



# N-Channel 40-V (D-S) 175 °C MOSFET

PRODUCT SUMMARY		
$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
40	0.0035 at $V_{GS} = 10$ V	110 <sup>a</sup>

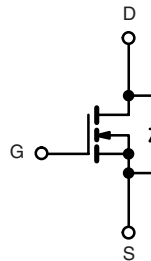
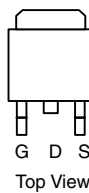
### FEATURES

- TrenchFET<sup>®</sup> Power MOSFET
- 175 °C Junction Temperature



RoHS\*  
COMPLIANT

TO-263



N-Channel MOSFET

Ordering Information: SUM110N04-04  
SUM110N04-04-E3 (Lead (Pb)-free)

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)	$I_D$	$T_C = 25$ °C	A		
		$T_C = 125$ °C			110 <sup>a</sup>
Pulsed Drain Current	$I_{DM}$	350			107 <sup>a</sup>
Avalanche Current	$I_{AR}$	60			
Repetitive Avalanche Energy <sup>b</sup>	$E_{AR}$	L = 0.1 mH	mJ		
Maximum Power Dissipation <sup>b</sup>		$T_C = 25$ °C			180
		$T_A = 25$ °C <sup>d</sup>	250 <sup>c</sup>	W	
		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	$R_{thJA}$	40	°C/W	
Junction-to-Case				

Notes:

