



# 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>

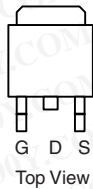
## FEATURES

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

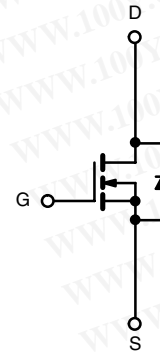


RoHS\* COMPLIANT

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)	$I_D$	$T_C = 25$ °C	110 <sup>a</sup>
		$T_C = 125$ °C	110 <sup>a</sup>
Pulsed Drain Current	$I_{DM}$	440	A
Avalanche Current	$I_{AS}$	L = 0.1 mH	70
Single Pulse Avalanche Energy <sup>b</sup>			$E_{AS}$
Maximum Power Dissipation <sup>b</sup>	$P_D$	$T_C = 25$ °C	375 <sup>c</sup>
		$T_A = 25$ °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:

- 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.

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<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>	$r_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 30\text{ A}$		0.0025	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
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		6500		$\text{pF}$
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	$\text{nC}$
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>	$t_{d(on)}$	$V_{DD} = 30\text{ V}, R_L = 0.27\text{ }\Omega$ $I_D \approx 110\text{ A}, V_{GEN} = 10\text{ V}, R_G = 2.5\text{ }\Omega$		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	
<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	$I_{RM(REC)}$			2.5	5	A
Reverse Recovery Charge	$Q_{rr}$			0.075	0.22	$\mu\text{C}$

