

## N-Channel 40-V (D-S) 175 °C MOSFET

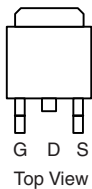
**PRODUCT SUMMARY**

$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
40	0.0028 at $V_{GS} = 10$ V	110 <sup>a</sup>

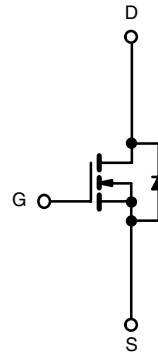
**FEATURES**

- TrenchFET<sup>®</sup> Power MOSFET
- Package with Low Thermal Resistance


**RoHS\***  
COMPLIANT

**TO-263**


Ordering Information: SUM110N04-03  
SUM110N04-03-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	$V_{GS}$	$\pm 20$		
Continuous Drain Current ( $T_J = 175$ °C)	$I_D$	$T_C = 25$ °C	110 <sup>a</sup>	A
		$T_C = 125$ °C	110 <sup>a</sup>	
Pulsed Drain Current	$I_{DM}$	440		
Avalanche Current	$I_{AR}$	70		
Repetitive Avalanche Energy <sup>b</sup>	$E_{AR}$	211	mJ	
Maximum Power Dissipation <sup>b</sup>	$P_D$	$T_C = 25$ °C	437.5 <sup>c</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	Limit	Unit
Junction-to-Ambient	$R_{thJA}$	40	°C/W
Junction-to-Case (Drain)	$R_{thJC}$	0.4	

Notes:

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

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

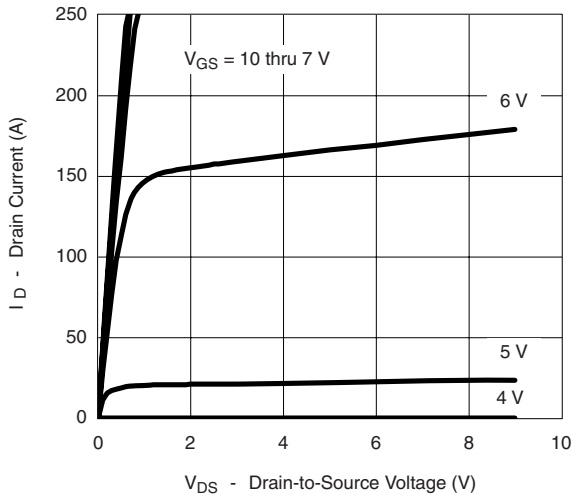
<b>SPECIFICATIONS</b> $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{DS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	40			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2.5		4	
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	
		$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^\circ\text{C}$			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>	$r_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 30\text{ A}$		0.0023	0.0028	$\Omega$
		$V_{GS} = 10\text{ V}, I_D = 30\text{ A}, T_J = 125\text{ }^\circ\text{C}$			0.0045	
		$V_{GS} = 10\text{ V}, I_D = 30\text{ A}, T_J = 175\text{ }^\circ\text{C}$			0.0056	
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	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		8250		pF
Output Capacitance	$C_{oss}$			1380		
Reverse Transfer Capacitance	$C_{rss}$			850		
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = 30\text{ V}, V_{GS} = 10\text{ V}, I_D = 110\text{ A}$		165	250	nC
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			45		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			65		
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>	$t_r$			170	255	
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$			55	85	
Fall Time <sup>c</sup>	$t_f$			110	165	
<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	$t_{rr}$	$I_F = 85\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		60	90	ns
Peak Reverse Recovery Current	$I_{RM(REC)}$			3.0	5	A
Reverse Recovery Charge	$Q_{rr}$			0.09	0.22	$\mu\text{C}$

Notes:

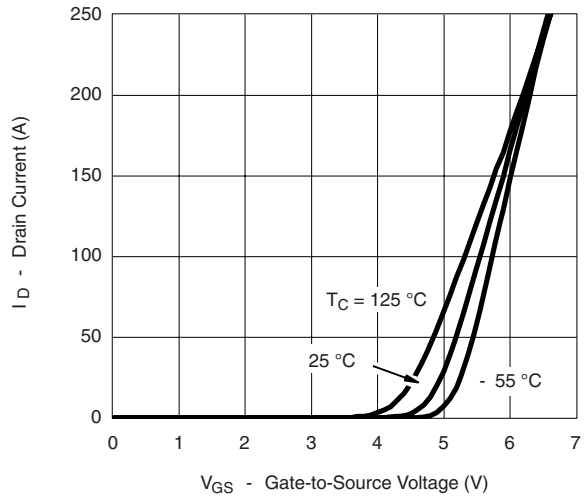
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- b. Guaranteed by design, not subject to production testing.
- c. Independent of operating temperature.

