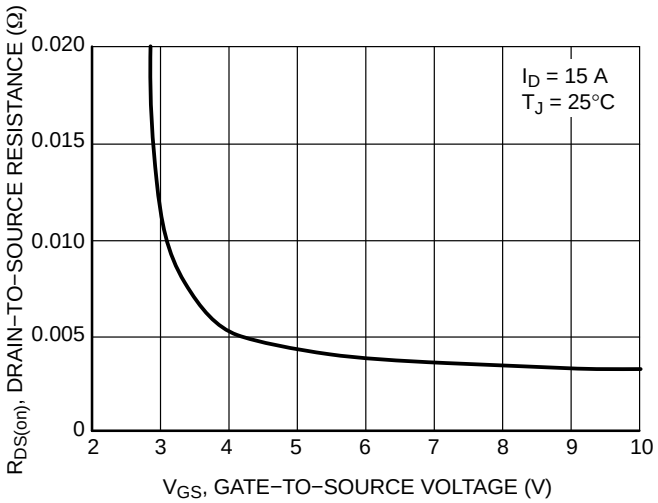


Figure 13. On−Resistance vs. Gate−to−Source Resistance

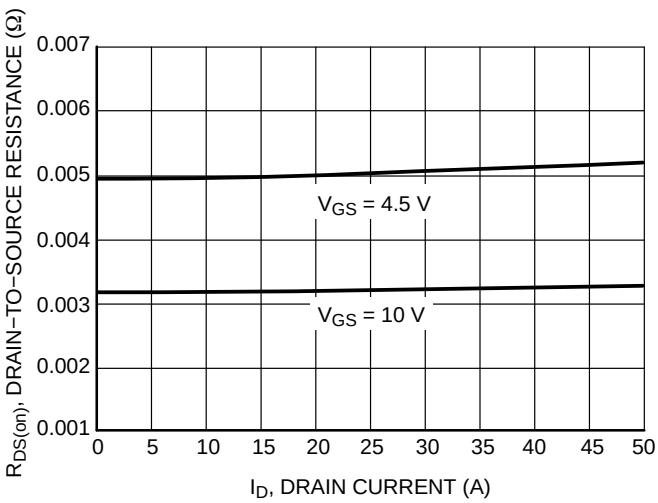


Figure 14. On−Resistance vs. Drain Current and Gate Voltage

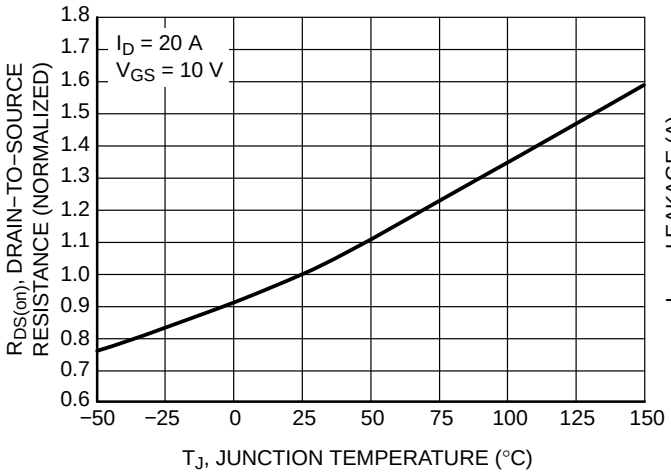


Figure 15. On−Resistance Variation with Temperature

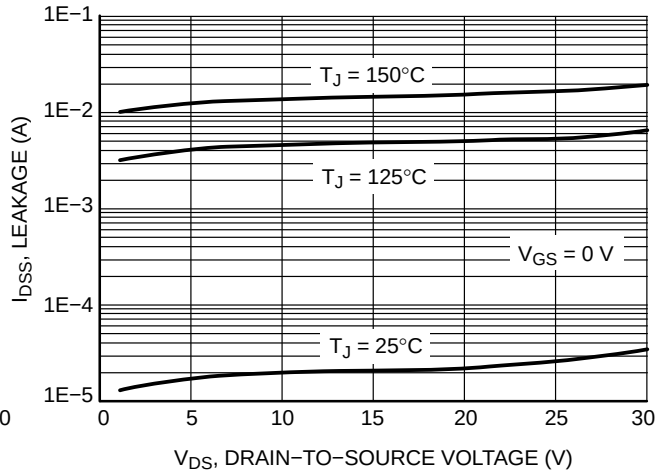


Figure 16. Drain−to−Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS − Q2

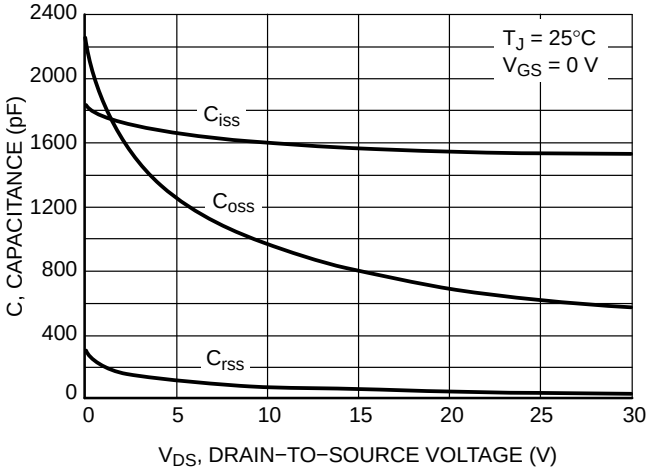


Figure 17. Capacitance Variation

