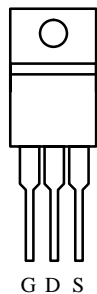# N-Channel Enhancement-Mode Transistors

Product Summary

$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ (Ω)	I_D (A)
60	0.014	70[a]

175° C Rated
Maximum Junction Temperature

TO-220AB

G D S

Top View

SUP70N06-14

DRAIN connected to TAB

TO-263
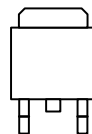
G D S
Top View

SUB70N06-14
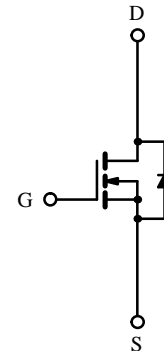
N-Channel MOSFET

Absolute Maximum Ratings (T_C = 25°C Unless Otherwise Noted)

Parameter		Symbol	Limit	Unit
Gate-Source Voltage		V_{GS}	± 20	V
Continuous Drain Current (T_J = 175°C)	T_C = 25°C	I_D	70[a]	A
	T_C = 100°C		49	
Pulsed Drain Current		I_{DM}	160	
Avalanche Current		I_{AR}	70	
Repetitive Avalanche Energy[b]	L = 0.1 mH	E_{AR}	180	mJ
Power Dissipation	T_C = 25°C (TO-220AB and TO-263)	P_D	142[c]	W
	T_A = 25°C (TO-263)[d]		3.7	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	−55 to 175	°C

Thermal Resistance Ratings

Parameter		Symbol	Limit	Unit
Junction-to-Ambient	PCB Mount (TO-263)[d]	R_{thJA}	40	°C/W
	Free Air (TO-220AB)		62.5	
Junction-to-Case		R_{thJC}	1.05	

Notes:
a. Package limited.
b. Duty cycle $\leq$ 1%.
c. See SOA curve for voltage derating.
d. When mounted on 1" square PCB (FR-4 material).

