MOSFET – Power, Single N-Channel, STD Gate, µ8FL
40 V, 2.45 mΩ, 114 A

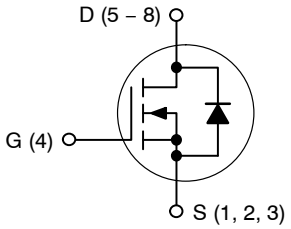
NVTFWS002N04XM

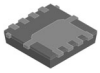
$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
40 V	2.45 mΩ @ 10 V	114 A

Features
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Small Footprint (3.3 x 3.3 mm) for Compact Design
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications
- Motor Drive
- Battery Protection
- Synchronous Rectification

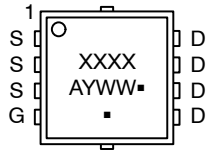
N–Channel





WDFNW8
(Full–Cut µ8FL WF)
CASE 515AN

MARKING DIAGRAM



XXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
▪ = Pb–Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION
See detailed ordering, marking and shipping information on page 5 of this data sheet.

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

Parameter			Symbol	Value	Unit
Drain–to–Source Voltage			V_{DSS}	40	V
Gate–to–Source Voltage			V_{GS}	±20	V
Continuous Drain Current	Steady State	T_C = 25°C	I_D	114	A
		T_C = 100°C		81	
Power Dissipation		T_C = 25°C	P_D	62	W
Pulsed Drain Current	T_A = 25°C, t_p = 10 µs		I_D	650	A
Operating Junction and Storage Temperature Range			T_J, T_{stg}	–55 to +175	°C
Source Current (Body Diode)			I_S	87	A
Single Pulse Drain–to–Source Avalanche Energy ($I_{L(pk)}$ = 6.3 A)			E_{AS}	183	mJ
Lead Temperature for Soldering Purposes			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.

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction–to–Case – Steady State	$R_{\theta JC}$	2.43	°C/W
Junction–to–Ambient – Steady State	$R_{\theta JA}$	47	

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 1 mA, T_J = 25°C	40			V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$\Delta V_{(BR)DSS}/\Delta T_J$	I_D = 1 mA, Referenced to 25°C		15		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 40 V, T_J = 25°C			1	μA
		V_{GS} = 0 V, V_{DS} = 40 V, T_J = 125°C			20	
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = 20 V			100	nA
ON CHARACTERISTICS (Note 1)						
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 11 A, T_J = 25°C		2.1	2.45	mΩ
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 50 μA, T_J = 25°C	2.5		3.5	V
Gate Threshold Voltage Temperature Coefficient	$\Delta V_{GS(TH)}/\Delta T_J$	V_{GS} = V_{DS}, I_D = 50 μA		−7.3		mV/°C
Forward Transconductance	g_{FS}	V_{DS} = 5 V, I_D = 11 A		59		S
CHARGES, CAPACITANCES & GATE RESISTANCE						
Input Capacitance	C_{iss}	V_{GS} = 0 V, f = 1.0 MHz, V_{DS} = 25 V		1364		pF
Output Capacitance	C_{oss}			880		
Reverse Transfer Capacitance	C_{rss}			18		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 10 V, V_{DS} = 32 V, I_D = 11 A		22		nC
Threshold Gate Charge	$Q_{G(TH)}$			4.0		
Gate−to−Source Charge	Q_{GS}			6.0		
Gate−to−Drain Charge	Q_{GD}			4.2		
Gate Resistance	R_G	f = 1 MHz		0.8		Ω
SWITCHING CHARACTERISTICS (Note 2)						
Turn−On Delay Time	$t_{d(on)}$	Resistive Load, V_{GS} = 10 V, V_{DS} = 32 V, I_D = 11 A, R_G = 0 Ω		6		ns
Rise Time	t_r			10		
Turn−Off Delay Time	$t_{d(off)}$			10		
Fall Time	t_f			12		
DRAIN−SOURCE DIODE CHARACTERISTICS						
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 11 A, T_J = 25°C		0.78	1.2	V
		V_{GS} = 0 V, I_S = 11 A, T_J = 125°C		0.62		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dI_S/dt = 100 A/μs, I_S = 11 A, V_{DS} = 32 V		38		ns
Charge Time	t_a			13		
Discharge Time	t_b			25		
Reverse Recovery Charge	Q_{RR}			25		nC

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.

