N-Channel 30-V (D-S) 175°C MOSFET

PRODUCT SUMMARY

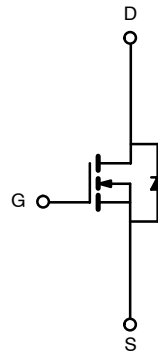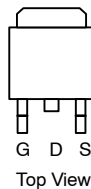| $V_{(BR)DSS}$ (V)	$r_{DS(on)}$ (Ω)	I_D (A)
30	0.006 @ V_{GS} = 10 V	85
	0.009 @ V_{GS} = 4.5 V	77

FEATURES

- TrenchFET® Power MOSFET
- 175°C Junction Temperature
- PWM Optimized for High Efficiency
- New Package with Low Thermal Resistance
- 100% R_g Tested

APPLICATIONS

- Buck Converter
  - High Side
  - Low Side
- Synchronous Rectifier
  - Secondary Rectifier

TO-263

G D S

Top View

Ordering Information: SUM85N03-06P
SUM85N03-06P-E3 (Lead Free)

N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C UNLESS OTHERWISE NOTED)

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	30	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current (T_J = 175°C)	T_C = 25°C	I_D	85	A
	T_C = 100°C		67	
Pulsed Drain Current		I_{DM}	200	
Avalanche Current		I_{AR}	45	
Repetitive Avalanche Energy[a]	L = 0.1 mH	E_{AR}	101	mJ
Maximum Power Dissipation[a]	T_C = 25°C	P_D	100[b]	W
	T_A = 25°C[c]		3.75	
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[c]	R_{thJA}	40	°C/W
	Free Air		62.5	
Junction-to-Case		R_{thJC}	1.5	

Notes
a. Duty cycle ≤ 1%.
b. See SOA curve for voltage derating.
c. When mounted on 1" square PCB (FR-4 material).

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SPECIFICATIONS ($T_J = 25°C$ UNLESS OTHERWISE NOTED)

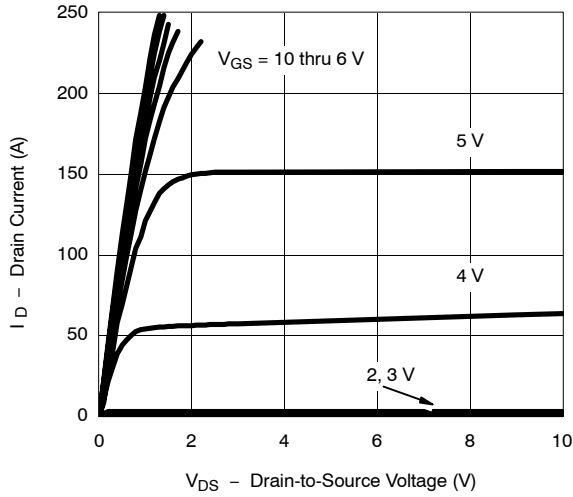| Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{DS} = 0$ V, $I_D = 250$ μA	30			V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250$ μA	1		3.0	
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0$ V, $V_{GS} = \pm 20$ V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 30$ V, $V_{GS} = 0$ V			1	μA
		$V_{DS} = 30$ V, $V_{GS} = 0$ V, $T_J = 125°C$			50	
		$V_{DS} = 30$ V, $V_{GS} = 0$ V, $T_J = 175°C$			250	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \geq 5$ V, $V_{GS} = 10$ V	120			A
Drain-Source On-State Resistance[a]	$r_{DS(on)}$	$V_{GS} = 10$ V, $I_D = 20$ A		0.0045	0.006	Ω
		$V_{GS} = 10$ V, $I_D = 20$ A, $T_J = 125°C$			0.0085	
		$V_{GS} = 10$ V, $I_D = 20$ A, $T_J = 175°C$			0.011	
		$V_{GS} = 4.5$ V, $I_D = 20$ A		0.0072	0.009	
Forward Transconductance[a]	g_{fs}	$V_{DS} = 15$ V, $I_D = 20$ A	20			S
Dynamic[b]						
Input Capacitance	C_{iss}	$V_{GS} = 0$ V, $V_{DS} = 25$ V, f = 1 MHz		3100		pF
Output Capacitance	C_{oss}			565		
Reverse Transfer Capacitance	C_{rss}			255		
Gate-Resistance	R_g		0.5	1.9	3.1	Ω
Total Gate Charge[b]	Q_g	$V_{DS} = 15$ V, $V_{GS} = 10$ V, $I_D = 50$ A		48	65	nC
Gate-Source Charge[b]	Q_{gs}			10		
Gate-Drain Charge[b]	Q_{gd}			7.5		
Turn-On Delay Time[b]	$t_{d(on)}$	$V_{DD} = 15$ V, $R_L = 0.3$ Ω, $I_D \cong 50$ A, $V_{GEN} = 10$ V, $R_g = 2.5$ Ω		12	20	ns
Rise Time[b]	t_r			12	20	
Turn-Off Delay Time[b]	$t_{d(off)}$			30	45	
Fall Time[b]	t_f			10	15	
Source-Drain Diode Ratings and Characteristics ($T_C = 25°C$)[c]						
Continuous Current	I_S				100	A
Pulsed Current	I_{SM}				200	
Forward Voltage[a]	V_{SD}	$I_F = 30$ A, $V_{GS} = 0$ V		1.2	1.5	V
Reverse Recovery Time	t_{rr}	$I_F = 50$ A, di/dt = 100 A/μs		35	70	ns