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.

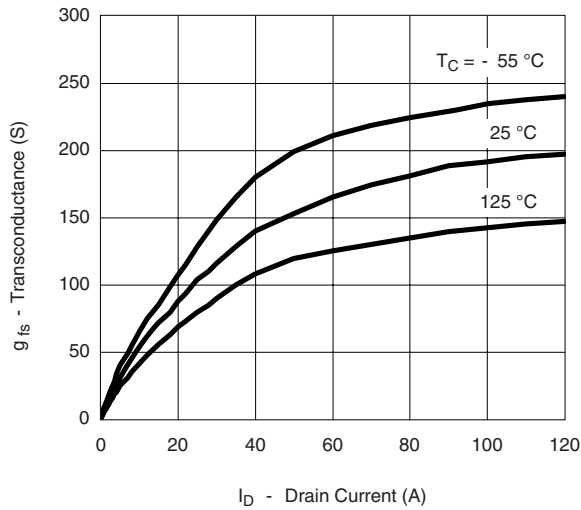
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



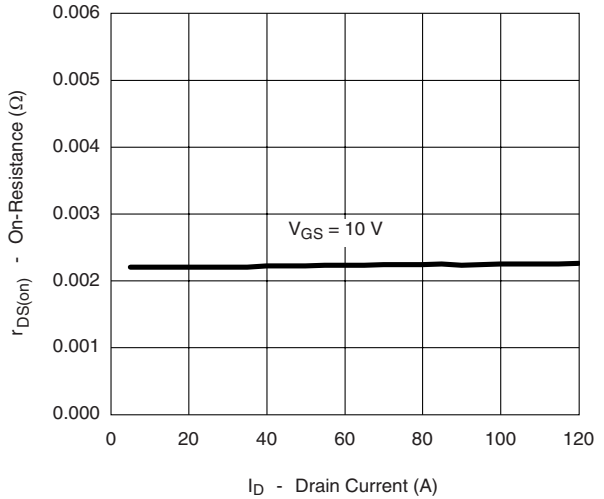
**Output Characteristics**



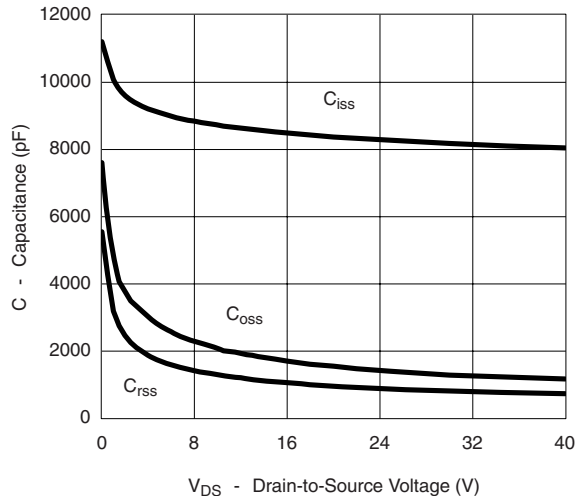
**Transfer Characteristics**



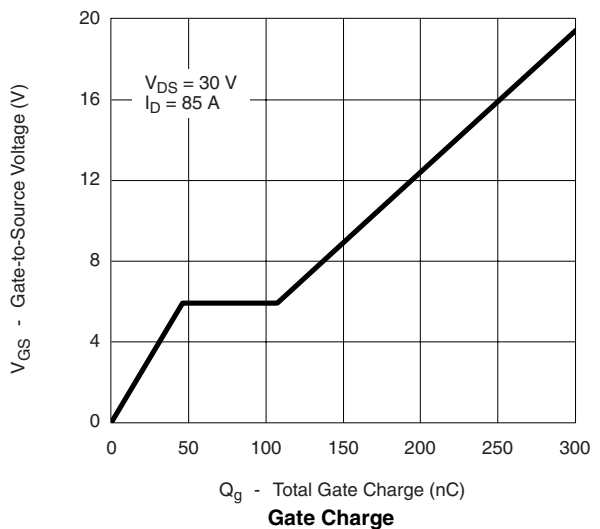
