Siliconix incorporated

MOSPOWER

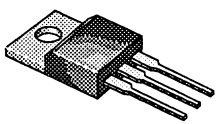
SMP20P10
SMP16P06

P-Channel Enhancement Mode Transistors[2]

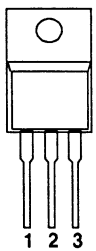
PRODUCT SUMMARY

PART NUMBER	$V_{(BR)DSS}$ (VOLTS)	$r_{DS(on)}$ (OHMS)	I_D (AMPS)
SMP20P10	100	0.20	20
SMP16P06	60	0.30	16

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 20P10	SMP 16P06	Units
Drain-Source Voltage		V_{DS}	100	60	V
Gate-Source Voltage		V_{GS}	± 40	±40	
Continuous Drain Current	T_C = 25°C	I_D	20	16	A
	T_C = 100°C		13	11	
Pulsed Drain Current[1]		I_{DM}	80	64	
Avalanche Current (see figure 9)		I_A	20	16	
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}	-	30	
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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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	SMP20P10 SMP16N06	$V_{(BR)DSS}$	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}	–	–	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	SMP20P10 SMP16P06	$I_{D(on)}$	20 16	– –	– –	A
Drain-Source On-State Resistance[2] V_{GS} = 10 V, I_D = 10 A	SMP20P10 SMP16P06	$r_{DS(on)}$	– –	0.15 0.19	0.20 0.30	Ω
Drain-Source On-State Resistance[2] V_{GS} = 10 V, I_D = 10 A, T_J = 125°C	SMP20P10 SMP16P06	$r_{DS(on)}$	– –	0.24 0.30	0.30 0.46	
Forward Transconductance[2] V_{DS} =15 V, I_D = 10 A		g_{fs}	4.8	6.7	–	S(℧)
Input Capacitance	V_{GS} = 0 V_{DS} = 25 V f = 1 MHz	C_{iss}	–	1300	1600	pF
Output Capacitance		C_{oss}	–	750	850	
Reverse Transfer Capacitance		C_{rss}	–	310	400	
Total Gate Charge	V_{DS} = 0.5 x $V_{(BR)DSS}$, V_{GS} = 10 V, I_D = 20 A (Gate charge is essentially independent of operating temperature)	Q_g	–	47	60	nC
Gate-Source Charge		Q_{gs}	–	10	–	
Gate-Drain Charge		Q_{gd}	–	27	–	
Turn-On Delay Time	V_{DD} = 40 V, R_L = 4.0Ω I_D ≅ 10 A, V_{GEN} = 10 V R_G = 4.7Ω (Switching time is essentially independent of operating temperature)	$t_{d(on)}$	–	10	30	ns
Rise Time		t_r	–	50	80	
Turn-Off Delay Time		$t_{d(off)}$	–	25	80	
Fall Time		t_f	–	15	60	

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

PARAMETERS/TEST CONDITIONS		Symbol	Min.	Typ.	Max.	Units
Continuous Current	SMP20P10 SMP16P06	I_S	– –	– –	20 16	A
Pulsed Current[1]	SMP20P10 SMP16P06	I_{SM}	– –	– –	80 64	
Forward Voltage[2] I_F = I_S, V_{GS} = 0	SMP20P10 SMP16P06	V_{SD}	– –	– –	1.70 1.60	V
Reverse Recovery Time I_F = I_S, dI_F/dt = 100 A/µs		t_{rr}	–	150	–	ns
Reverse Recovered Charge I_F = I_S, dI_F/dt = 100 A/µs		Q_{rr}	–	0.3	–	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