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

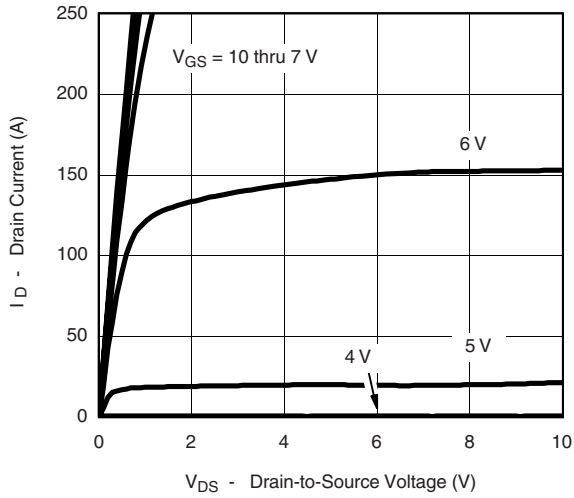
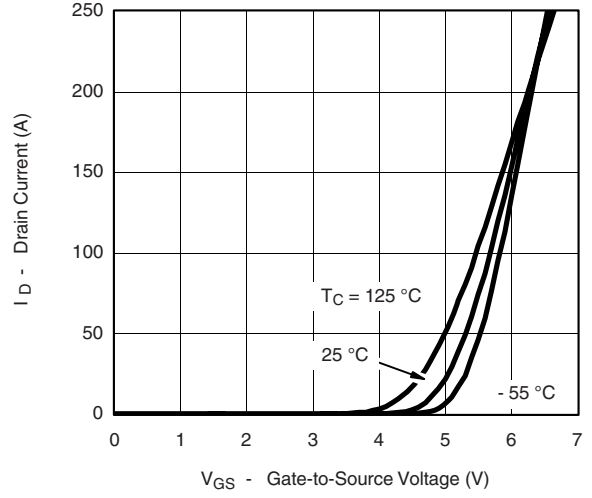
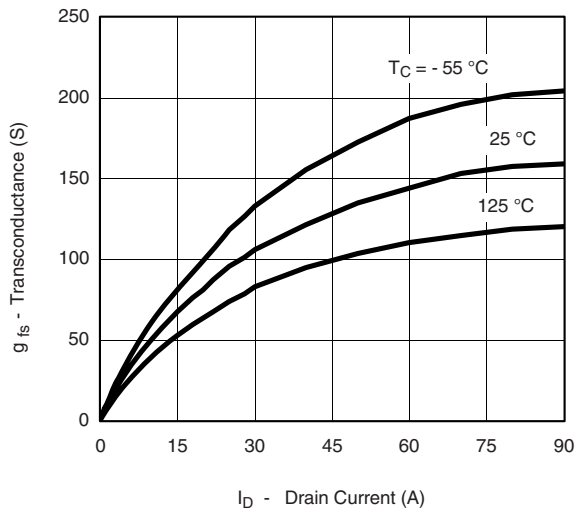
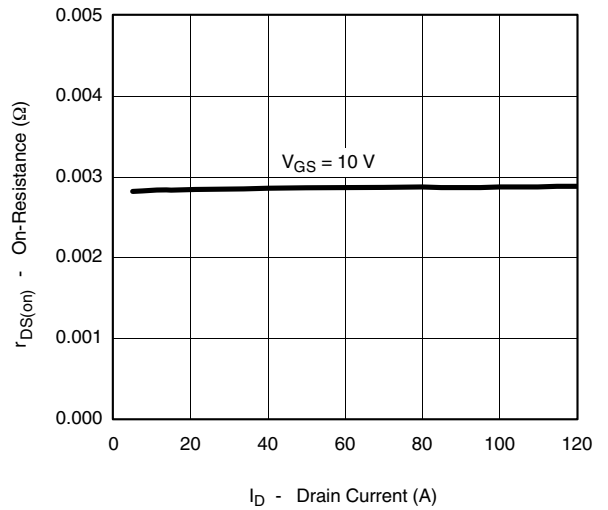
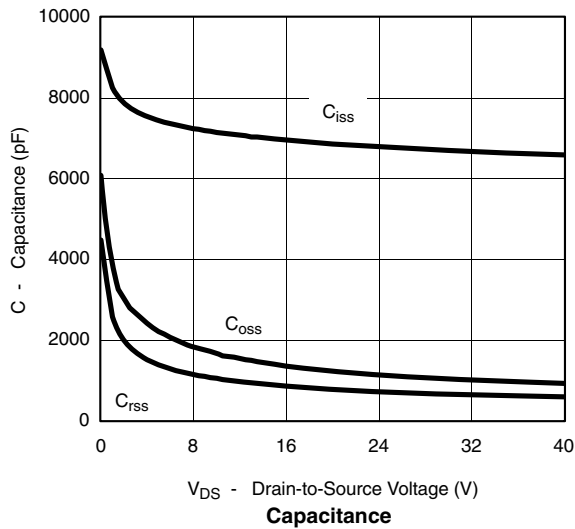
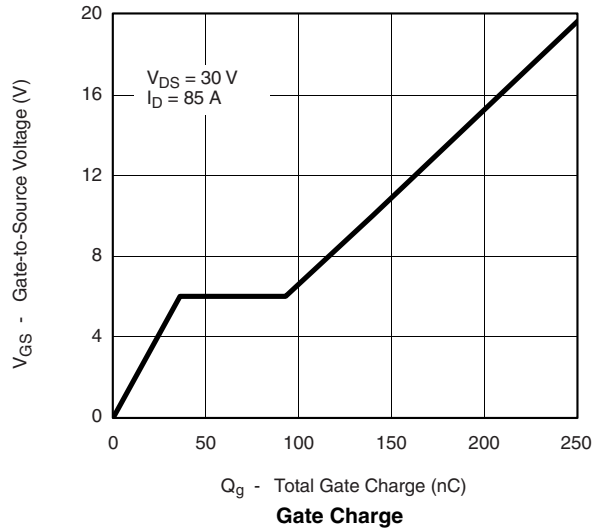
\* Pb containing terminations are not RoHS compliant, exemptions may apply.

<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	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2		4	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = 20\text{ V}$			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	
		$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^\circ\text{C}$			250	
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>	$r_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 30\text{ A}$		0.0028	0.0035	$\Omega$
		$V_{GS} = 10\text{ V}, I_D = 30\text{ A}, T_J = 125\text{ }^\circ\text{C}$			0.0055	
		$V_{GS} = 10\text{ V}, I_D = 30\text{ A}, T_J = 175\text{ }^\circ\text{C}$			0.006	
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	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		6800		$\text{pF}$
Output Capacitance	$C_{oss}$			1110		
Reverse Transfer Capacitance	$C_{rss}$			690		
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = 30\text{ V}, V_{GS} = 10\text{ V}, I_D = 110\text{ A}$		140	200	$\text{nC}$
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			35		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			55		
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 30\text{ V}, R_L = 0.47\text{ }\Omega$ $I_D \cong 110\text{ A}, V_{GEN} = 10\text{ V}, R_g = 2.5\text{ }\Omega$		20	35	$\text{ns}$
Rise Time <sup>c</sup>	$t_r$			115	175	
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$			75	115	
Fall Time <sup>c</sup>	$t_f$			85	130	
<b>Source-Drain Diode Ratings and Characteristics</b> $T_C = 25\text{ }^\circ\text{C}^b$						
Continuous Current	$I_S$				110	A
Pulsed Current	$I_{SM}$				350	
Forward Voltage <sup>a</sup>	$V_{SD}$	$I_F = 110\text{ A}, V_{GS} = 0\text{ V}$		1.1	1.4	V
Reverse Recovery Time	$t_{rr}$	$I_F = 110\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		50	80	ns
Peak Reverse Recovery Current	$I_{RM(REC)}$			2	3	A
Reverse Recovery Charge	$Q_{rr}$			0.05	0.12	$\mu\text{C}$

