

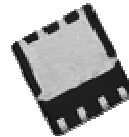
**P-Channel 20-V (D-S) MOSFET**

These miniature surface mount MOSFETs utilize a high cell density trench process to provide low  $r_{DS(on)}$  and to ensure minimal power loss and heat dissipation. Typical applications are DC-DC converters and power management in portable and battery-powered products such as computers, printers, PCMCIA cards, cellular and cordless telephones.

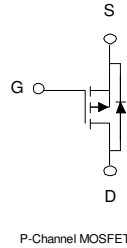
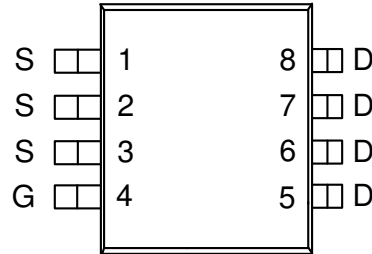
- Low  $r_{DS(on)}$  provides higher efficiency and extends battery life
- Low thermal impedance copper leadframe DFN3x3-8PP saves board space
- Fast switching speed
- High performance trench technology



PRODUCT SUMMARY		
$V_{DS}$ (V)	$r_{DS(on)}$ m( $\Omega$ )	$I_D$ (A)
-20	14 @ $V_{GS} = -4.5V$	-13
	19 @ $V_{GS} = -2.5V$	-12



DFN3x3-8PP  
Top View



ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ C$ UNLESS OTHERWISE NOTED)			
Parameter	Symbol	Maximum	Units
Drain-Source Voltage	$V_{DS}$	-20	V
Gate-Source Voltage	$V_{GS}$	$\pm 8$	
Continuous Drain Current <sup>a</sup>	$T_A=25^\circ C$	-13	A
	$T_A=70^\circ C$	-11	
Pulsed Drain Current <sup>b</sup>	$I_{DM}$	$\pm 50$	
Continuous Source Current (Diode Conduction) <sup>a</sup>	$I_S$	-2.1	A
Power Dissipation <sup>a</sup>	$T_A=25^\circ C$	3.5	W
	$T_A=70^\circ C$	2.0	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to 150	$^\circ C$

THERMAL RESISTANCE RATINGS			
Parameter	Symbol	Maximum	Units
Maximum Junction-to-Ambient <sup>a</sup>	$t \leq 10$ sec	35	$^\circ C/W$
	Steady State	81	$^\circ C/W$

Notes

- a. Surface Mounted on 1" x 1" FR4 Board.
- b. Pulse width limited by maximum junction temperature

SPECIFICATIONS ( $T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)						
Parameter	Symbol	Test Conditions	Limits			Unit
			Min	Typ	Max	
<b>Static</b>						
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250 \mu\text{A}$	-1			V
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 8 \text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -16 \text{ V}, V_{GS} = 0 \text{ V}$			-1	uA
		$V_{DS} = -16 \text{ V}, V_{GS} = 0 \text{ V}, T_J = 55^\circ\text{C}$			-5	
On-State Drain Current <sup>A</sup>	$I_{D(on)}$	$V_{DS} = -5 \text{ V}, V_{GS} = -10 \text{ V}$	-50			A
Drain-Source On-Resistance <sup>A</sup>	$r_{DS(on)}$	$V_{GS} = -4.5 \text{ V}, I_D = -11.5 \text{ A}$			14	m $\Omega$
		$V_{GS} = -2.5 \text{ V}, I_D = -9.3 \text{ A}$			19	
Forward Transconductance <sup>A</sup>	$g_{fs}$	$V_{DS} = -15 \text{ V}, I_D = -11.5 \text{ A}$		29		S
Diode Forward Voltage	$V_{SD}$	$I_S = 2.5 \text{ A}, V_{GS} = 0 \text{ V}$		-0.8		V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	$Q_g$	$V_{DS} = -15 \text{ V}, V_{GS} = -4.5 \text{ V}, I_D = -11.5 \text{ A}$		25		nC
Gate-Source Charge	$Q_{gs}$			11		
Gate-Drain Charge	$Q_{gd}$			17		
Input Capacitance	$C_{iss}$	$V_{DS} = -15 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$		2300		pF
Output Capacitance	$C_{oss}$			600		
Reverse Transfer Capacitance	$C_{rss}$			300		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -15 \text{ V}, R_L = 6 \Omega, I_D = -1 \text{ A}, V_{GEN} = -10 \text{ V}$		15		nS
Rise Time	$t_r$			13		
Turn-Off Delay Time	$t_{d(off)}$			100		
Fall-Time	$t_f$			54		