1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
2. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

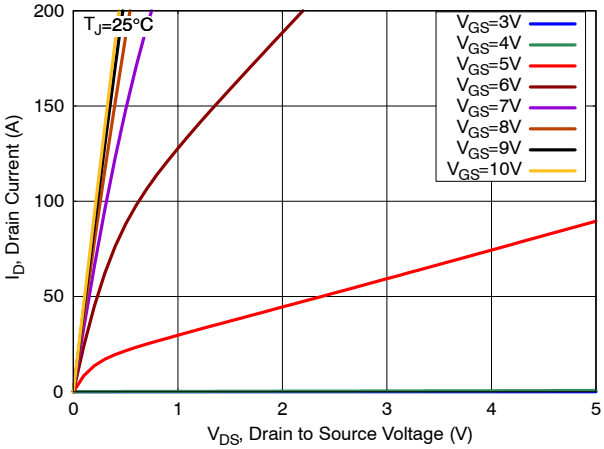


Figure 1. On−Region Characteristics

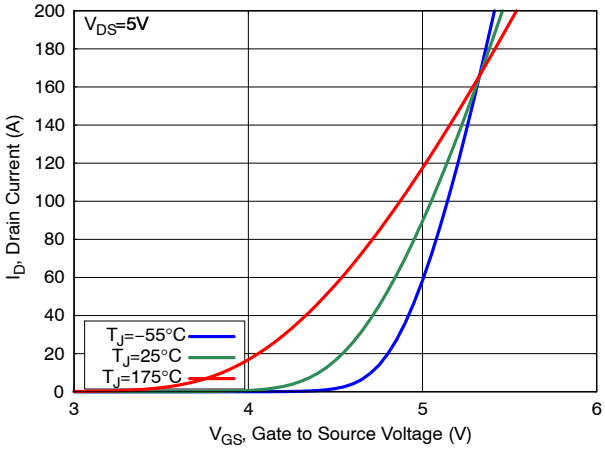


Figure 2. Transfer Characteristics

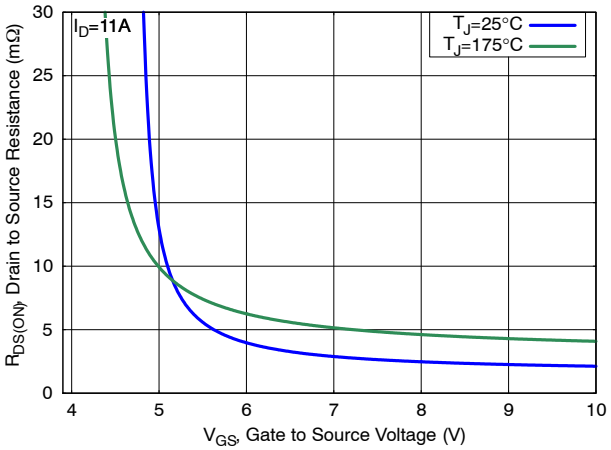


Figure 3. On−Resistance vs. Gate Voltage

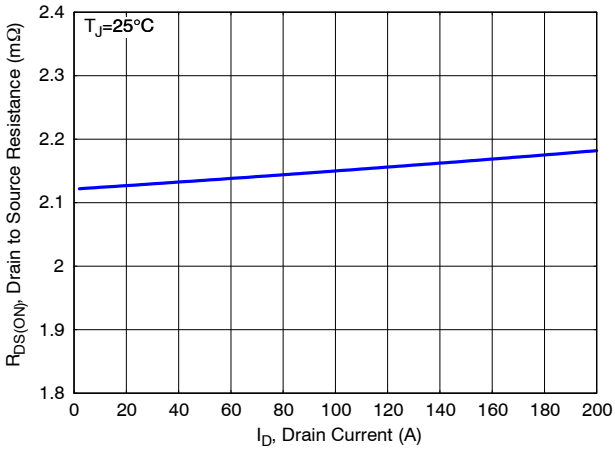


Figure 4. On−Resistance vs. Drain Current

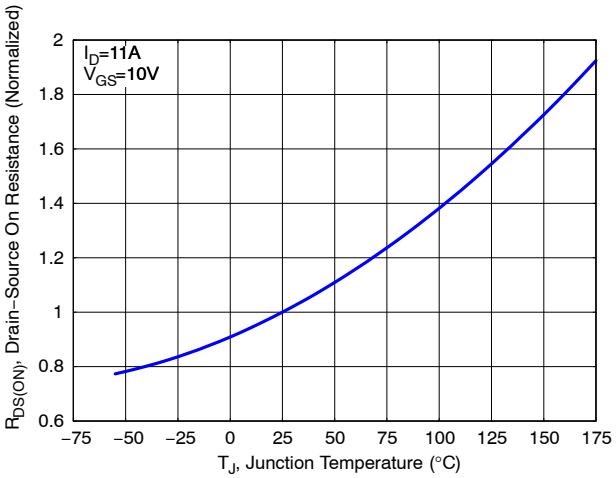


Figure 5. Normalized On−Resistance vs. Junction Temperature

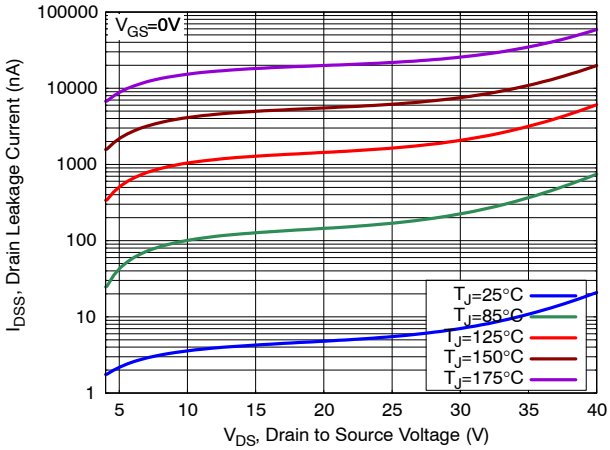


Figure 6. Drain Leakage Current vs. Drain Voltage

TYPICAL CHARACTERISTICS