**Transconductance**



**On-Resistance vs. Drain Current**

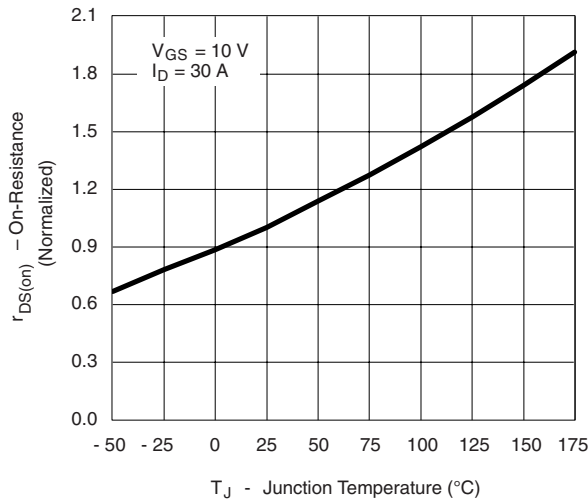


**Capacitance**

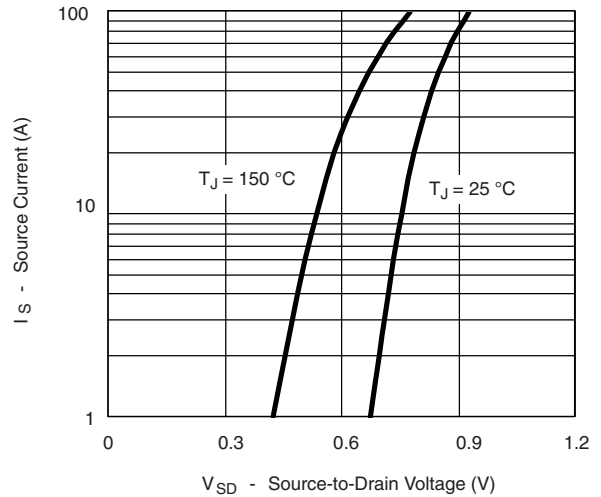


**Gate Charge**

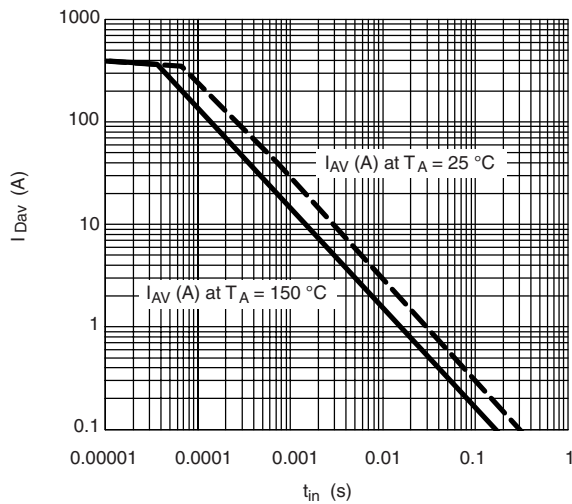
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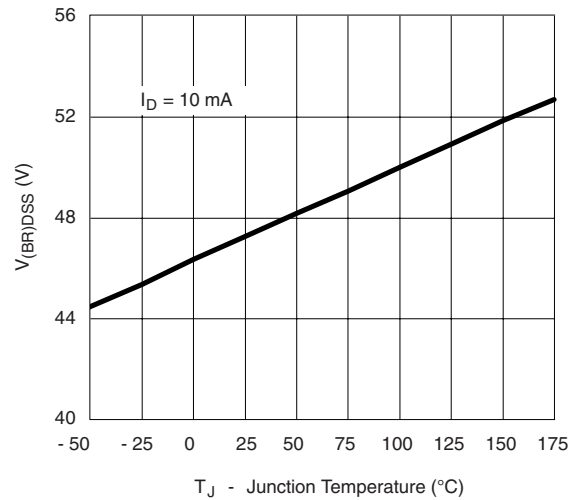
**On-Resistance vs. Junction Temperature**