## Notes

- Pulse test:  $PW \leq 300 \mu\text{s}$  duty cycle  $\leq 2\%$ .
- Guaranteed by design, not subject to production testing.

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### Typical Electrical Characteristics (P-Channel)

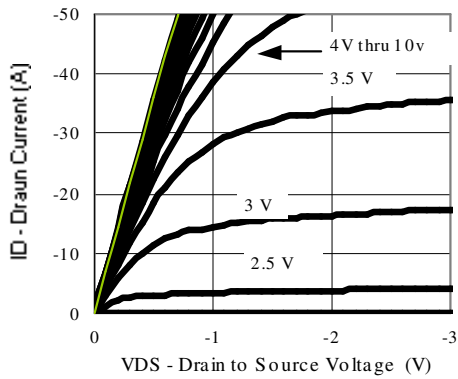


Figure 1. On-Region Characteristics

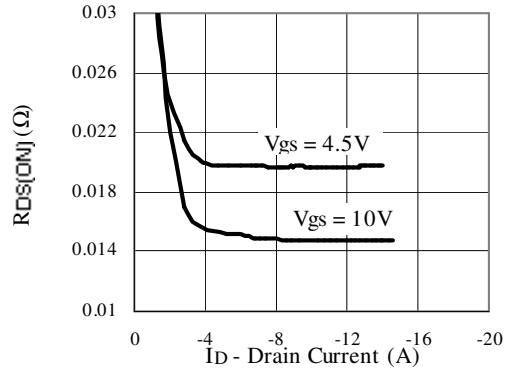


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

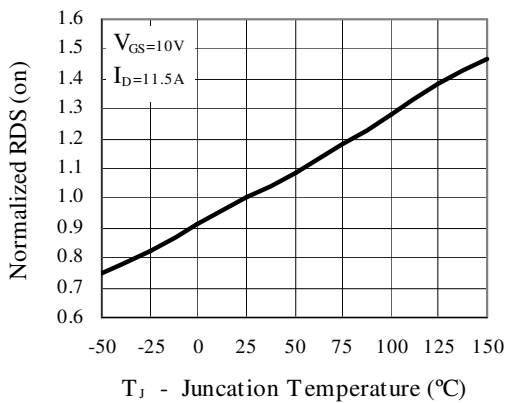


Figure 3. On-Resistance Variation with Temperature

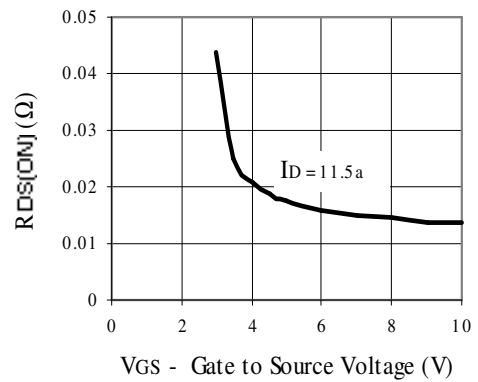


Figure 4. On-Resistance with Gate to Source Voltage