**Notes:**

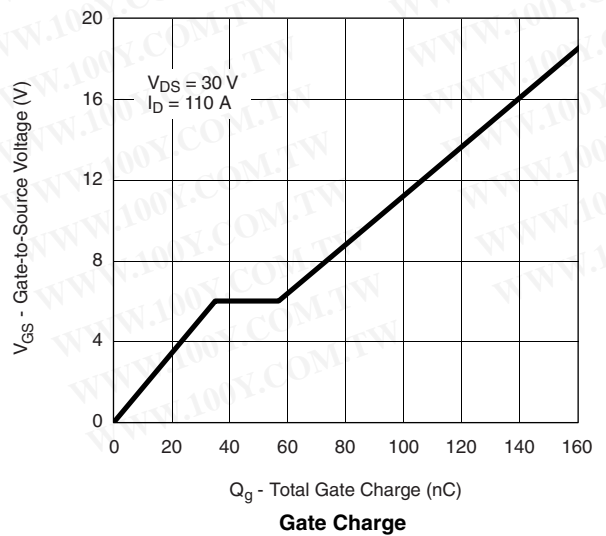
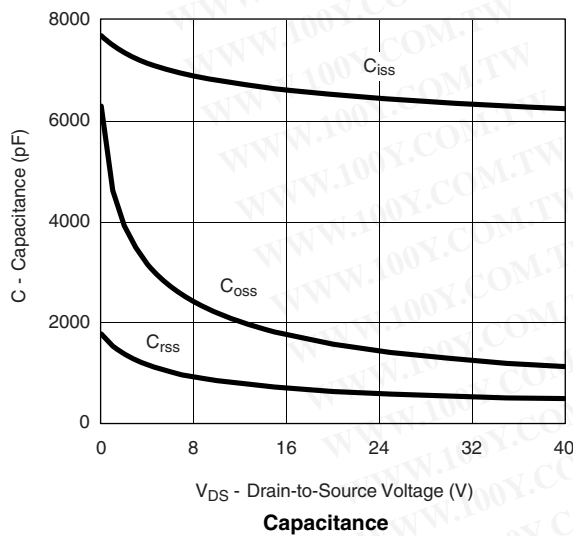
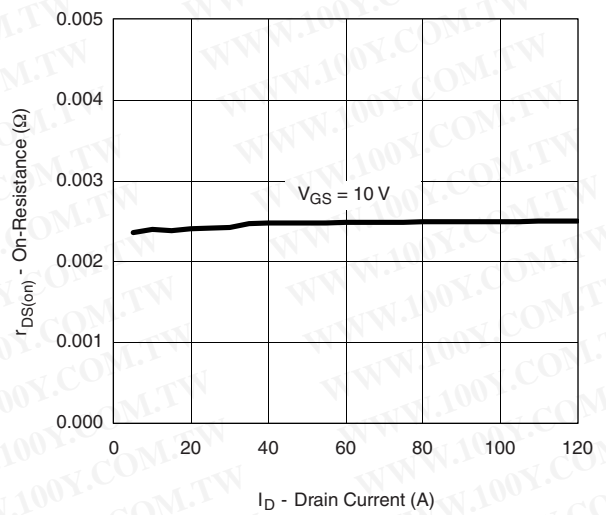
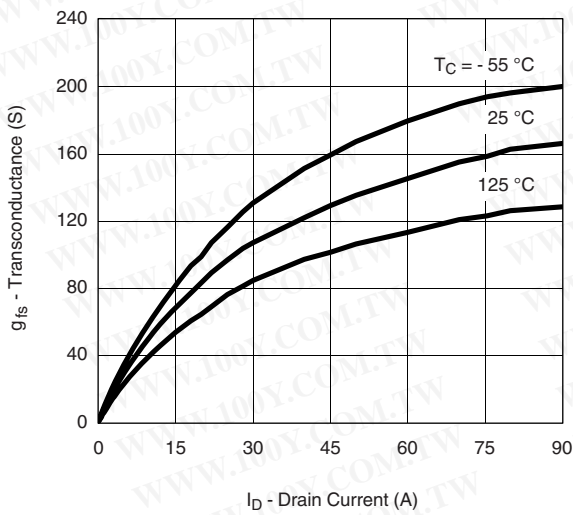
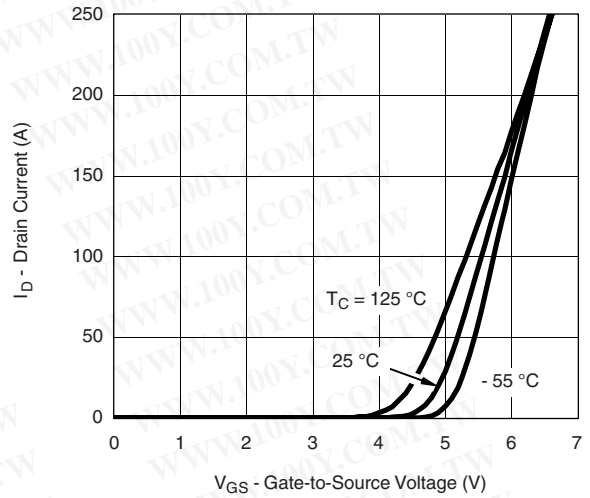
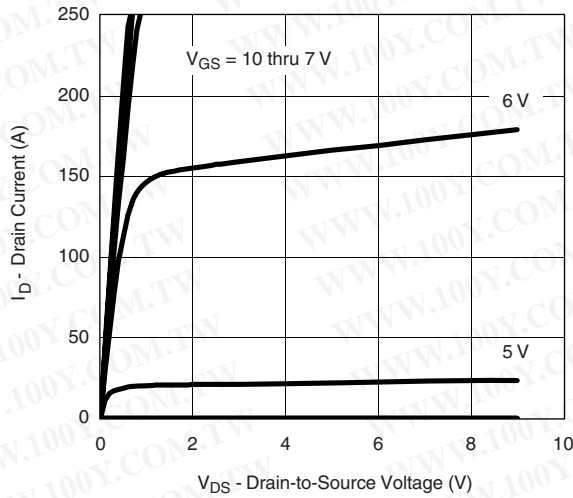
- Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- Guaranteed by design, not subject to production testing.
- Independent of operating temperature.

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.

