

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

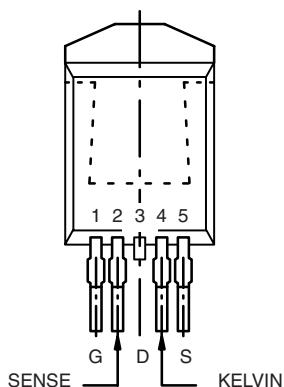
PRODUCT SUMMARY		
$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
30	0.013 at $V_{GS} = 10$ V	50 <sup>a</sup>
	0.017 at $V_{GS} = 4.5$ V	48 <sup>a</sup>

### FEATURES

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



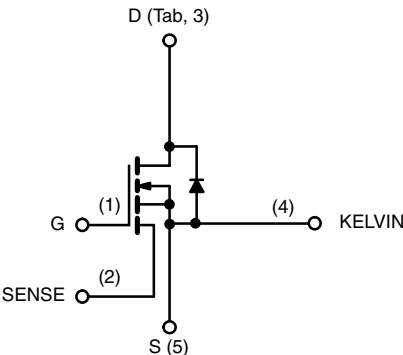
D<sup>2</sup>PAK-5



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	$V_{GS}$	$\pm 20$	
Continuous Drain Current ( $T_J = 175$ °C)	$I_D$	50 <sup>a</sup>	A
		32 <sup>a</sup>	
Pulsed Drain Current	$I_{DM}$	100	
Avalanche Current	$I_{AR}$	25	
Repetitive Avalanche Energy <sup>b</sup>	$E_{AR}$	31	mJ
Maximum Power Dissipation <sup>b</sup>	$P_D$	83 <sup>c</sup>	W
		2.7 <sup>d</sup>	
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  $\leq 1$  %.
- 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.

