National Semiconductor™

April 1995

NDS0605

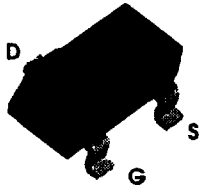
P-Channel Enhancement Mode Field Effect Transistor

General Description

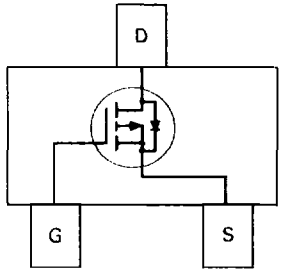
These P-Channel enhancement mode power field effect transistors are produced using National's proprietary, high cell density, DMOS technology. This very high density process has been designed to minimize on-state resistance, provide rugged and reliable performance and fast switching. They can be used, with a minimum of effort, in most applications requiring up to 0.18A DC and can deliver pulsed currents up to 1A. This product is particularly suited to low voltage applications requiring a low current high side switch.

Features

- -0.18A, -60V. $R_{DS(ON)}$ = 5Ω @ V_{GS} = -10V.
- Voltage controlled p-channel small signal switch.
- High density cell design for low $R_{DS(ON)}$.
- High saturation current.



SOT23
(TO-236AB)



Absolute Maximum Ratings

T_A = 25°C unless otherwise noted

Symbol	Parameter	NDS0605	Units
V_{DSS}	Drain-Source Voltage	-60	V
V_{DGR}	Drain-Gate Voltage ($R_{GS} \leq 1$ MΩ)	-60	V
V_{GSS}	Gate-Source Voltage - Continuous	±20	V
I_D	Drain Current - Continuous	-0.18	A
	- Pulsed	-1	
P_D	Maximum Power Dissipation T_A = 25°C	0.36	W
	Derate above 25°C	2.9	mW/°C
T_J,T_{STG}	Operating and Storage Temperature Range	-55 to 150	°C
T_L	Maximum lead temperature for soldering purposes, 1/16" from case for 10 seconds	300	°C
THERMAL CHARACTERISTICS			
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	350	°C/W

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
OFF CHARACTERISTICS						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = -10 µA	-60			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = -48 V, V_{GS} = 0 V			-1	µA
		T_J = 125°C			-500	µA
I_{GSSF}	Gate - Body Leakage, Forward	V_{GS} = 20 V, V_{DS} = 0 V			100	nA
I_{GSSR}	Gate - Body Leakage, Reverse	V_{GS} = -20 V, V_{DS} = 0 V			-100	nA
ON CHARACTERISTICS (Note 1)						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = -250 µA	-1		-3	V
		T_J = 125°C	-0.6		-2.8	
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} = -10 V, I_D = -0.5 A			5	Ω
		T_J = 125°C			10	
		V_{GS} = -4.5 V, I_D = -0.25 A			7.5	
		T_J = 125°C			15	
$I_{D(on)}$	On-State Drain Current	V_{GS} = -10 V, V_{DS} = -10 V	-0.6			A
		V_{GS} = -4.5 V, V_{DS} = -10 V	-0.25			
g_{FS}	Forward Transconductance	V_{DS} = -10 V, I_D = -0.2 A	0.07			S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = -25 V, V_{GS} = 0 V, f = 1.0 MHz			60	pF
C_{oss}	Output Capacitance				25	pF
C_{rss}	Reverse Transfer Capacitance				5	pF
SWITCHING CHARACTERISTICS (Note 1)						
$t_{D(on)}$	Turn - On Delay Time	V_{DD} = -30 V, I_D = -0.2 A, V_{GS} = -10 V, R_{GEN} = 25 Ω			10	nS
t_r	Turn - On Rise Time				15	nS
$t_{D(off)}$	Turn - Off Delay Time				15	nS
t_f	Turn - Off Fall Time				20	nS
DRAIN-SOURCE DIODE CHARACTERISTICS						
I_S	Continuous Source Diode Current				-0.18	A
I_{SM}	Maximum Pulsed Source Diode Current (Note 1)				-1	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = -0.5 A (Note 1)			-1.5	V
		T_J = 125°C			-1.3	

Note :
1. Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%.