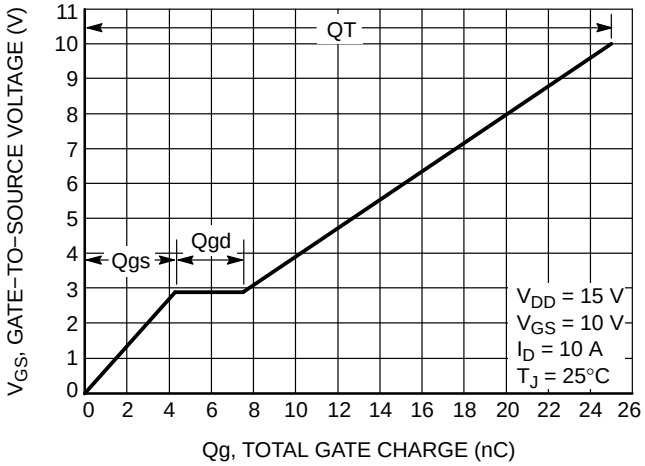


Figure 18. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

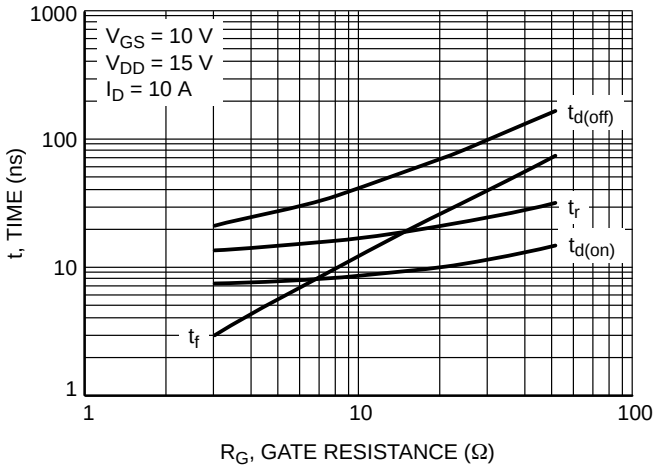


Figure 19. Resistive Switching Time Variation vs. Gate Resistance

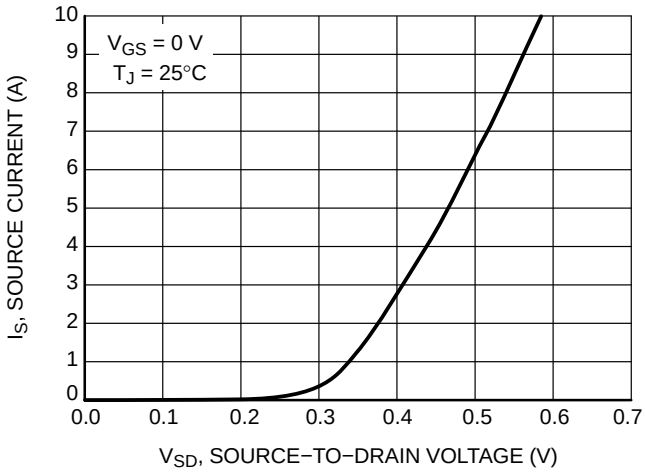
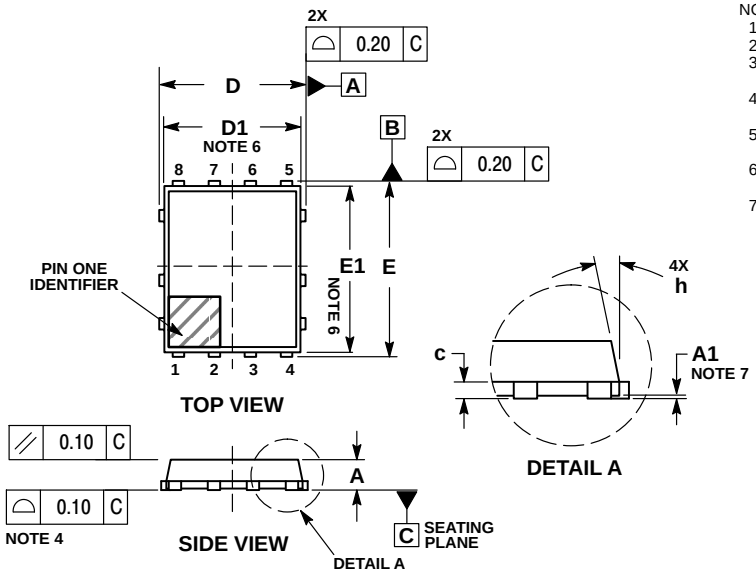
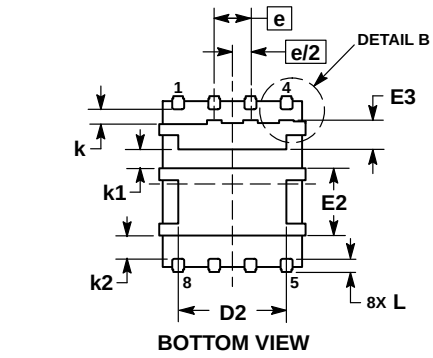


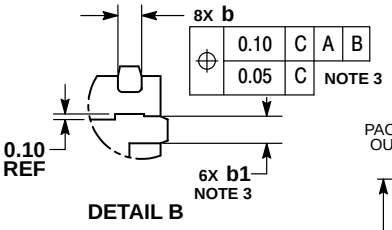
Figure 20. Diode Forward Voltage vs. Current

PACKAGE DIMENSIONS

DFN8 5x6, 1.27P Dual Flag (SO8FL−Dual−Asymmetrical)
CASE 506BX
ISSUE D



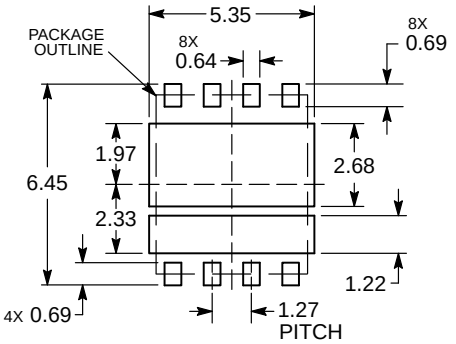




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.25 MM FROM THE TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
5. DIMENSIONS b AND L ARE 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

RECOMMENDED SOLDERING FOOTPRINT*



DIMENSION: 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.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
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