Siliconix incorporated

MOSPOWER

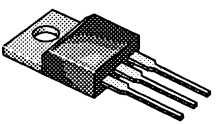
SMP2P20
SMP2P15

P-Channel Enhancement Mode Transistors [2]

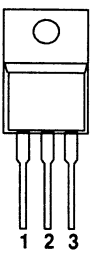
PRODUCT SUMMARY

PART NUMBER	$V_{(BR)DSS}$ (VOLTS)	$r_{DS(on)}$ (OHMS)	I_D (AMPS)
SMP2P20	200	3.0	1.75
SMP2P15	150	4.5	1.50

TO-220AB



TOP VIEW



1 GATE
2 DRAIN
3 SOURCE

ABSOLUTE MAXIMUM RATINGS (T_C= 25°C unless otherwise noted)

PARAMETERS/TEST CONDITIONS		Symbol	SMP 2P20	SMP 2P15	Units
Drain-Source Voltage		V_{DS}	200	150	V
Gate-Source Voltage		V_{GS}	±40	±40	V
Continuous Drain Current	T_C = 25°C	I_D	1.75	1.50	A
	T_C = 100°C		1.1	0.9	A
Pulsed Drain Current[1]		I_{DM}	7.0	6.0	A
Avalanche Current (see figure 9)		I_A	1.75	1.50	A
Power Dissipation	T_C = 25°C	P_D	20	20	W
	T_C = 100°C		8	8	W
Operating Junction & Storage Temperature Range		T_J, T_{stg}	-55 to 150		°C
Lead Temperature (1/16" from case for 10 secs.)		T_L	300		°C

THERMAL RESISTANCE RATINGS

THERMAL RESISTANCE	Symbol	Typ.	Max.	Units
Junction-to-Case	R_{thJC}	-	6.4	K/W
Junction-to-Ambient	R_{thJA}	-	80	K/W
Case-to-Sink	R_{thCS}	1.0	-	K/W

[1]Pulse width limited by maximum junction temperature (refer to transient thermal impedance data, figure 11)
[2]Negative signs for current and voltage values have been omitted for the sake of clarity

4

Siliconix incorporated

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted) P-Channel Device

Negative signs have been omitted for clarity

PARAMETERS/TEST CONDITIONS		Symbol	Min.	Typ.	Max.	Units
Drain-Source Breakdown Voltage V_{GS} = 0, I_D = 250 µA	SMP2P20 SMP2P15	$V_{(BR)DSS}$	200 150	– –	– –	V
Gate Threshold Voltage V_{DS} = V_{GS}, I_D = 250 µA		$V_{GS(th)}$	2.0	–	4.0	V
Gate-Body Leakage V_{DS} = 0, V_{GS} = ±20 V		I_{GSS}	–	–	500	nA
Zero Gate Voltage Drain Current V_{DS} = $V_{(BR)DSS}$, V_{GS} = 0		I_{DSS}	–	–	250	µA
Zero Gate Voltage Drain Current V_{DS} = 0.8 x $V_{(BR)DSS}$, V_{GS} = 0, T_J = 125°C		I_{DSS}	–	–	1000	µA
On-State Drain Current[2] V_{DS} = 10 V, V_{GS} = 10 V	SMP2P20 SMP2P15	$I_{D(on)}$	1.75 1.50	– –	– –	A
Drain-Source On-State Resistance[2] V_{GS} = 10 V, I_D = 0.9 A	SMP2P20 SMP2P15	$r_{DS(on)}$	– –	2.2 3.0	3.0 4.5	Ω
Drain-Source On-State Resistance[2] V_{GS} = 10 V, I_D = 0.9 A, T_J = 125°C	SMP2P20 SMP2P15	$r_{DS(on)}$	– –	4.0 5.4	5.4 8.1	Ω
Forward Transconductance[2] V_{DS} = 15 V, I_D = 0.9 A		g_{fs}	0.5	0.8	–	S(℧)
Input Capacitance	V_{GS} = 0 V_{DS} = 25 V f = 1 MHz	C_{iss}	–	170	300	pF
Output Capacitance		C_{oss}	–	70	100	pF
Reverse Transfer Capacitance		C_{rss}	–	25	35	pF
Total Gate Charge	V_{DS} = 0.5 x $V_{(BR)DSS}$, V_{GS} = 10 V, I_D = 1.75 A (Gate charge is essentially independent of operating temperature)	Q_g	–	5.8	11	nC
Gate-Source Charge		Q_{gs}	–	0.9	–	nC
Gate-Drain Charge		Q_{gd}	–	3.2	–	nC
Turn-On Delay Time	V_{DD} = 100 V, R_L = 110 Ω I_D ≅ 0.9 A, V_{GEN} = 10 V R_G = 25 Ω (Switching time is essentially independent of operating temperature)	$t_{d(on)}$	–	7.5	15	ns
Rise Time		t_r	–	13	25	ns
Turn-Off Delay Time		$t_{d(off)}$	–	45	60	ns
Fall Time		t_f	–	28	40	ns

SOURCE-DRAIN DIODE RATINGS & CHARACTERISTICS (T_J = 25°C unless otherwise noted)

