FDWS9511L-F085

Power MOSFET

−40 V, 20.5 mΩ, −30 A, Single P−Channel

Features

- Small Footprint (5x6 mm) for Compact Design
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low QG and Capacitance to Minimize Driver Losses
- Wettable Flank Option for Enhanced Optical Inspection
- AEC−Q101 Qualified and PPAP Capable
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

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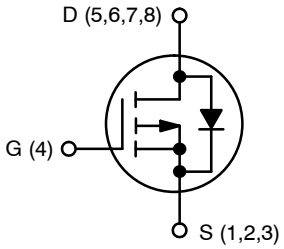
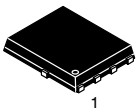
$V_{(BR)DSS}$	$R_{DS(ON)}$ MAX	I_D MAX
−40 V	20.5 mΩ @ −10 V	−30 A
	32.0 mΩ @ −4.5 V	



P−CHANNEL MOSFET



DFN8
Power 56
CASE 506DW

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 $R_{\theta JC}$ (Notes 1, 3)	Steady State	T_C = 25°C	I_D	−30	A
		T_C = 100°C		−30	
Power Dissipation $R_{\theta JC}$ (Note 1)		T_C = 25°C	P_D	68.2	W
		T_C = 100°C		34.1	
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2, 3)	Steady State	T_C = 25°C	I_D	−9.1	A
		T_C = 100°C		−6.5	
Power Dissipation $R_{\theta JA}$ (Notes 1, 2)		T_C = 25°C	P_D	3.0	W
		T_C = 100°C		1.5	
Pulsed Drain Current	T_C = 25°C, t_p = 10 μs		I_{DM}	−298	A
Operating Junction and Storage Temperature Range			T_J, T_{STG}	−55 to +175	°C
Source Current (Body Diode)			I_S	−100	A
Single Pulse Drain−to−Source Avalanche Energy ($I_{L(pk)}$ = −25)			E_{AS}	25	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.

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction−to−Case − Steady State	$R_{\theta JC}$	2.2	°C/W
Junction−to−Ambient − Steady State (Note 2)	$R_{\theta JA}$	50	

1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted. Current is limited by wirebond configuration
2. Surface−mounted on FR4 board using a 650 mm^2, 2 oz. Cu pad.
3. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 2 of this data sheet.

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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 = −250 μA		−40			V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$				20		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = −40 V	T_J = 25°C			−1	μA
			T_J = 175°C			−1	mA
Zero Gate Voltage Drain Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±16 V				±100	nA
ON CHARACTERISTICS (Note 4)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = −250 μA		−1	−1.8	−3	V
Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$				−5.1		mV/°C
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = −10 V	I_D = −30 A		17	20.5	mΩ
		V_{GS} = −4.5 V	I_D = −15 A		26	34	
CHARGES, CAPACITANCES & GATE RESISTANCE							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 100 KHz, V_{DS} = −20 V			1200		pF
Output Capacitance	C_{OSS}				470		
Reverse Transfer Capacitance	C_{RSS}				26		
Gate Resistance	R_G	V_{GS} = 0.5 V, f = 1 MHz			37		Ω
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = −4.5 V, V_{DS} = −20 V; I_D = −30 A			8		nC
		V_{GS} = −10 V, V_{DS} = −20 V; I_D = −30 A			18		
Threshold Gate Charge	$Q_{G(TH)}$	V_{GS} = 0 to −1 V			1		
Gate−to−Source Gate Charge	Q_{GS}	V_{DD} = −20 V, I_D = −30 A			4		
Gate−to−Drain “Miller” Charge	Q_{GD}				3		
Plateau Voltage	V_{GP}				−3.8		V
SWITCHING CHARACTERISTICS							
Turn−On Delay Time	$t_{d(ON)}$	V_{DD} = −20 V, I_D = −30 A, V_{GS} = −10 V, R_{GEN} = 6 Ω			8		ns
Turn−On Rise Time	t_r				28		
Turn−Off Delay Time	$t_{d(OFF)}$				112		
Turn−Off Fall Time	t_f				40		
DRAIN−SOURCE DIODE CHARACTERISTICS							
Source−to−Drain Diode Voltage	V_{SD}	I_{SD} = −30 A, V_{GS} = 0 V			−0.9	−1.3	V
		I_{SD} = −15 A, V_{GS} = 0 V			−0.85	−1.2	
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dI_{SD}/dt = 100 A/μs, I_S = −30 A			36		ns
Charge Time	t_a				18		
Discharge Time	t_b				18		
Reverse Recovery Charge	Q_{RR}				24		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.

