



## N-Channel 40-V (D-S) MOSFET

## PRODUCT SUMMARY

V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A) <sup>a, c</sup>	Q <sub>g</sub> (Typ.)
40	0.0021 at V <sub>GS</sub> = 10 V	110	240 nC
	0.0024 at V <sub>GS</sub> = 4.5 V	110	

## FEATURES

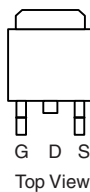
- TrenchFET<sup>®</sup> Power MOSFET
- 100 % R<sub>g</sub> and UIS Tested

RoHS  
COMPLIANT

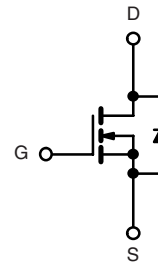
## APPLICATIONS

- Synchronous Rectification
- Power Supplies

TO-263



Top View



N-Channel MOSFET

Ordering Information: SUM110N04-2m1P-E3 (Lead (Pb)-free)

ABSOLUTE MAXIMUM RATINGS T<sub>A</sub> = 25 °C, unless otherwise noted

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V <sub>DS</sub>	40	V
Gate-Source Voltage	V <sub>GS</sub>	± 20	
Continuous Drain Current (T <sub>J</sub> = 175 °C)	I <sub>D</sub>	T <sub>C</sub> = 25 °C	110 <sup>a, c</sup>
		T <sub>C</sub> = 70 °C	110 <sup>c</sup>
		T <sub>A</sub> = 25 °C	29 <sup>b</sup>
		T <sub>A</sub> = 70 °C	23 <sup>b</sup>
Pulsed Drain Current	I <sub>DM</sub>	250	A
Avalanche Current Pulse	I <sub>AS</sub>	80	
Single Pulse Avalanche Energy	E <sub>AS</sub>	320	
Continuous Source-Drain Diode Current	I <sub>S</sub>	T <sub>C</sub> = 25 °C	110 <sup>a, c</sup>
		T <sub>A</sub> = 25 °C	2.6 <sup>b</sup>
Maximum Power Dissipation	P <sub>D</sub>	T <sub>C</sub> = 25 °C	312 <sup>a</sup>
		T <sub>C</sub> = 70 °C	200
		T <sub>A</sub> = 25 °C	3.13 <sup>b</sup>
		T <sub>A</sub> = 70 °C	2.0 <sup>b</sup>
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	- 55 to 150	°C

## THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>b</sup>	R <sub>thJA</sub>	32	40	°C/W
Maximum Junction-to-Case	R <sub>thJC</sub>	0.33	0.4	

Notes:

a. Based on T<sub>C</sub> = 25 °C.

b. Surface Mounted on 1" x 1" FR4 board.

c. Calculated based on maximum junction temperature. Package limitation current is 110 A.

SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	40			V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		41		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 8		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.2		2.5	V
Gate-Source 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	$\mu\text{A}$
		$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			10	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	120			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 30\text{ A}$		0.0017	0.0021	$\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 20\text{ A}$		0.002	0.0024	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}, I_D = 30\text{ A}$		180		S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		18800		pF
Output Capacitance	$C_{oss}$			1550		
Reverse Transfer Capacitance	$C_{rss}$			850		
Total Gate Charge	$Q_g$	$V_{DS} = 20\text{ V}, V_{GS} = 10\text{ V}, I_D = 20\text{ A}$		240	360	nC
Gate-Source Charge	$Q_{gs}$			40		
Gate-Drain Charge	$Q_{gd}$			22		
Gate Resistance	$R_g$	$f = 1\text{ MHz}$		0.85	1.3	$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 20\text{ V}, R_L = 1.0\text{ }\Omega$ $I_D \cong 20\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$		20	30	ns
Rise Time	$t_r$			11	17	
Turn-Off Delay Time	$t_{d(off)}$			77	115	
Fall Time	$t_f$			10	15	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 20\text{ V}, R_L = 1.0\text{ }\Omega$ $I_D \cong 20\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$		102	155	
Rise Time	$t_r$			62	95	
Turn-Off Delay Time	$t_{d(off)}$			180	270	
Fall Time	$t_f$			60	90	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25\text{ }^\circ\text{C}$			110	A
Pulse Diode Forward Current <sup>a</sup>	$I_{SM}$				200	
Body Diode Voltage	$V_{SD}$	$I_S = 20\text{ A}$		0.8	1.2	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = 20\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		50	75	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$			70	105	nC
Reverse Recovery Fall Time	$t_a$			30		ns
Reverse Recovery Rise Time	$t_b$			20		

