

N-Channel 40-V (D-S), 175 °C MOSFET

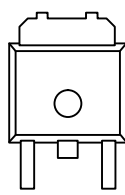
PRODUCT SUMMARY

$V_{(BR)DSS}$ (V)	$r_{DS(on)}$ (Ω)	I_D (A) ^c	Q_g (Typ)
40	0.006 at $V_{GS} = 10$ V	109	95

FEATURES

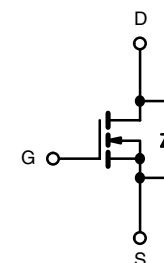
- TrenchFET® Power MOSFETS
- 175 °C Junction Temperature
- High Threshold Voltage At High Temperature


RoHS
COMPLIANT

TO-252


Top View

Drain Connected to Tab

Ordering Information: SUD50N04-06H-E3 (Lead (Pb)-free)


N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ($T_J = 175$ °C)	I_D	$T_C = 25$ °C	109 ^c
		$T_C = 100$ °C	77 ^c
Pulsed Drain Current	I_{DM}	100	A
Avalanche Current (Single Pulse)	I_{AS}	50	A
Repetitive Avalanche Energy (Single Pulse) ^a	E_{AS}	125	mJ
Power Dissipation	P_D	136	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 175	°C

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Junction-to-Ambient ^b	R_{thJA}	$t \leq 10$ sec	15	°C/W
		Steady State	40	
Junction-to-Case	R_{thJC}	0.85	1.1	°C/W

Notes:

a. Duty cycle ≤ 1 %.

b. Surface Mounted on 1" FR4 board.

c. Based on maximum allowable Junction Temperature. Package limitation current is 50 A.

SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	40			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	3.4		5.0	
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	μA
		$V_{DS} = 40\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^{\circ}\text{C}$			50	
		$V_{DS} = 40\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 175\text{ }^{\circ}\text{C}$			150	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} = 5\text{ V}$, $V_{GS} = 10\text{ V}$	50			A
Drain-Source On-State Resistance ^a	$r_{DS(on)}$	$V_{GS} = 10\text{ V}$, $I_D = 20\text{ A}$		0.0049	0.006	Ω
		$V_{GS} = 10\text{ V}$, $I_D = 20\text{ A}$, $T_J = 125\text{ }^{\circ}\text{C}$			0.009	
		$V_{GS} = 10\text{ V}$, $I_D = 20\text{ A}$, $T_J = 175\text{ }^{\circ}\text{C}$			0.012	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 15\text{ V}$, $I_D = 15\text{ A}$	20	50		S
Dynamic ^b						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$		6700		pF
Output Capacitance	C_{oss}			600		
Reversen Transfer Capacitance	C_{rss}			320		
Total Gate Charge ^c	Q_g	$V_{DS} = 20\text{ V}$, $V_{GS} = 10\text{ V}$, $I_D = 50\text{ A}$		95		nC
Gate-Source Charge ^c	Q_{gs}			37		
Gate-Drain Charge ^c	Q_{gd}			21		
Gate Resistance	R_g	$f = 1.0\text{ MHz}$		1.7		Ω
Turn-On Delay Time ^c	$t_{d(on)}$	$V_{DD} = 20\text{ V}$, $R_L = 0.4\text{ }\Omega$ $I_D \cong 50\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_g = 2.5\text{ }\Omega$		20	30	ns
Rise Time ^c	t_r			95	145	
Turn-Off Delay Time ^c	$t_{d(off)}$			50	75	
Fall Time ^c	t_f			12	20	
Source-Drain Diode Ratings and Characteristics ($T_C = 25\text{ }^{\circ}\text{C}$) ^b						
Continuous Current	I_S				50	A
Pulsed Current	I_{SM}				100	
Forward Voltage ^a	V_{SD}	$I_F = 30\text{ A}$, $V_{GS} = 0\text{ V}$		0.90	1.50	V
Reverse Recovery Time	t_{rr}	$I_F = 30\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		40	60	ns

