

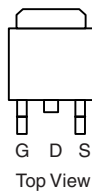
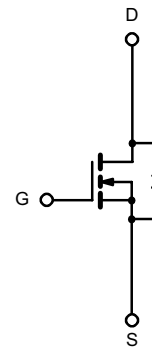
## N-Channel 40-V (D-S) 175 °C MOSFET

PRODUCT SUMMARY		
$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
40	0.0023 at $V_{GS} = 10$ V	110 <sup>a</sup>
	0.003 at $V_{GS} = 4.5$ V	

**FEATURES**

- TrenchFET<sup>®</sup> Power MOSFET
- 100 %  $R_g$  Tested


**RoHS**  
COMPLIANT

**TO-263**

**Ordering Information:** SUM110N04-2m3L-E3 (Lead (Pb)-free)


N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted				
Parameter		Symbol	Limit	Unit
Drain-Source Voltage		$V_{DS}$	40	V
Gate-Source Voltage		$V_{GS}$	$\pm 20$	
Continuous Drain Current ( $T_J = 175$ °C)	$T_C = 25$ °C	$I_D$	110 <sup>a</sup>	A
	$T_C = 125$ °C		110 <sup>a</sup>	
Pulsed Drain Current		$I_{DM}$	440	
Avalanche Current, Single Pulse		$I_{AS}$	75	
Repetitive Avalanche Energy, Single Pulse	$L = 0.1$ mH	$E_{AS}$	280	mJ
Maximum Power Dissipation	$T_C = 25$ °C	$P_D$	375 <sup>b</sup>	W
	$T_A = 25$ °C		3.75	
Operating Junction and Storage Temperature Range		$T_J, T_{stg}$	- 55 to 175	°C

THERMAL RESISTANCE RATINGS				
Parameter		Symbol	Typical	Unit
Junction-to-Ambient	PCB Mount <sup>c</sup>	$R_{thJA}$	40	°C/W
Junction-to-Case (Drain)		$R_{thJC}$	0.4	

Notes:

- Package limited.
- See SOA curve for voltage derating.
- When Mounted on 1" square PCB (FR-4 material).

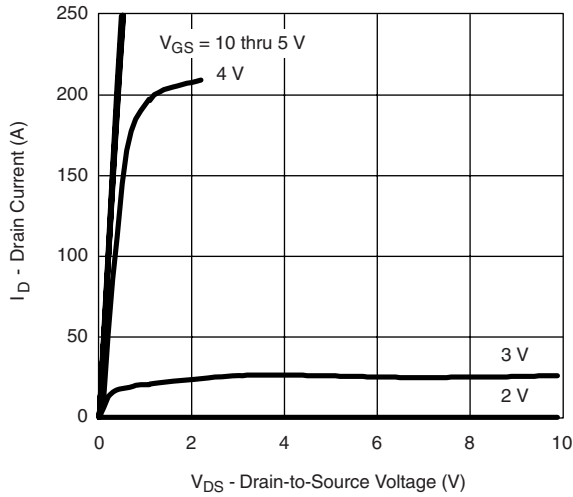
<b>SPECIFICATIONS</b> $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	40			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1		3	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			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	
		$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^\circ\text{C}$			10	mA
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>	$r_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 30\text{ A}$		0.0019	0.0023	$\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 20\text{ A}$		0.0024	0.003	
		$V_{GS} = 10\text{ V}, I_D = 30\text{ A}, T_J = 125\text{ }^\circ\text{C}$			0.0035	
		$V_{GS} = 10\text{ V}, I_D = 30\text{ A}, T_J = 175\text{ }^\circ\text{C}$			0.0044	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}, I_D = 30\text{ A}$	30			S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		13600		$\mu\text{F}$
Output Capacitance	$C_{oss}$			1420		
Reverse Transfer Capacitance	$C_{rss}$			1040		
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = 30\text{ V}, V_{GS} = 10\text{ V}, I_D = 110\text{ A}$		240	360	nC
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			53		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			55		
Gate Resistance	$R_g$	$f = 1.0\text{ MHz}$	0.65	1.3	2	$\Omega$
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 30\text{ V}, R_L = 0.27\text{ }\Omega$ $I_D \cong 110\text{ A}, V_{GEN} = 10\text{ V}, R_g = 2.5\text{ }\Omega$		25	40	ns
Rise Time <sup>c</sup>	$t_r$			100	150	
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$			125	190	
Fall Time <sup>c</sup>	$t_f$			200	300	
<b>Source-Drain Diode Ratings and Characteristics</b> $T_C = 25\text{ }^\circ\text{C}^b$						
Continuous Current	$I_S$				110	A
Pulsed Current	$I_{SM}$				240	
Forward Voltage <sup>a</sup>	$V_{SD}$	$I_F = 85\text{ A}, V_{GS} = 0\text{ V}$		1.1	1.5	V
Reverse Recovery Time	$t_{rr}$	$I_F = 85\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		56	85	ns
Peak Reverse Recovery Charge	$I_{RM(REC)}$			3.1	4.7	A
Reverse Recovery Charge	$Q_{rr}$			0.087	0.2	$\mu\text{C}$

