

# N-Channel 40-V (D-S) 175 °C MOSFET

## PRODUCT SUMMARY

$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
40	0.0031 at $V_{GS} = 10$ V	110 <sup>a</sup>

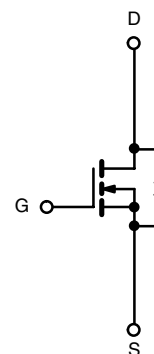
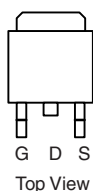
## FEATURES

- TrenchFET® Power MOSFET
- 175 °C Junction Temperature
- Package with Low Thermal Resistance
- Extremely Low  $Q_{gd}$  WFET™ Technology for Low Switching Losses
- 100 %  $R_g$  Tested



Available  
**RoHS\***  
COMPLIANT

TO-263



Ordering Information: SUM110N04-03P-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	$I_D$ 110 <sup>a</sup>	A
	$T_C = 125$ °C	110 <sup>a</sup>	
Pulsed Drain Current	$I_{DM}$	440	
Avalanche Current	$I_{AS}$	70	mJ
Single Pulse Avalanche Energy <sup>b</sup>	$E_{AS}$	211	
Maximum Power Dissipation <sup>b</sup>	$T_C = 25$ °C	$P_D$ 375 <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).