PARAMETERS/TEST CONDITIONS		Symbol	Min.	Typ.	Max.	Units
Continuous Current	SMP2P20 SMP2P15	I_S	– –	– –	1.75 1.5	A
Pulsed Current[1]	SMP2P20 SMP2P15	I_{SM}	– –	– –	7.0 6.0	A
Forward Voltage[2] I_F = I_S, V_{GS} = 0	SMP2P20 SMP2P15	V_{SD}	– –	– –	5.8 5.5	V
Reverse Recovery Time I_F = I_S, dI_F/dt = 100 A/µs		t_{rr}	–	100	–	ns
Reverse Recovered Charge I_F = I_S, dI_F/dt = 100 A/µs		Q_{rr}	–	0.36	–	µC

[1] Pulse width limited by maximum junction temperature (refer to transient thermal impedance data, figure 11)

[2] Pulse test: Pulse width ≤ 300 µsec, Duty Cycle ≤ 2%

PERFORMANCE CURVES (25°C Unless otherwise noted)

FIGURE 1: Typical Output Characteristics

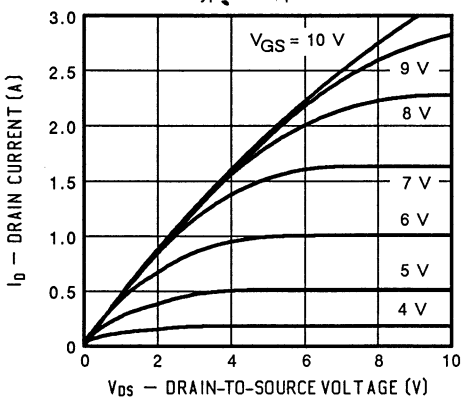


FIGURE 2: Typical Transfer Characteristics

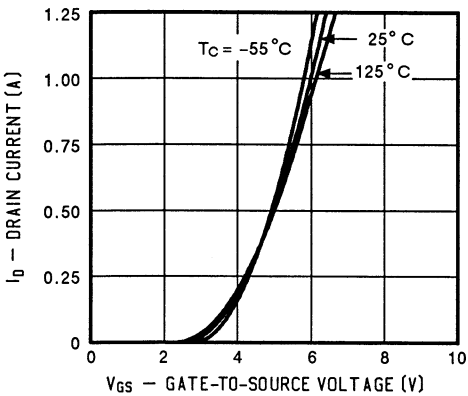


FIGURE 3: Typical Transconductance

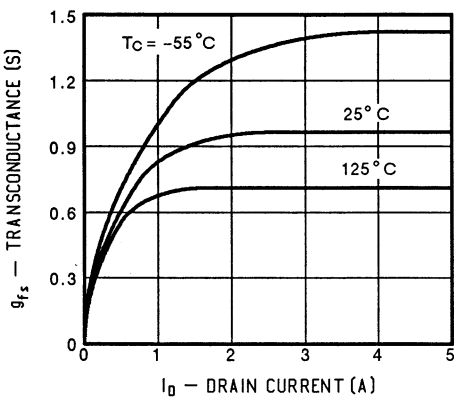


FIGURE 4: Typical On-Resistance

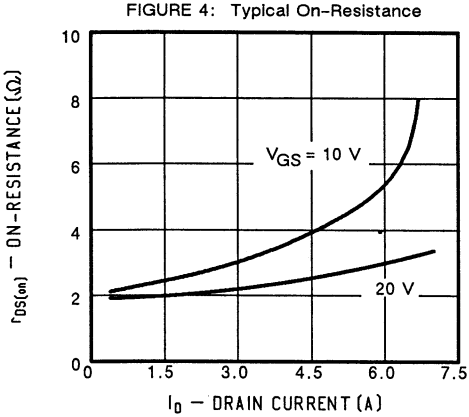


FIGURE 5: Typical Capacitance

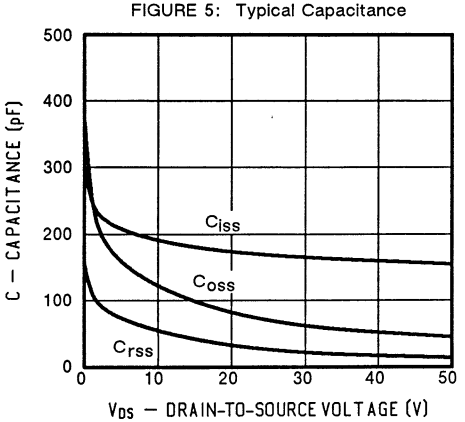
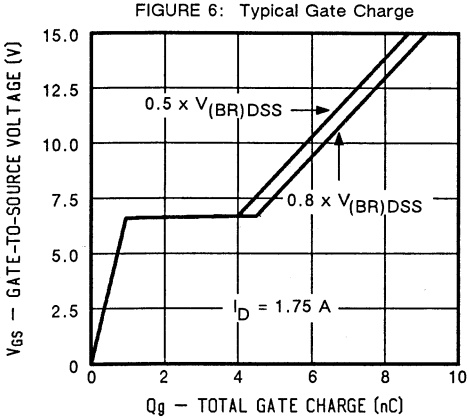


FIGURE 6: Typical Gate Charge



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PERFORMANCE CURVES (25°C Unless otherwise noted)

