

N-Channel 30-V (D-S) MOSFET with Sense Terminal

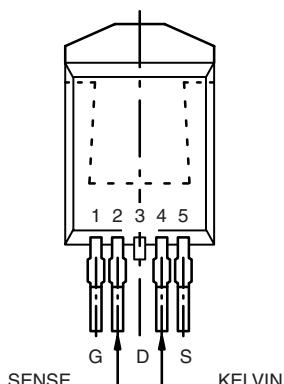
PRODUCT SUMMARY		
$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ (Ω)	I_D (A)
30	0.013 at $V_{GS} = 10$ V	50 ^a
	0.017 at $V_{GS} = 4.5$ V	48 ^a

FEATURES

- TrenchFET® Power MOSFET Plus Current Sensing Diode
- Low Thermal Resistance Package



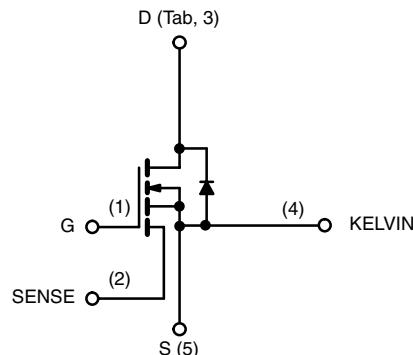
D²PAK-5



Ordering Information: SUM50N03-13LC-E3 (Lead (Pb)-free)

APPLICATIONS

- Industrial



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS $T_C = 25$ °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)	I_D	50 ^a	A
		32 ^a	
Pulsed Drain Current	I_{DM}	100	
Avalanche Current	I_{AR}	25	
Repetitive Avalanche Energy ^b	E_{AR}	31	mJ
Maximum Power Dissipation ^b	P_D	83 ^c	W
		2.7 ^d	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 175	°C

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Limit	Unit
Junction-to-Ambient	R_{thJA}	55	°C/W
Junction-to-Case	R_{thJC}	1.8	

Notes:

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

* Pb containing terminations are not RoHS compliant, exemptions may apply.