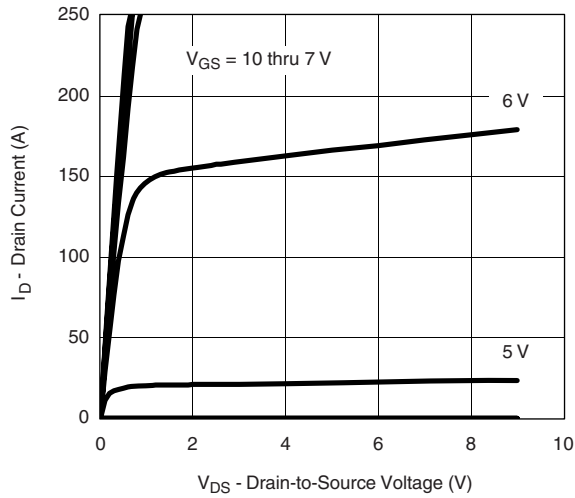
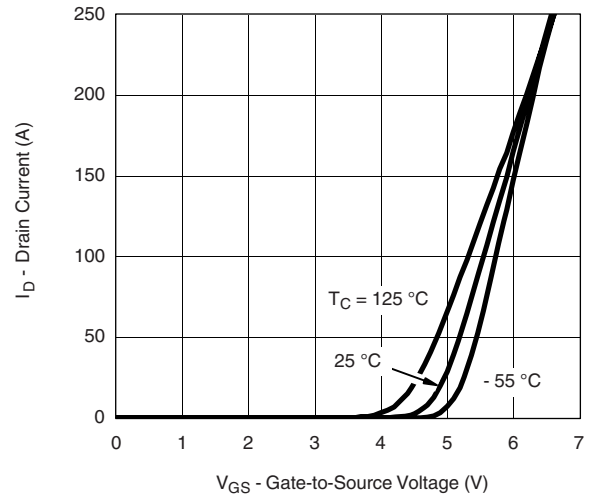
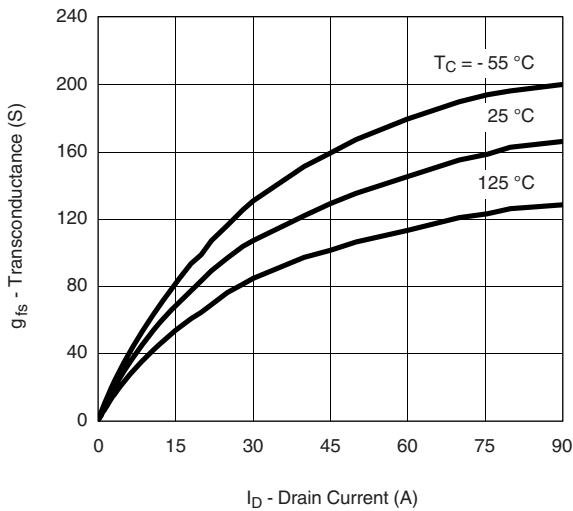
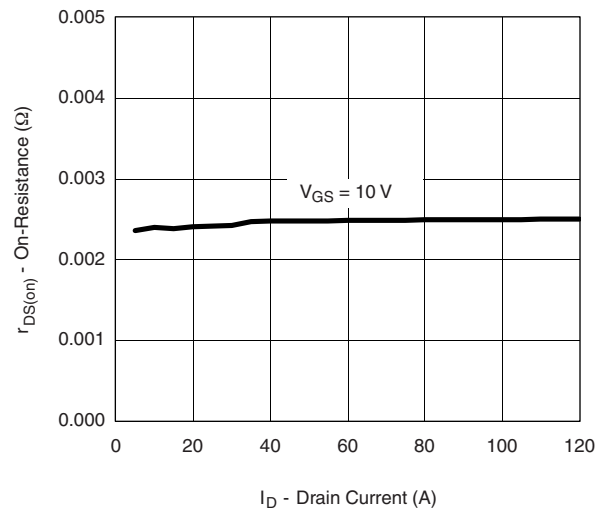
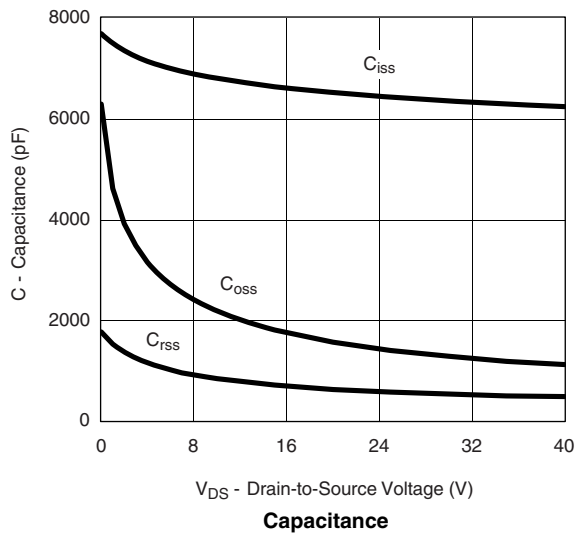
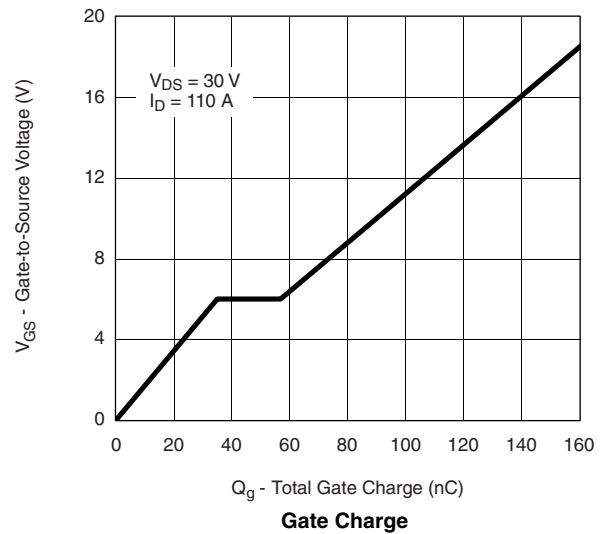
\* Pb containing terminations are not RoHS compliant, exemptions may apply.

SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
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	
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>	$r_{DS(on)}$	$V_{GS} = 10\text{ V}$ , $I_D = 30\text{ A}$		0.0025	0.0031	$\Omega$
		$V_{GS} = 10\text{ V}$ , $I_D = 30\text{ A}$ , $T_J = 125\text{ }^{\circ}\text{C}$			0.0049	
		$V_{GS} = 10\text{ V}$ , $I_D = 30\text{ A}$ , $T_J = 175\text{ }^{\circ}\text{C}$			0.0059	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}$ , $I_D = 30\text{ A}$	30			S
Dynamic <sup>b</sup>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$		6500		pF
Output Capacitance	$C_{oss}$			1400		
Reverse Transfer Capacitance	$C_{rss}$			570		
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 110\text{ A}$		90	150	nC
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			35		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			22		
Gate Resistance	$R_g$	$f = 1\text{ MHz}$	0.5	1.1	1.9	$\Omega$
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 30\text{ V}$ , $R_L = 0.27\text{ }\Omega$ $I_D \cong 110\text{ A}$ , $V_{GEN} = 10\text{ V}$ , $R_G = 2.5\text{ }\Omega$		145	220	ns
Rise Time <sup>c</sup>	$t_r$			35	55	
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$			20	30	
Fall Time <sup>c</sup>	$t_f$			55	85	
Source-Drain Diode Ratings and Characteristics $T_C = 25\text{ }^{\circ}\text{C}$ <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	$I_{RM(REC)}$			2.5	5	A
Reverse Recovery Charge	$Q_{rr}$			0.075	0.22	$\mu\text{C}$