FIGURE 7: On-Resistance vs. Junction Temperature

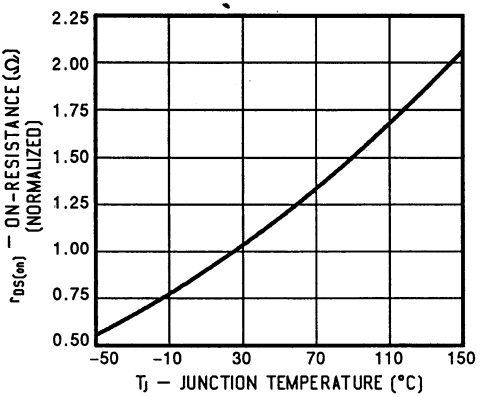


FIGURE 8: Typical Source-Drain Diode Forward Voltage

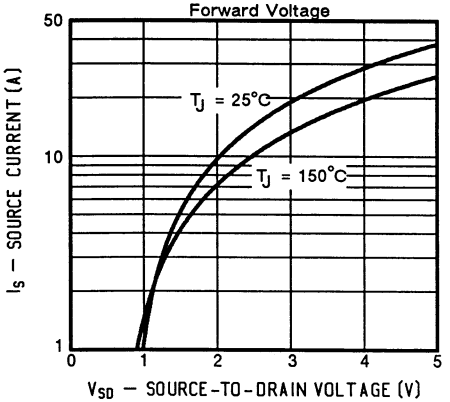


FIGURE 9: Maximum Avalanche and Drain Current vs. Case Temperature

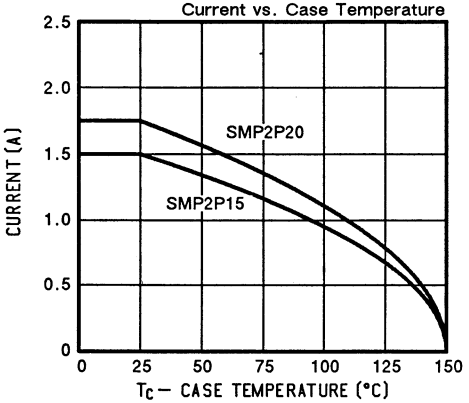
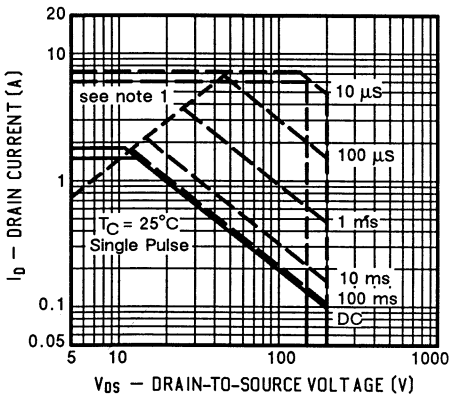
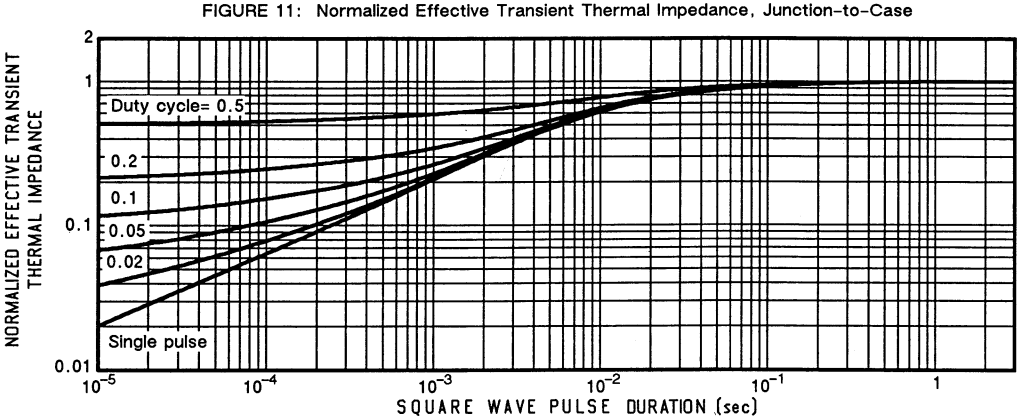


FIGURE 10: Safe Operating Area



[1] Operation in this area may be limited by $r_{DS(on)}$

FIGURE 11: Normalized Effective Transient Thermal Impedance, Junction-to-Case



Siliconix incorporated

SMP3P10, SMP3P06

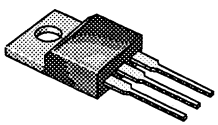
P-Channel Enhancement Mode Transistor[2]

MOSPOWER

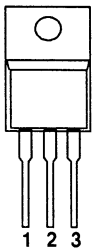
PRODUCT SUMMARY

PART NUMBER	$V_{(BR)DSS}$ (VOLTS)	$r_{DS(on)}$ (OHMS)	I_D (AMPS)
SMP3P10	100	1.2	3.0
SMP3P06	60	1.6	2.5

TO-220AB



TOP VIEW



1 GATE
2 DRAIN
3 SOURCE

ABSOLUTE MAXIMUM RATINGS (T_C= 25°C unless otherwise noted)

PARAMETERS/TEST CONDITIONS		Symbol	SMP		Units
			3P10	3P06	
Drain-Source Voltage		V_{DS}	100	60	V
Gate-Source Voltage		V_{GS}	±40	±40	
Continuous Drain Current	T_C = 25°C	I_D	3.0	2.5	A
	T_C = 100°C		2.0	1.5	
Pulsed Drain Current[1]		I_{DM}	12	10	
Avalanche Current (see figure 9)		I_A	3.0	2.5	
Power Dissipation	T_C = 25°C	P_D	20	20	W
	T_C = 100°C		8	8	
Operating Junction & Storage Temperature Range		T_J, T_{stg}	-55 to 150		°C
Lead Temperature (1/16" from case for 10 secs.)		T_L	300		