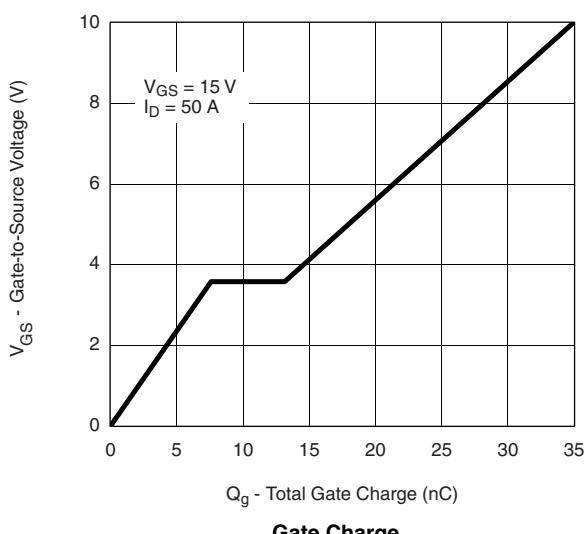
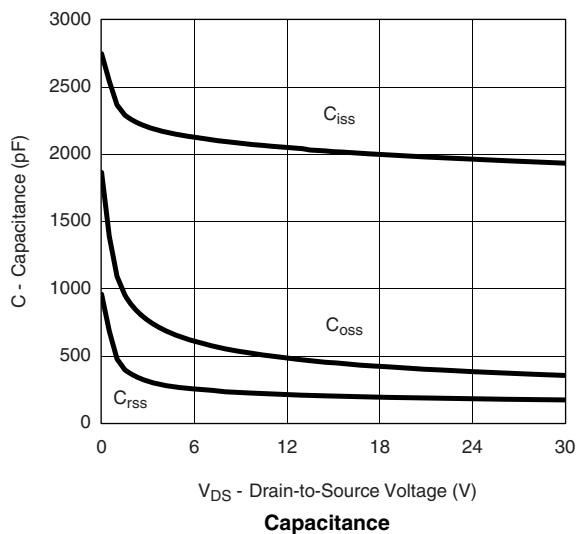
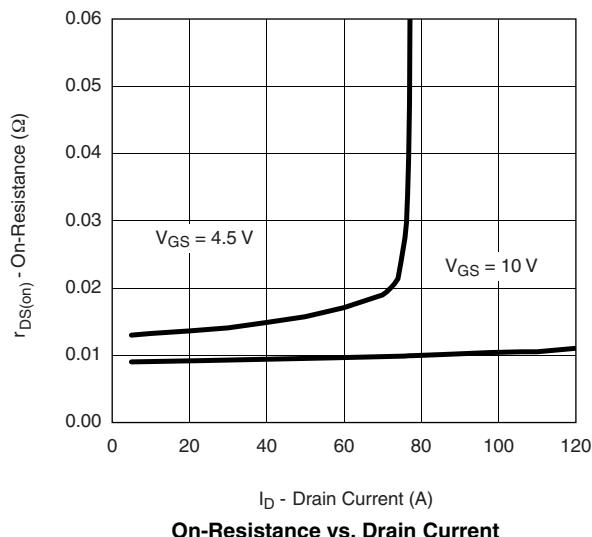
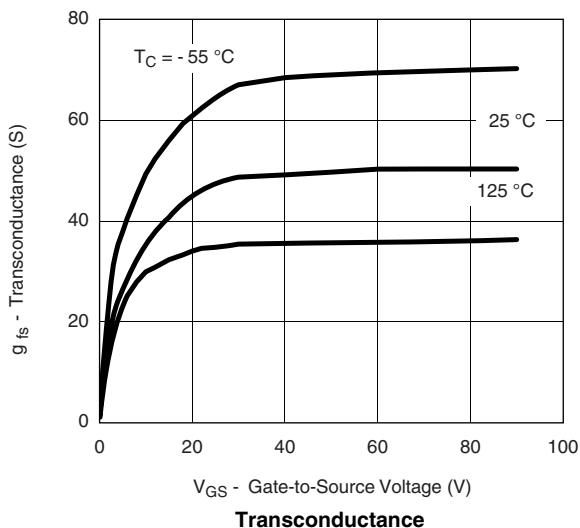
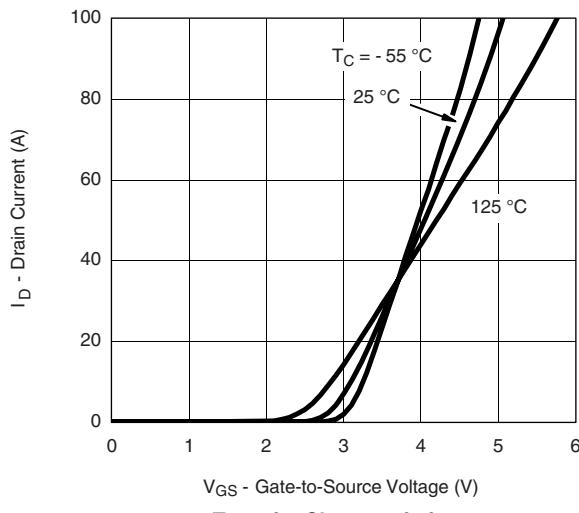
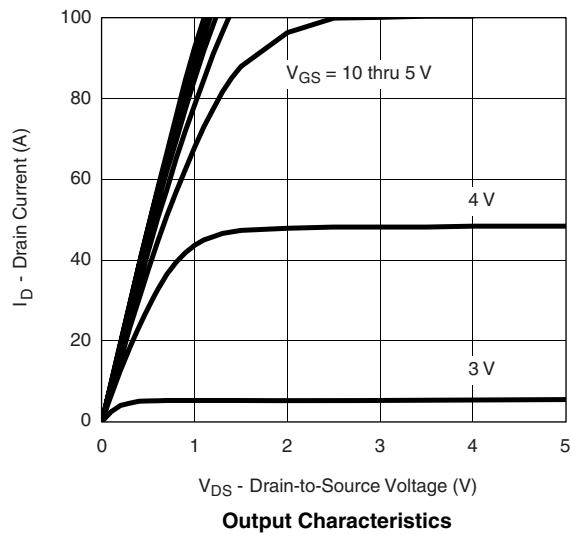
**MOSFET SPECIFICATIONS**  $T_J = 25^\circ\text{C}$ , unless otherwise noted