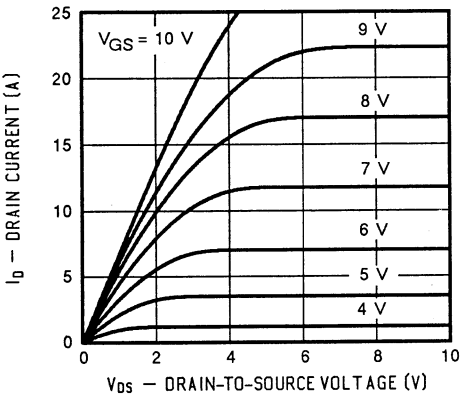


FIGURE 2: Typical Transfer Characteristics

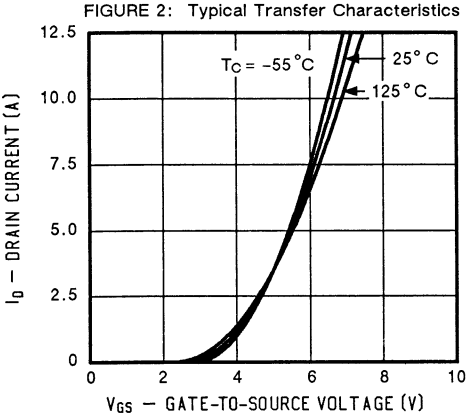


FIGURE 3: Typical Transconductance

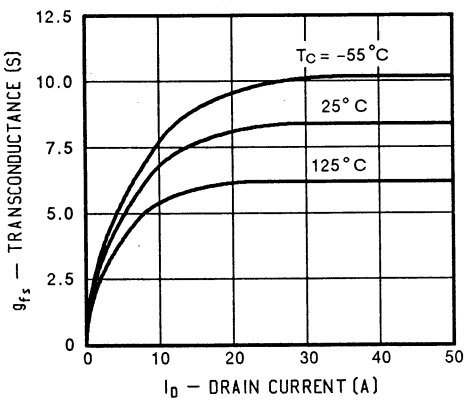


FIGURE 4: Typical On-Resistance

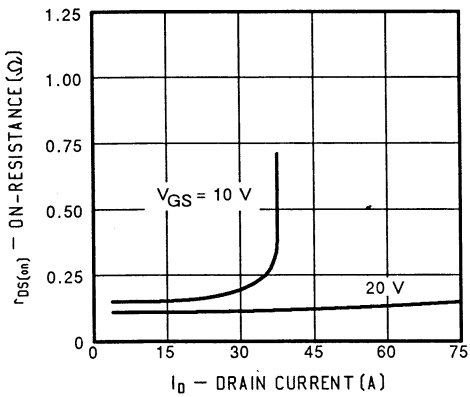


FIGURE 5: Typical Capacitance

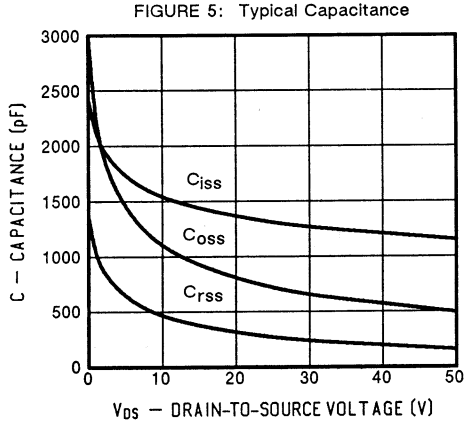
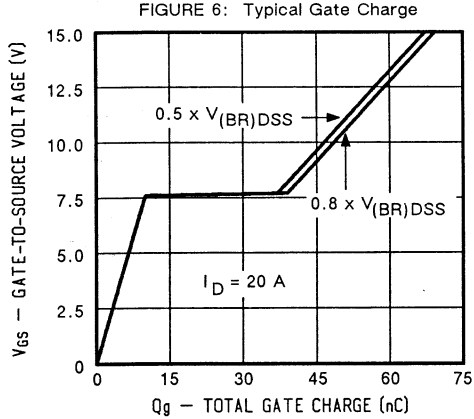


FIGURE 6: Typical Gate Charge



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PERFORMANCE CURVES (25°C Unless otherwise noted)