THERMAL RESISTANCE RATINGS

THERMAL RESISTANCE	Symbol	Typ.	Max.	Units
Junction-to-Case	R_{thJC}	-	6.4	K/W
Junction-to-Ambient	R_{thJA}	-	80	
Case-to-Sink	R_{thCS}	1.0	-	

[1]Pulse width limited by maximum junction temperature (refer to transient thermal impedance data, figure 11)
[2]Negative signs for current and voltage values have been omitted for the sake of clarity

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Siliconix incorporated

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted) P-Channel Device

Negative signs have been omitted for clarity

PARAMETERS/TEST CONDITIONS		Symbol	Min.	Typ.	Max.	Units
Drain-Source Breakdown Voltage V_{GS} = 0, I_D = 250 µA	SMP3P10 SMP3P06	$V_{(BR)DSS}$	100 60	– –	– –	V
Gate Threshold Voltage V_{DS} = V_{GS}, I_D = 250 µA		$V_{GS(th)}$	2.0	–	4.0	
Gate-Body Leakage V_{DS} = 0, V_{GS} = ±20 V		I_{GSS}	–	–	500	nA
Zero Gate Voltage Drain Current V_{DS} = $V_{(BR)DSS}$, V_{GS} = 0		I_{DSS}	–	–	250	µA
Zero Gate Voltage Drain Current V_{DS} = 0.8 x $V_{(BR)DSS}$, V_{GS} = 0, T_J = 125°C		I_{DSS}	–	–	1000	
On-State Drain Current[2] V_{DS} = 5.0 V, V_{GS} = 10 V	SMP3P10 SMP3P06	$I_{D(on)}$	3.0 2.5	– –	– –	A
Drain-Source On-State Resistance[2] V_{GS} = 10 V, I_D = 1.5 A	SMP3P10 SMP3P06	$r_{DS(on)}$	– –	1.0 1.3	1.2 1.6	Ω
Drain-Source On-State Resistance[2] V_{GS} = 10 V, I_D = 1.5 A, T_J = 125°C	SMP3P10 SMP3P06	$r_{DS(on)}$	– –	1.6 2.1	2.0 2.6	
Forward Transconductance[2] V_{DS} = 15 V, I_D = 1.5 A		g_{fs}	0.5	0.9	–	S(℧)
Input Capacitance	V_{GS} = 0 V_{DS} = 25 V f = 1 MHz	C_{iss}	–	150	250	pF
Output Capacitance		C_{oss}	–	65	120	
Reverse Transfer Capacitance		C_{rss}	–	25	45	
Total Gate Charge	V_{DS} = 0.5 x $V_{(BR)DSS}$, V_{GS} = 10 V, I_D = 3.0 A (Gate charge is essentially independent of operating temperature)	Q_g	–	6.6	11	nC
Gate-Source Charge		Q_{gs}	–	1.5	–	
Gate-Drain Charge		Q_{gd}	–	3.8	–	
Turn-On Delay Time	V_{DD} = 50 V, R_L = 33 Ω I_D ≅ 1.5 A, V_{GEN} = 10 V R_G = 25 Ω (Switching time is essentially independent of operating temperature)	$t_{d(on)}$	–	7	30	ns
Rise Time		t_r	–	45	60	
Turn-Off Delay Time		$t_{d(off)}$	–	38	60	
Fall Time		t_f	–	55	75	

SOURCE-DRAIN DIODE RATINGS & CHARACTERISTICS (T_J = 25°C unless otherwise noted)

PARAMETERS/TEST CONDITIONS		Symbol	Min.	Typ.	Max.	Units
Continuous Current	SMP3P10 SMP3P06	I_S	– –	– –	3.0 2.5	A
Pulsed Current[1]	SMP3P10 SMP3P06	I_{SM}	– –	– –	12 10	
Forward Voltage[2] I_F = I_S, V_{GS} = 0	SMP3P10 SMP3P06	V_{SD}	– –	– –	5.5 5.3	V
Reverse Recovery Time I_F = I_S, dI_F/dt = 100 A/µs		t_{rr}	–	70	–	ns
Reverse Recovered Charge I_F = I_S, dI_F/dt = 100 A/µs		Q_{rr}	–	0.20	–	µC

[1] Pulse width limited by maximum junction temperature (refer to transient thermal impedance data, figure 11)
[2] Pulse test: Pulse width ≤ 300 µsec, Duty Cycle ≤ 2%

PERFORMANCE CURVES (25°C Unless otherwise noted)