Typical Electrical Characteristics

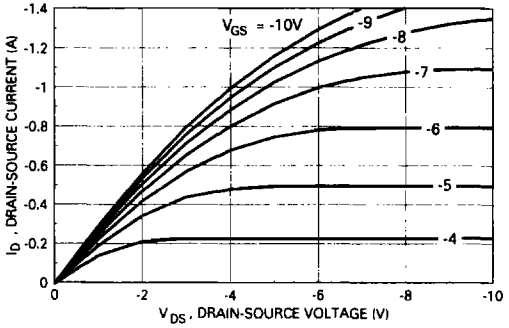


Figure 1. On-Region Characteristics

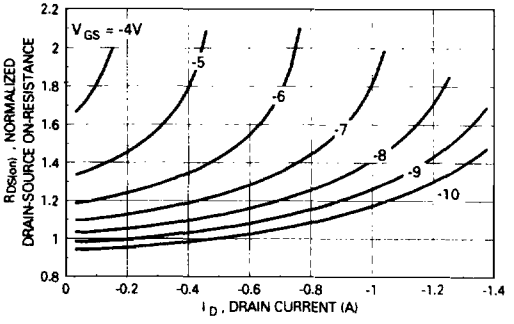


Figure 2. On-Resistance Variation with Gate Voltage and Drain Current

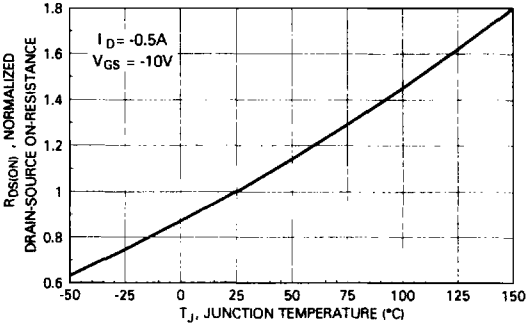


Figure 3. On-Resistance Variation with Temperature

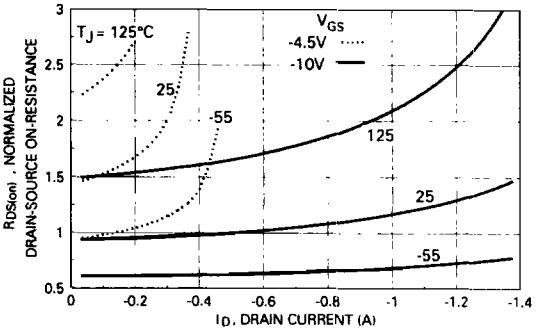


Figure 4. On-Resistance Variation with Drain Current and Temperature

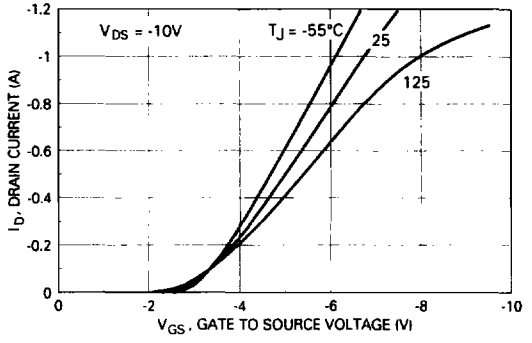


Figure 5. Transfer Characteristics

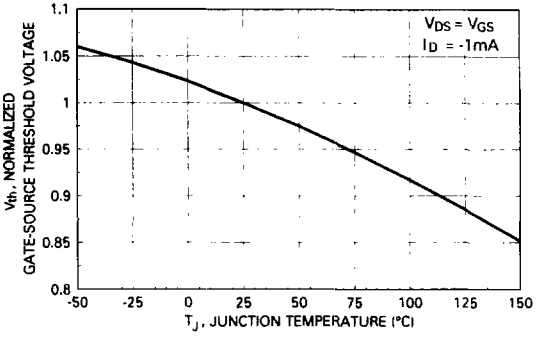


Figure 6. Gate Threshold Variation with Temperature

Typical Electrical Characteristics (continued)