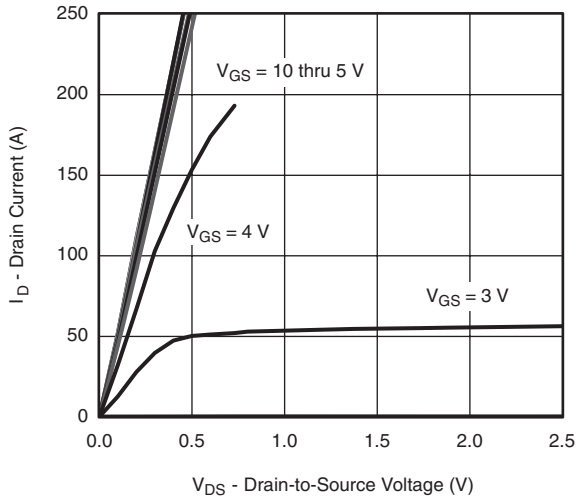
## Notes:

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

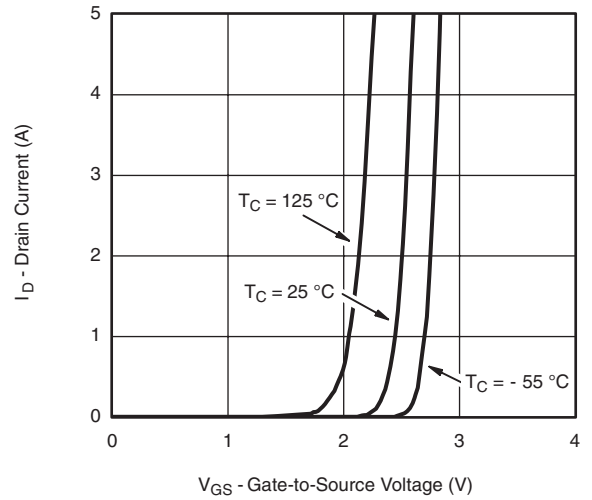
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



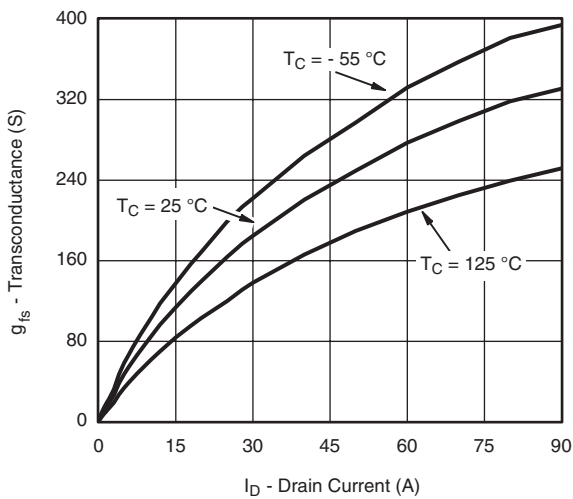
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