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
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	$I_{\text{GSS}}$	$V_{\text{DS}} = 0 \text{ V}, V_{\text{GS}} = \pm 20 \text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{\text{DSS}}$	$V_{\text{DS}} = 30 \text{ V}, V_{\text{GS}} = 0 \text{ V}$			1	$\mu\text{A}$
		$V_{\text{DS}} = 30 \text{ V}, V_{\text{GS}} = 0 \text{ V}, T_J = 125^\circ\text{C}$			50	
		$V_{\text{DS}} = 30 \text{ V}, V_{\text{GS}} = 0 \text{ V}, T_J = 175^\circ\text{C}$			150	
On-State Drain Current <sup>a</sup>	$I_{\text{D}(\text{on})}$	$V_{\text{DS}} = 5 \text{ V}, V_{\text{GS}} = 10 \text{ V}$	50			A
Drain-Source On-State Resistance <sup>a</sup>	$r_{\text{DS}(\text{on})}$	$V_{\text{GS}} = 10 \text{ V}, I_D = 25 \text{ A}$		0.010	0.013	$\Omega$
		$V_{\text{GS}} = 10 \text{ V}, I_D = 25 \text{ A}, T_J = 125^\circ\text{C}$		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 <sup>a</sup>	$g_{\text{fs}}$	$V_{\text{DS}} = 15 \text{ V}, I_D = 25 \text{ A}$	30			S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{\text{iss}}$	$V_{\text{GS}} = 0 \text{ V}, V_{\text{DS}} = 25 \text{ V}, f = 1 \text{ MHz}$		1960		$\text{pF}$
Output Capacitance	$C_{\text{oss}}$			380		
Reverse Transfer Capacitance	$C_{\text{rss}}$			180		
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{\text{DS}} = 15 \text{ V}, V_{\text{GS}} = 20 \text{ V}, I_D = 50 \text{ A}$		35	50	$\text{nC}$
Gate-Source Charge <sup>c</sup>	$Q_{\text{gs}}$			7.6		
Gate-Drain Charge <sup>c</sup>	$Q_{\text{gd}}$			5.6		
Turn-On Delay Time <sup>c</sup>	$t_{\text{d}(\text{on})}$	$V_{\text{DD}} = 15 \text{ V}, R_L = 0.3 \Omega$ $I_D \approx 50 \text{ A}, V_{\text{GEN}} = 10 \text{ V}, R_G = 2.5 \Omega$		10	20	$\text{ns}$
Rise Time <sup>c</sup>	$t_r$			93	180	
Turn-Off Delay Time <sup>c</sup>	$t_{\text{d}(\text{off})}$			30	60	
Fall Time <sup>c</sup>	$t_f$			10	20	
<b>Source-Drain Diode Ratings and Characteristics</b> $T_C = 25^\circ\text{C}^b$						
Continuous Current	$I_S$				50	$\text{A}$
Pulsed Current	$I_{\text{SM}}$				100	
Forward Voltage <sup>a</sup>	$V_{\text{SD}}$	$I_F = 50 \text{ A}, V_{\text{GS}} = 0 \text{ V}$		1.3	1.6	V
Reverse Recovery Time	$t_{\text{rr}}$	$I_F = 50 \text{ A}, \text{di/dt} = 100 \text{ A}/\mu\text{s}$		35	70	ns
Peak Reverse Recovery Current	$I_{\text{RM}(\text{REC})}$			1.5		A
Reverse Recovery Charge	$Q_{\text{rr}}$			0.026		$\mu\text{C}$
<b>Current Sense Characteristics</b>						
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		$\Omega$

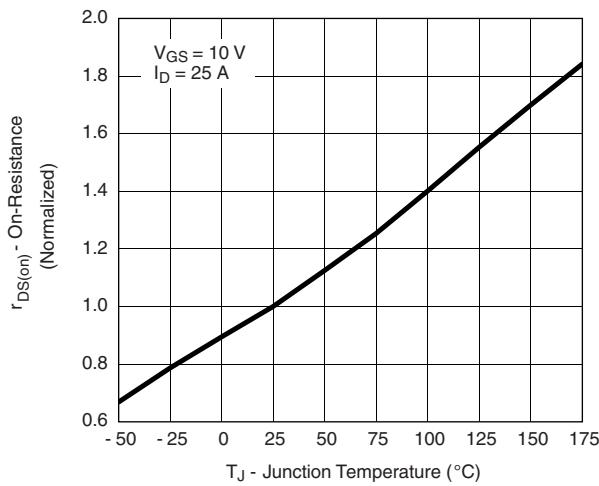
## Notes:

- 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.

