



**THE DATASHEET OF  
SUM110N04-05H-E3**





# N-Channel 40-V (D-S) 175 °C MOSFET

PRODUCT SUMMARY			
$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)	$Q_g$ (Typ.)
40	0.0053 at $V_{GS} = 10$ V	110	95

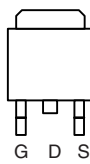
### FEATURES

- TrenchFET® Power MOSFET
- 175 °C Junction Temperature
- High Threshold Voltage at High Temperature



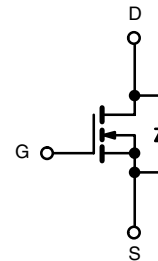
RoHS COMPLIANT

TO-263



Top View

Ordering Information: SUM110N04-05H-E3 (Lead (Pb)-free)



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS $T_C = 25$ °C, unless otherwise noted				
Parameter		Symbol	Limit	Unit
Drain-Source Voltage		$V_{DS}$	40	V
Gate-Source Voltage		$V_{GS}$	20	
Continuous Drain Current ( $T_J = 175$ °C)	$T_C = 25$ °C	$I_D$	110	A
	$T_C = 125$ °C		70	
Pulsed Drain Current		$I_{DM}$	300	
Avalanche Current		$I_{AR}$	50	
Repetitive Avalanche Energy <sup>a</sup>	L = 0.1 mH	$E_{AR}$	125	mJ
Maximum Power Dissipation <sup>a</sup>	$T_C = 25$ °C	$P_D$	150 <sup>b</sup>	W
	$T_A = 25$ °C <sup>c</sup>		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 <sup>c</sup>	$R_{thJA}$	40	°C/W
Junction-to-Case		$R_{thJC}$	1	

Notes:

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

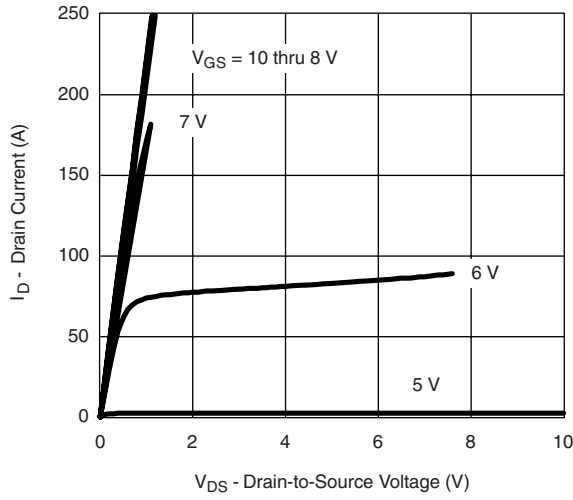
<b>SPECIFICATIONS</b> $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{DS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	40			V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	3.4	3.8	5.0	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$			50	
		$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^\circ\text{C}$			250	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} = 5\text{ V}, V_{GS} = 10\text{ V}$	120			A
Drain-Source On-State Resistance <sup>a</sup>	$r_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 30\text{ A}$		0.0044	0.0053	$\Omega$
		$V_{GS} = 10\text{ V}, I_D = 30\text{ A}, T_J = 125\text{ }^\circ\text{C}$			0.008	
		$V_{GS} = 10\text{ V}, I_D = 30\text{ A}, T_J = 175\text{ }^\circ\text{C}$			0.0106	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}, I_D = 15\text{ A}$	20	50		S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		6700		$\text{pF}$
Output Capacitance	$C_{oss}$			600		
Reverse Transfer Capacitance	$C_{rss}$			320		
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = 20\text{ V}, V_{GS} = 10\text{ V}, I_D = 50\text{ A}$		95		nC
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			37		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			21		
Gate Resistance	$R_g$	$f = 1.0\text{ MHz}$		1.7		$\Omega$
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 20\text{ V}, R_L = 0.4\text{ }\Omega$ $I_D \cong 50\text{ A}, V_{GEN} = 10\text{ V}, R_g = 2.5\text{ }\Omega$		20	30	ns
Rise Time <sup>c</sup>	$t_r$			95	145	
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$			50	75	
Fall Time <sup>c</sup>	$t_f$			12	20	
<b>Source-Drain Diode Ratings and Characteristics</b> $T_C = 25\text{ }^\circ\text{C}$ <sup>b</sup>						
Continuous Current	$I_S$				100	A
Pulsed Current	$I_{SM}$				300	
Forward Voltage <sup>a</sup>	$V_{SD}$	$I_F = 30\text{ A}, V_{GS} = 0\text{ V}$		0.90	1.50	V
Reverse Recovery Time	$t_{rr}$	$I_F = 30\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		40	60	ns