FIGURE 7: On-Resistance vs. Junction Temperature

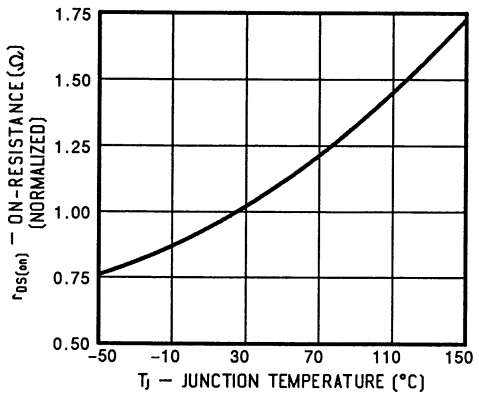


FIGURE 8: Typical Source-Drain Diode Forward Voltage

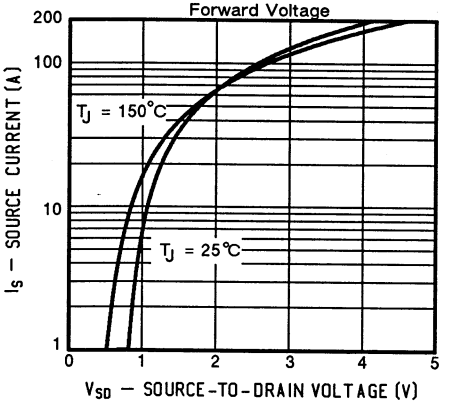


FIGURE 9: Maximum Avalanche and Drain Current vs. Case Temperature

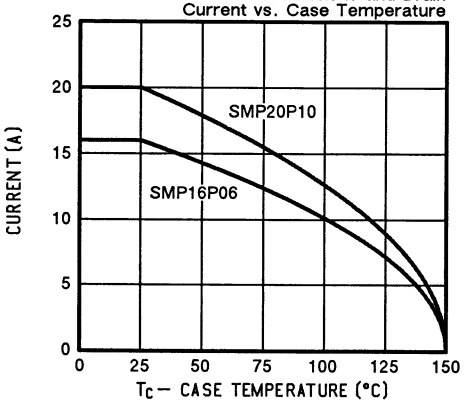
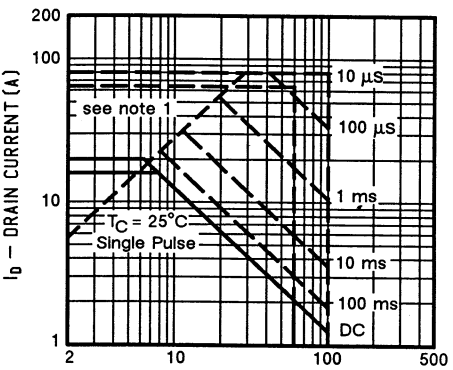
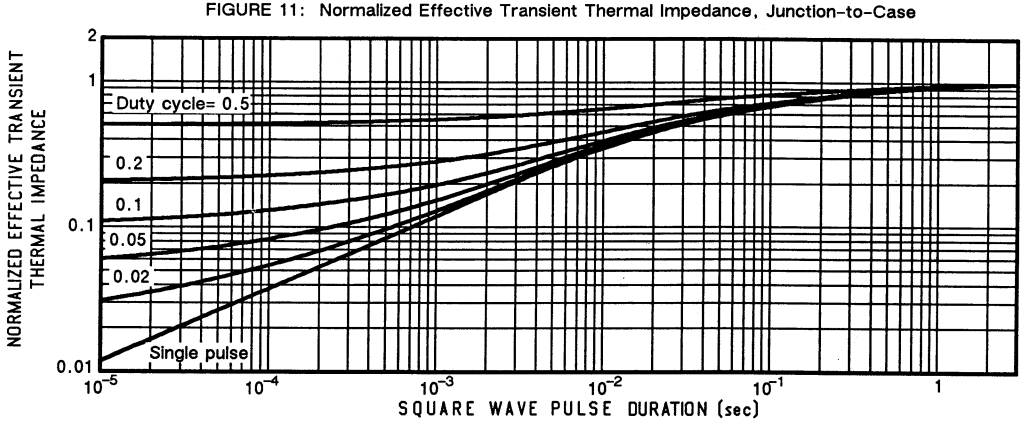


FIGURE 10: Safe Operating Area



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

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



Siliconix incorporated

MOSPOWER

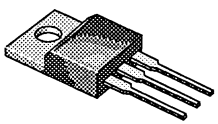
SMP25N06
SMP25N05

N-Channel Enhancement Mode Transistors

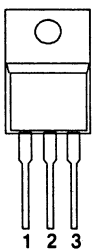
PRODUCT SUMMARY

PART NUMBER	$V_{(BR)DSS}$ (VOLTS)	$r_{DS(on)}$ (OHMS)	I_D (AMPS)
SMP25N06	60	0.060	25
SMP25N05	50	0.060	25

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
			25N06	25N05	
Drain-Source Voltage		V_{DS}	60	50	V
Gate-Source Voltage		V_{GS}	± 40	± 40	
Continuous Drain Current	T_C = 25°C	I_D	25	25	A
	T_C = 100°C		16	16	
Pulsed Drain Current[1]		I_{DM}	100	100	
Power Dissipation	T_C = 25°C	P_D	85	85	W
	T_C = 100°C		34	34	
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}	-	1.47	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)