FIGURE 1: Typical Output Characteristics

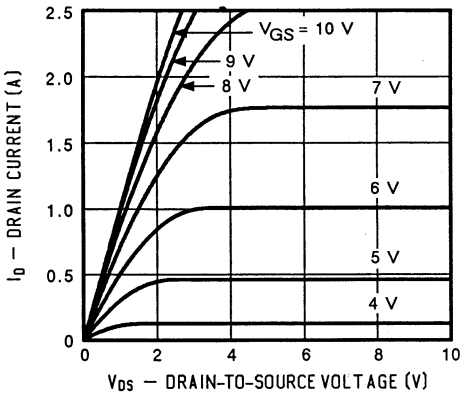


FIGURE 2: Typical Transfer Characteristics

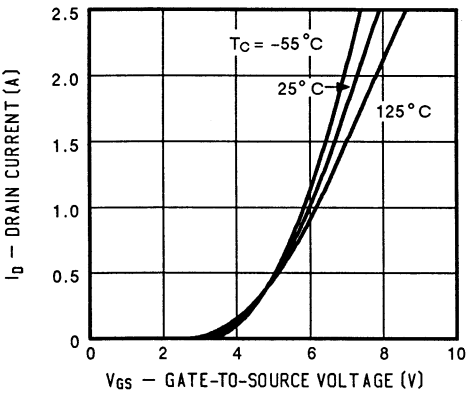


FIGURE 3: Typical Transconductance

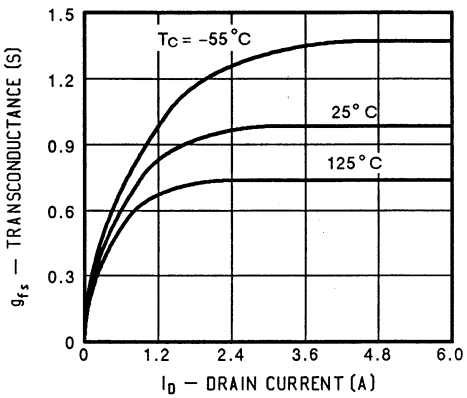


FIGURE 4: Typical On-Resistance

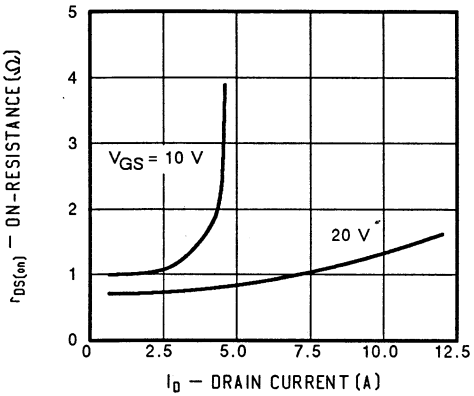


FIGURE 5: Typical Capacitance

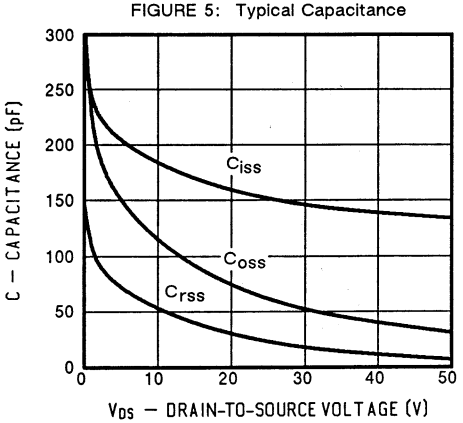
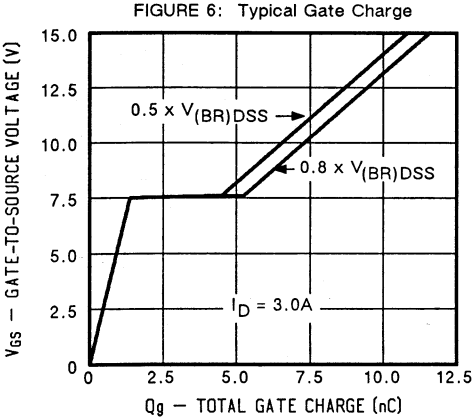


FIGURE 6: Typical Gate Charge



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Siliconix incorporated

PERFORMANCE CURVES (25°C Unless otherwise noted)