Notes:

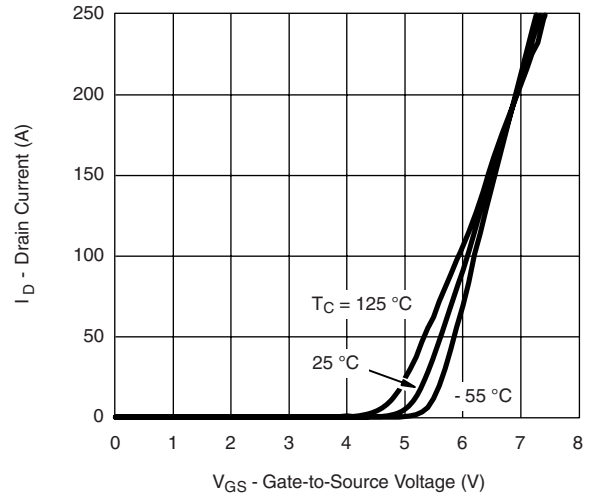
- Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- Guaranteed by design, not subject to production testing.
- Independent of operating temperature.

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.

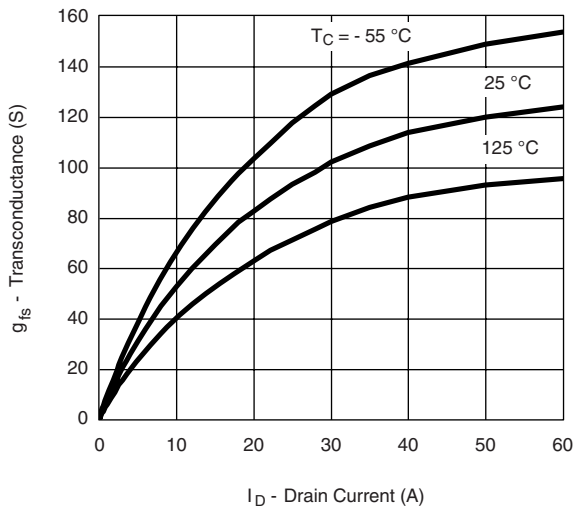
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