4

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

PARAMETERS/TEST CONDITIONS		Symbol	Min.	Typ.	Max.	Units
Drain-Source Breakdown Voltage V_{GS} = 0, I_D = 250 µA	SMP25N06 SMP25N05	$V_{(BR)DSS}$	60 50	65 60	– –	V
Gate Threshold Voltage V_{DS} = V_{GS}, I_D = 1000 µA		$V_{GS(th)}$	2.0	3.3	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} = 5 V, V_{GS} = 10 V	SMP25N06 SMP25N05	$I_{D(on)}$	25 25	35 35	– –	A
Drain-Source On-State Resistance[2] V_{GS} = 10 V, I_D = 12.5 A	SMP25N06 SMP25N05	$r_{DS(on)}$	– –	0.05 0.05	0.060 0.060	Ω
Drain-Source On-State Resistance[2] V_{GS} = 10 V, I_D = 12.5 A, T_J = 125°C	SMP25N06 SMP25N05	$r_{DS(on)}$	– –	0.08 0.08	0.11 0.11	
Forward Transconductance[2] V_{DS} =15 V, I_D = 12.5 A		g_{fs}	5.0	9.0	–	S(℧)
Input Capacitance	V_{GS} = 0 V_{DS} = 25 V f = 1 MHz	C_{iss}	–	1020	1400	pF
Output Capacitance		C_{oss}	–	500	900	
Reverse Transfer Capacitance		C_{rss}	–	120	400	
Total Gate Charge	V_{DS} = 0.5 x $V_{(BR)DSS}$, V_{GS} = 10 V, I_D = 25 A (Gate charge is essentially independent of operating temperature)	Q_g	–	28	40	nC
Gate-Source Charge		Q_{gs}	–	8	–	
Gate-Drain Charge		Q_{gd}	–	15	–	
Turn-On Delay Time	V_{DD} = 30 V, R_L = 2.4 Ω I_D = 12.5 A, V_{GEN} = 10 V R_G = 4.7 Ω (Switching time is essentially independent of operating temperature)	$t_{d(on)}$	–	15	50	ns
Rise Time		t_r	–	20	75	
Turn-Off Delay Time		$t_{d(off)}$	–	25	50	
Fall Time		t_f	–	15	50	

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

PARAMETERS/TEST CONDITIONS		Symbol	Min.	Typ.	Max.	Units
Continuous Current	SMP25N06 SMP25N05	I_S	– –	– –	25 25	A
Pulsed Current[1]	SMP25N06 SMP25N05	I_{SM}	– –	– –	100 100	
Forward Voltage[2] I_F = I_S, V_{GS} = 0	SMP25N06 SMP25N05	V_{SD}	– –	1.25 1.25	2.4 2.4	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}	–	0.15	–	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