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

PACKAGE MARKING AND ORDERING INFORMATION

Device	Device Marking	Package	Reel Size	Tape Width	Quantity
FDWS9511L−F085	FDWS9511L	Power 56	13″	12 mm	3000 units

TYPICAL CHARACTERISTICS

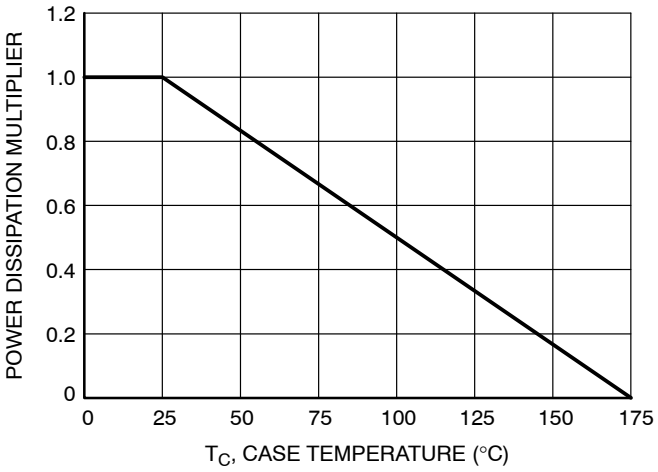


Figure 1. Normalized Power Dissipation vs. Case Temperature

