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

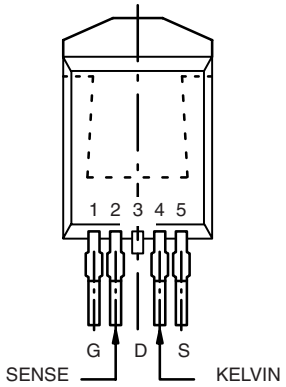
- TrenchFET® Power MOSFET Plus Current Sensing Diode
- Low Thermal Resistance Package

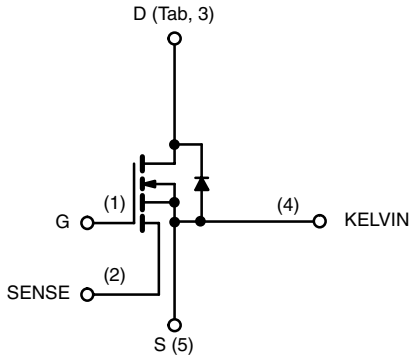
Available
RoHS* COMPLIANT

APPLICATIONS

- Industrial

D²PAK-5





N-Channel MOSFET

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

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)	T_C = 25 °C	I_D	50[a]	A
	T_C = 125 °C		32[a]	
Pulsed Drain Current		I_{DM}	100	
Avalanche Current		I_{AR}	25	
Repetitive Avalanche Energy[b]	L = 0.1 mH	E_{AR}	31	mJ
Maximum Power Dissipation[b]	T_C = 25 °C	P_D	83[c]	W
	T_A = 25 °C		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	PCB Mount[d]	R_{thJA}	55	°C/W
Junction-to-Case		R_{thJC}	1.8	

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

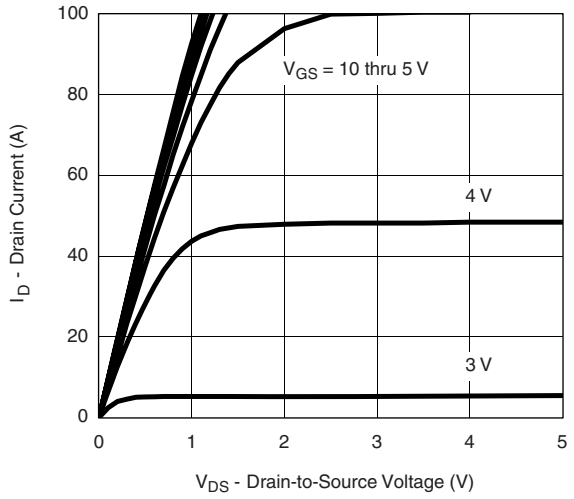
* Pb containing terminations are not RoHS compliant, exemptions may apply.

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

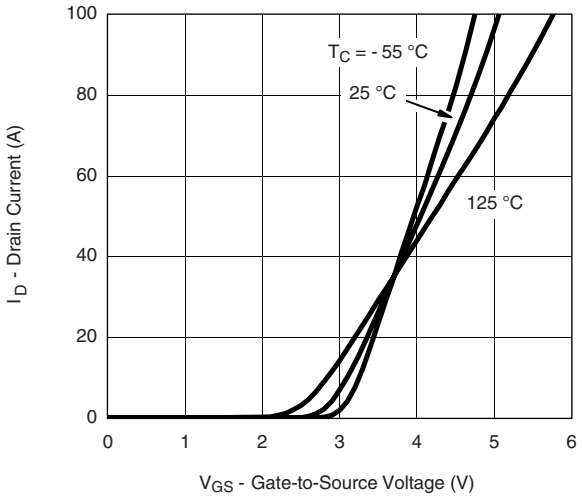
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

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.

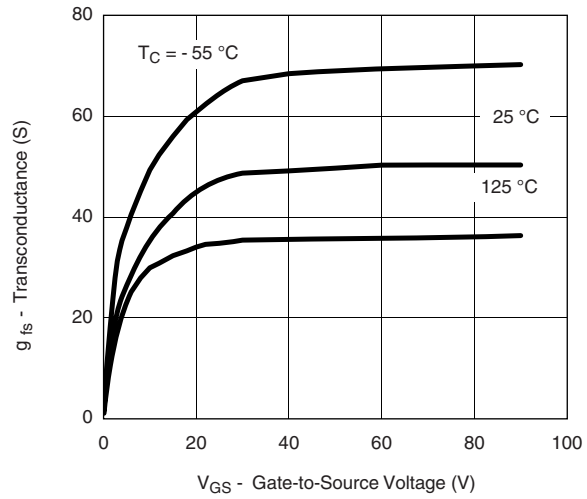
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