Notes:

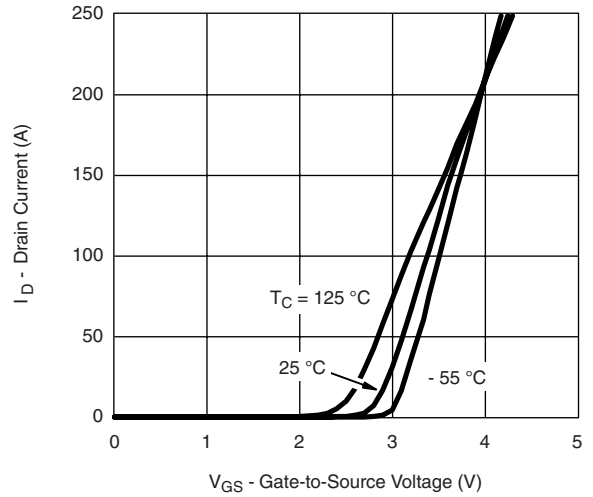
- Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- Guaranteed by design, not subject to production testing.
- Independent of operating temperature.

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.

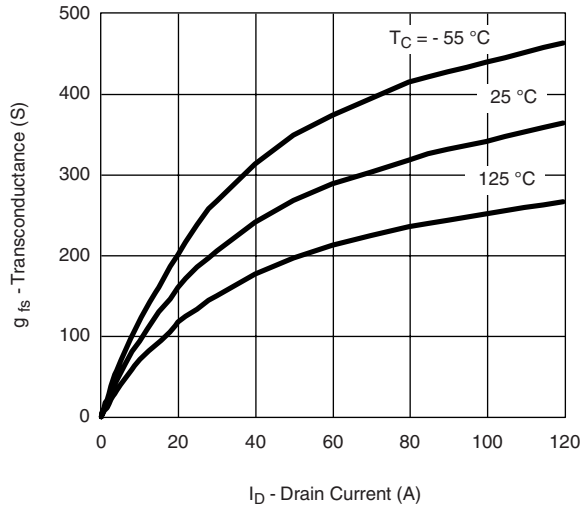
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



