

## N-Channel 40-V (D-S) 175 °C MOSFET

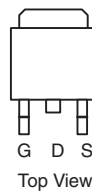
PRODUCT SUMMARY		
$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
40	0.0023 at $V_{GS} = 10$ V	110 <sup>a</sup>
	0.0038 at $V_{GS} = 4.5$ V	

### FEATURES

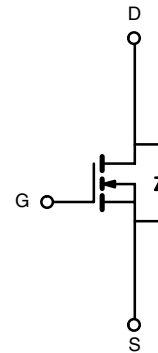
- TrenchFET<sup>®</sup> Power MOSFET
- New Package with Low Thermal Resistance



Available  
**RoHS\***  
COMPLIANT

**TO-263**


Ordering Information: SUM110N04-02L  
SUM110N04-02L-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)		$T_C = 25$ °C	110 <sup>a</sup>	A
		$T_C = 125$ °C	110 <sup>a</sup>	
Pulsed Drain Current	$I_{DM}$	440		
Avalanche Current	$I_{AR}$	75		
Repetitive Avalanche Energy <sup>b</sup>		L = 0.1 mH	280	mJ
Maximum Power Dissipation <sup>b</sup>		$T_C = 25$ °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)			

Notes:

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

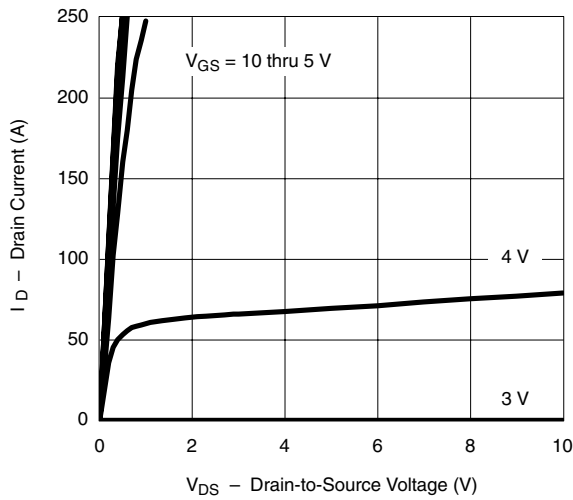
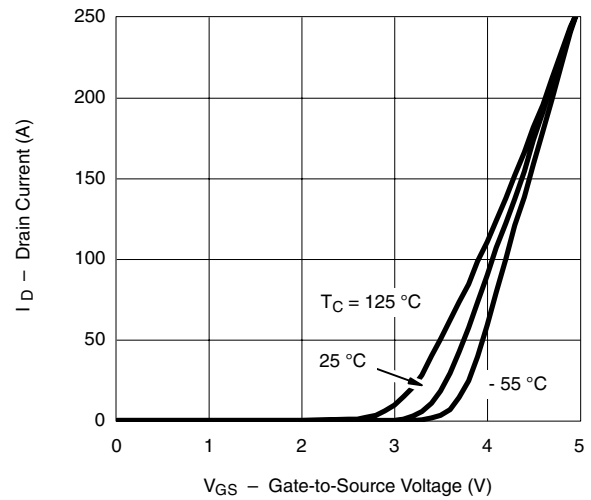
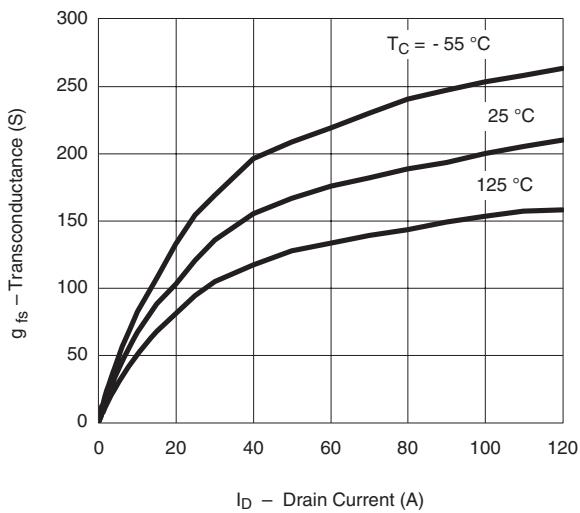
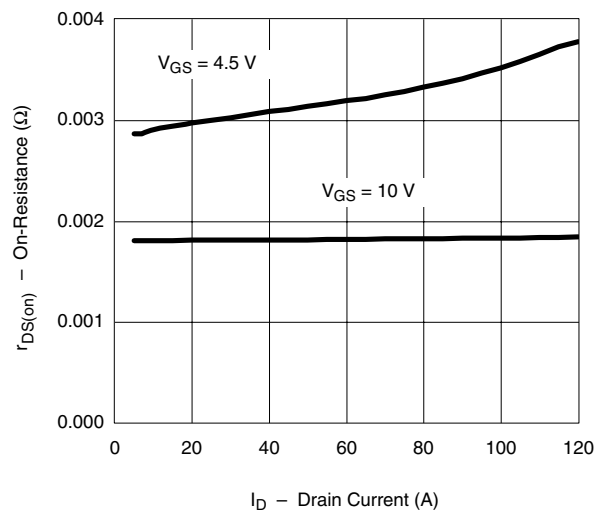
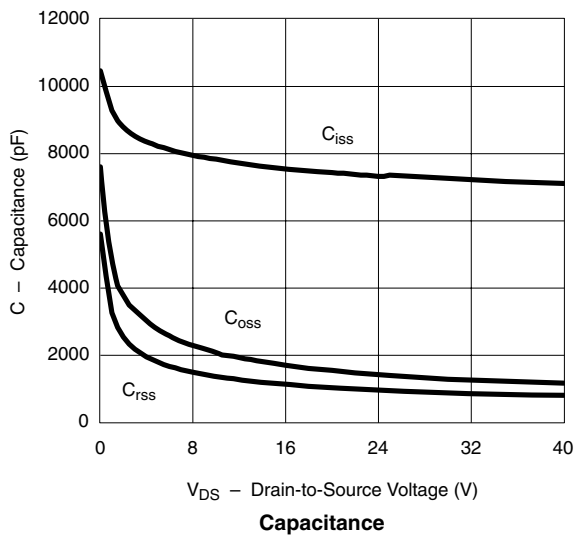
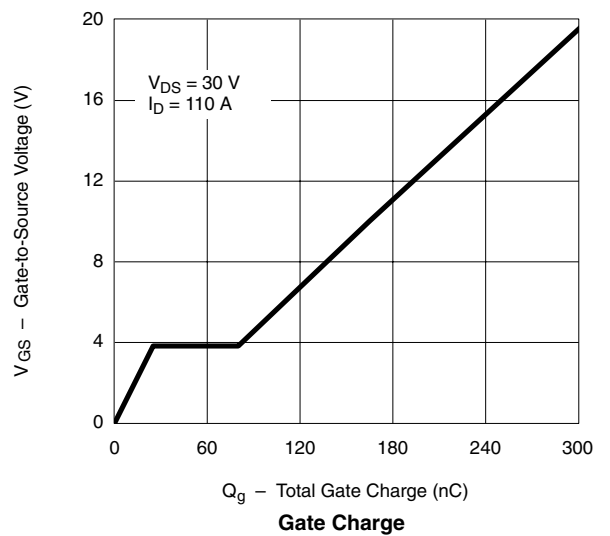
\* Pb containing terminations are not RoHS compliant, exemptions may apply.

<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	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	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	