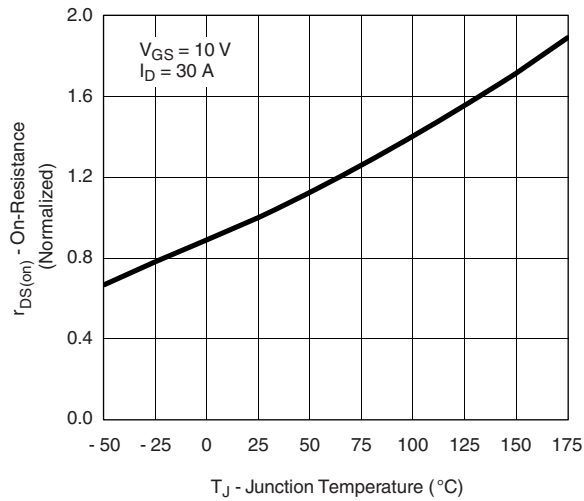
## Notes:

- 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.

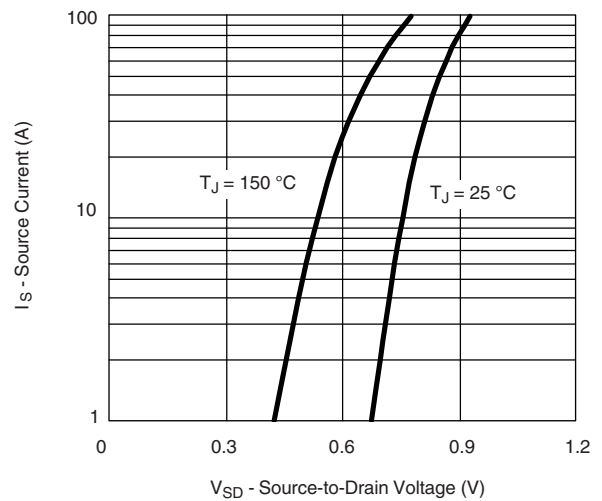
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

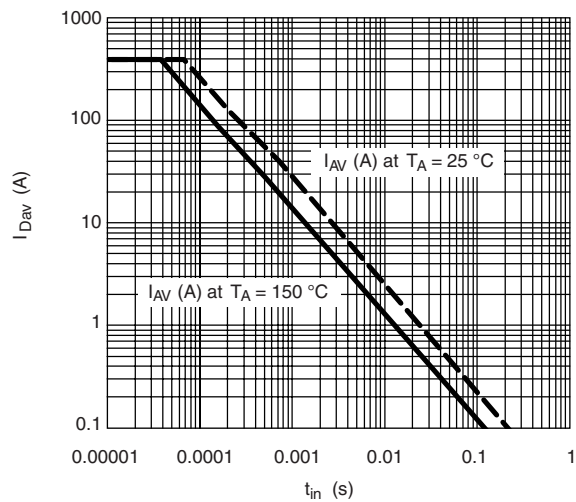
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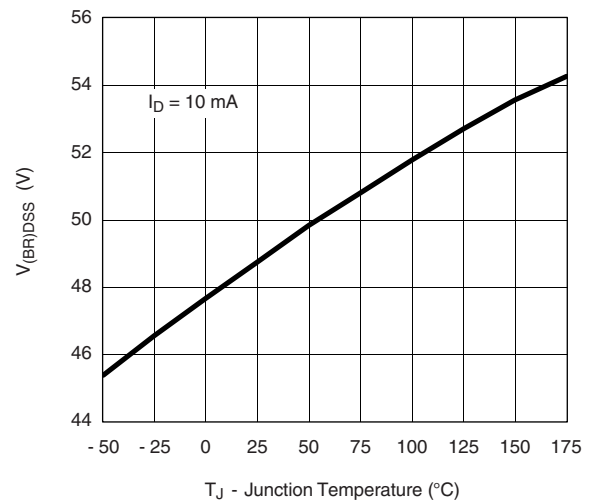
On-Resistance vs. Junction Temperature