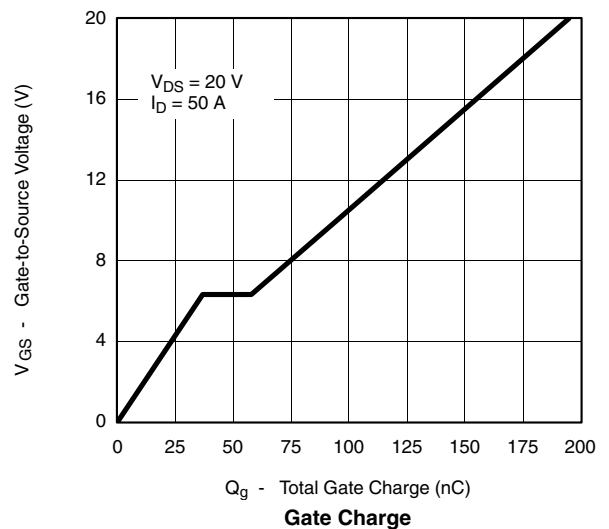
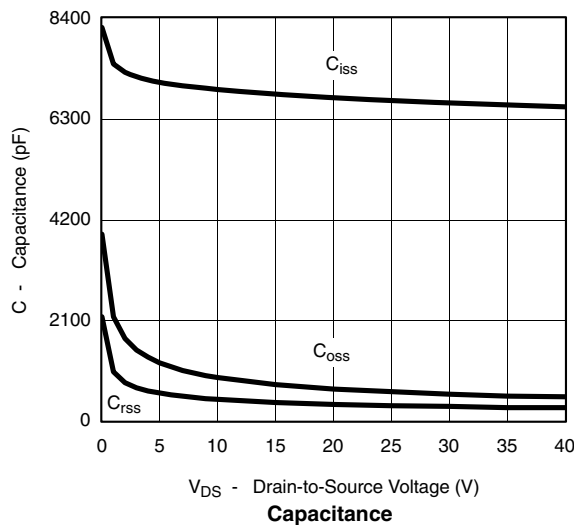
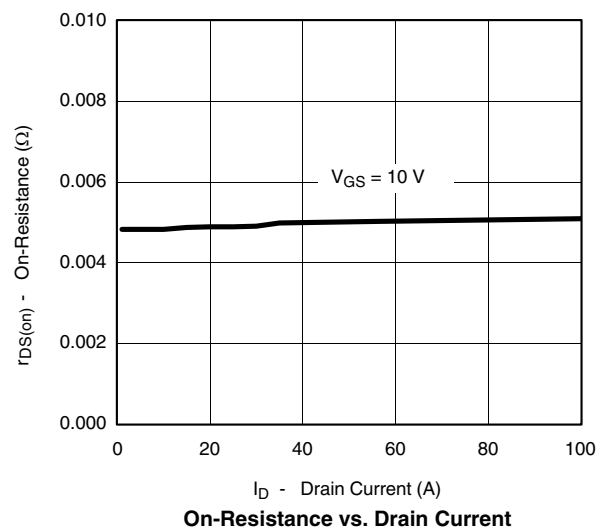
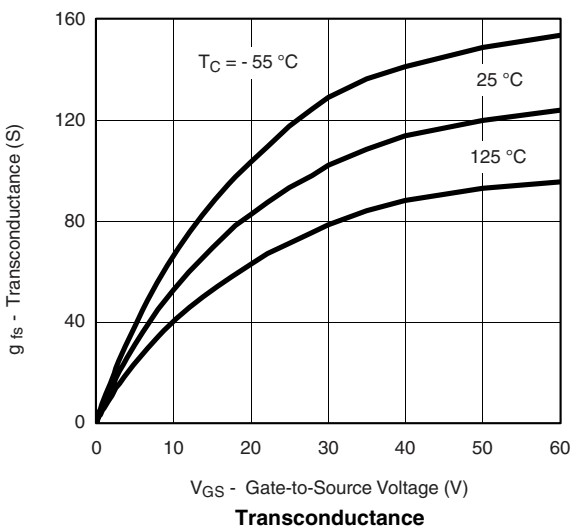
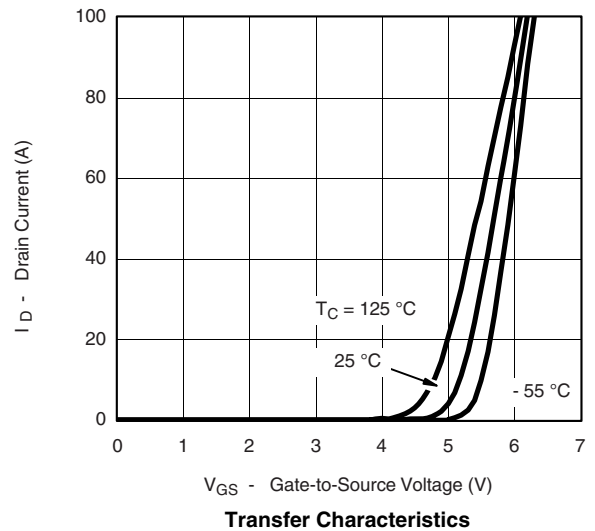
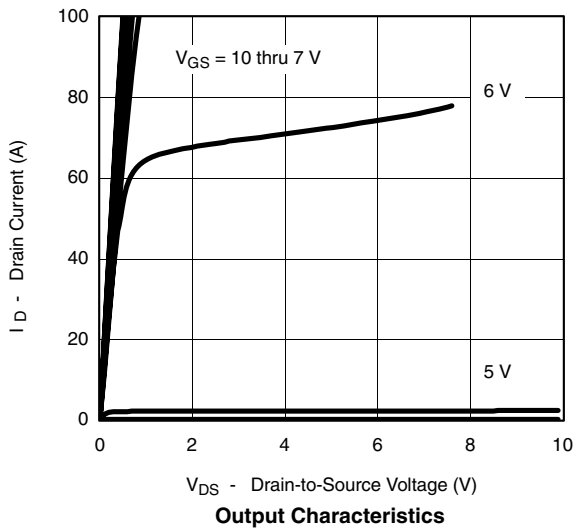
Notes:

a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

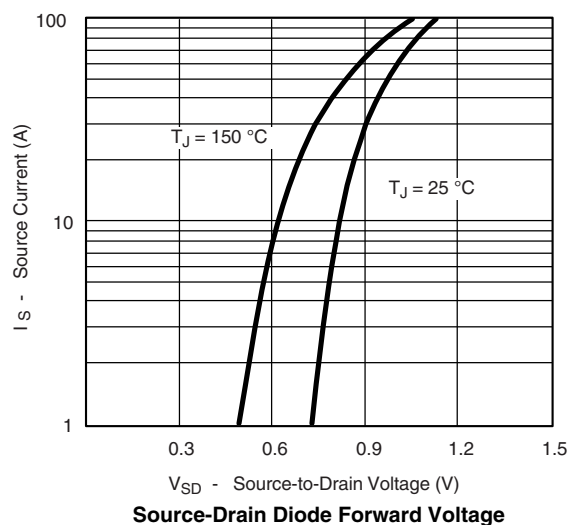
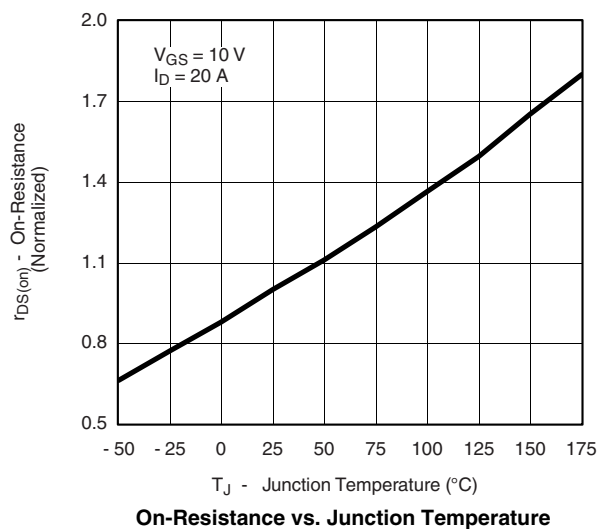
b. Guaranteed by design, not subject to production testing.