		$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^\circ\text{C}$			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>	$r_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 30\text{ A}$		0.00185	0.0023	$\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 20\text{ A}$		0.0031	0.0038	
		$V_{GS} = 10\text{ V}, I_D = 30\text{ A}, T_J = 125\text{ }^\circ\text{C}$			0.0037	
		$V_{GS} = 10\text{ V}, I_D = 30\text{ A}, T_J = 175\text{ }^\circ\text{C}$			0.0046	
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	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		7300		$\mu\text{F}$
Output Capacitance	$C_{oss}$			1380		
Reverse Transfer Capacitance	$C_{rss}$			930		
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>	$Q_{gs}$			25		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			55		
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 30\text{ V}, R_L = 0.27\text{ }\Omega$ $I_D \cong 110\text{ A}, V_{GEN} = 10\text{ V}, R_G = 2.5\text{ }\Omega$		30	45	ns
Rise Time <sup>c</sup>	$t_r$			80	120	
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$			155	230	
Fall Time <sup>c</sup>	$t_f$			120	180	
<b>Source-Drain Diode Ratings and Characteristics</b> $T_C = 25\text{ }^\circ\text{C}$ <sup>b</sup>						
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 Charge	$I_{RM(REC)}$			2.6	4	A
Reverse Recovery Charge	$Q_{rr}$			0.08	0.15	$\mu\text{C}$