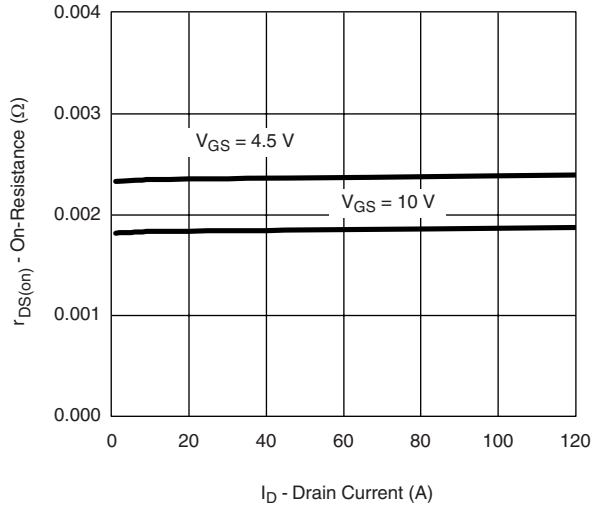
**Output Characteristics**



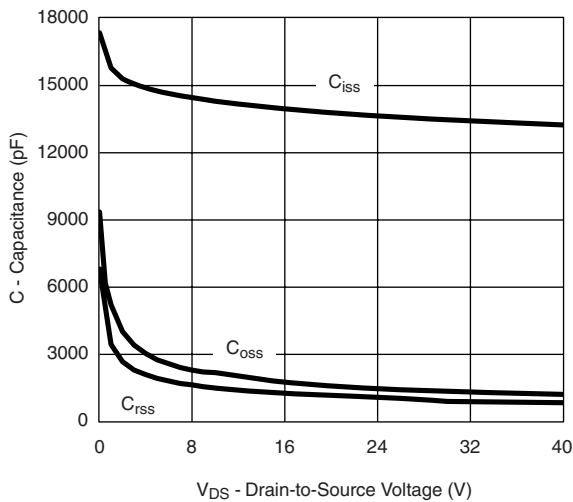
**Transfer Characteristics**



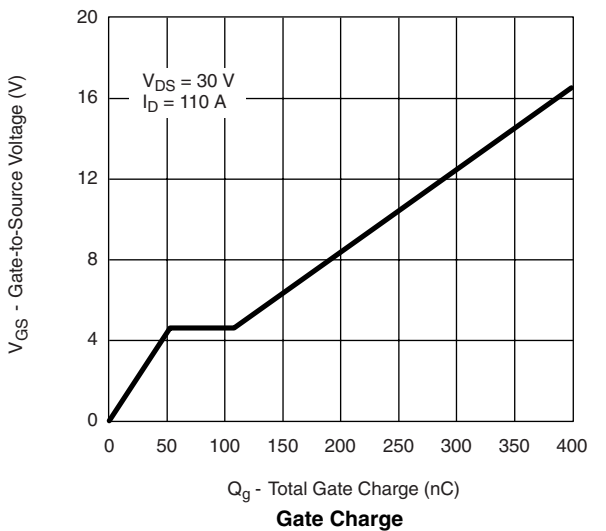
**Transconductance**



**On-Resistance vs. Drain Current**

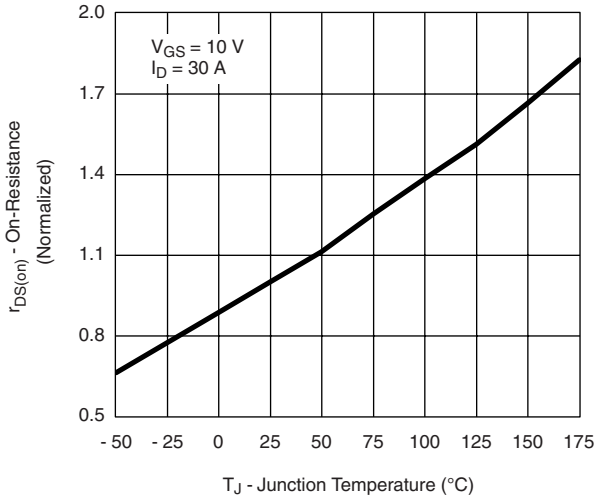


**Capacitance**

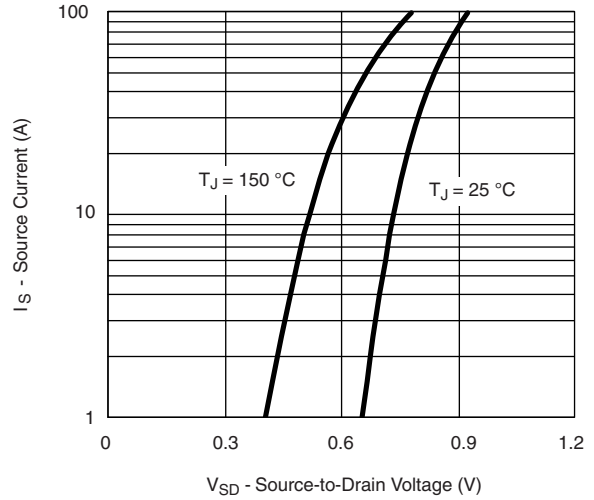


**Gate Charge**

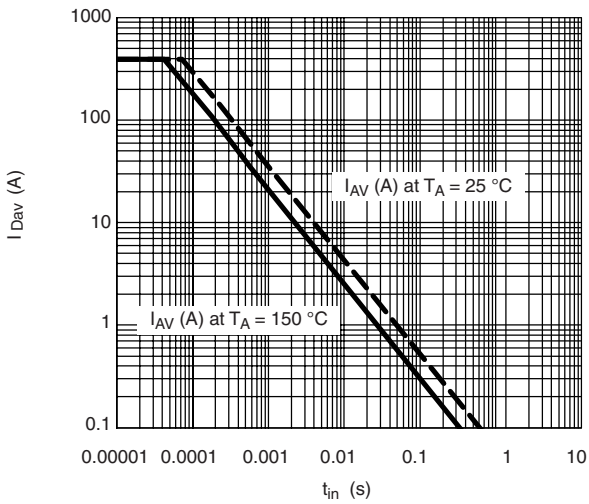
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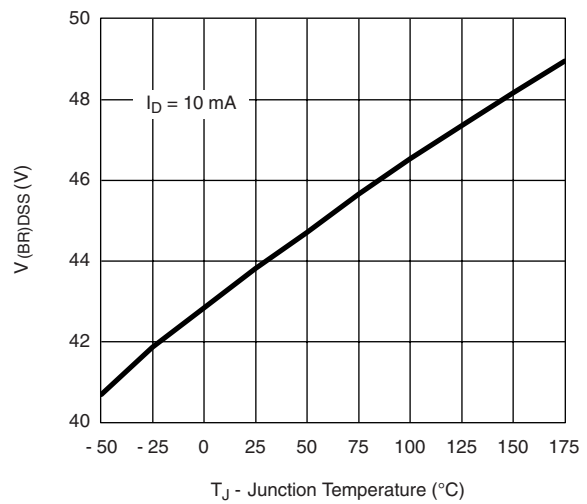
**On-Resistance vs. Junction Temperature**