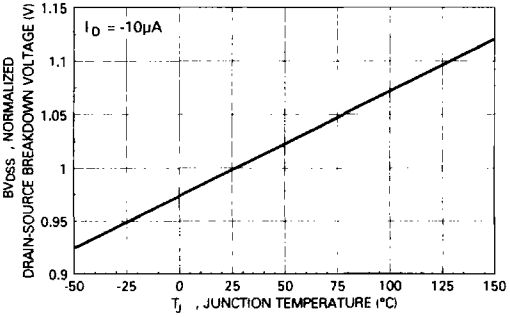


Figure 7. Breakdown Voltage Variation with Temperature

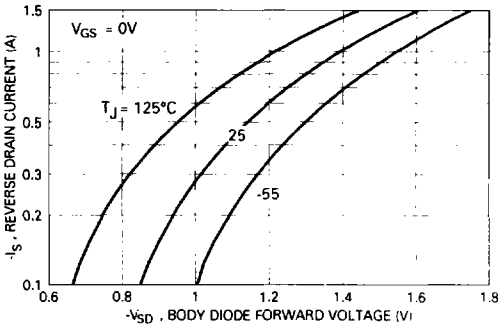


Figure 8. Body Diode Forward Voltage Variation with Current and Temperature

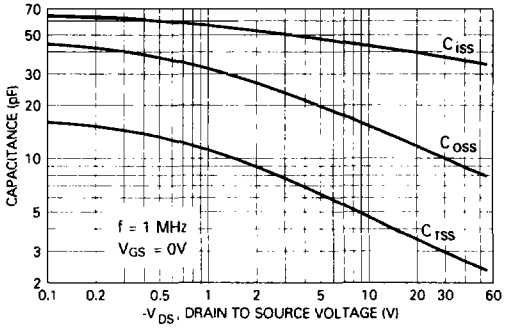


Figure 9. Capacitance Characteristics

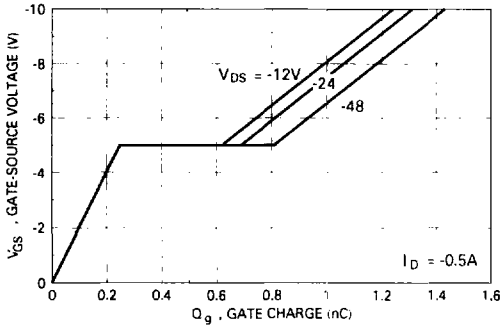


Figure 10. Gate Charge Characteristics

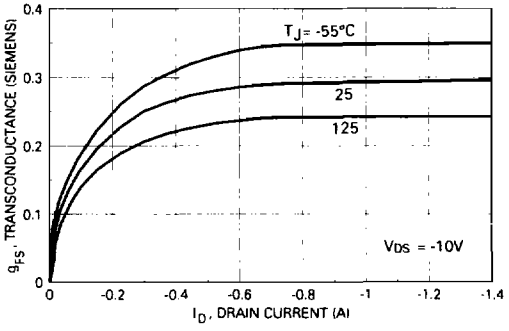


Figure 11. Transconductance Variation with Drain Current and Temperature

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Typical Electrical Characteristics (continued)

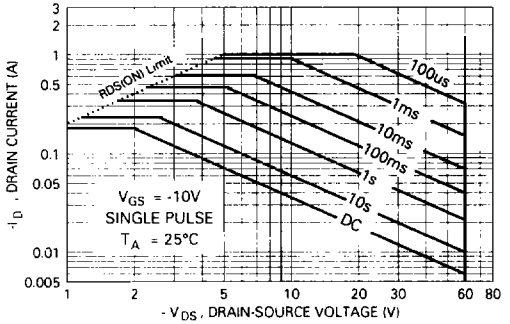

Figure 12. Maximum Safe Operating Area

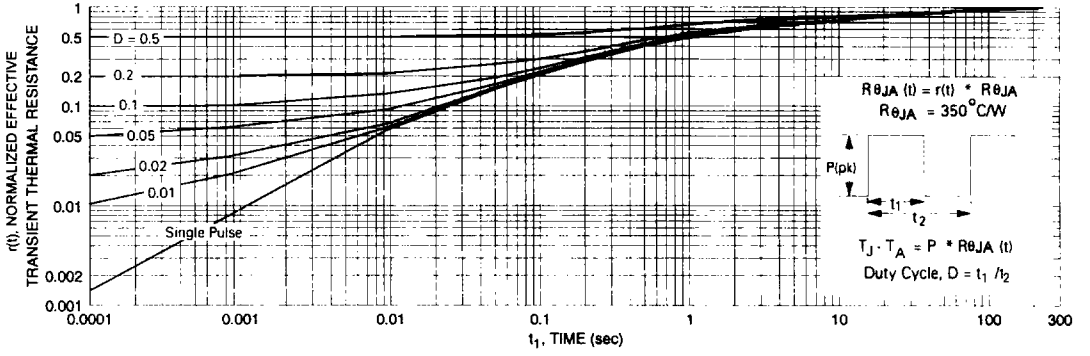

Figure 13. Transient Thermal Response Curve.