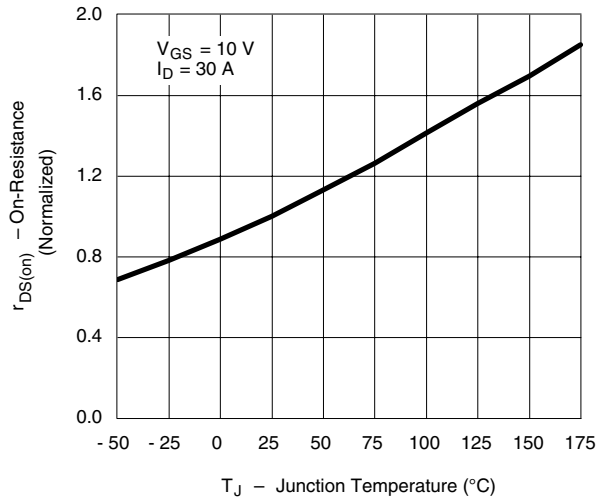
Notes:

- 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.

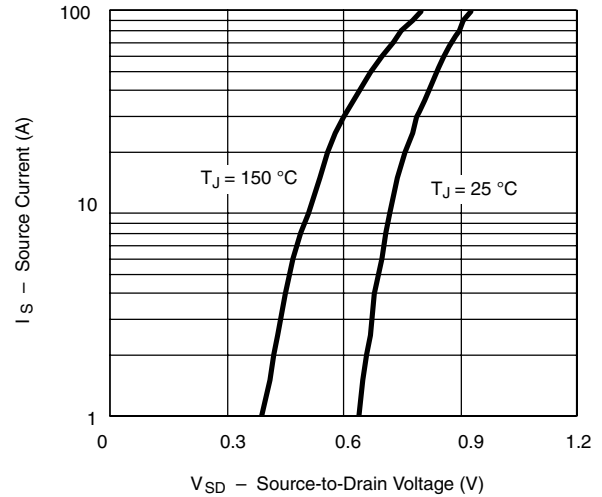
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

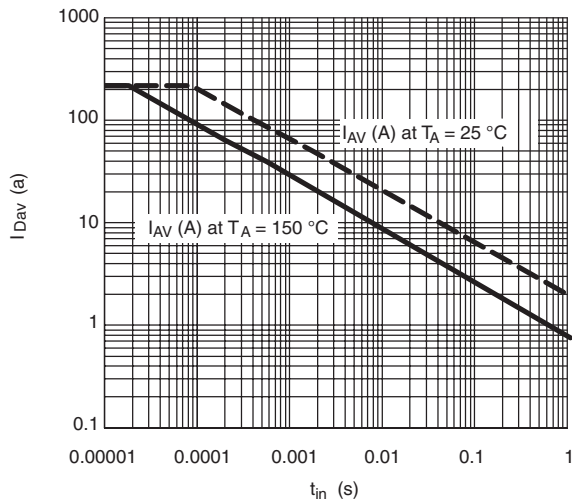
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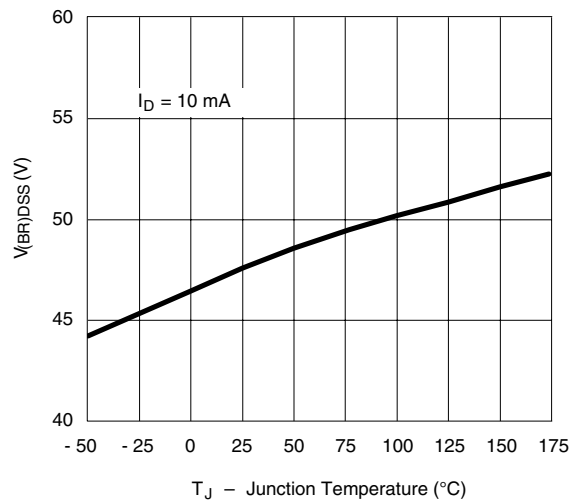
**On-Resistance vs. Junction Temperature**