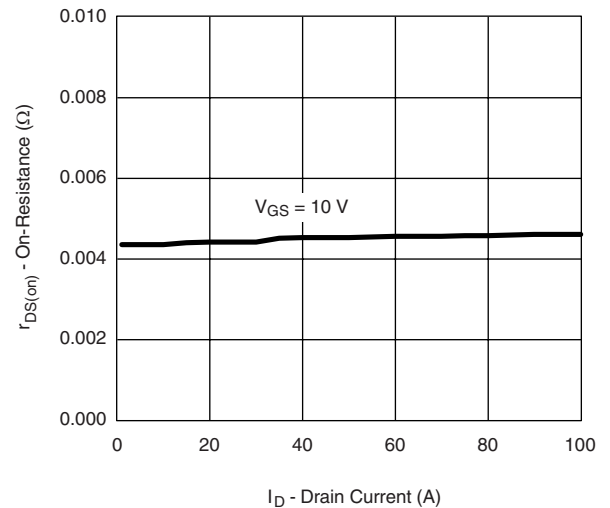
**Output Characteristics**



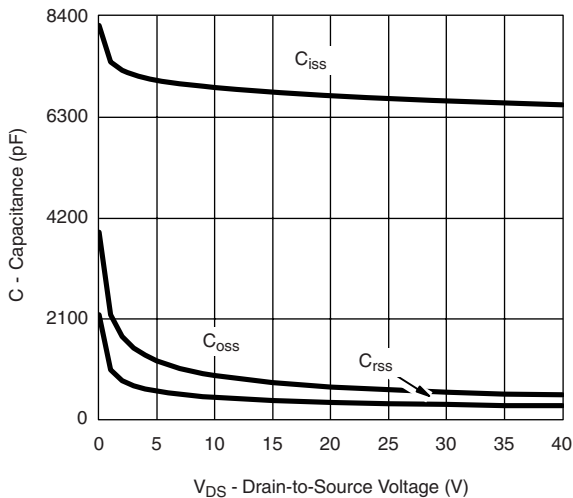
**Transfer Characteristics**



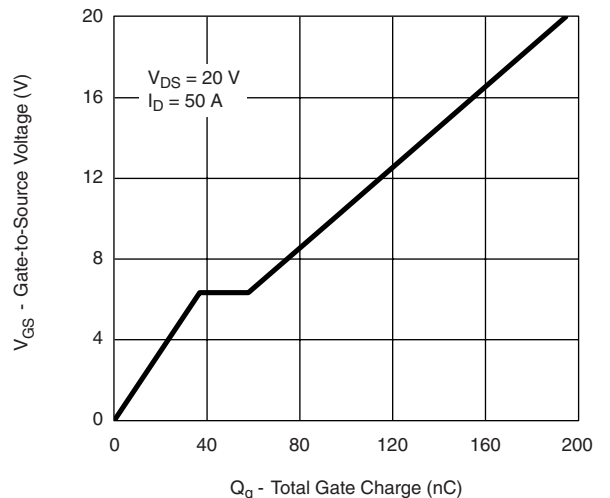
**Transconductance**



**On-Resistance vs. Drain Current**

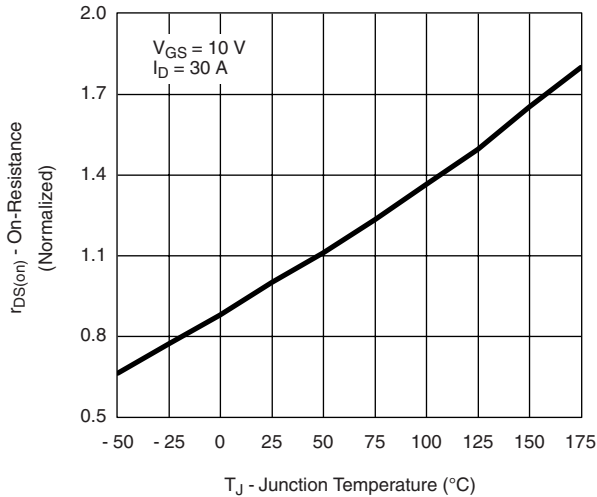


**Capacitance**

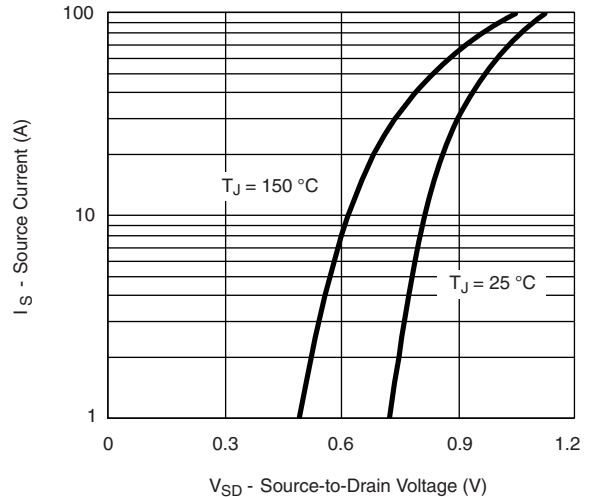


**Gate Charge**

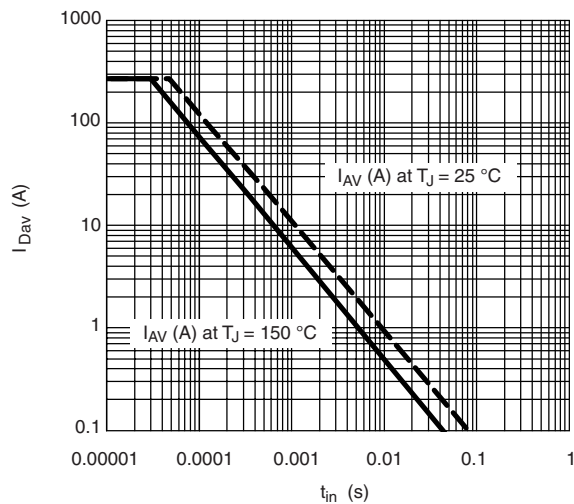
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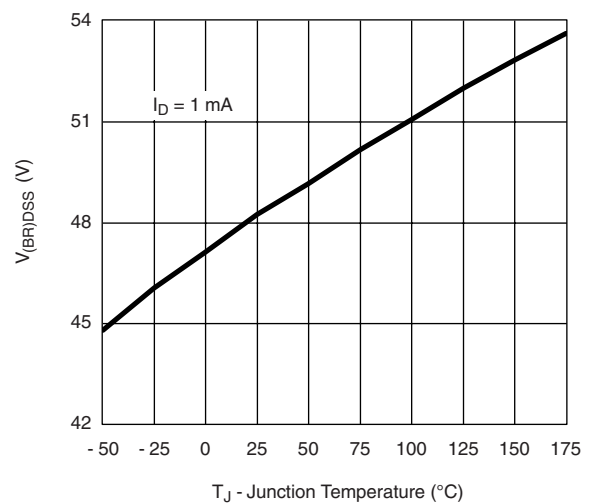
**On-Resistance vs. Junction Temperature**