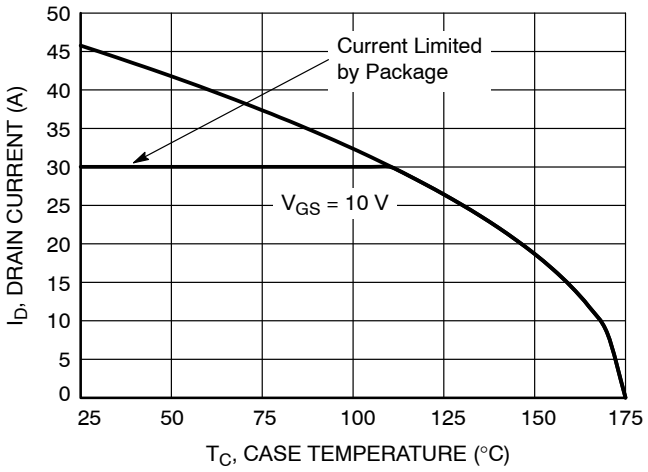


Figure 2. Maximum Continuous Drain Current vs. Case Temperature

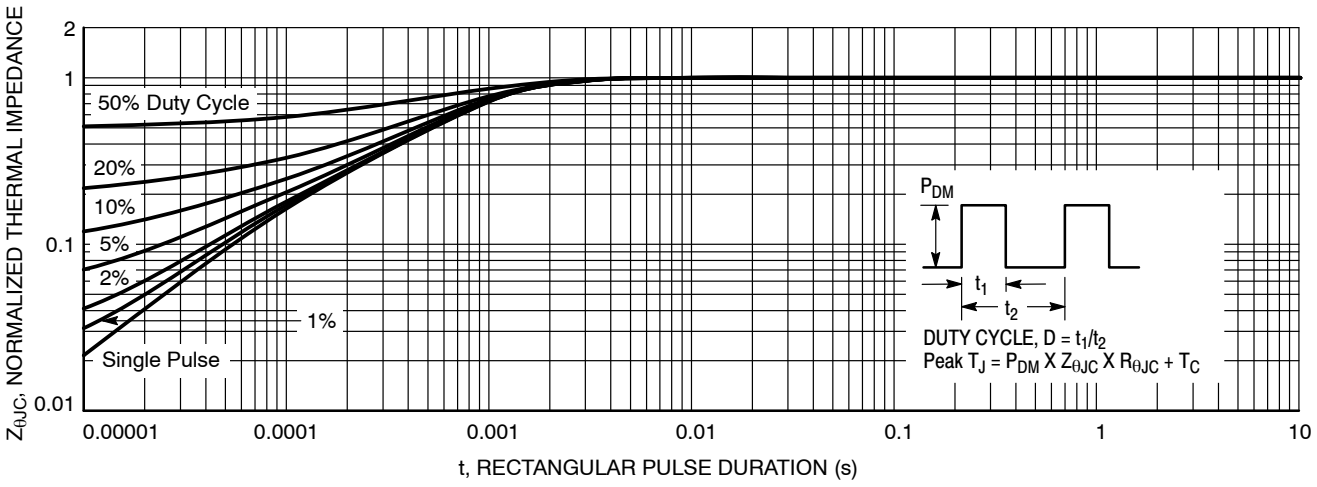


Figure 3. Normalized Maximum Transient Thermal Impedance

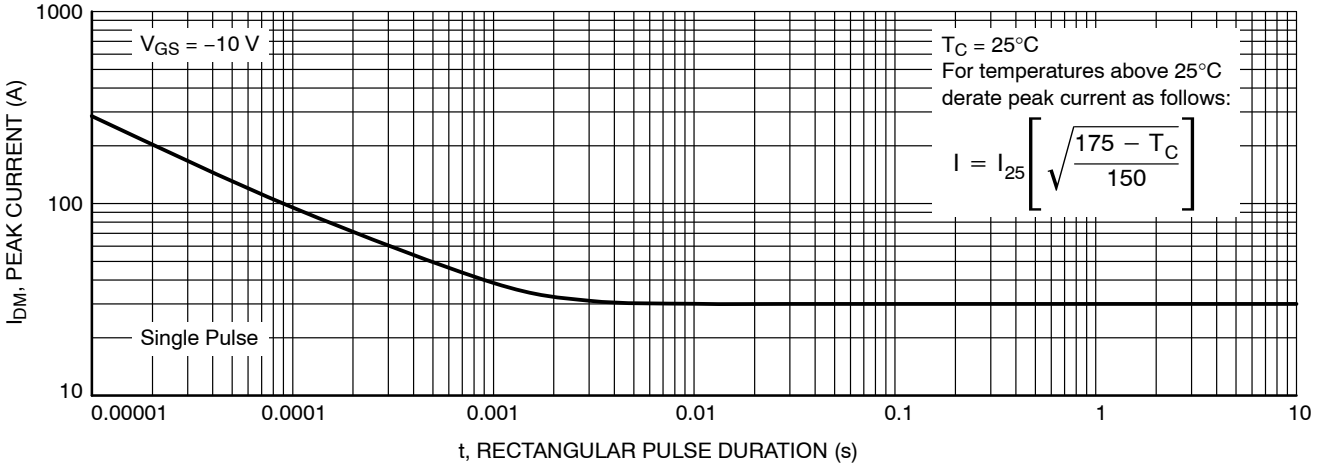


Figure 4. Peak Current Capability

TYPICAL CHARACTERISTICS

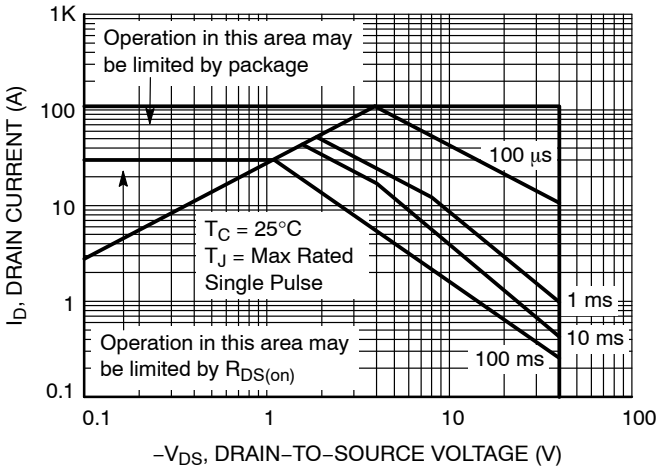