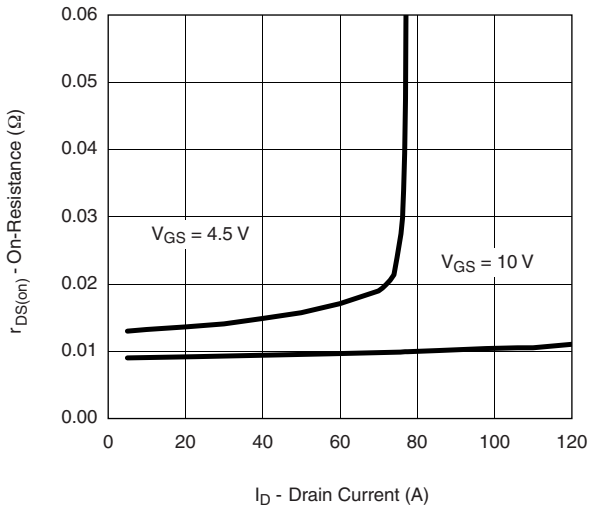
Output Characteristics



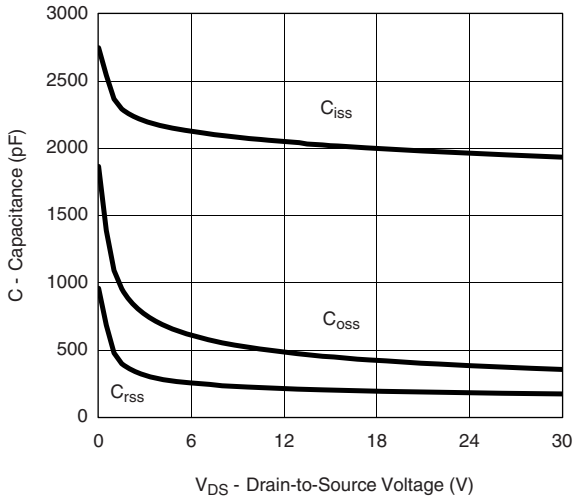
Transfer Characteristics



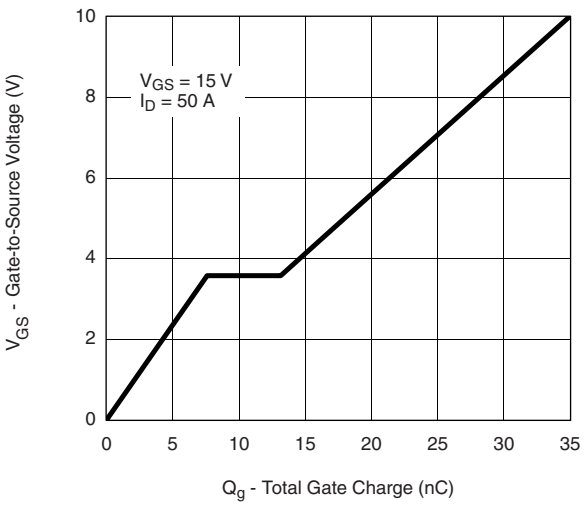
Transconductance



On-Resistance vs. Drain Current

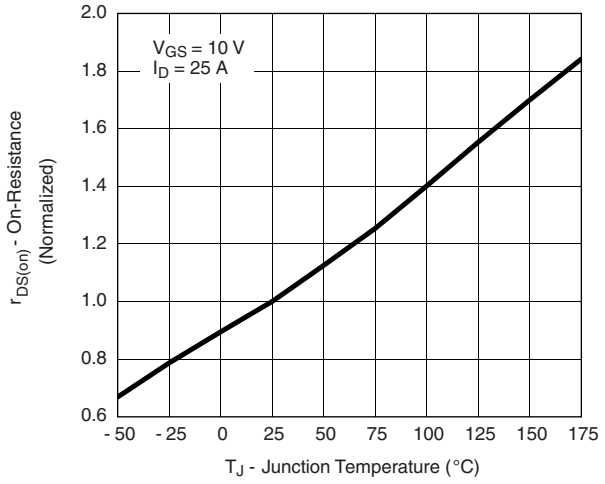


Capacitance

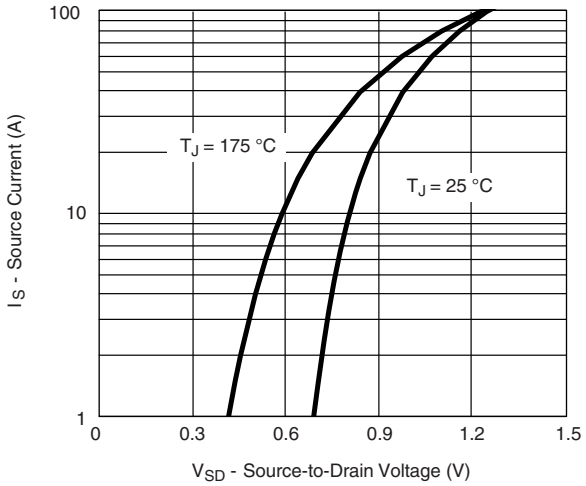


Gate Charge

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