Notes
a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%.
b. Independent of operating temperature.
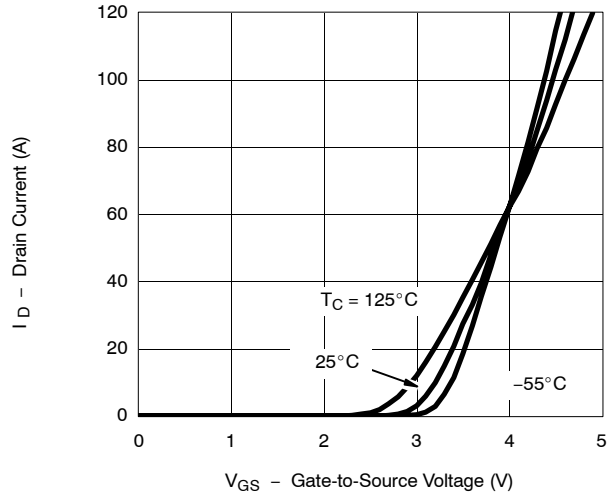c. Guaranteed by design, not subject to production testing.
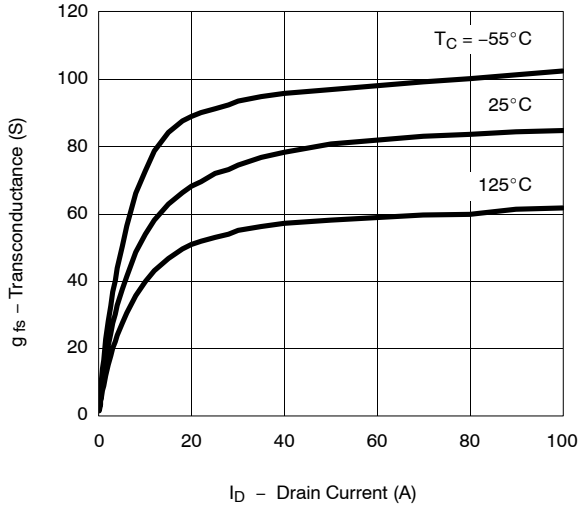
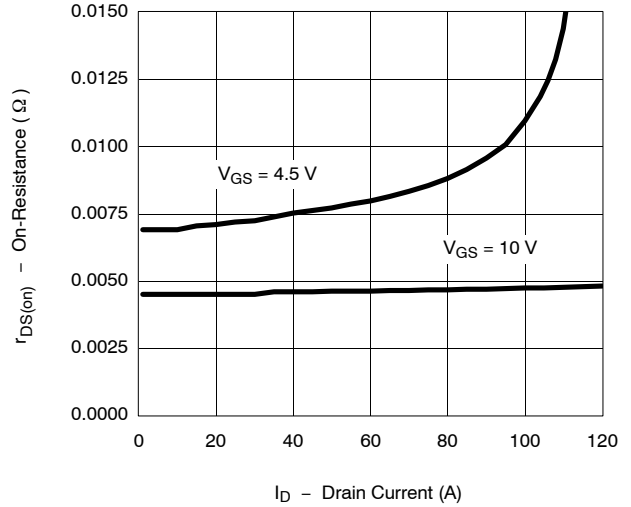## TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