Figure 5. Forward Bias Safe Operating Area

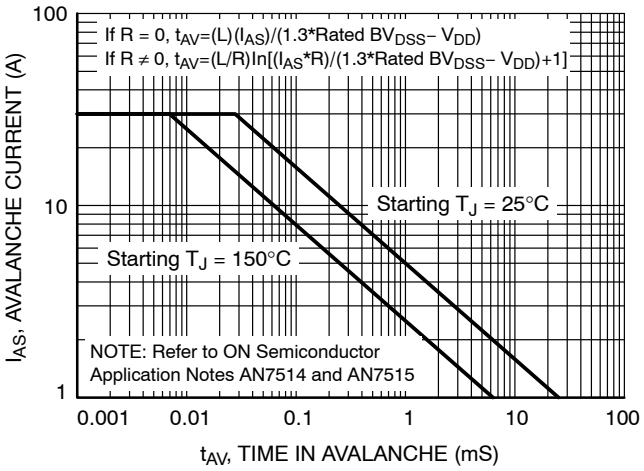


Figure 6. Unclamped Inductive Switching Capability

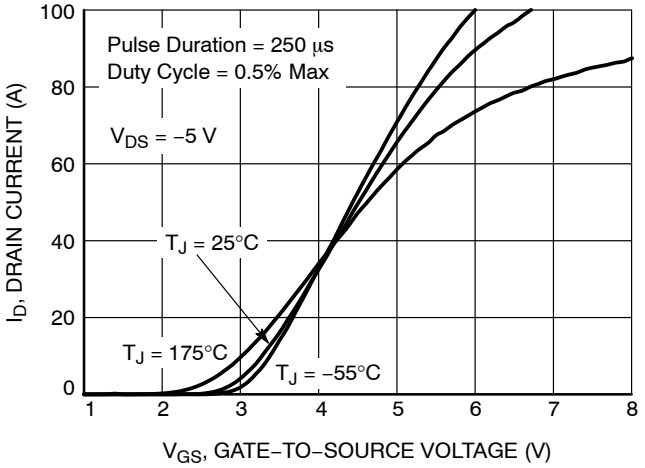


Figure 7. Transfer Characteristics

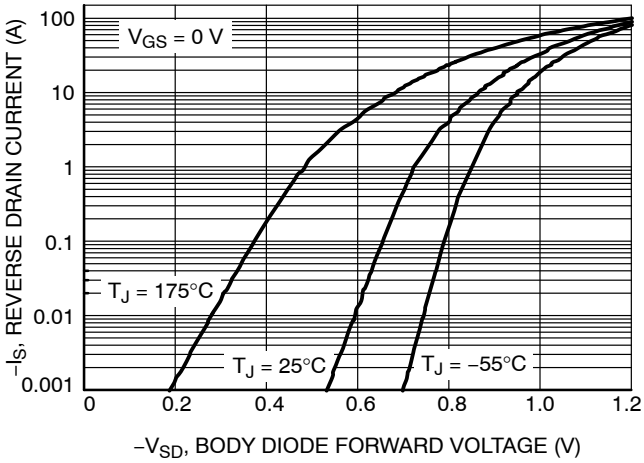


Figure 8. Forward Diode Characteristics

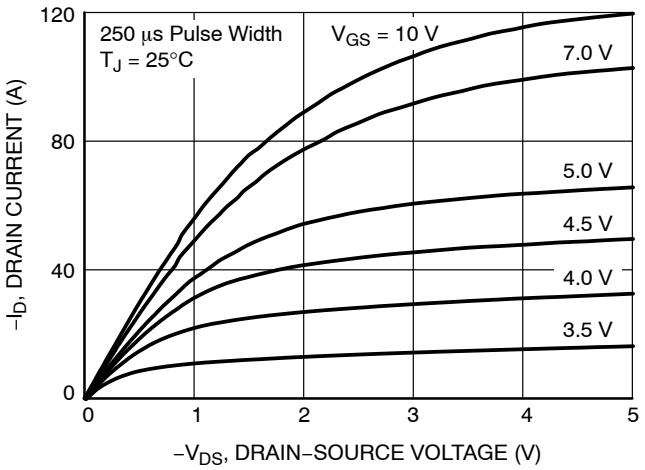


Figure 9. Saturation Characteristics