SUM50N03-13LC

Vishay Siliconix



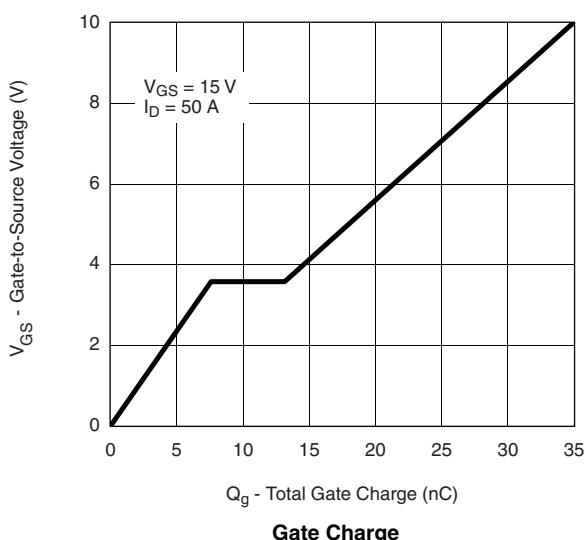
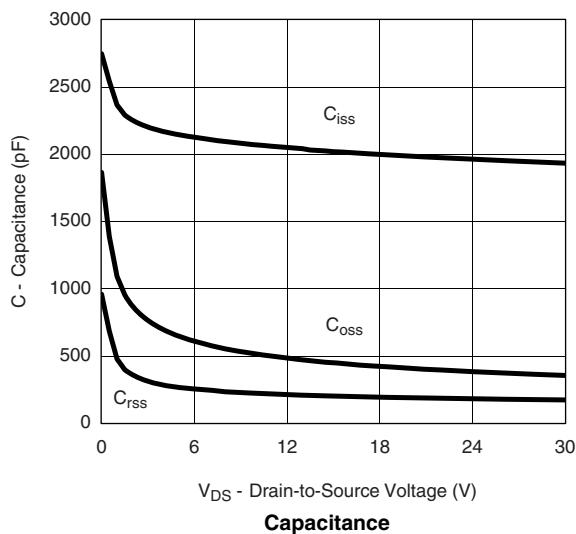
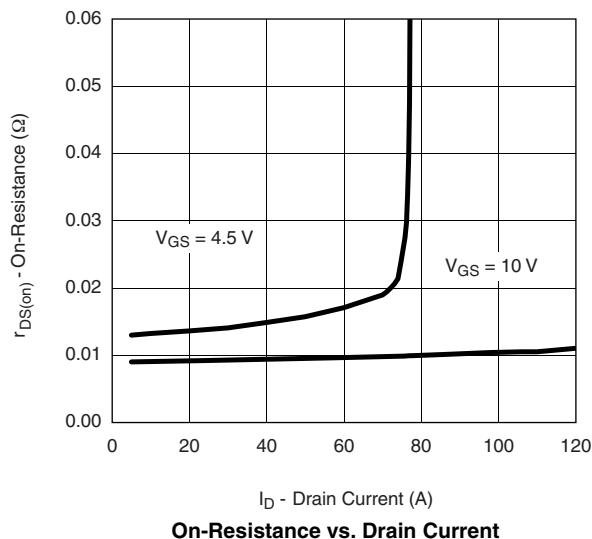
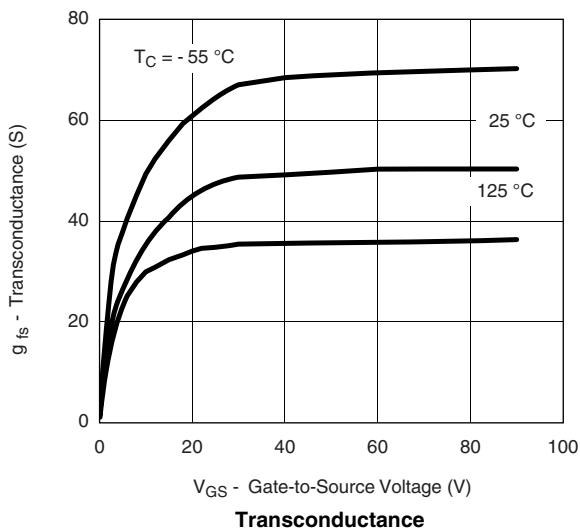
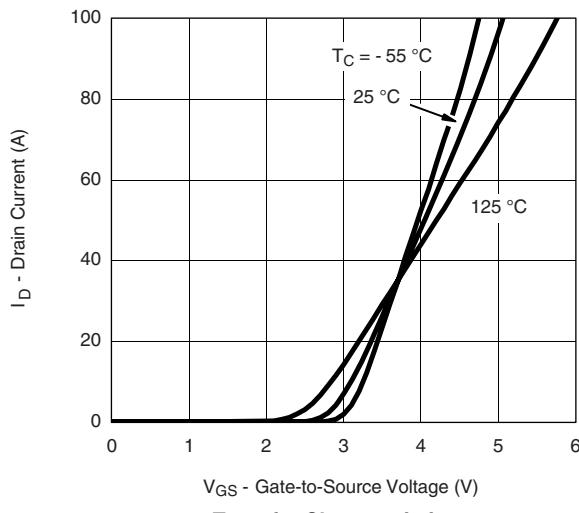
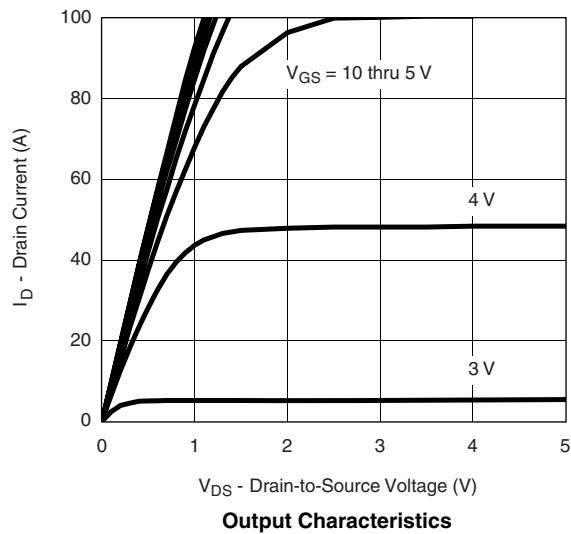
MOSFET SPECIFICATIONS $T_J = 25^\circ\text{C}$, unless otherwise noted