FIGURE 7: On-Resistance vs. Junction Temperature

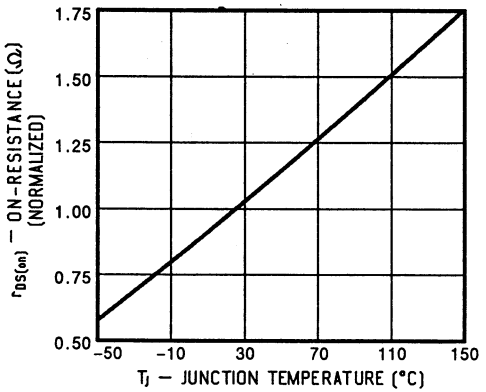


FIGURE 8: Typical Source-Drain Diode Forward Voltage

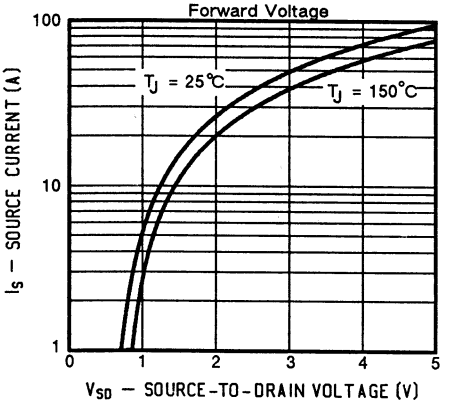


FIGURE 9: Maximum Avalanche and Drain Current vs. Case Temperature

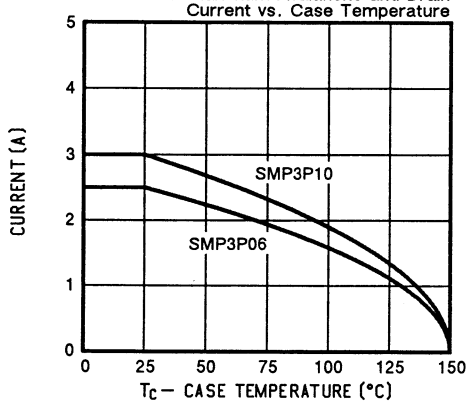
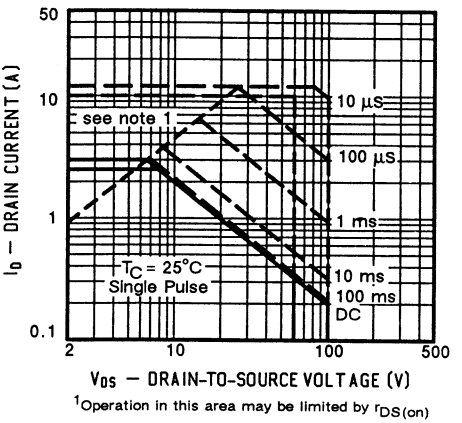
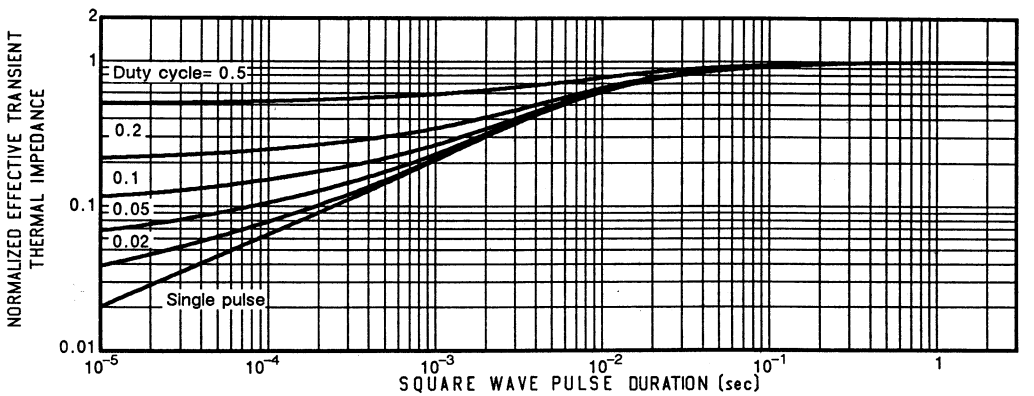


FIGURE 10: Safe Operating Area



[1]Operation in this area may be limited by $r_{DS(on)}$

FIGURE 11: Normalized Effective Transient Thermal Impedance, Junction-to-Case



Siliconix incorporated

MOSPOWER

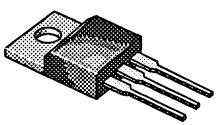
SMP11P20
SMP9P15

P-Channel Enhancement Mode Transistors [2]

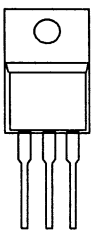
PRODUCT SUMMARY

PART NUMBER	$V_{(BR)DSS}$ (VOLTS)	$r_{DS(on)}$ (OHMS)	I_D (AMPS)
SMP11P20	200	0.50	11
SMP9P15	150	0.70	9.0

TO-220AB



TOP VIEW



1 GATE
2 DRAIN
3 SOURCE

ABSOLUTE MAXIMUM RATINGS (T_C= 25°C unless otherwise noted)

PARAMETERS/TEST CONDITIONS		Symbol	SMP 11P20	SMP 9P15	Units
Drain-Source Voltage		V_{DS}	200	150	V
Gate-Source Voltage		V_{GS}	±40	±40	
Continuous Drain Current	T_C = 25°C	I_D	11	9.0	A
	T_C = 100°C		7.0	5.6	
Pulsed Drain Current[1]		I_{DM}	44	36	
Avalanche Current (see figure 9)		I_A	11	9.0	
Power Dissipation	T_C = 25°C	P_D	125	125	W
	T_C = 100°C		50	50	
Operating Junction & Storage Temperature Range		T_J, T_{stg}	-55 to 150		°C
Lead Temperature (1/16" from case for 10 secs.)		T_L	300		

THERMAL RESISTANCE RATINGS

THERMAL RESISTANCE	Symbol	Typ.	Max.	Units
Junction-to-Case	R_{thJC}	-	1.0	K/W
Junction-to-Ambient	R_{thJA}	-	80	
Case-to-Sink	R_{thCS}	1.0	-	

[1]Pulse width limited by maximum junction temperature (refer to transient thermal impedance data, figure 11)
[2]Negative signs for current and voltage values have been omitted for the sake of clarity