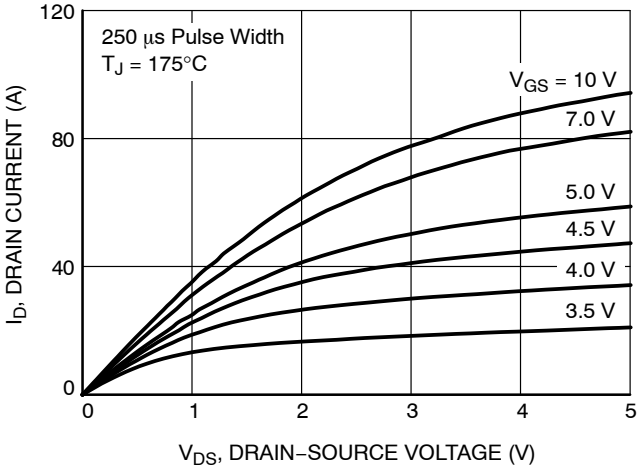


Figure 10. Saturation Characteristics

TYPICAL CHARACTERISTICS

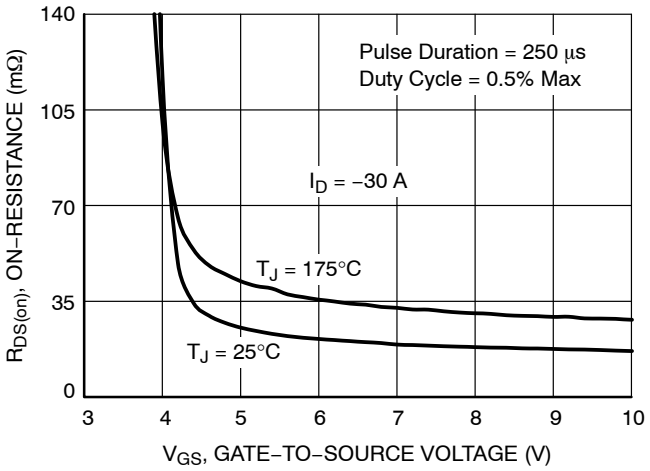


Figure 11. $R_{DS(on)}$ vs. Gate Voltage

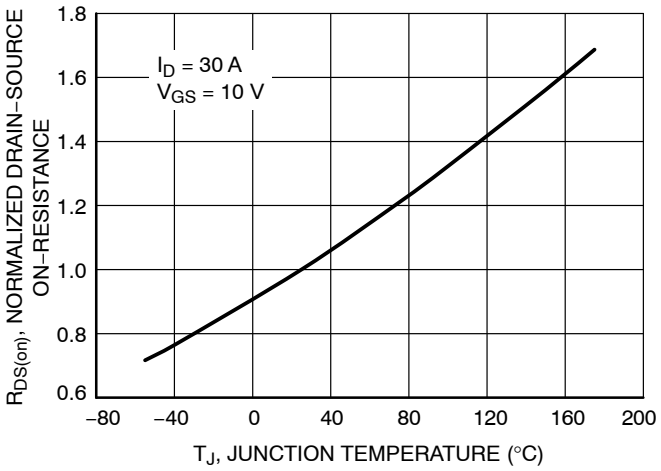


Figure 12. Normalized $R_{DS(on)}$ vs. Junction Temperature

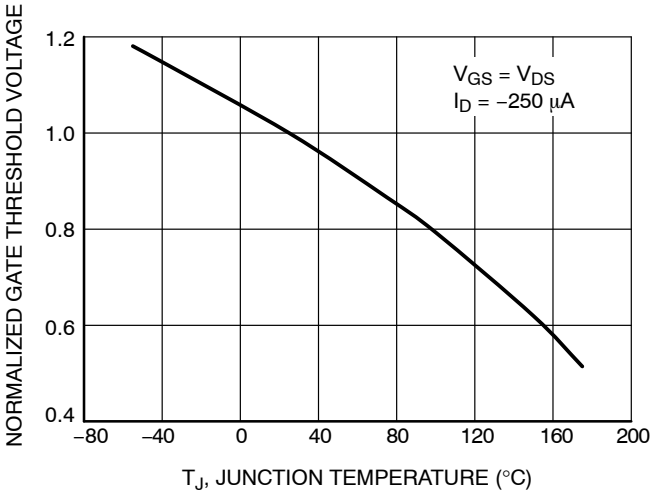