**Source-Drain Diode Forward Voltage**



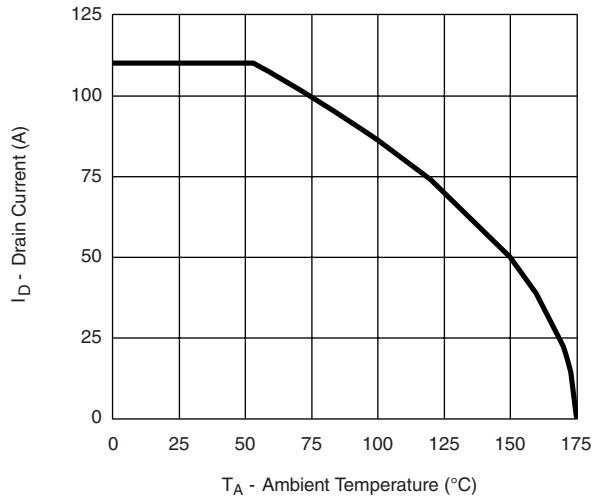
**Avalanche Current vs. Time**



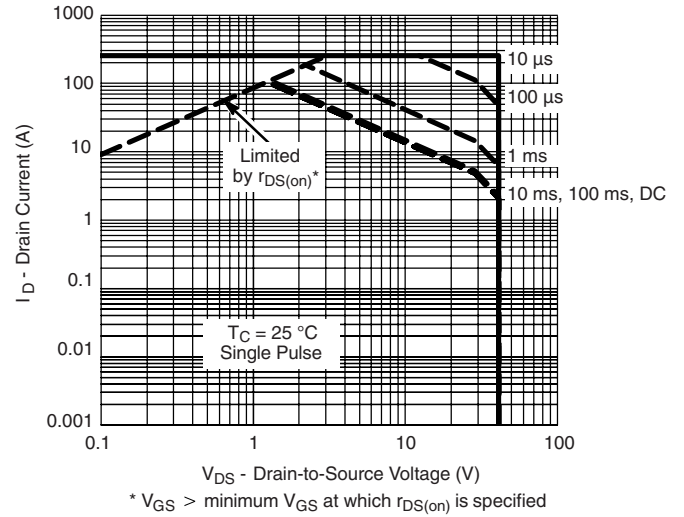
**Drain Source Breakdown vs. Junction Temperature**



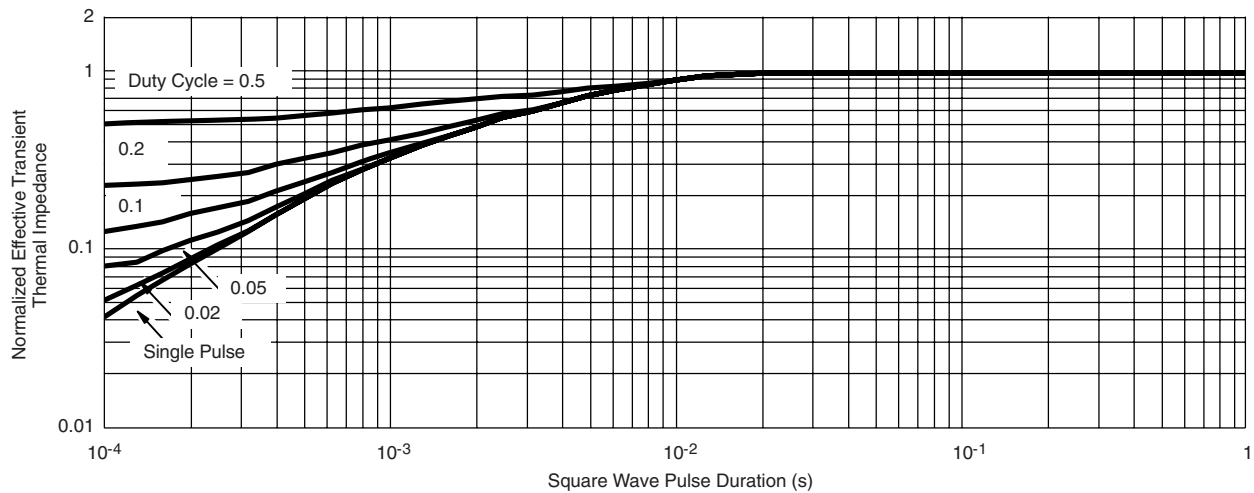
**THERMAL RATINGS**



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



**Safe Operating Area**



**Normalized Thermal Transient Impedance, Junction-to-Case**

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