4

Siliconix incorporated

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted) P-Channel Device

Negative signs have been omitted for clarity

PARAMETERS/TEST CONDITIONS		Symbol	Min.	Typ.	Max.	Units
Drain-Source Breakdown Voltage V_{GS} = 0, I_D = 250 µA	SMP11P20 SMP9P15	$V_{(BR)DSS}$	200 150	– –	– –	V
Gate Threshold Voltage V_{DS} = V_{GS}, I_D = 250 µA		$V_{GS(th)}$	2.0	–	4.0	
Gate-Body Leakage V_{DS} = 0, V_{GS} = ±20 V		I_{GSS}	–	–	100	nA
Zero Gate Voltage Drain Current V_{DS} = $V_{(BR)DSS}$, V_{GS} = 0		I_{DSS}	–	–	250	µA
Zero Gate Voltage Drain Current V_{DS} = 0.8 x $V_{(BR)DSS}$, V_{GS} = 0, T_J =125°C		I_{DSS}	–	–	1000	
On-State Drain Current[2] V_{DS} = 10 V, V_{GS} = 10 V	SMP11P20 SMP9P15	$I_{D(on)}$	11 9.0	– –	– –	A
Drain-Source On-State Resistance[2] V_{GS} = 10 V, I_D = 6.0 A	SMP11P20 SMP9P15	$r_{DS(on)}$	– –	0.28 0.40	0.50 0.70	Ω
Drain-Source On-State Resistance[2] V_{GS} = 10 V, I_D = 6.0 A, T_J = 125°C	SMP11P20 SMP9P15	$r_{DS(on)}$	– –	0.50 0.72	1.0 1.4	
Forward Transconductance[2] V_{DS} = 15 V, I_D = 6.0 A		g_{fs}	4.0	4.3	–	S(℧)
Input Capacitance	V_{GS} = 0 V_{DS} = 25 V f = 1 MHz	C_{iss}	–	1300	1400	pF
Output Capacitance		C_{oss}	–	500	600	
Reverse Transfer Capacitance		C_{rss}	–	250	300	
Total Gate Charge	V_{DS} = 0.5 x $V_{(BR)DSS}$, V_{GS} = 10 V, I_D = 11.0 A (Gate charge is essentially independent of operating temperature)	Q_g	–	55	75	nC
Gate-Source Charge		Q_{gs}	–	9	–	
Gate-Drain Charge		Q_{gd}	–	30	–	
Turn-On Delay Time	V_{DD} = 100 V, R_L = 15.5 Ω I_D ≅ 6.0 A, V_{GEN} = 10 V R_G = 4.7 Ω (Switching time is essentially independent of operating temperature)	$t_{d(on)}$	–	10	30	ns
Rise Time		t_r	–	30	60	
Turn-Off Delay Time		$t_{d(off)}$	–	35	80	
Fall Time		t_f	–	16	40	

SOURCE-DRAIN DIODE RATINGS & CHARACTERISTICS (T_J = 25°C unless otherwise noted)

PARAMETERS/TEST CONDITIONS		Symbol	Min.	Typ.	Max.	Units
Continuous Current	SMP11P20 SMP9P15	I_S	– –	– –	11 9.0	A
Pulsed Current[1]	SMP11P20 SMP9P15	I_{SM}	– –	– –	44 36	
Forward Voltage[2] I_F = I_S, V_{GS} = 0	SMP11P20 SMP9P15	V_{SD}	– –	– –	2.6 2.4	V
Reverse Recovery Time I_F = I_S, dI_F/dt = 100 A/µs		t_{rr}	–	200	–	ns
Reverse Recovered Charge I_F = I_S, dI_F/dt = 100 A/µs		Q_{rr}	–	1.0	–	µC

[1] Pulse width limited by maximum junction temperature (refer to transient thermal impedance data, figure 11)
[2] Pulse test: Pulse width ≤ 300 µsec, Duty Cycle ≤ 2%

PERFORMANCE CURVES (25°C Unless otherwise noted)