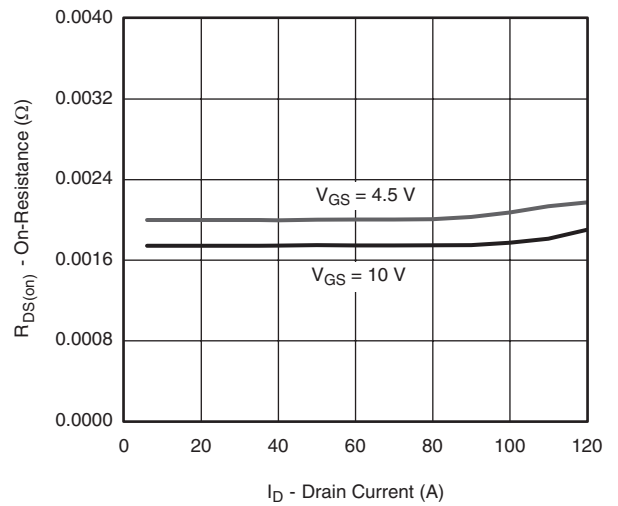
**Output Characteristics**



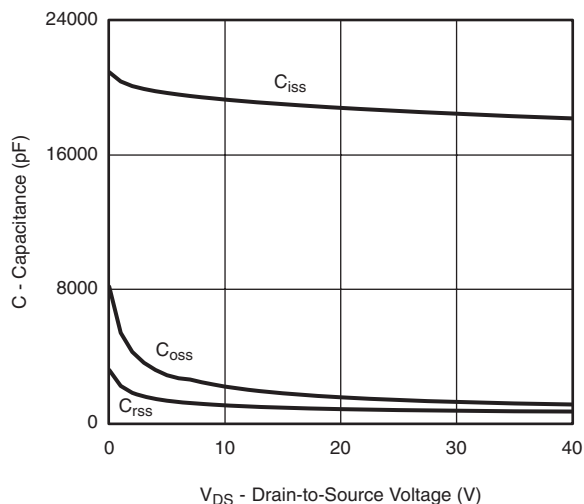
**Transfer Characteristics**



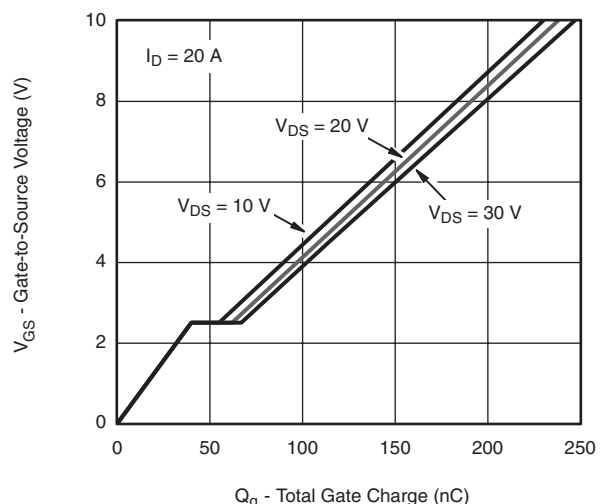
**Transconductance**



**On-Resistance vs. Drain Current**



**Capacitance**



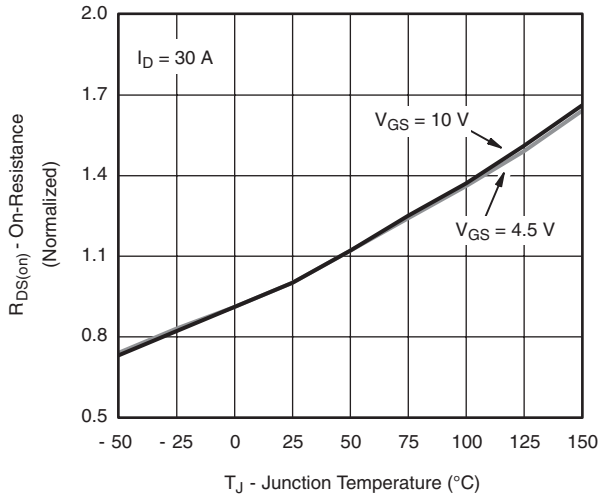