Output Characteristics

V_{GS} = 10 thru 6 V

5 V

4 V

2, 3 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)

I_D – Drain Current (A)

On-Resistance vs. Drain Current

V_{GS} = 4.5 V

V_{GS} = 10 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} = 15 V
I_D = 50 A

V_{GS} – Gate-to-Source Voltage (V)

Q_g – Total Gate Charge (nC)

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TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

On-Resistance vs. Junction Temperature

Source-Drain Diode Forward Voltage

Drain-Source Voltage Breakdown vs. Junction Temperature

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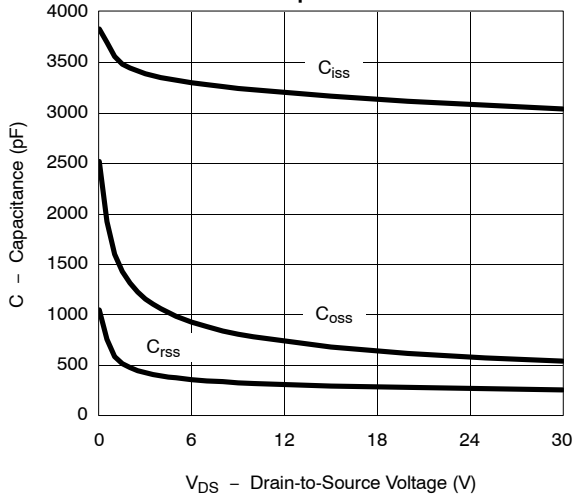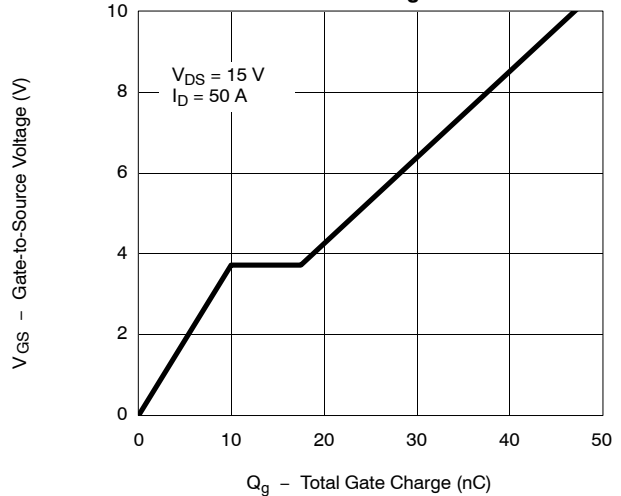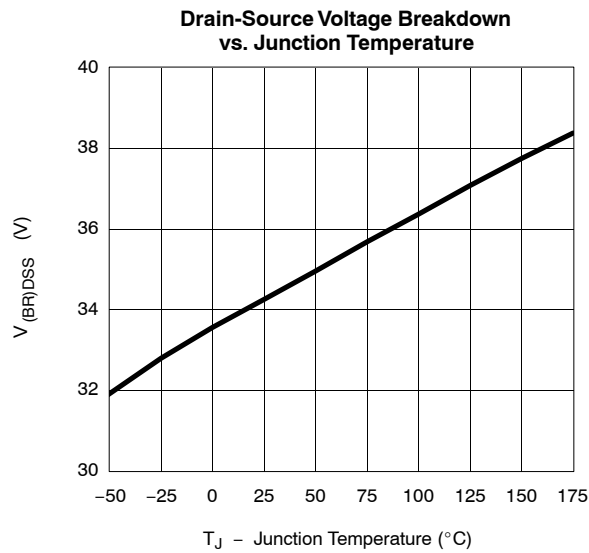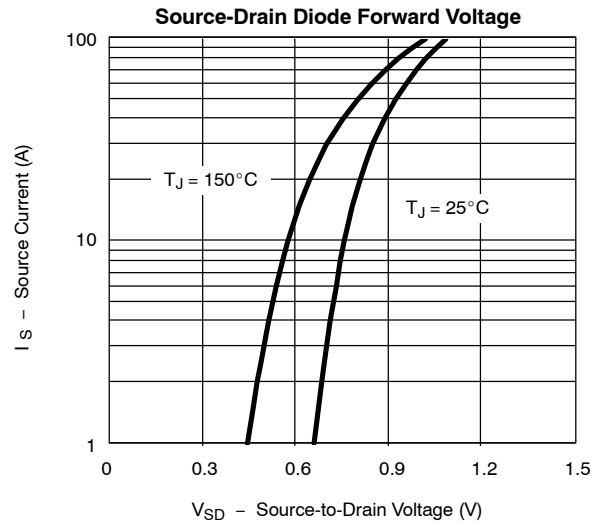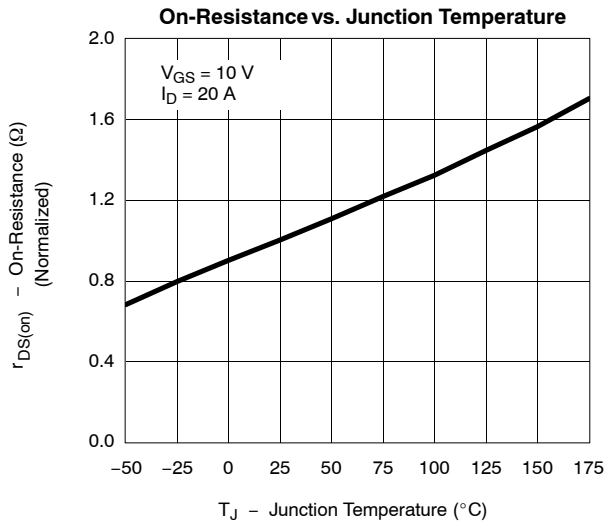
THERMAL RATINGS

**Maximum Avalanche Drain Current
vs. Case Temperature**

I_D – Drain Current (A)

T_C – Case Temperature (°C)
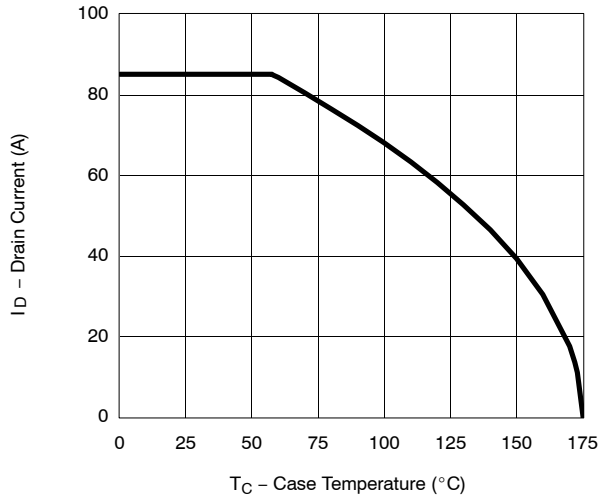
Safe Operating Area, Junction-to-Case