Subsequent updates to this data sheet may be obtained via facsimile by calling Siliconix FaxBack, 1-408-970-5600. Please request FaxBack document # 1487. A SPICE Model data sheet is available for this product (FaxBack document #5133).
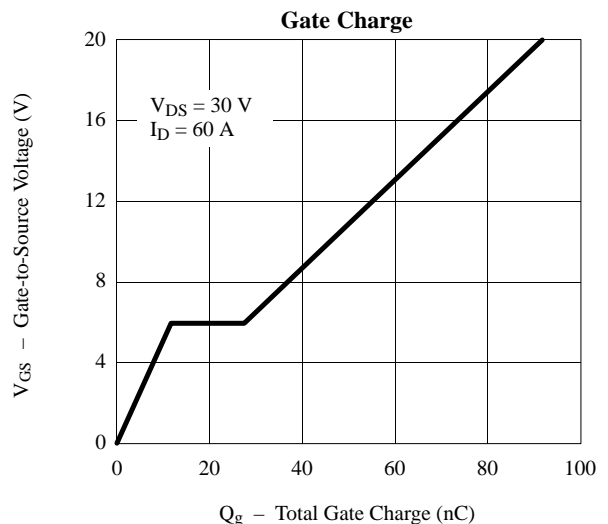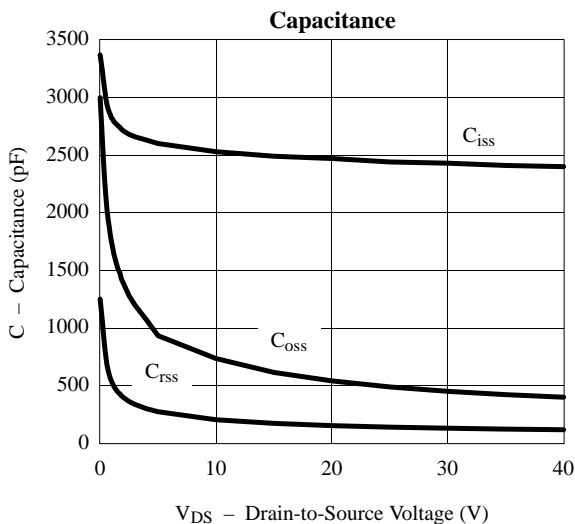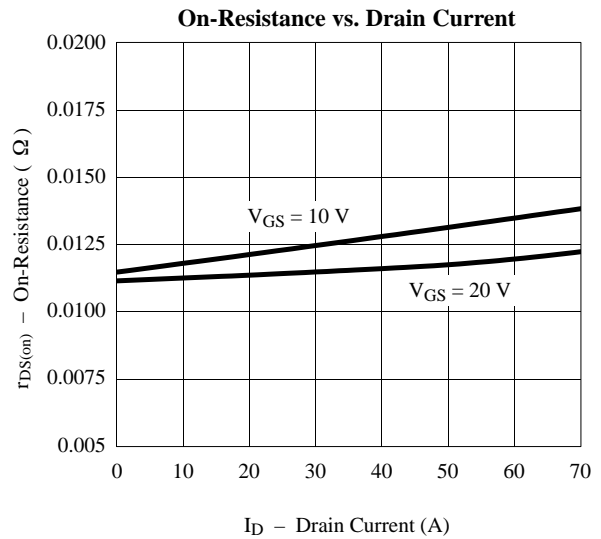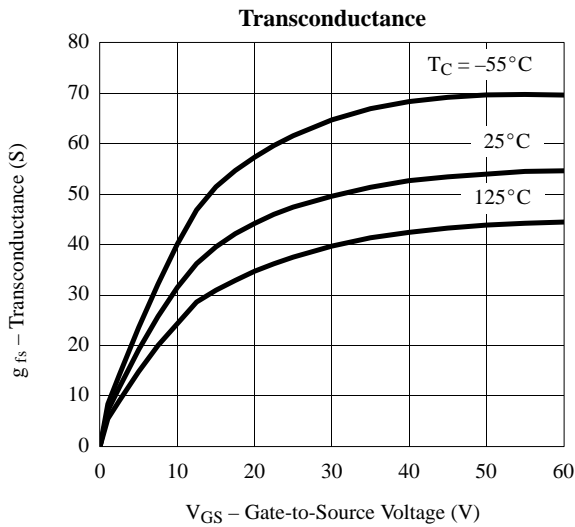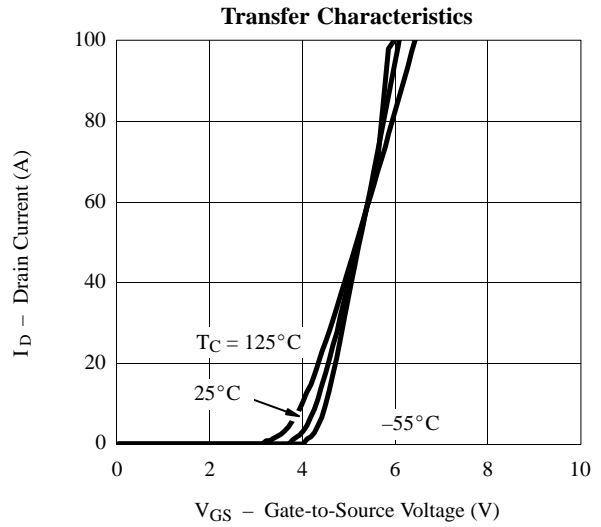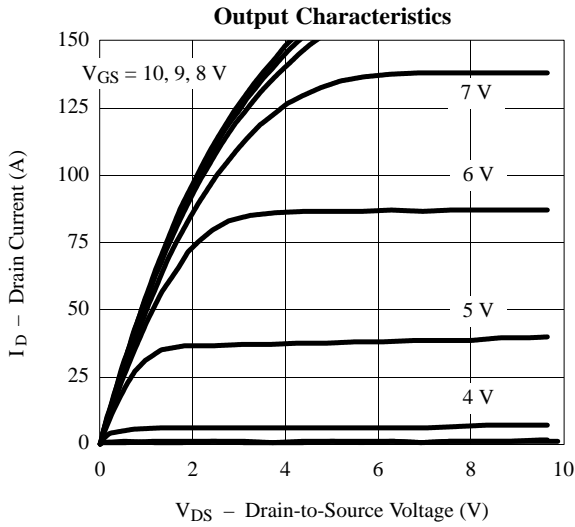
Specifications (T_J = 25°C Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 250 µA	60			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_{DS} = 1 mA	2.0	3.0	4.0	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 60 V, V_{GS} = 0 V			1	µA
		V_{DS} = 60 V, V_{GS} = 0 V, T_J = 125°C			50	
		V_{DS} = 60 V, V_{GS} = 0 V, T_J = 175°C			150	
On-State Drain Current[b]	$I_{D(on)}$	V_{DS} = 5 V, V_{GS} = 10 V	70			A
Drain-Source On-State Resistance[b]	$r_{DS(on)}$	V_{GS} = 10 V, I_D = 30 A			0.014	Ω
		V_{GS} = 10 V, I_D = 30 A, T_J = 125°C			0.023	
		V_{GS} = 10 V, I_D = 30 A, T_J = 175°C			0.028	
Forward Transconductance[b]	g_{fs}	V_{DS} = 15 V, I_D = 30 A	25	50		S
Dynamic[a]						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz		2400		pF
Output Capacitance	C_{oss}			490		
Reversen Transfer Capacitance	C_{rss}			130		
Total Gate Charge[c]	Q_g	V_{DS} = 30 V, V_{GS} = 10 V, I_D = 60 A		45	70	nC
Gate-Source Charge[c]	Q_{gs}			12		
Gate-Drain Charge[c]	Q_{gd}			16		
Turn-On Delay Time[c]	$t_{d(on)}$	V_{DD} = 30 V, R_L = 0.47 Ω		13	30	ns
Rise Time[c]	t_r	I_D ≃ 60 A, V_{GEN} = 10 V, R_G = 2.5 Ω		11	30	
Turn-Off Delay Time[c]	$t_{d(off)}$			30	60	
Fall Time[c]	t_f			11	25	
Source-Drain Diode Ratings and Characteristics (T_C = 25°C)[a]						
Continuous Current	I_s				70	A
Pulsed Current	I_{SM}				160	
Forward Voltage[b]	V_{SD}	I_F = 70 A, V_{GS} = 0 V			1.4	V
Reverse Recovery Time	t_{rr}	I_F = 60 A, di/dt = 100 A/µs		47		ns
Peak Reverse Recovery Current	$I_{RM(REC)}$			3.5		A
Reverse Recovery Charge	Q_{rr}			0.08		µC