**Source-Drain Diode Forward Voltage**

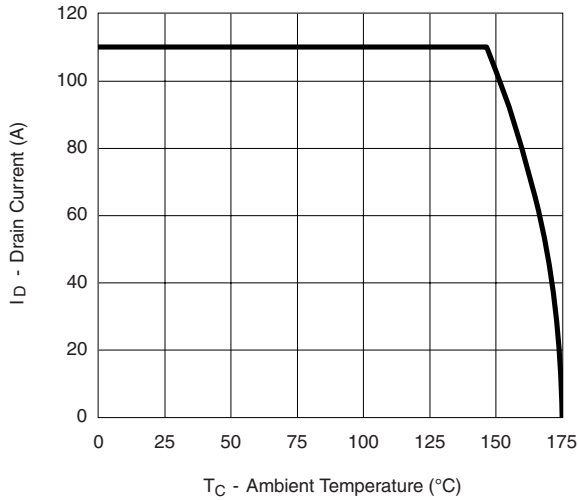


**Avalanche Current vs. Time**

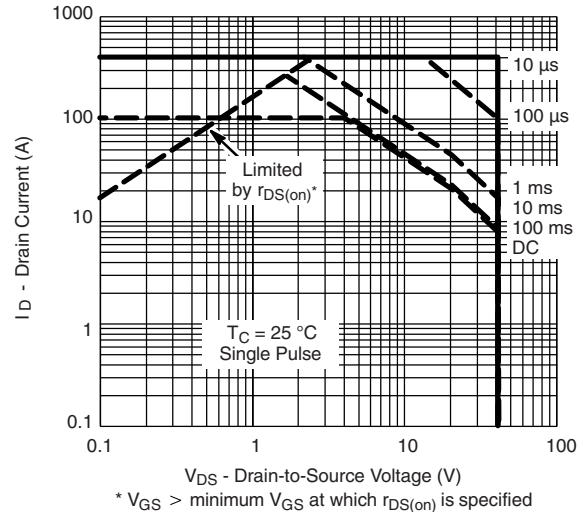


**Drain Source Breakdown vs. Junction Temperature**

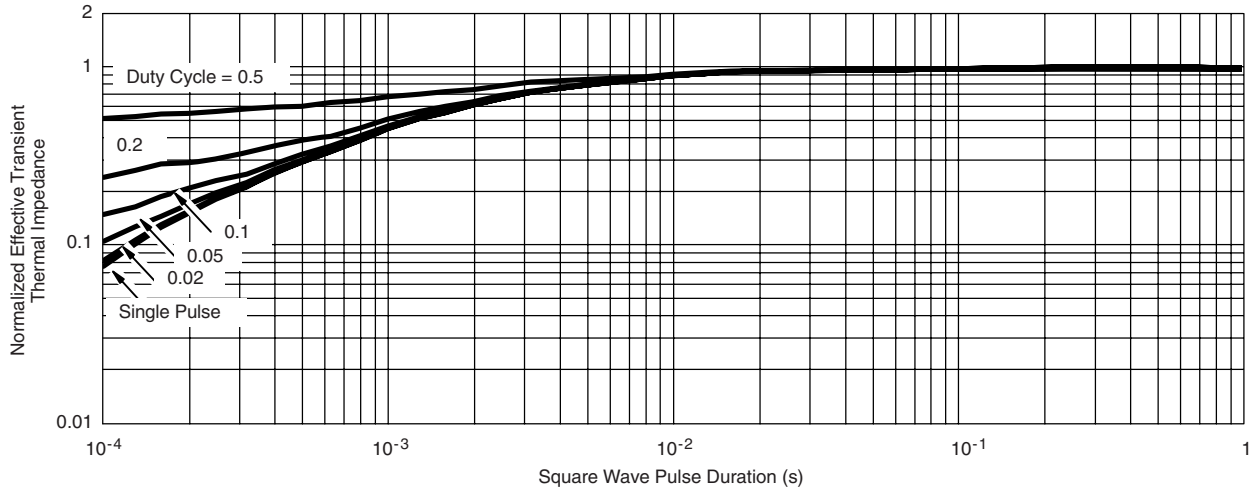
**THERMAL RATINGS**



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



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



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

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