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(\text{BR})\text{DSS}}$	$V_{\text{GS}} = 0 \text{ V}, I_D = 250 \mu\text{A}$	30			V
Gate-Threshold Voltage	$V_{\text{GS}(\text{th})}$	$V_{\text{DS}} = V_{\text{GS}}, I_{\text{DS}} = 250 \mu\text{A}$	1		3	
Gate-Body Leakage	I_{GSS}	$V_{\text{DS}} = 0 \text{ V}, V_{\text{GS}} = \pm 20 \text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{\text{DS}} = 30 \text{ V}, V_{\text{GS}} = 0 \text{ V}$			1	μA
		$V_{\text{DS}} = 30 \text{ V}, V_{\text{GS}} = 0 \text{ V}, T_J = 125^\circ\text{C}$			50	
		$V_{\text{DS}} = 30 \text{ V}, V_{\text{GS}} = 0 \text{ V}, T_J = 175^\circ\text{C}$			150	
On-State Drain Current ^a	$I_{\text{D}(\text{on})}$	$V_{\text{DS}} = 5 \text{ V}, V_{\text{GS}} = 10 \text{ V}$	50			A
Drain-Source On-State Resistance ^a	$r_{\text{DS}(\text{on})}$	$V_{\text{GS}} = 10 \text{ V}, I_D = 25 \text{ A}$		0.010	0.013	Ω
		$V_{\text{GS}} = 10 \text{ V}, I_D = 25 \text{ A}, T_J = 125^\circ\text{C}$		0.016	0.021	
		$V_{\text{GS}} = 10 \text{ V}, I_D = 25 \text{ A}, T_J = 175^\circ\text{C}$		0.018	0.024	
		$V_{\text{GS}} = 4.5 \text{ V}, I_D = 24 \text{ A}$		0.014	0.017	
Forward Transconductance ^a	g_{fs}	$V_{\text{DS}} = 15 \text{ V}, I_D = 25 \text{ A}$	30			S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{\text{GS}} = 0 \text{ V}, V_{\text{DS}} = 25 \text{ V}, f = 1 \text{ MHz}$		1960		pF
Output Capacitance	C_{oss}			380		
Reverse Transfer Capacitance	C_{rss}			180		
Total Gate Charge ^c	Q_g	$V_{\text{DS}} = 15 \text{ V}, V_{\text{GS}} = 20 \text{ V}, I_D = 50 \text{ A}$		35	50	nC
Gate-Source Charge ^c	Q_{gs}			7.6		
Gate-Drain Charge ^c	Q_{gd}			5.6		
Turn-On Delay Time ^c	$t_{\text{d}(\text{on})}$	$V_{\text{DD}} = 15 \text{ V}, R_L = 0.3 \Omega$ $I_D \approx 50 \text{ A}, V_{\text{GEN}} = 10 \text{ V}, R_G = 2.5 \Omega$		10	20	ns
Rise Time ^c	t_r			93	180	
Turn-Off Delay Time ^c	$t_{\text{d}(\text{off})}$			30	60	
Fall Time ^c	t_f			10	20	
Source-Drain Diode Ratings and Characteristics $T_C = 25^\circ\text{C}^b$						
Continuous Current	I_S				50	A
Pulsed Current	I_{SM}				100	
Forward Voltage ^a	V_{SD}	$I_F = 50 \text{ A}, V_{\text{GS}} = 0 \text{ V}$		1.3	1.6	V
Reverse Recovery Time	t_{rr}	$I_F = 50 \text{ A}, \text{di/dt} = 100 \text{ A}/\mu\text{s}$		35	70	ns
Peak Reverse Recovery Current	$I_{\text{RM}(\text{REC})}$			1.5		A
Reverse Recovery Charge	Q_{rr}			0.026		μC
Current Sense Characteristics						
Current Sensing Ratio	r	$I_D = 1 \text{ A}, V_{\text{GSS}} = 10 \text{ V}, R_{\text{SENSE}} = 1.1 \Omega$	420	520	620	
Mirror Active Resistance	$r_{\text{m}(\text{on})}$	$V_{\text{GS}} = 10 \text{ V}, I_D = 10 \text{ mA}$		3.5		Ω

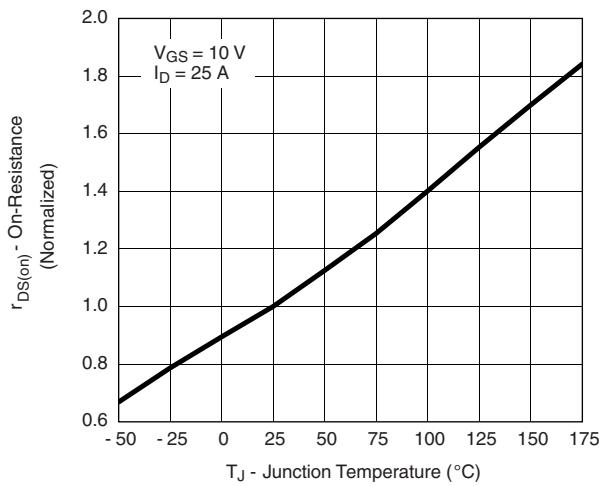
Notes:

- a. Pulse test; pulse width $\leq 300 \mu\text{s}$, duty cycle $\leq 2\%$.
- b. Guaranteed by design, not subject to production testing.
- c. Independent of operating temperature.