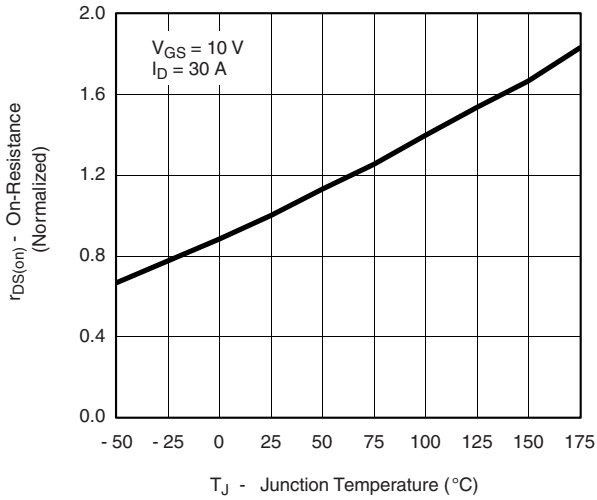
Notes:

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

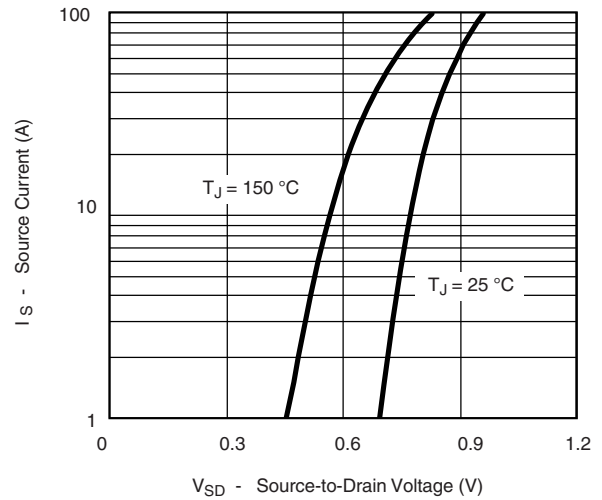
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

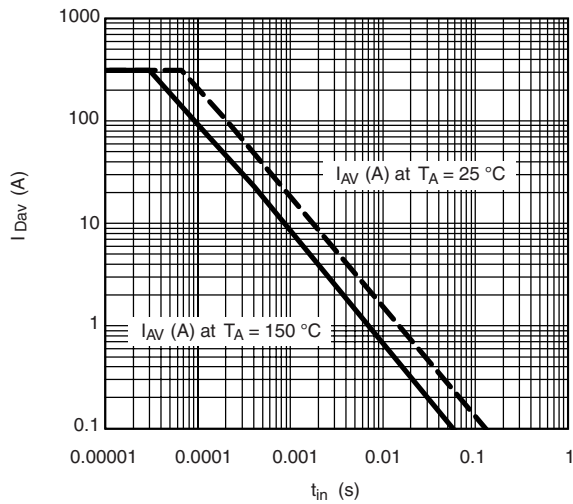
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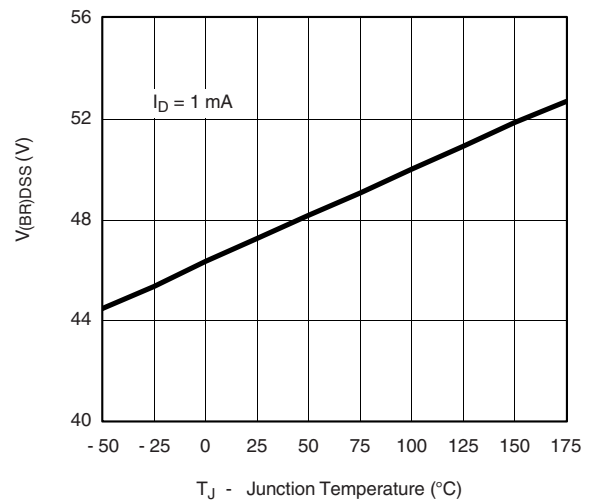
**On-Resistance vs. Junction Temperature**