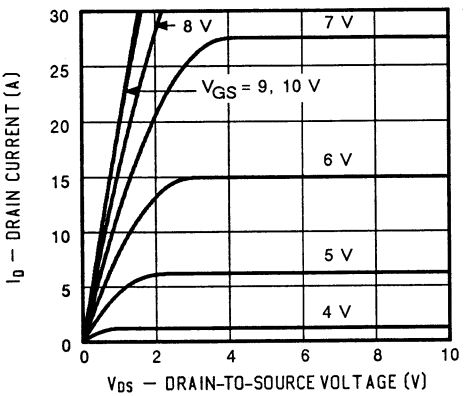


FIGURE 2: Typical Transfer Characteristics

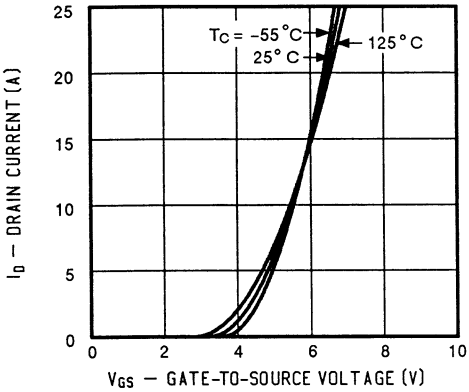


FIGURE 3: Typical Transconductance

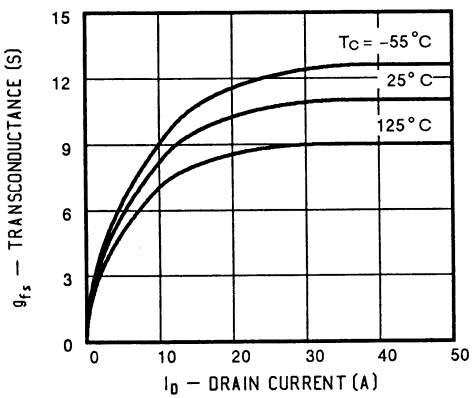


FIGURE 4: Typical On-Resistance

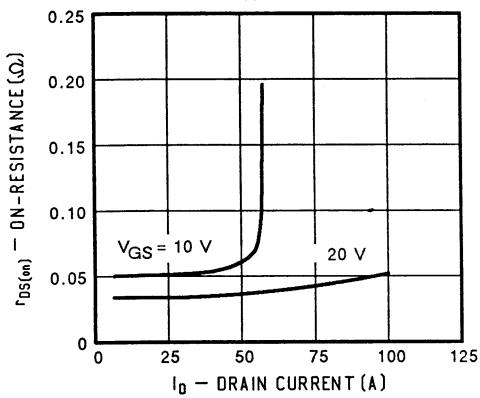


FIGURE 5: Typical Capacitance

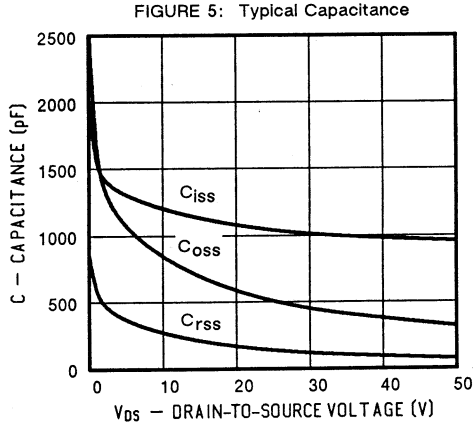
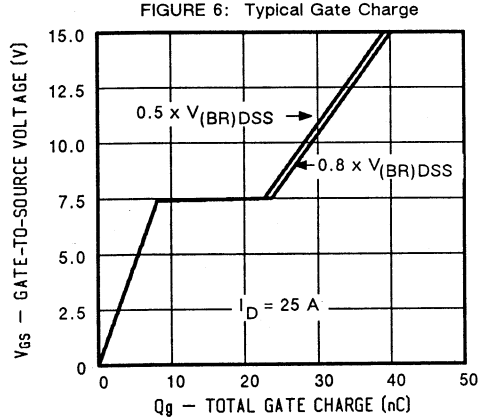


FIGURE 6: Typical Gate Charge



PERFORMANCE CURVES (25°C Unless otherwise noted)