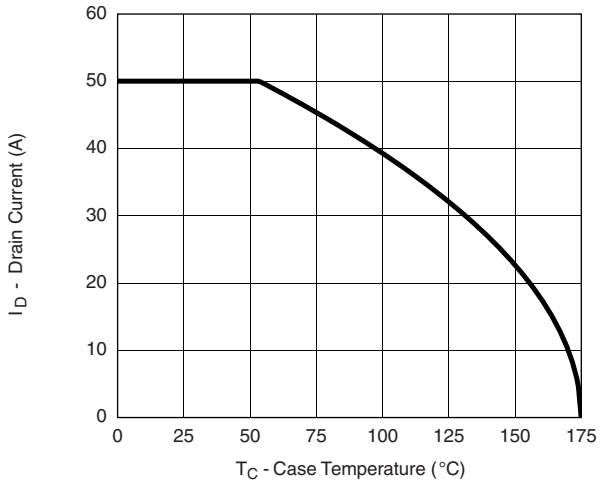


On-Resistance vs. Junction Temperature

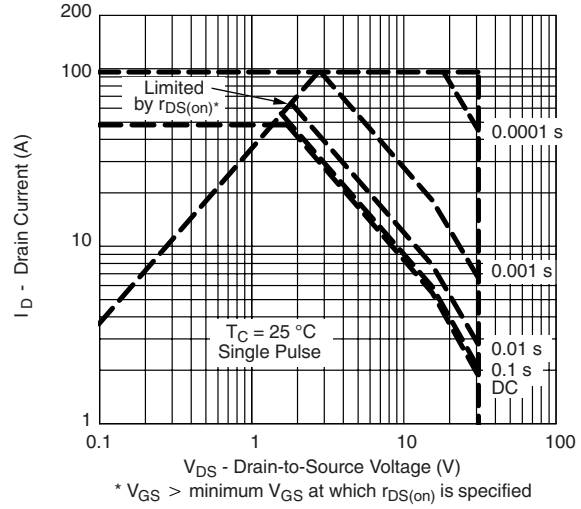


Source-Drain Diode Forward Voltage

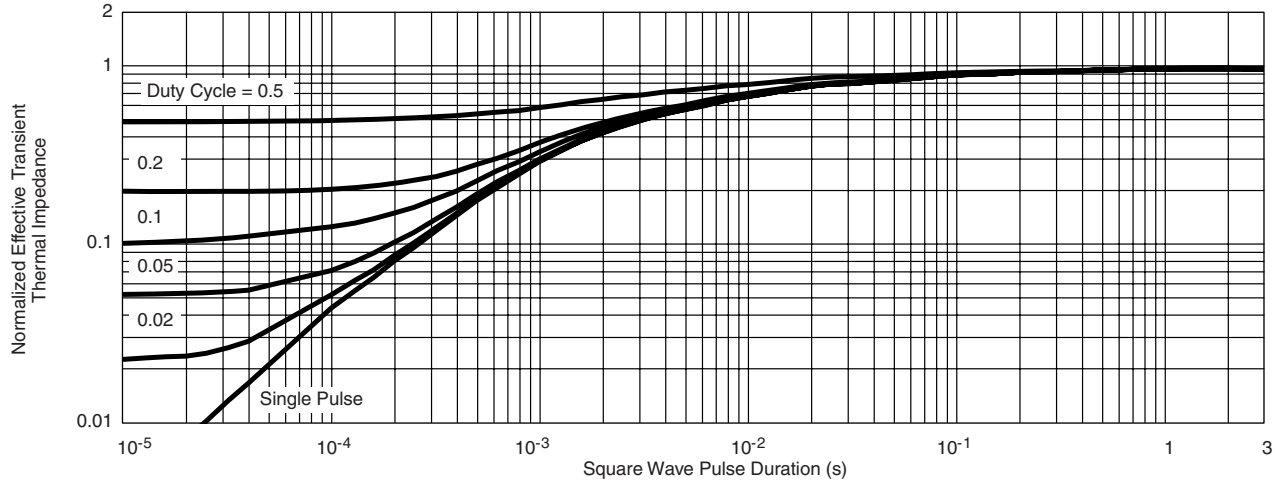
THERMAL RATINGS



Maximum Drain Current vs. Case Temperature

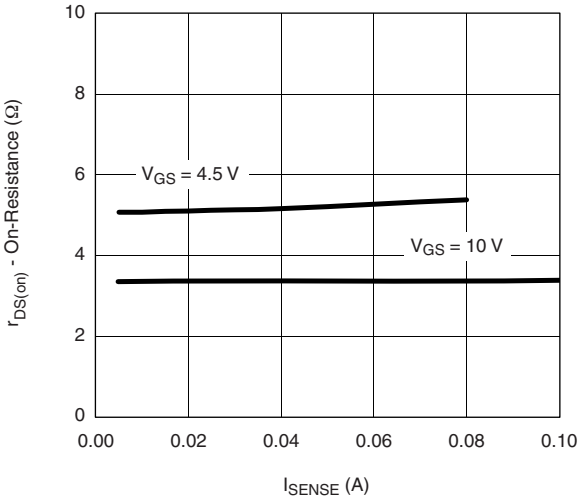


Safe Operating Area

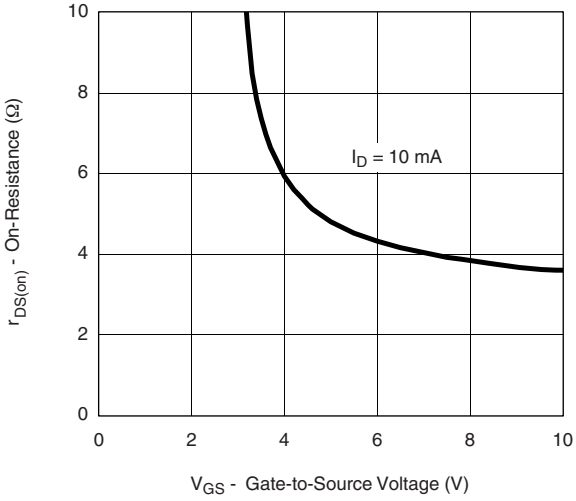