FIGURE 1: Typical Output Characteristics

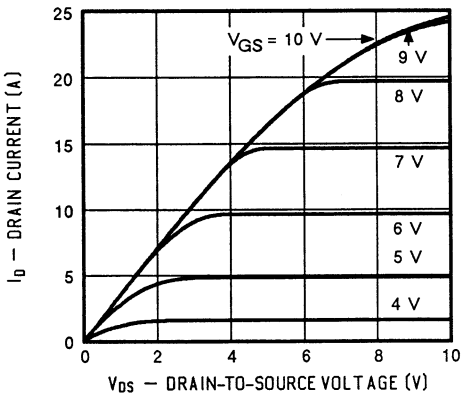


FIGURE 2: Typical Transfer Characteristics

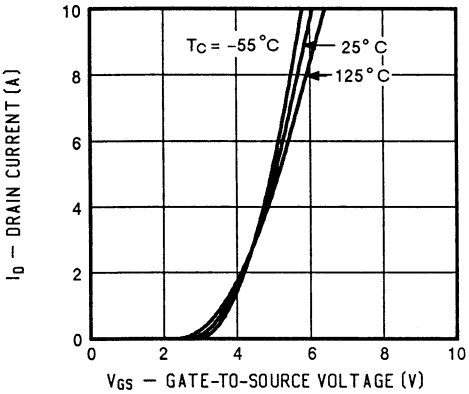


FIGURE 3: Typical Transconductance

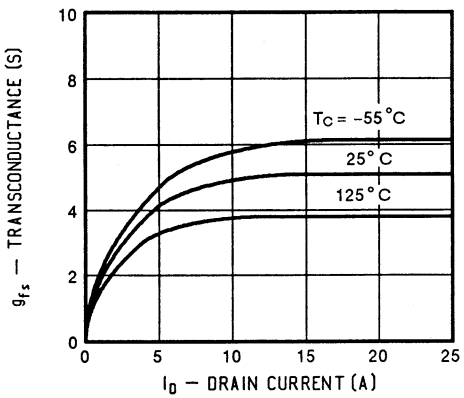


FIGURE 4: Typical On-Resistance

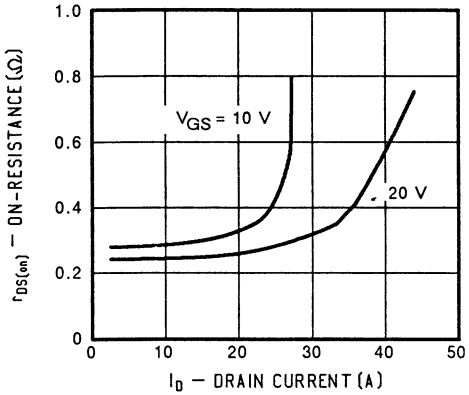


FIGURE 5: Typical Capacitance

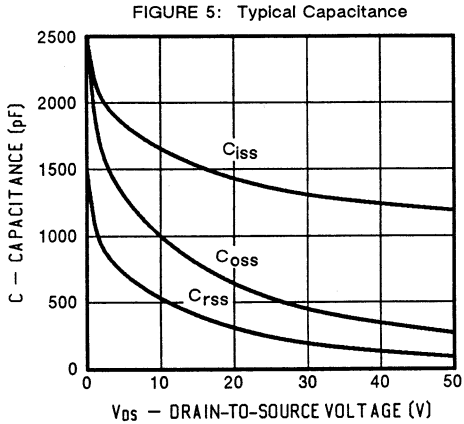
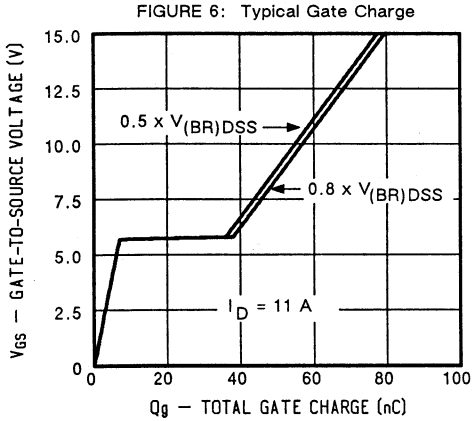


FIGURE 6: Typical Gate Charge



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Siliconix incorporated

PERFORMANCE CURVES (25°C Unless otherwise noted)

FIGURE 7: On-Resistance vs. Junction Temperature

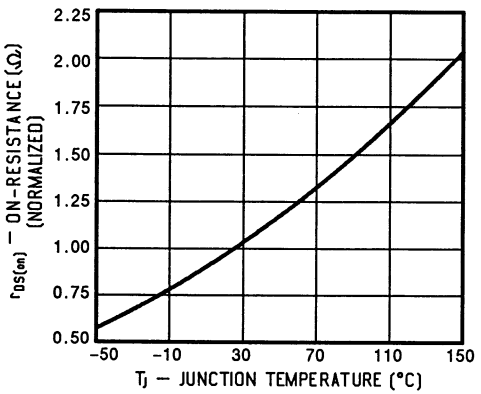


FIGURE 8: Typical Source-Drain Diode Forward Voltage

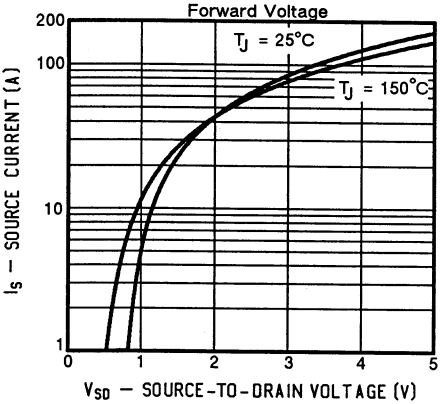


FIGURE 9: Maximum Avalanche and Drain Current vs. Case Temperature

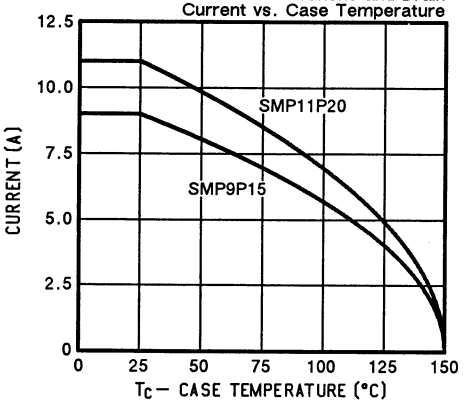
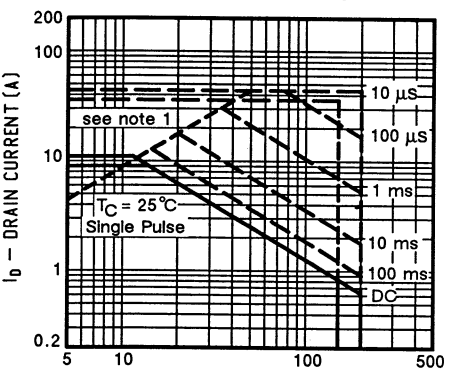


FIGURE 10: Safe Operating Area



[1]Operation in this area may be limited by $r_{DS(on)}$

FIGURE 11: Normalized Effective Transient Thermal Impedance, Junction-to-Case