FIGURE 7: On-Resistance vs. Junction Temperature

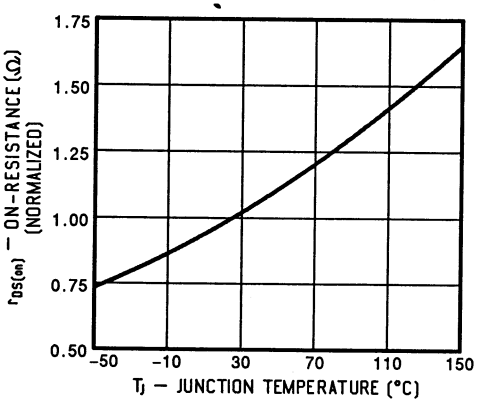


FIGURE 8: Typical Source-Drain Diode Forward Voltage

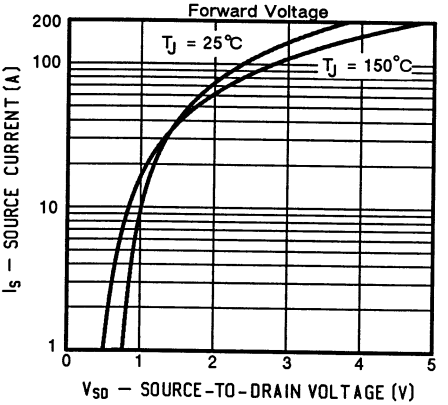


FIGURE 9: Maximum Drain Current vs. Case Temperature

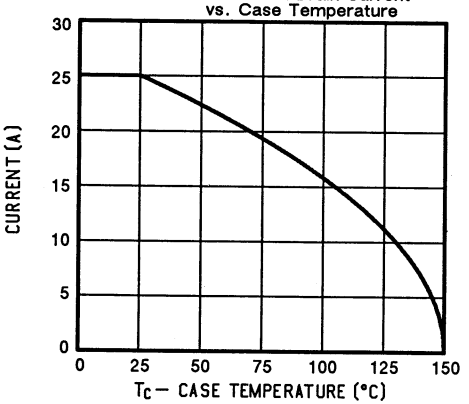
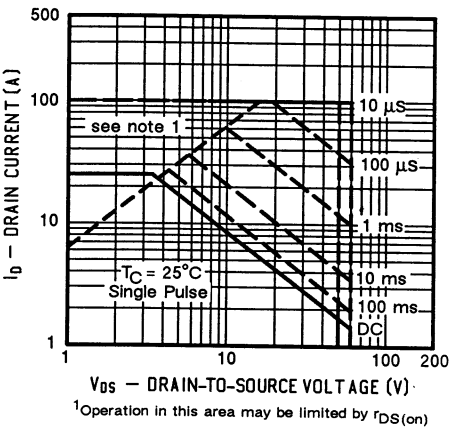
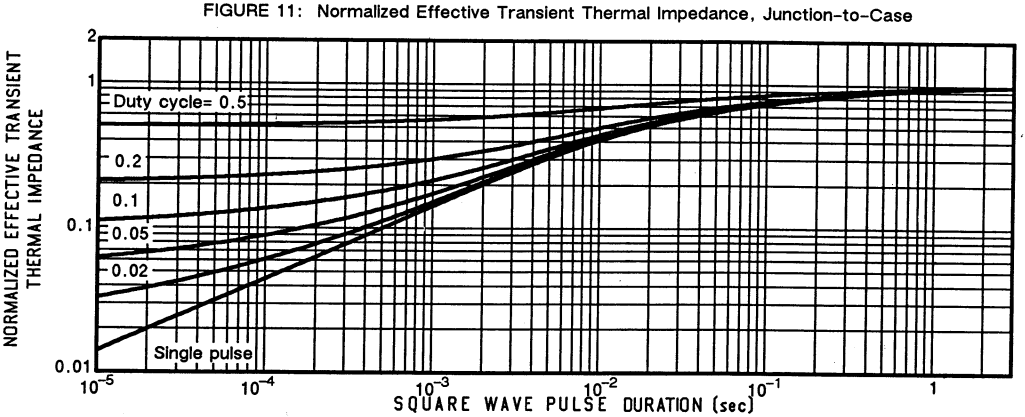


FIGURE 10: Safe Operating Area



[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

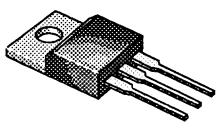
SMP60N06, 60N05
SMP50N06, 50N05

N-Channel Enhancement Mode Transistors

PRODUCT SUMMARY

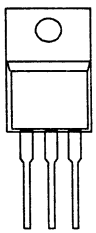
PART NUMBER	$V_{(BR)DSS}$ (VOLTS)	$r_{DS(on)}$ (OHMS)	I_D (AMPS)
SMP60N06	60	0.023	60
SMP60N05	50	0.023	60
SMP50N06	60	0.028	50
SMP50N05	50	0.028	50

TO-220AB



1 GATE
2 DRAIN
3 SOURCE

TOP VIEW



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

PARAMETERS/TEST CONDITIONS		Symbol	SMP				Units
			60N06	60N05	50N06	50N05	
Drain-Source Voltage		V_{DS}	60	50	60	50	V
Gate-Source Voltage		V_{GS}	± 40	± 40	± 40	±40	
Continuous Drain Current	T_C = 25°C	I_D	60	60	50	50	A
	T_C = 100°C		38	38	31	31	
Pulsed Drain Current[1]		I_{DM}	240	240	200	200	
Power Dissipation	T_C = 25°C	P_D	125	125	125	125	W
	T_C = 100°C		50	50	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)

4

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

PARAMETERS/TEST CONDITIONS		Symbol	Min.	Typ.	Max.	Units