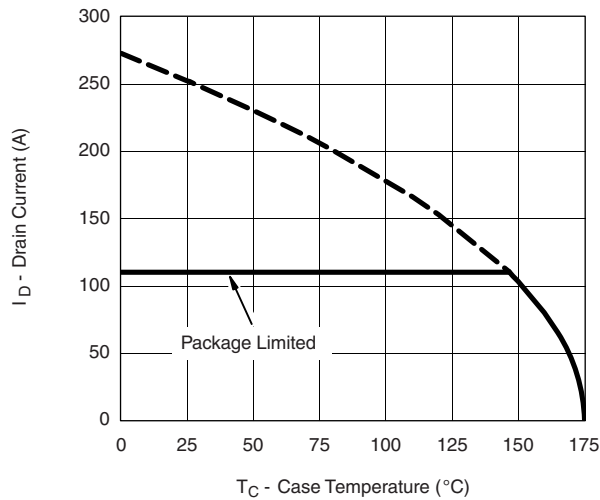
Source-Drain Diode Forward Voltage



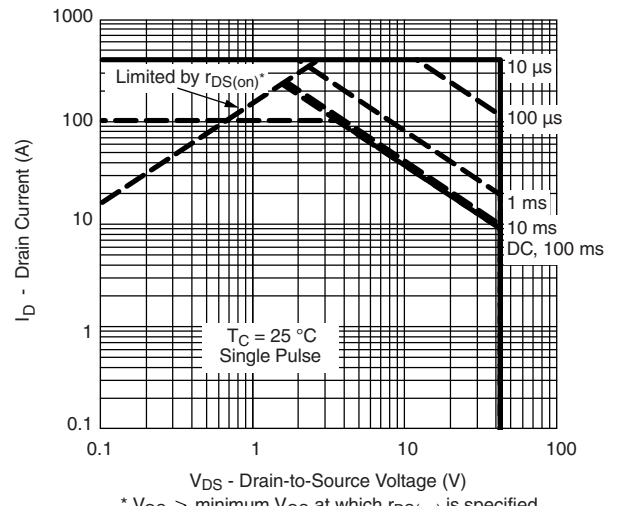
Avalanche Current vs. Time



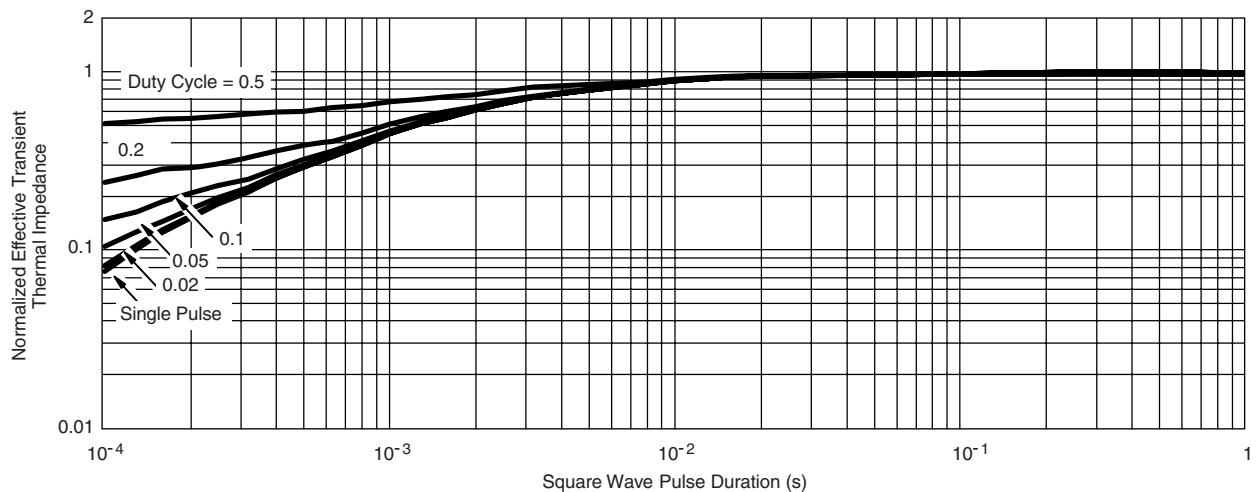
Drain Source Breakdown vs. Junction Temperature

**THERMAL RATINGS**

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



**Safe Operating Area**



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

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