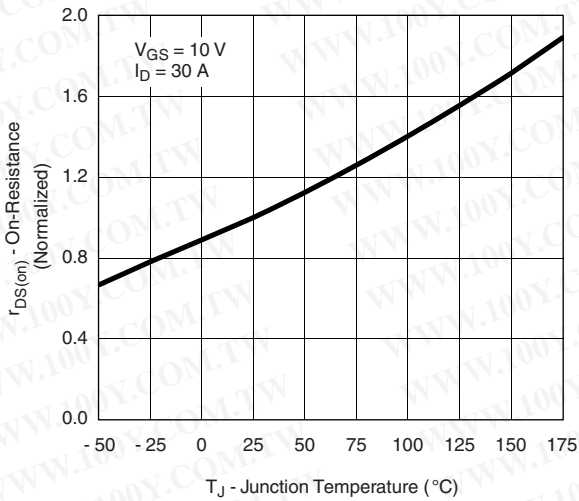
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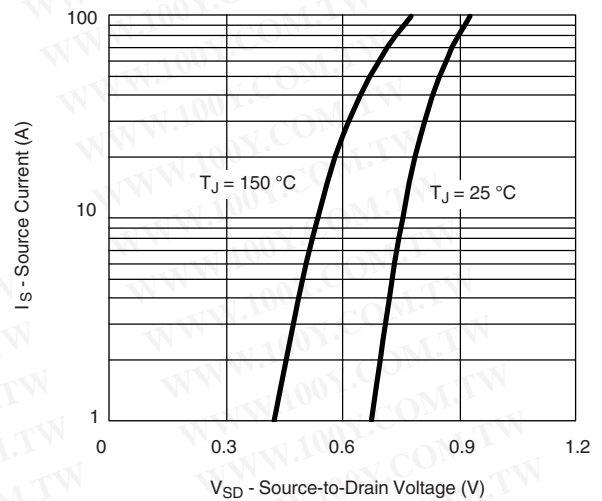
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



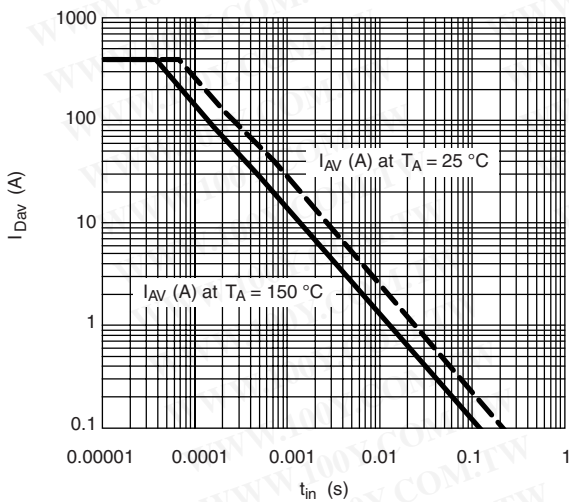
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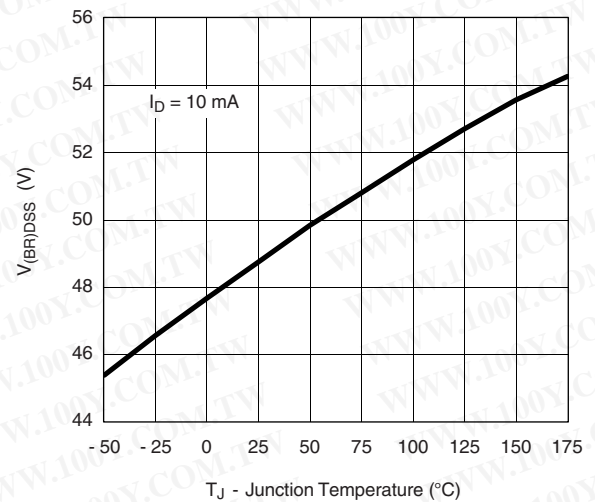
**On-Resistance vs. Junction Temperature**