Drain-Source Breakdown Voltage V_{GS} = 0, I_D = 250 µA	SMP60N06,50N06 SMP60N05,50N05	$V_{(BR)DSS}$	60 50	65 55	– –	V
Gate Threshold Voltage V_{DS} = V_{GS}, I_D = 1000 µA		$V_{GS(th)}$	2.0	–	4.0	
Gate-Body Leakage V_{DS} = 0, V_{GS} = ±20 V		I_{GSS}	–	10	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} = 25 V, V_{GS} = 10 V	SMP60N06,60N05 SMP50N06,50N05	$I_{D(on)}$	60 50	– –	– –	A
Drain-Source On-State Resistance[2] V_{GS} = 10 V, I_D = 30 A	SMP60N06,60N05 SMP50N06,50N05	$r_{DS(on)}$	– –	0.019 0.023	0.023 0.028	Ω
Drain-Source On-State Resistance[2] V_{GS} = 10 V, I_D = 30 A, T_J = 125°C	SMP60N06,60N05 SMP50N06,50N05	$r_{DS(on)}$	– –	0.025 0.030	0.030 0.036	
Forward Transconductance[2] V_{DS} =25 V, I_D = 30 A		g_{fs}	15	18	–	S(℧)
Input Capacitance	V_{GS} = 0 V_{DS} = 25 V f = 1 MHz	C_{iss}	–	2900	3500	pF
Output Capacitance		C_{oss}	–	1500	1600	
Reverse Transfer Capacitance		C_{rss}	–	500	600	
Total Gate Charge	V_{DS} = 0.5 x $V_{(BR)DSS}$ V_{GS} = 10 V, I_D = 60 A (Gate charge is essentially independent of operating temperature)	Q_g	–	65	75	nC
Gate-Source Charge		Q_{gs}	–	15	–	
Gate-Drain Charge		Q_{gd}	–	35	–	
Turn-On Delay Time	V_{DD} = 30 V, R_L = 1.0Ω I_D ≅ 30 A, V_{GEN} = 10 V R_G = 2.5Ω (Switching time is essentially independent of operating temperature)	$t_{d(on)}$	–	20	40	ns
Rise Time		t_r	–	25	50	
Turn-Off Delay Time		$t_{d(off)}$	–	30	60	
Fall Time		t_f	–	20	40	