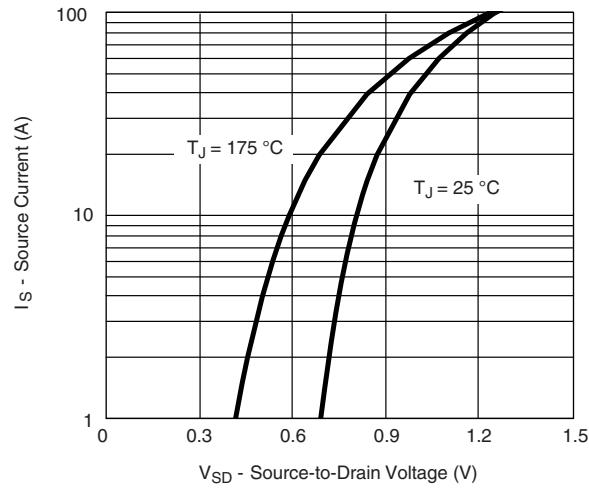
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


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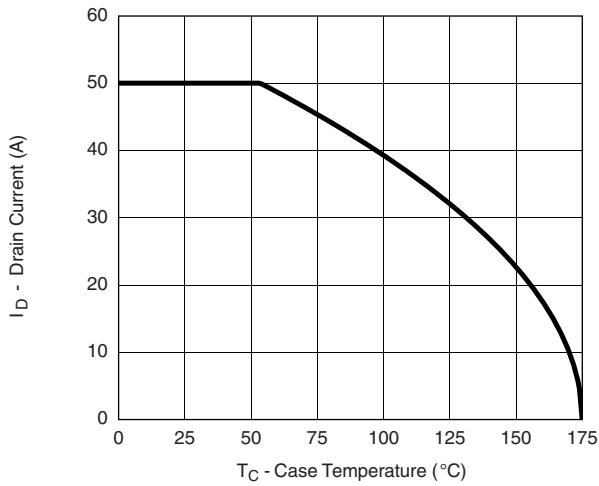