**Source-Drain Diode Forward Voltage**



**Avalanche Current vs. Time**

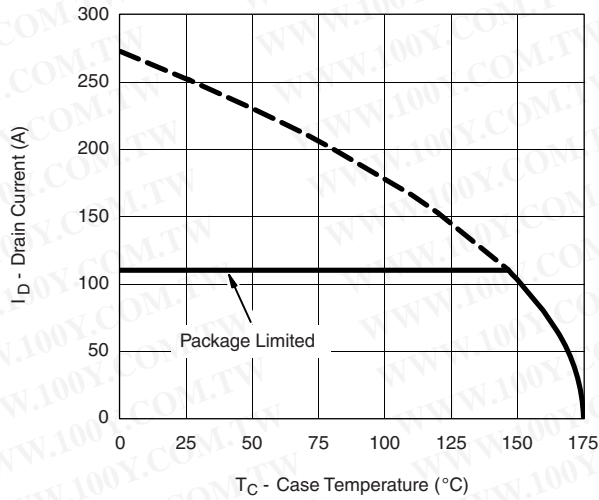


**Drain Source Breakdown vs. Junction Temperature**

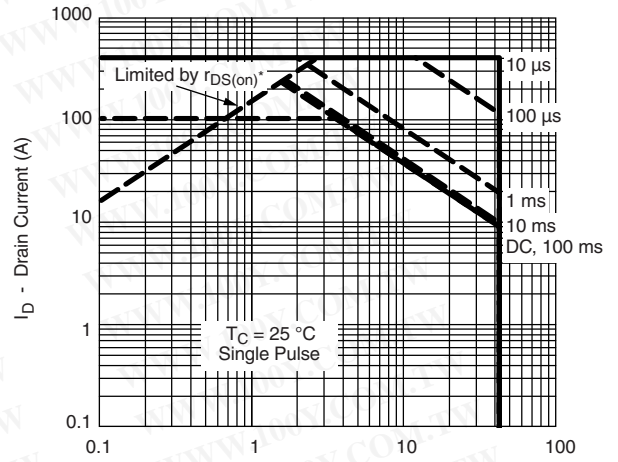
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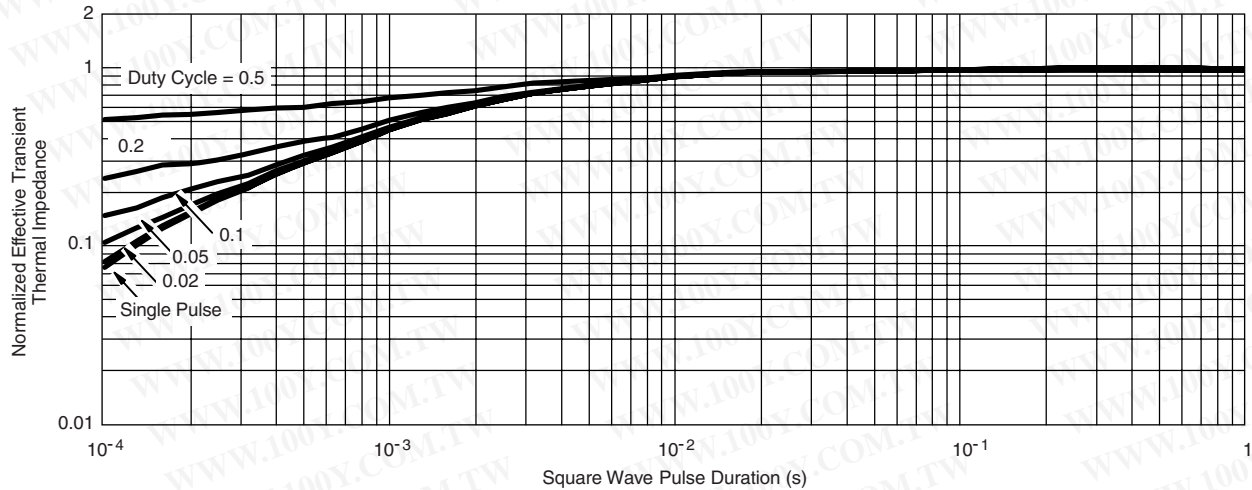
THERMAL RATINGS



Maximum Avalanche and Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

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