**Source-Drain Diode Forward Voltage**

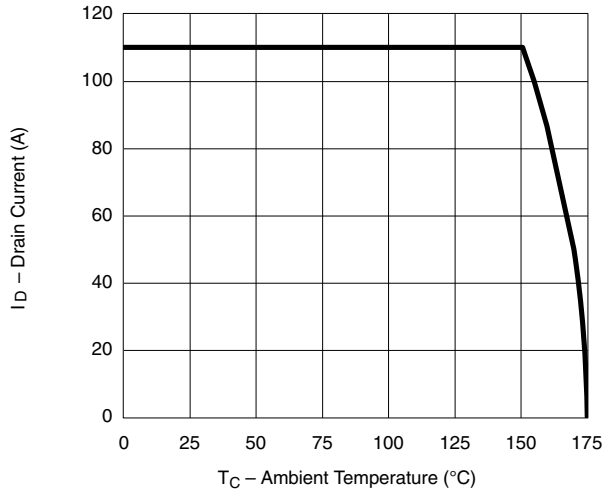


**Avalanche Current vs. Time**

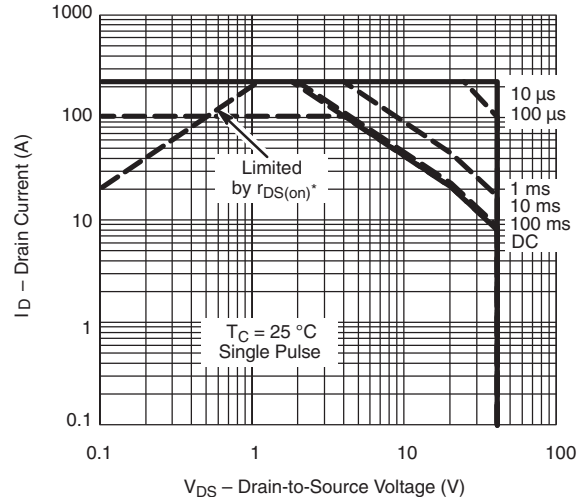


**Drain Source Breakdown vs. Junction Temperature**

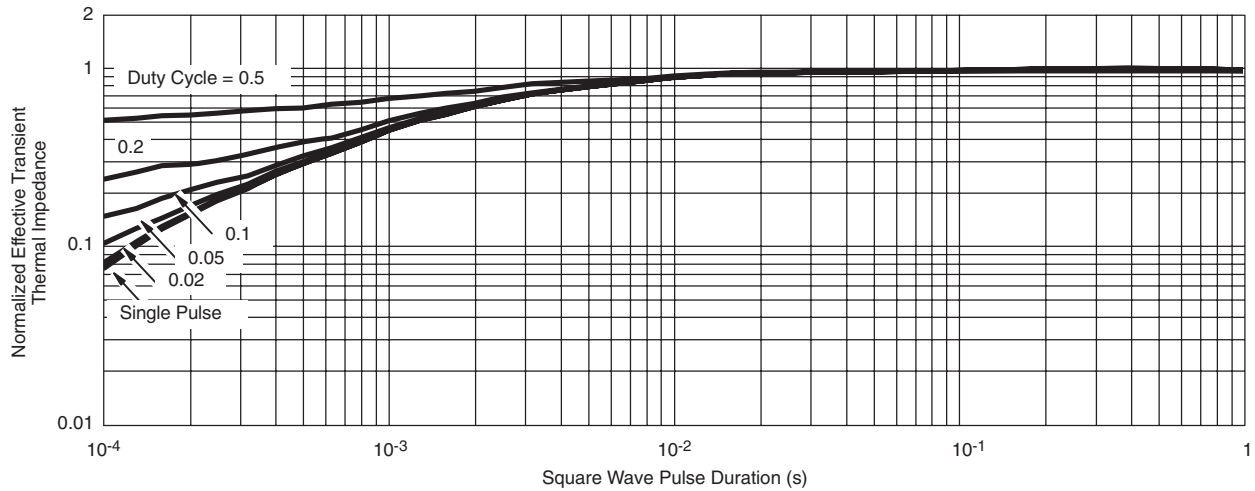
**THERMAL RATINGS**



**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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