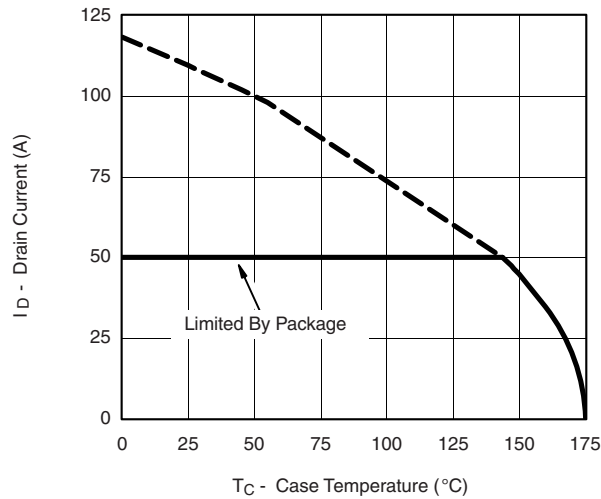
c. Independent of operating temperature.

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.

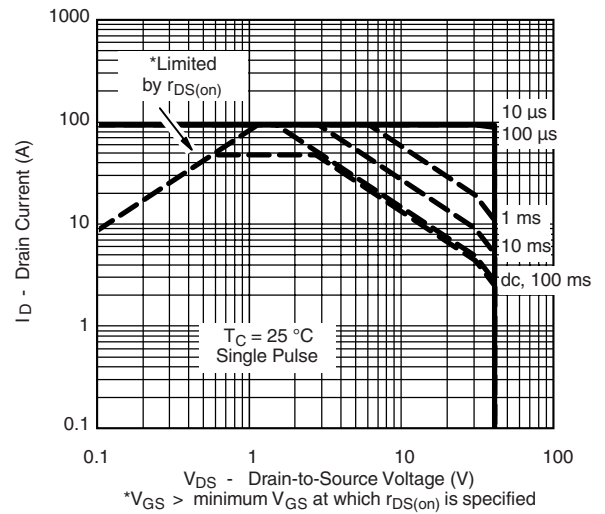
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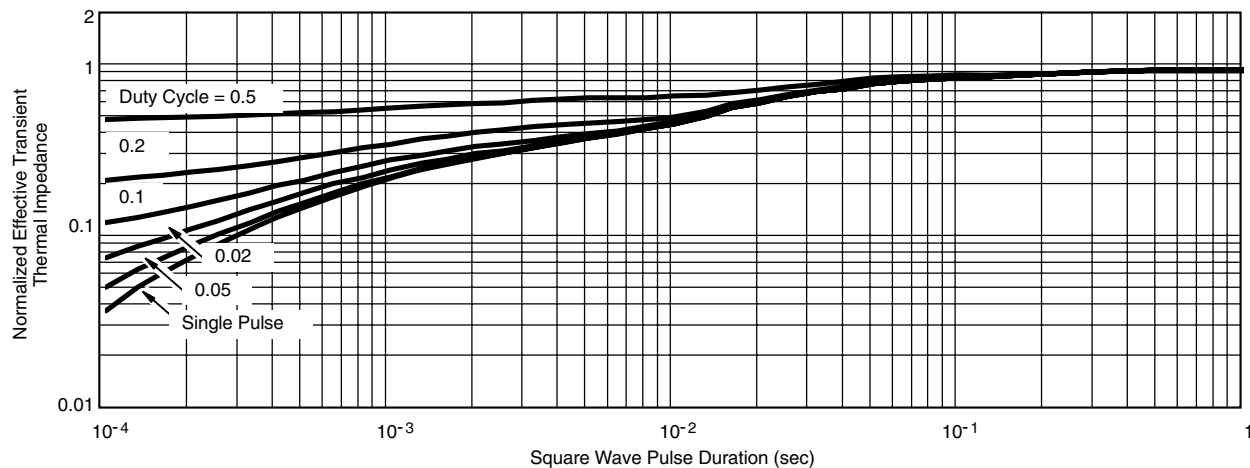


**THERMAL RATINGS**

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



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

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Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

moschip.ru

moschip.ru_4

moschip.ru_6

moschip.ru_9