**Source-Drain Diode Forward Voltage**

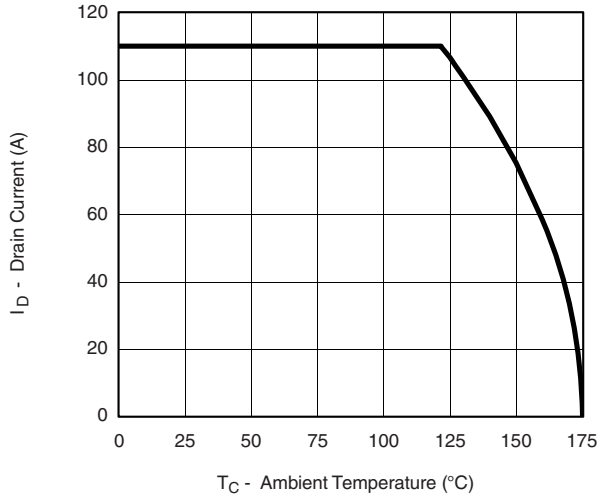


**Avalanche Current vs. Time**

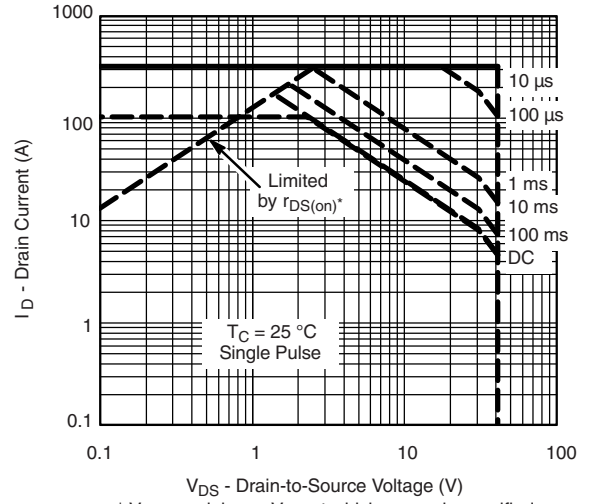


**Drain Source Breakdown vs. Junction Temperature**

**THERMAL RATINGS**

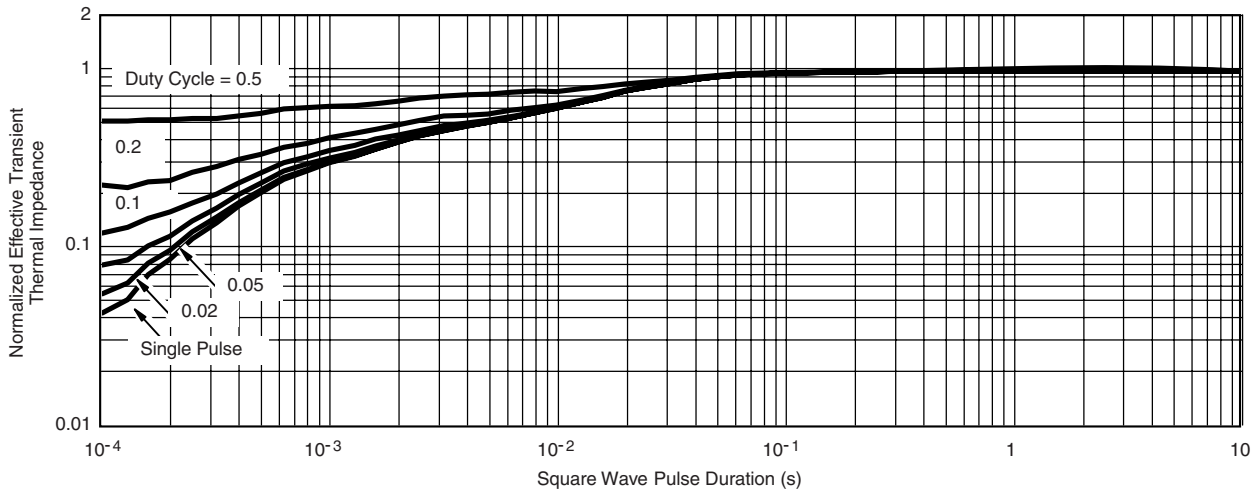


**Maximum Avalanche and Drain Current vs. Case Temperature**



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

**Safe Operating Area**



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

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