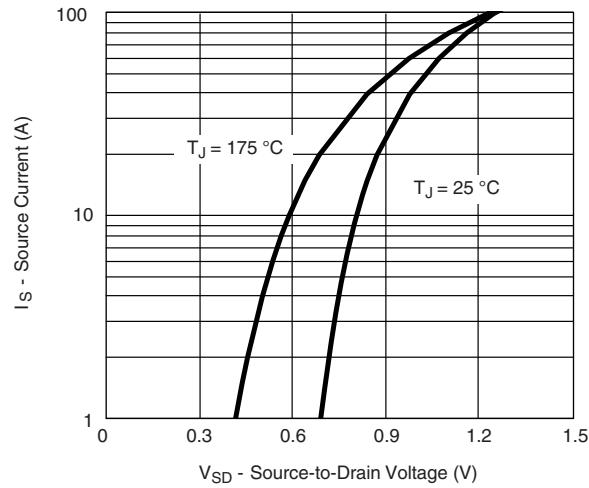
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted


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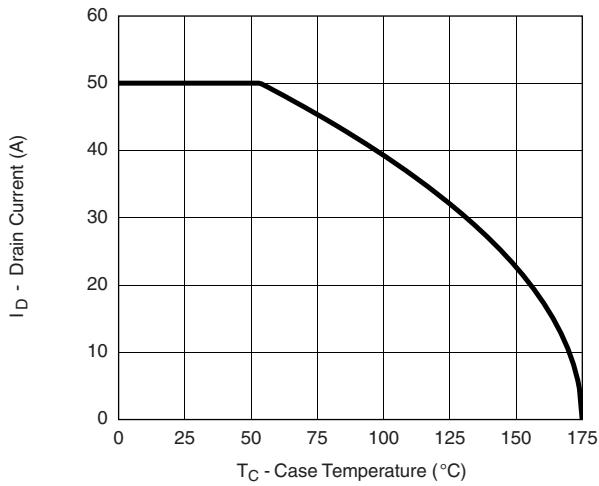