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

PARAMETERS/TEST CONDITIONS		Symbol	Min.	Typ.	Max.	Units
Continuous Current	SMP60N06,60N05 SMP50N06,50N05	I_S	– –	– –	60 50	A
Pulsed Current[1]	SMP60N06,60N05 SMP50N06,50N05	I_{SM}	– –	– –	190 190	
Forward Voltage[2] I_F = I_S, V_{GS} = 0	SMP60N06,60N05 SMP50N06,50N05	V_{SD}	– –	– –	2.5 2.4	V
Reverse Recovery Time I_F = I_S, dI_F/dt = 100 A/µs		t_{rr}	–	75	100	ns
Reverse Recovered Charge I_F = I_S, dI_F/dt = 100 A/µs		Q_{rr}	–	0.19	–	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

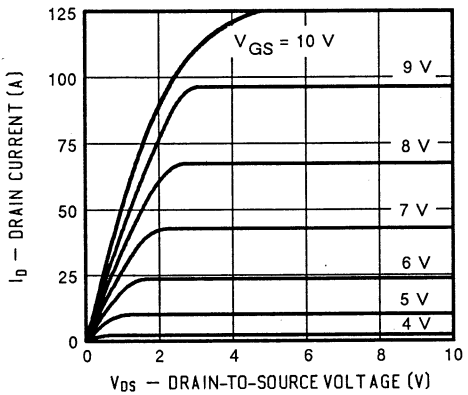


FIGURE 2: Typical Transfer Characteristics

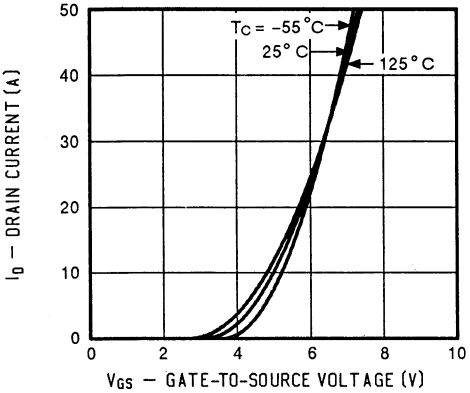


FIGURE 3: Typical Transconductance

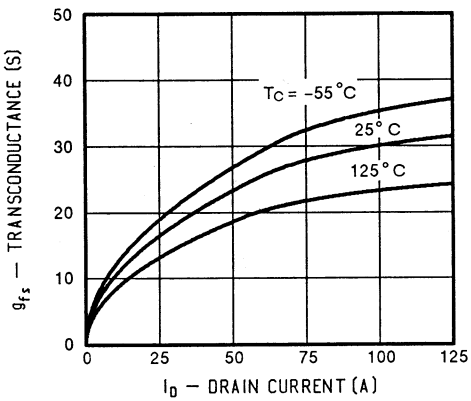


FIGURE 4: Typical On-Resistance

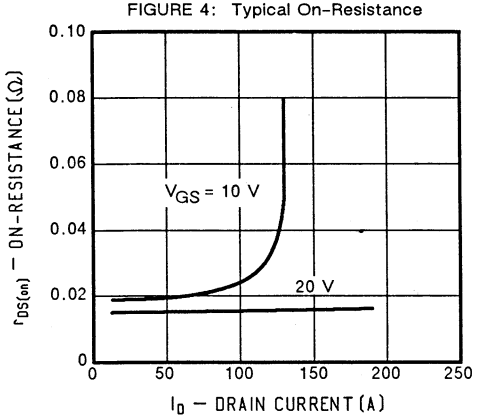


FIGURE 5: Typical Capacitance

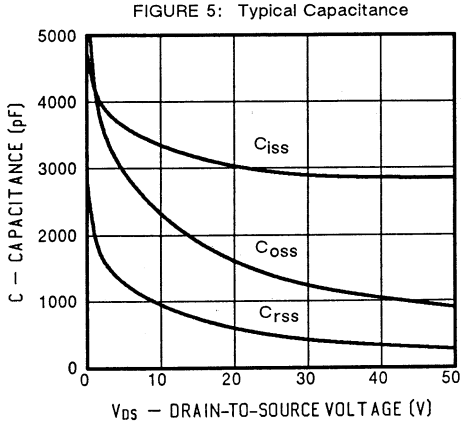
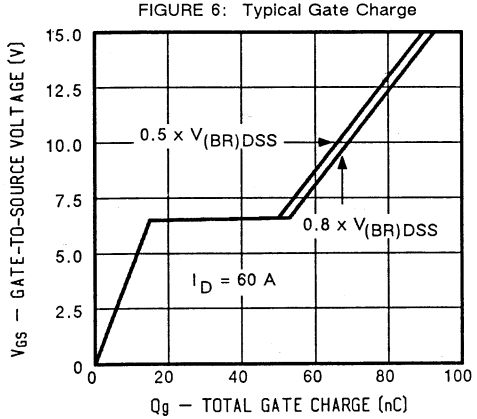


FIGURE 6: Typical Gate Charge



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Siliconix incorporated

PERFORMANCE CURVES (25°C Unless otherwise noted)

FIGURE 7: On-Resistance vs. Junction Temperature

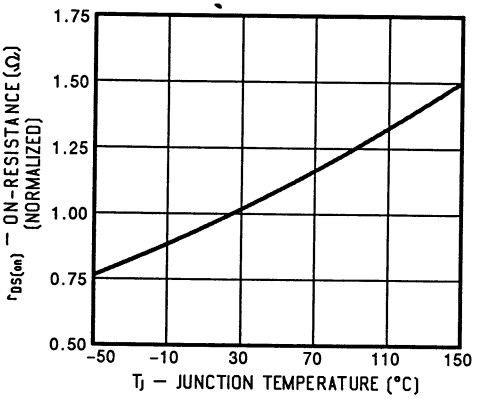


FIGURE 8: Typical Source-Drain Diode Forward Voltage

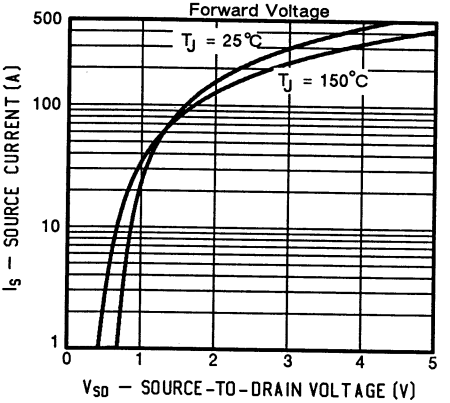


FIGURE 9: Maximum Drain Current vs. Case Temperature

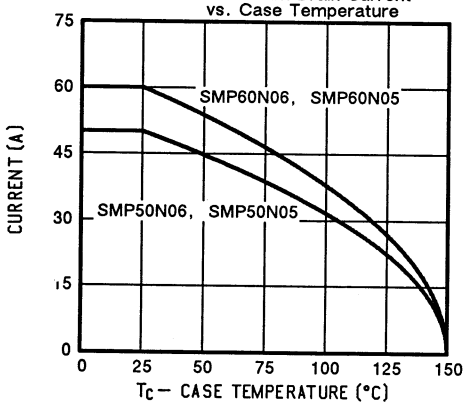
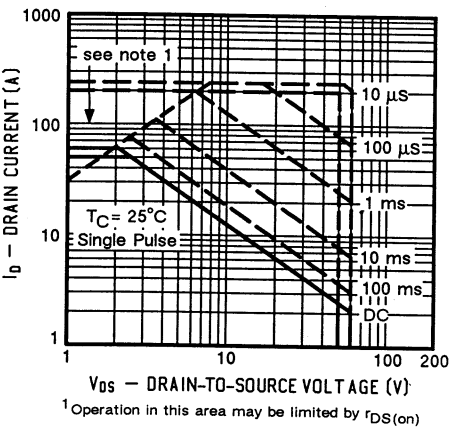


FIGURE 10: Safe Operating Area



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

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