**Source-Drain Diode Forward Voltage**

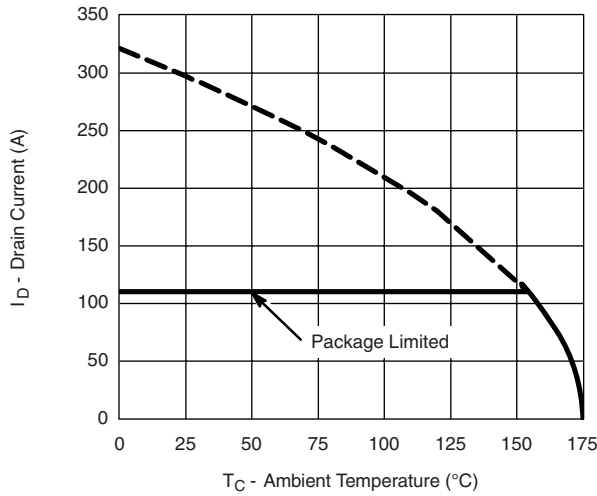


**Avalanche Current vs. Time**



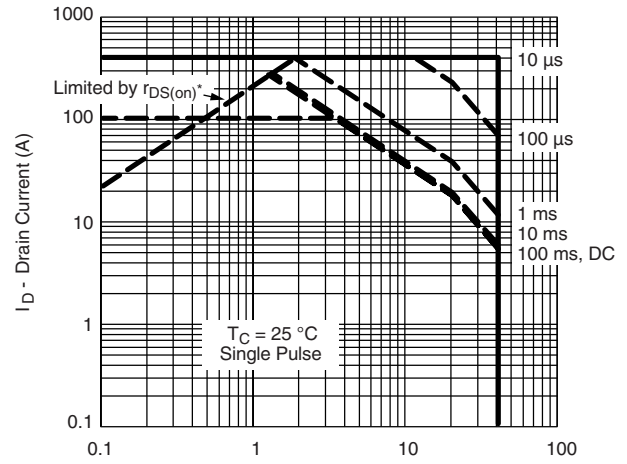
**Drain Source Breakdown vs. Junction Temperature**

**THERMAL RATINGS**



$T_C$  - Ambient Temperature ( $^{\circ}C$ )

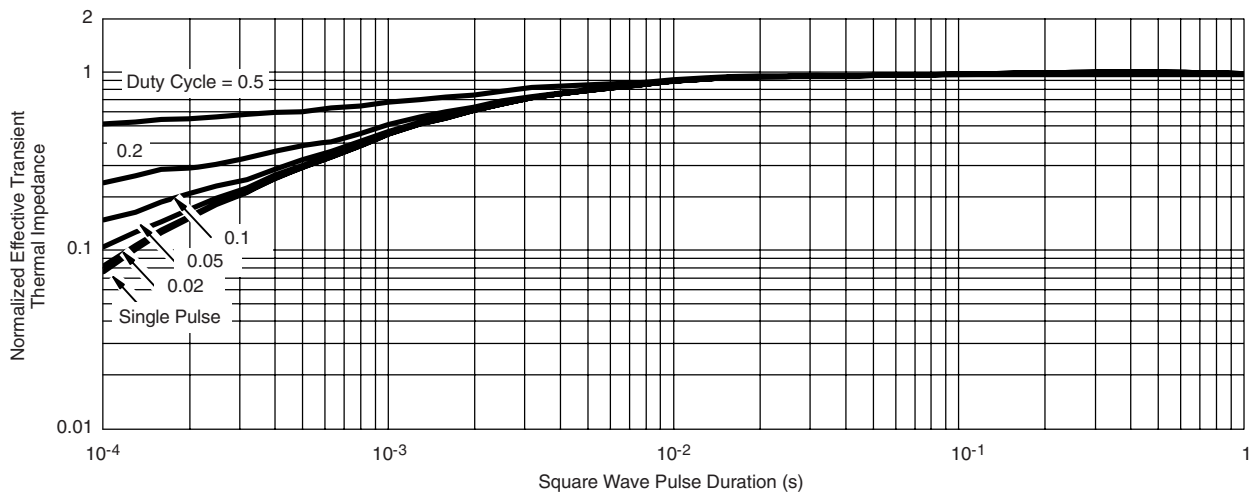
**Maximum Drain Current vs. Case Temperature**



$V_{DS}$  - Drain-to-Source Voltage (V)

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

**Safe Operating Area**



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

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