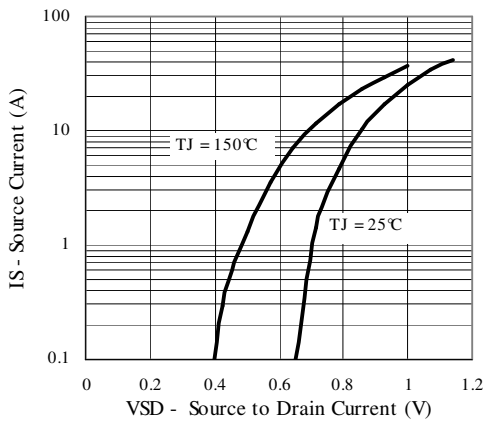


Figure 5. Transfer Characteristics

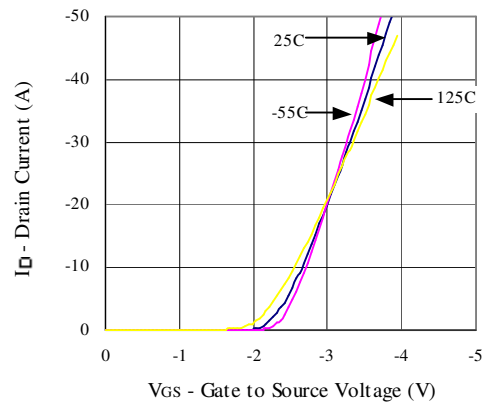


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

### Typical Electrical Characteristics (P-Channel)

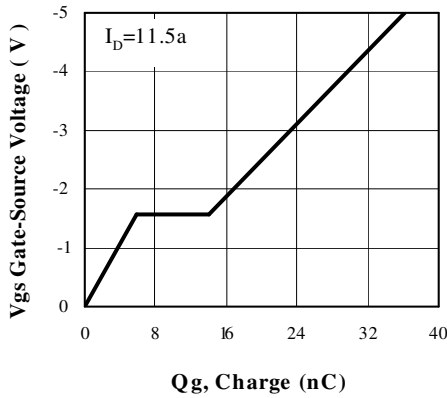


Figure 7. Gate Charge Characteristics

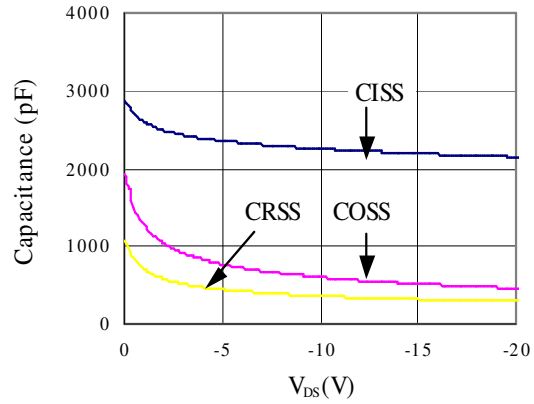


Figure 8. Capacitance Characteristics

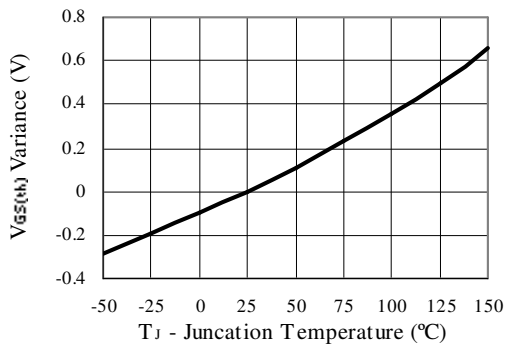


Figure 9. Maximum Safe Operating Area

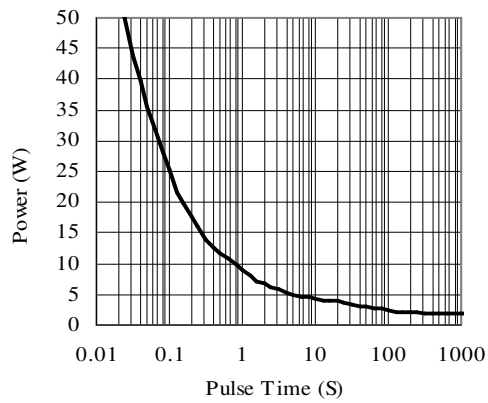


Figure 10. Single Pulse Maximum Power Dissipation

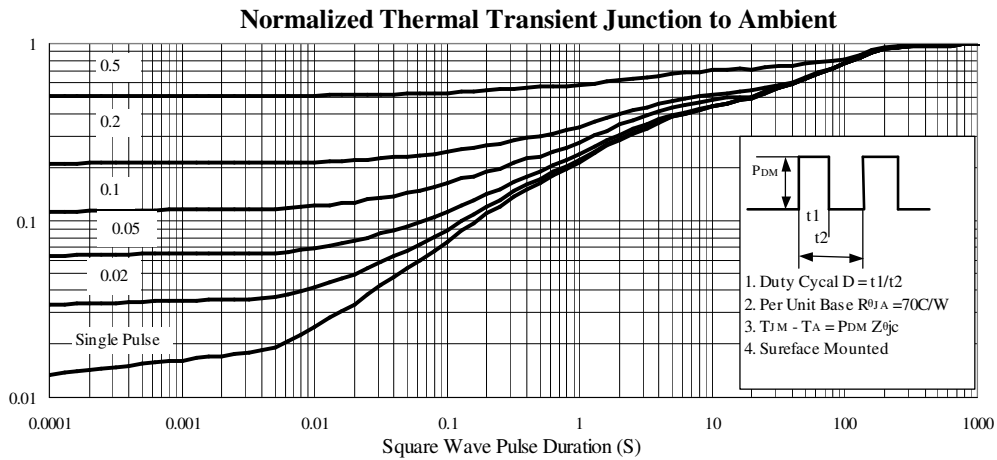