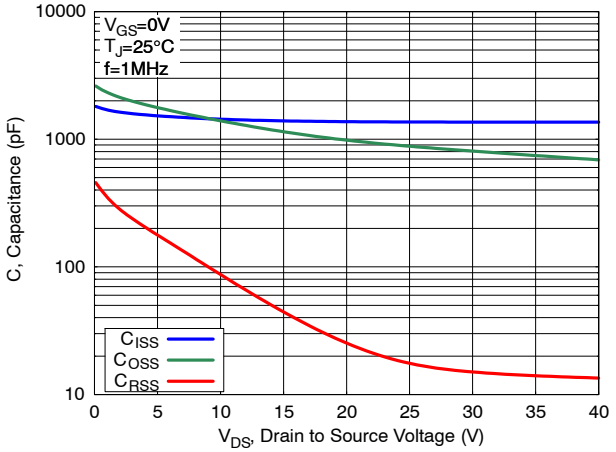


Figure 7. Capacitance Characteristics

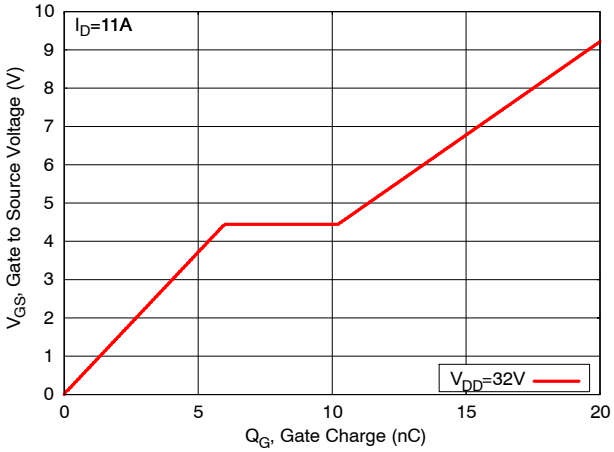


Figure 8. Gate Charge Characteristics

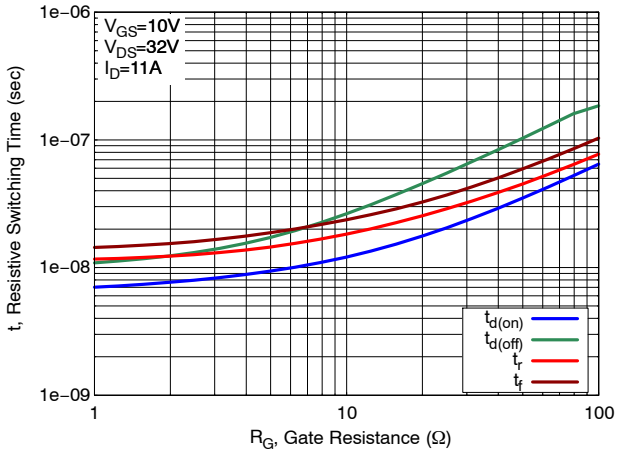


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

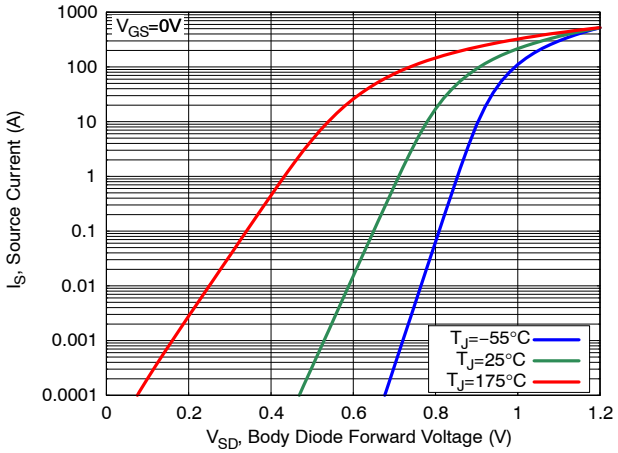


Figure 10. Diode Forward Characteristics

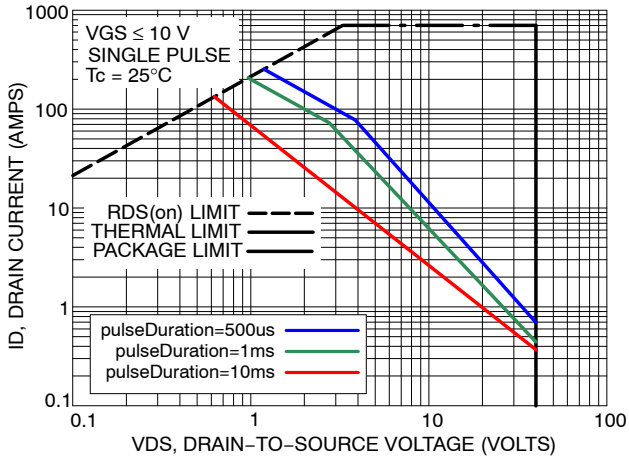


Figure 11. Maximum Rated Forward Biased Safe Operating Area

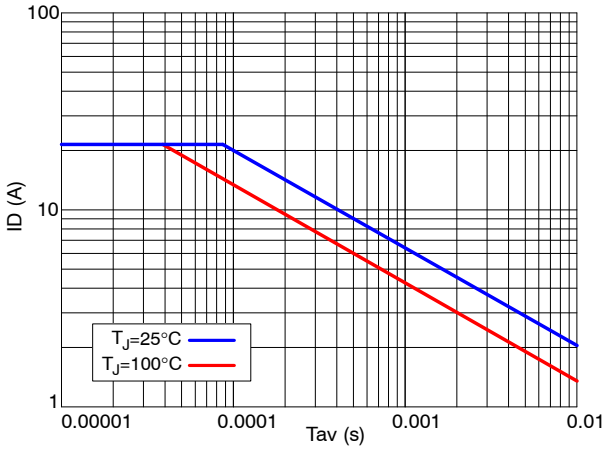


Figure 12. UIS

TYPICAL CHARACTERISTICS

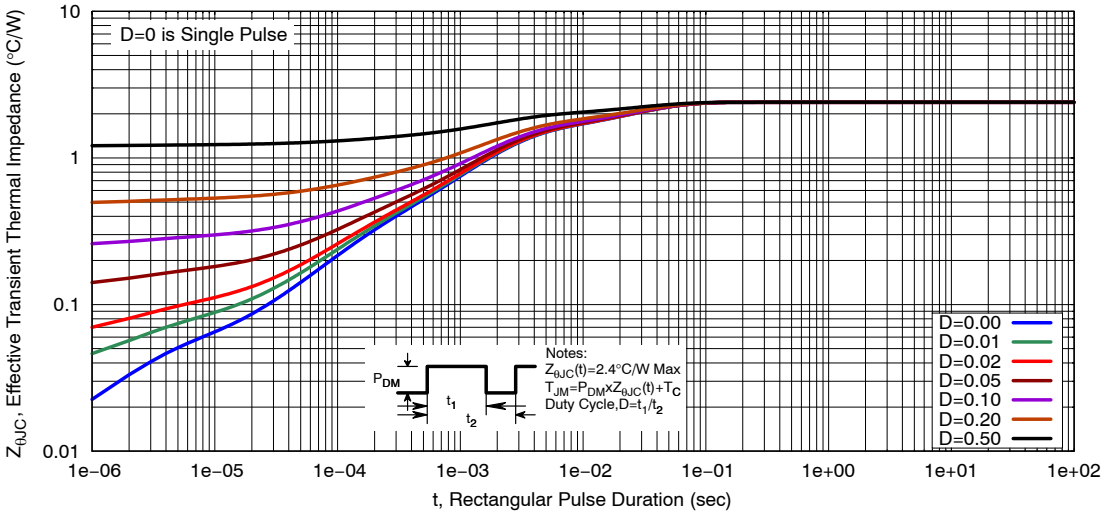


Figure 13. Thermal Characteristics

DEVICE ORDERING INFORMATION

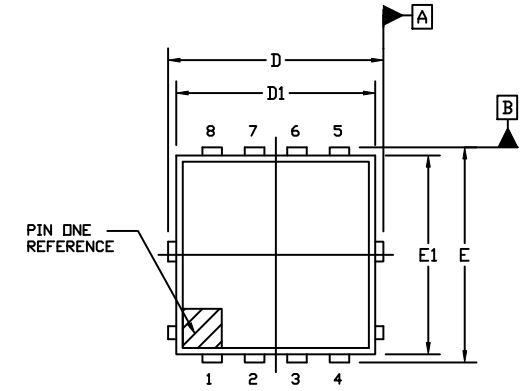