**Gate Charge**

# SUM110N04-2m1P

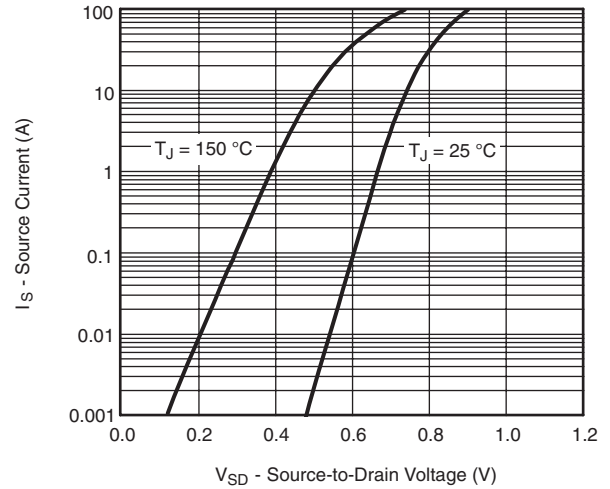
Vishay Siliconix



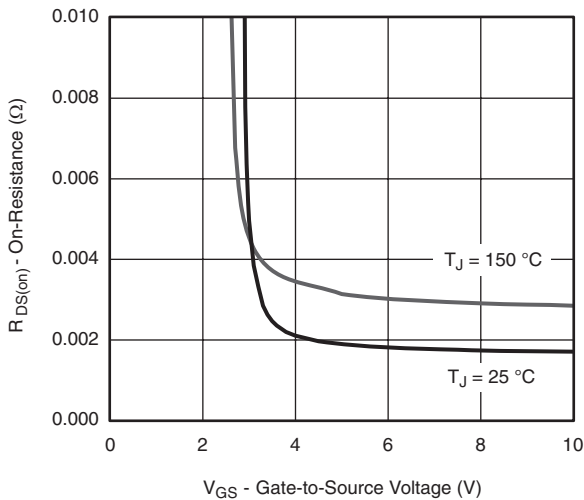
## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



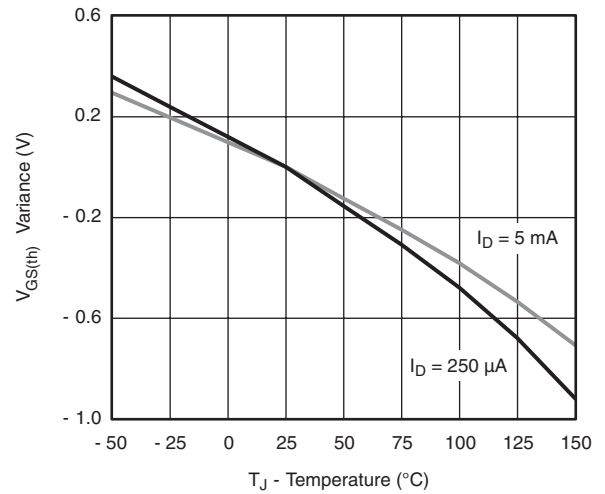
**On-Resistance vs. Junction Temperature**



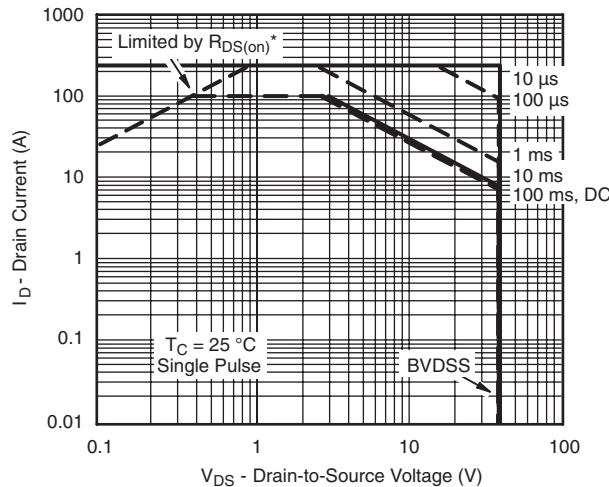
**Forward Diode Voltage vs. Temperature**