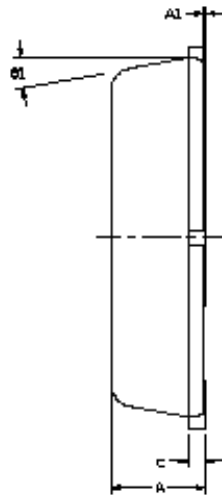
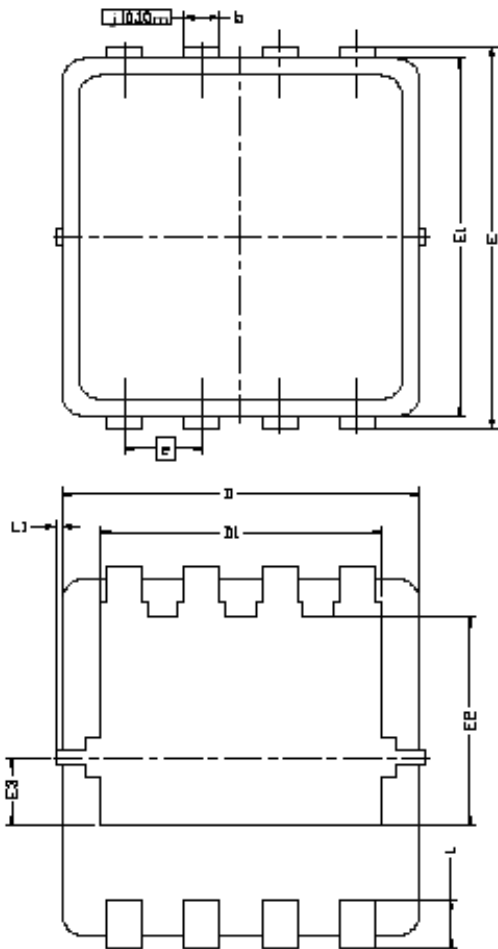


Figure 11. Transient Thermal Response Curve

# Package Information



DIM.	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.700	0.80	0.900	0.0276	0.0315	0.0354
A1	0.00	---	0.05	0.000	---	0.002
b	0.24	0.30	0.35	0.009	0.012	0.014
c	0.10	0.152	0.25	0.004	0.006	0.010
D	3.00 BSC			0.118 BSC		
D1	2.35 BSC			0.093 BSC		
E	3.20 BSC			0.126 BSC		
E1	3.00 BSC			0.118 BSC		
E2	1.75 BSC			0.069 BSC		
E3	0.575 BSC			0.023 BSC		
e	0.65 BSC			0.026 BSC		
L	0.30	0.40	0.50	0.0118	0.0157	0.0197
L1	0	---	0.100	0	---	0.004
θ1	0°	10°	12°	0°	10°	12°