Normalized Thermal Transient Impedance, Junction-to-Case

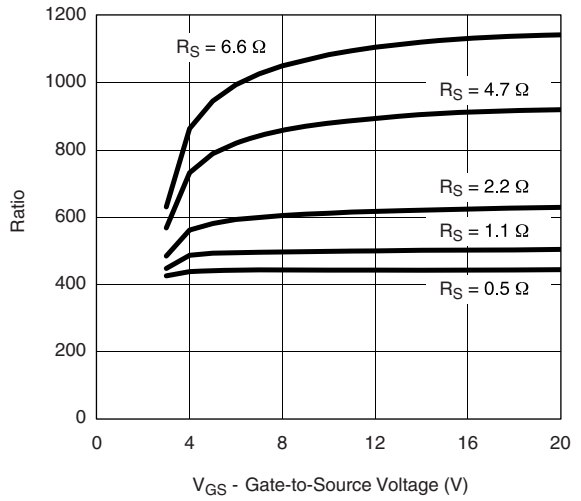
SENSE DIE TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



On-Resistance vs. Sense Current



On-Resistance vs. Gate-Source Voltage



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

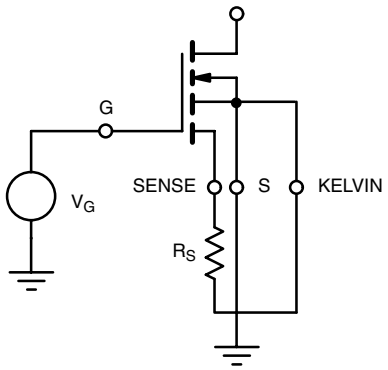


Figure 1.

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