On-Resistance vs. Junction Temperature

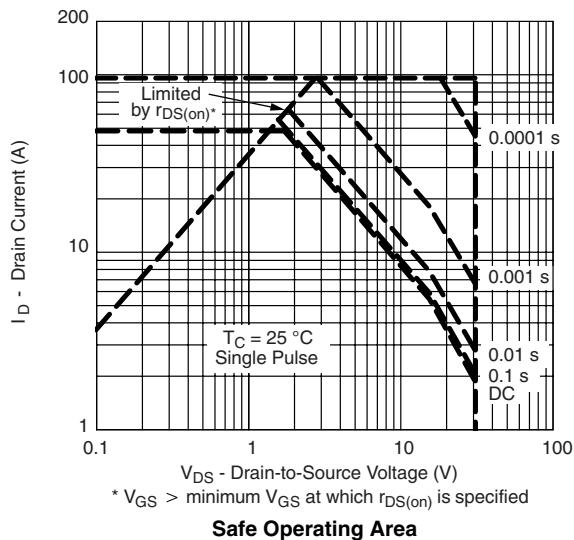


Source-Drain Diode Forward Voltage

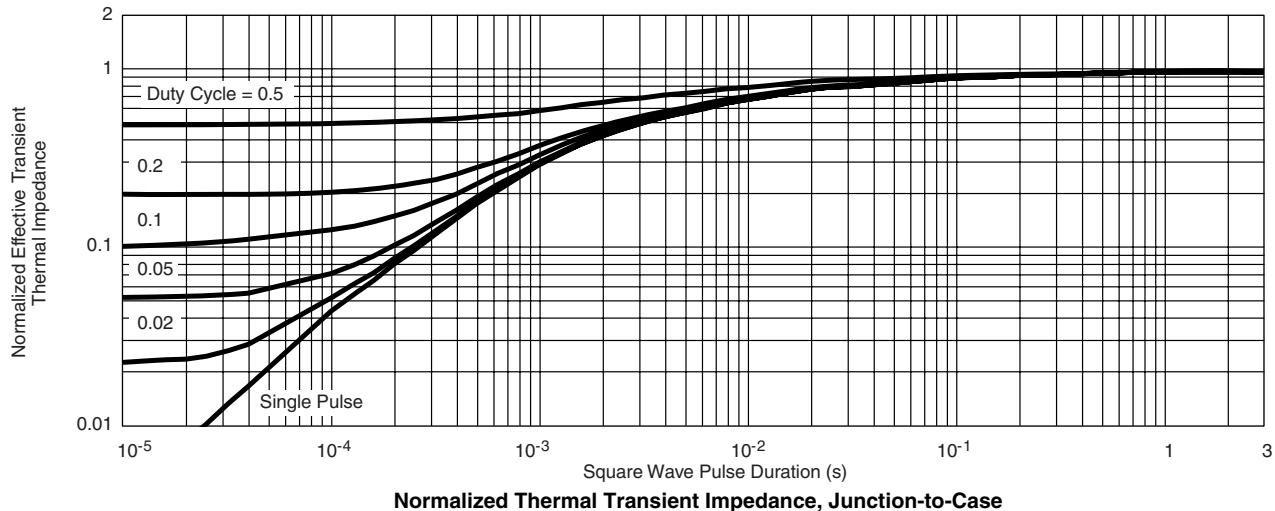
THERMAL RATINGS



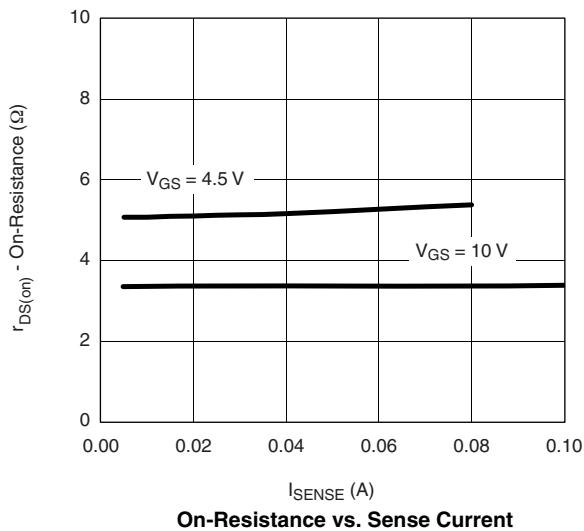
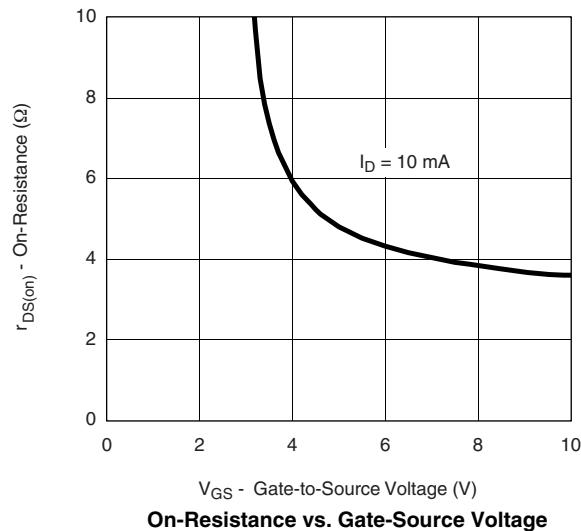
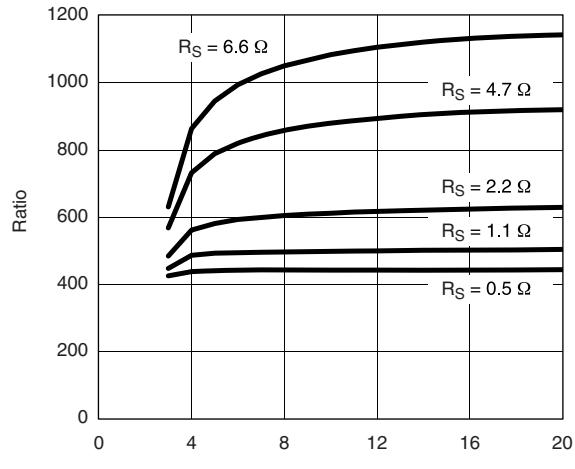
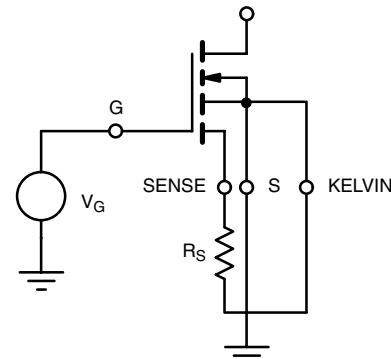
Maximum Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

SENSE DIE TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

On-Resistance vs. Sense Current

On-Resistance vs. Gate-Source Voltage

**Current Ratio ($I_{(MAIN)}/I_S$)
vs. Gate-Source Voltage (Figure 1)**

Figure 1.

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