On-Resistance vs. Junction Temperature

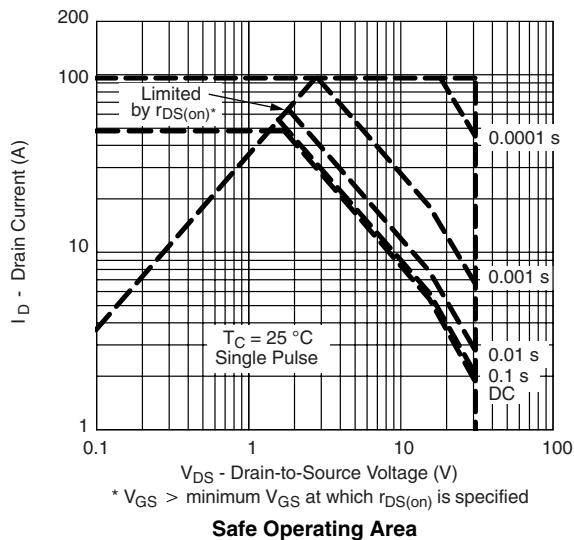


Source-Drain Diode Forward Voltage

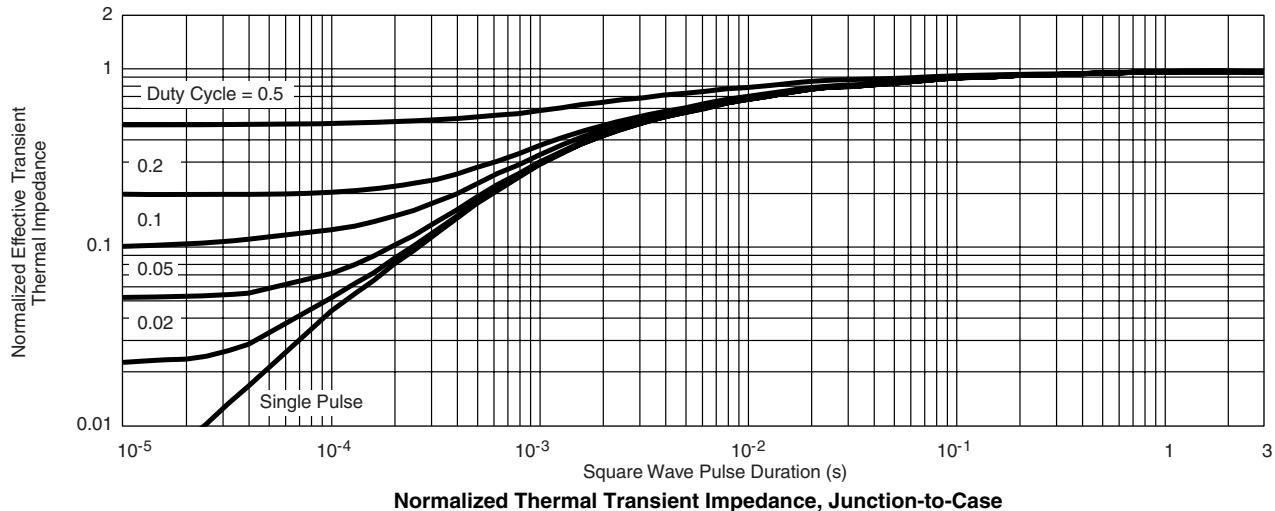
### THERMAL RATINGS



Maximum Drain Current vs. Case Temperature

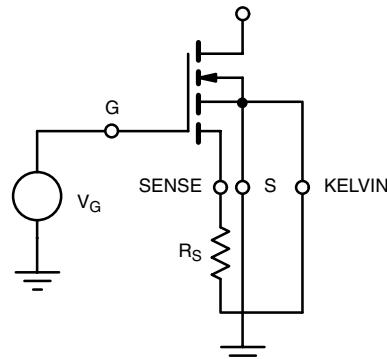
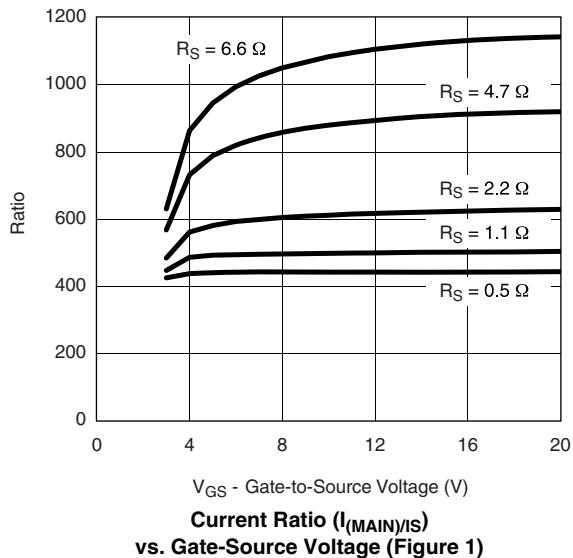
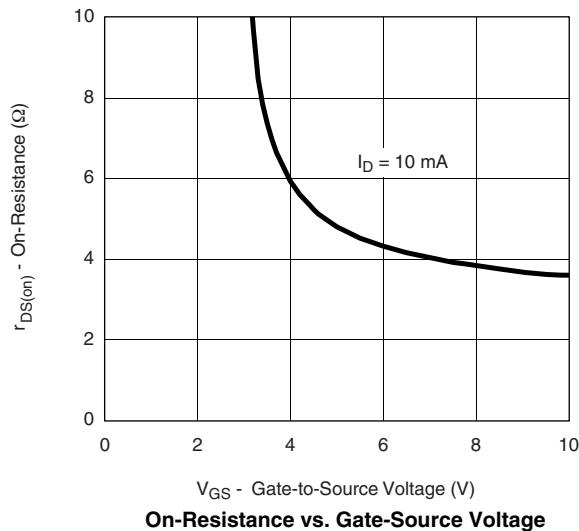
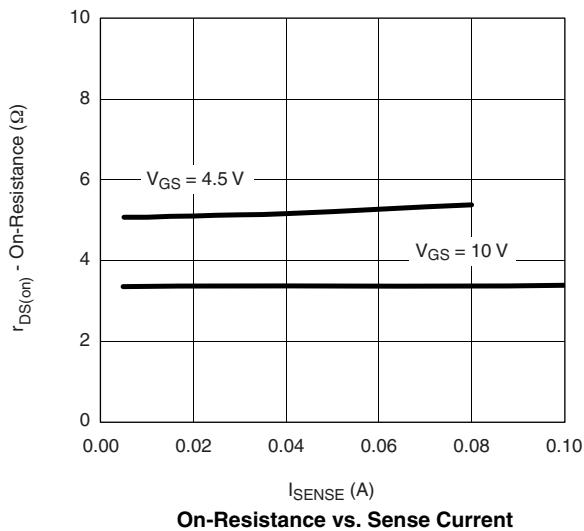


Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

**SENSE DIE TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



**Figure 1.**

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