I_D – Drain Current (A)

V_{DS} – Drain-to-Source Voltage (V)

10 μs
100 μs
1 ms
10 ms
100 ms
dc

Limited
by $r_{DS(on)}$

$T_C = 25°C$
Single Pulse
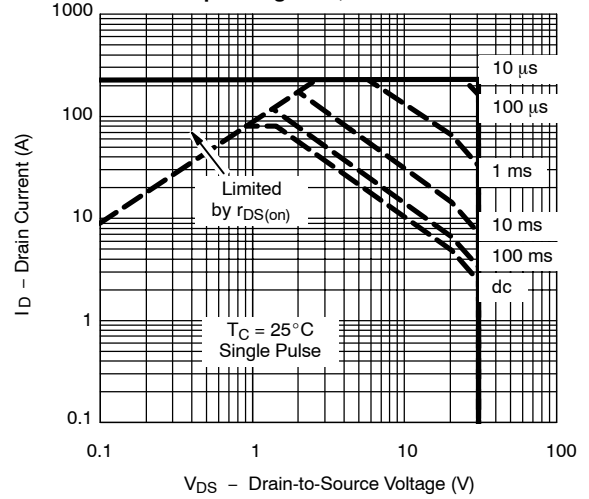
Normalized Thermal Transient Impedance, Junction-to-Case

Normalized Effective Transient
Thermal Impedance

Square Wave Pulse Duration (sec)

Duty Cycle = 0.5
0.2
0.1
0.05
0.02
Single Pulse
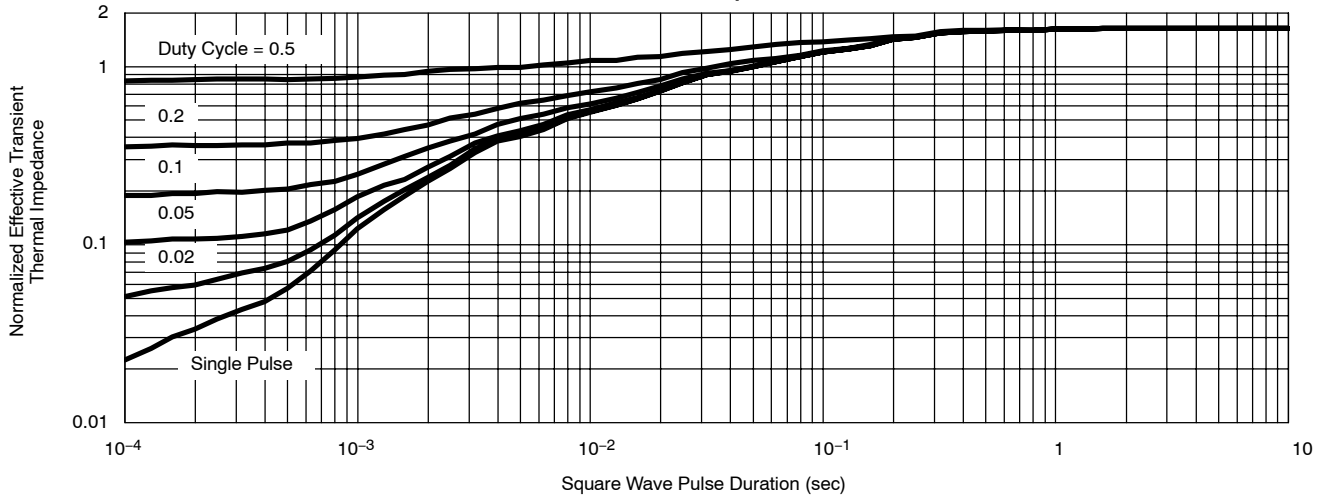
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