**On-Resistance vs. Gate-to-Source Voltage**



**Threshold Voltage**

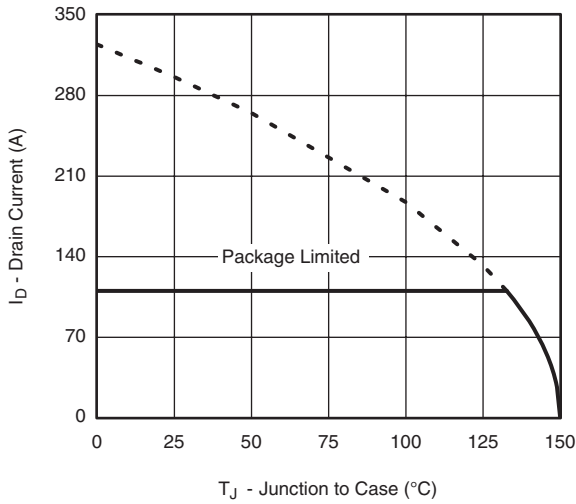


\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

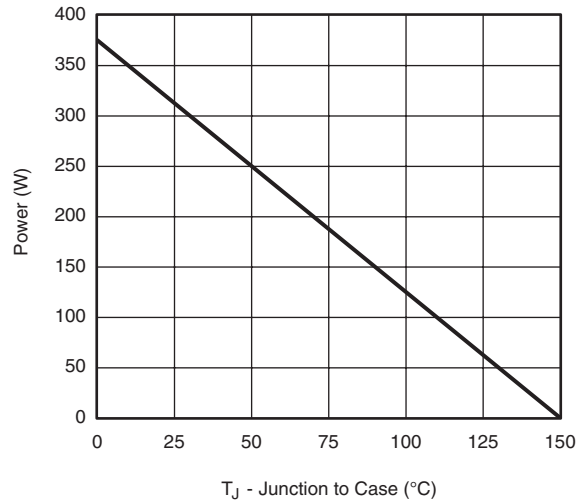
**Safe Operating Area, Junction-to-Ambient**



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

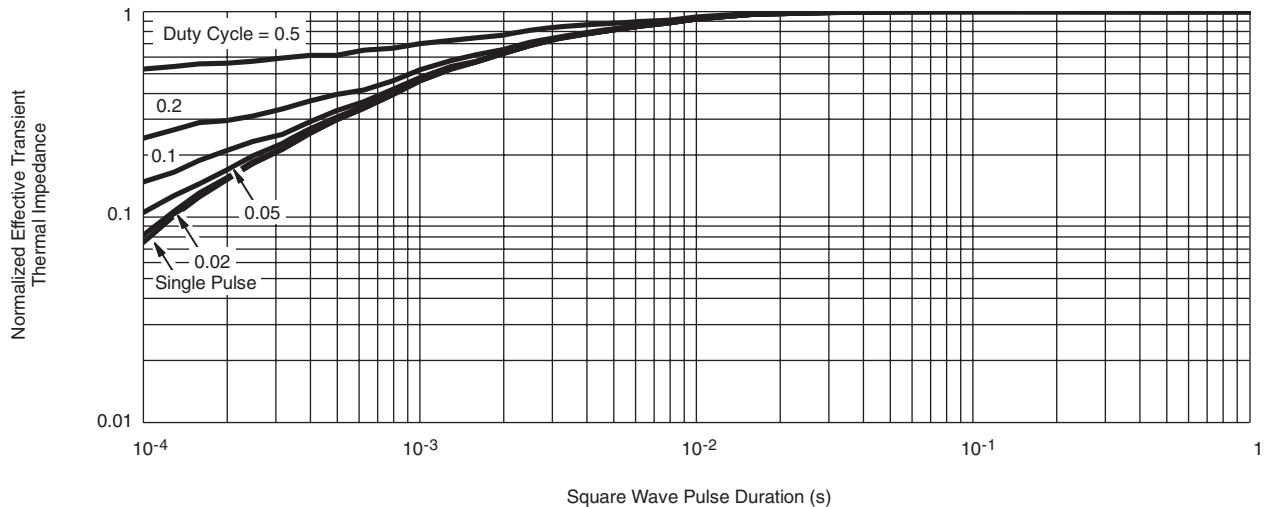


**Current Derating\***



**Power Derating**

\* The power dissipation P<sub>D</sub> is based on T<sub>J(max)</sub> = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



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

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