Notes:
a. Guaranteed by design, not subject to production testing.
b. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2%.
c. Independent of operating temperature.

Typical Characteristics (25°C Unless Otherwise Noted)

Output Characteristics

V_{GS} = 10, 9, 8 V

7 V

6 V

5 V

4 V

I_D – Drain Current (A)

V_{DS} – Drain-to-Source Voltage (V)

Transfer Characteristics

T_C = 125°C

25°C

–55°C

I_D – Drain Current (A)

V_{GS} – Gate-to-Source Voltage (V)

Transconductance

T_C = –55°C

25°C

125°C

g_{fs} – Transconductance (S)

V_{GS} – Gate-to-Source Voltage (V)

On-Resistance vs. Drain Current

V_{GS} = 10 V

V_{GS} = 20 V

$r_{DS(on)}$ – On-Resistance (Ω)

I_D – Drain Current (A)

Capacitance

C_{iss}

C_{oss}

C_{rss}

C – Capacitance (pF)

V_{DS} – Drain-to-Source Voltage (V)

Gate Charge

V_{DS} = 30 V
I_D = 60 A

V_{GS} – Gate-to-Source Voltage (V)

Q_g – Total Gate Charge (nC)

Typical Characteristics (25°C Unless Otherwise Noted)

On-Resistance vs. Junction Temperature

$V_{GS} = 10$ V
$I_D = 30$ A

y-axis: $r_{DS(on)}$ – On-Resistance (Ω) (Normalized)
x-axis: T_J – Junction Temperature (°C)

Source-Drain Diode Forward Voltage

$T_C = 150°C$
$T_C = 25°C$

y-axis: I_S – Source Current (A)
x-axis: V_{SD} – Source-to-Drain Voltage (V)

Thermal Ratings

Maximum Avalanche and Drain Current vs. Case Temperature

y-axis: I_D – Drain Current (A)
x-axis: T_C – Case Temperature (°C)

Safe Operating Area

Limited by $r_{DS(on)}$

100 ms
1 ms
10 ms
100 ms,
1 s, dc

$T_C = 25°C$
Single Pulse

y-axis: I_D – Drain Current (A)
x-axis: V_{DS} – Drain-to-Source Voltage (V)

Normalized Thermal Transient Impedance, Junction-to-Case

Duty Cycle = 0.5
0.2
0.1
0.05
0.02
Single Pulse

y-axis: Normalized Effective Transient Thermal Impedance
x-axis: Square Wave Pulse Duration (sec)