Figure 13. Normalized Gate Threshold Voltage vs. Temperature

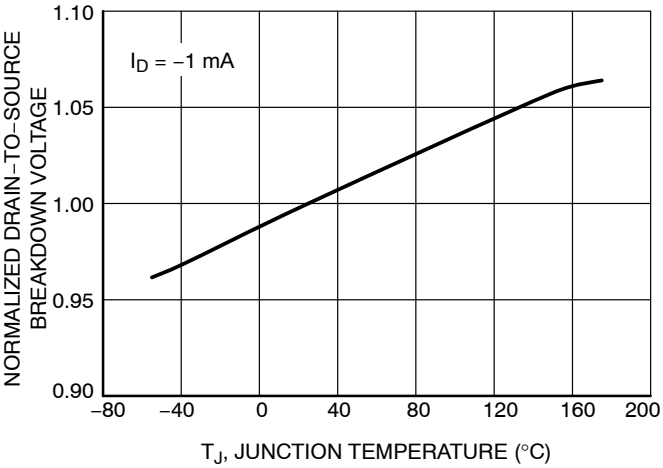


Figure 14. Normalized Drain−to−Source Breakdown Voltage vs. Junction Temperature

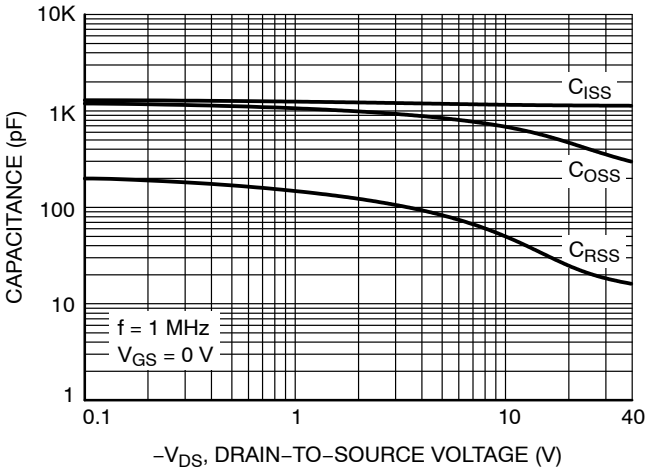


Figure 15. Capacitance vs. Drain−to−Source Voltage

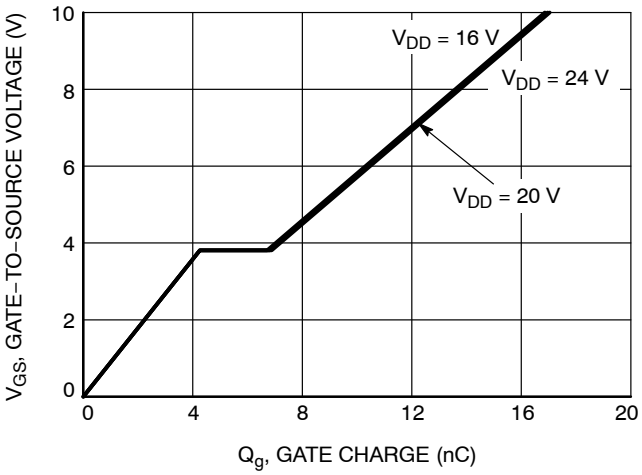
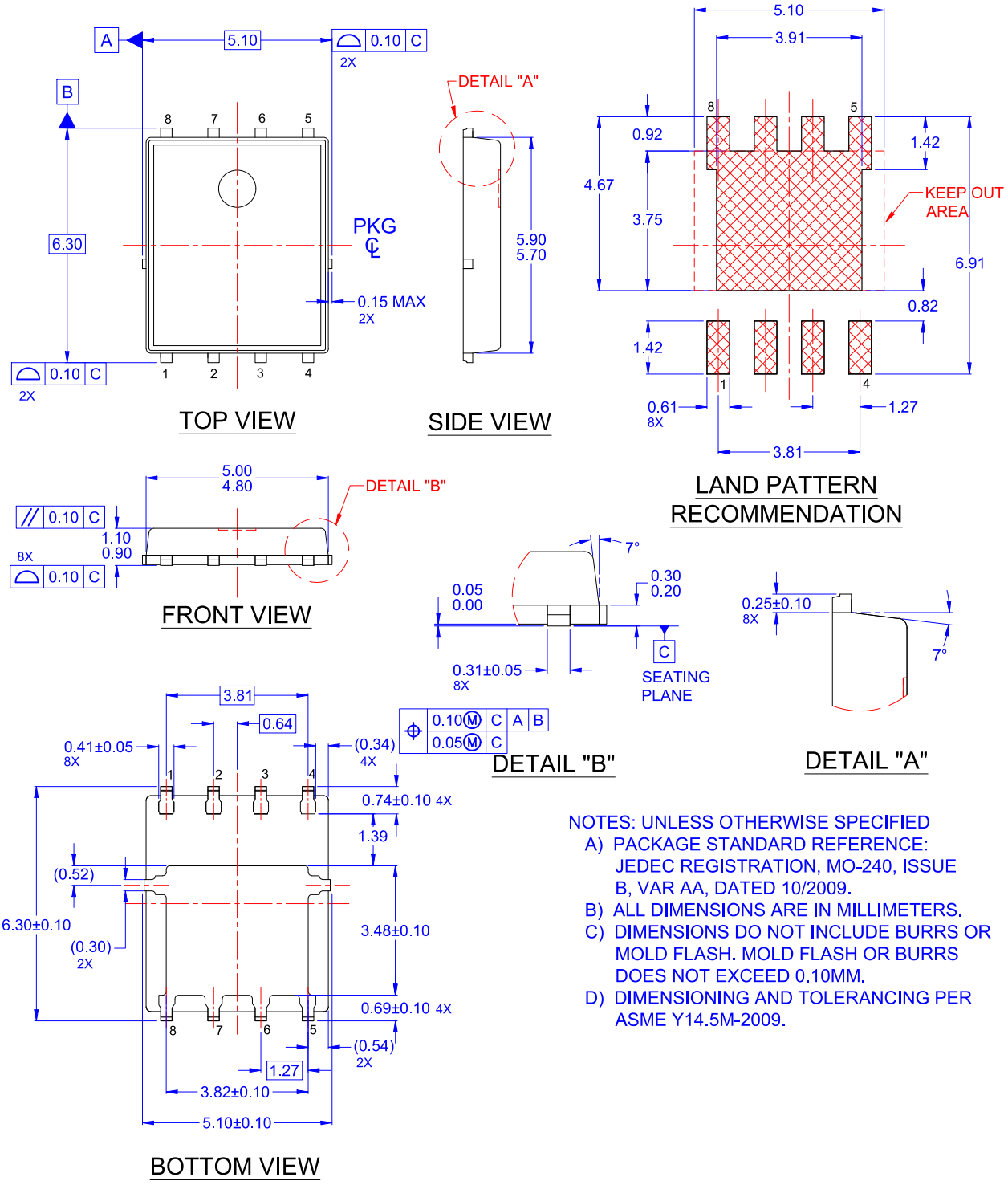


Figure 16. Gate Charge vs. Gate−to−Source Voltage

PACKAGE DIMENSIONS

DFN8 5.1x6.3, 1.27P
CASE 506DW
ISSUE O



NOTES: UNLESS OTHERWISE SPECIFIED

A) PACKAGE STANDARD REFERENCE: JEDEC REGISTRATION, MO-240, ISSUE B, VAR AA, DATED 10/2009.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2009.

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