Device	Marking	Package	Shipping†
NVTFWS002N04XMTAG	002W	WDFN8 (Pb−Free)	1500 / Tape & Reel

†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.

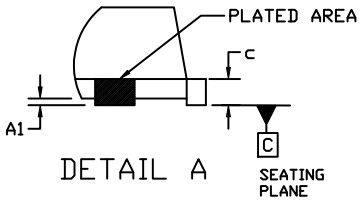
NVTFWS002N04XM

PACKAGE DIMENSIONS

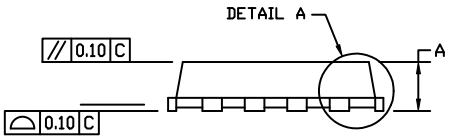
WDFNW8 3.3x3.3, 0.65P (Full−Cut μ8FL WF)
CASE 515AN
ISSUE O



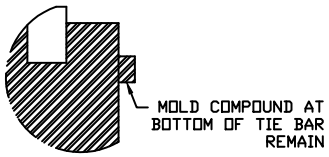
TOP VIEW



DETAIL A



SIDE VIEW

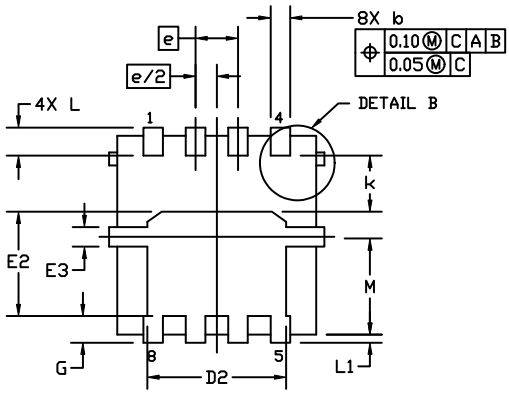


DETAIL B

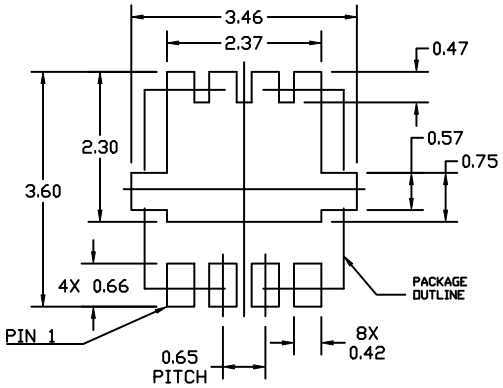
NOTES:

1. DIMENSIONING AND TOLERANCING PER.ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

	MILLIMETERS		
DIM	MIN.	NOM.	MAX.
A	0.70	0.75	0.80
A1	0.00	----	0.05
b	0.23	0.30	0.40
c	0.15	0.20	0.25
D	3.05	3.30	3.55
D1	2.95	3.05	3.15
D2	1.98	2.11	2.24
E	3.05	3.30	3.55
E1	2.95	3.05	3.15
E2	1.47	1.60	1.73
E3	0.23	0.30	0.40
e	0.65 BSC		
G	0.30	0.41	0.51
K	0.65	0.80	0.95
L	0.30	0.43	0.59
L1	0.06	0.13	0.20
M	1.40	1.50	1.60



BOTTOM VIEW



RECOMMENDED MOUNTING 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.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:
Technical Library: www.onsemi.com/design/resources/technical−documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support
For additional information, please contact your local Sales Representative at www.onsemi.com/support/sales

◊