



N-Channel 20-V (D-S), 175 °C MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (A) ^a	Q_g (Typ)
20	0.0033 at $V_{GS} = 10$ V	40	30 nC
	0.0044 at $V_{GS} = 4.5$ V	40	

FEATURES

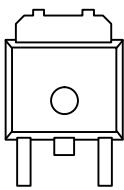
- TrenchFET® Power MOSFET
- 100 % R_g Tested



APPLICATIONS

- Server

TO-252

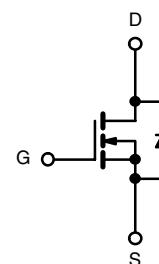


Drain Connected to Tab

Top View

Order Number:

SUD40N02-3m3P-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}	20	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ($T_J = 150$ °C)	I_D	40 ^a	A
		40 ^a	
		24.4 ^b	
		17.2 ^b	
		100	
Pulsed Drain Current	I_{DM}		
Continuous Source-Drain Diode Current	I_S	40 ^a	W
		2.8 ^b	
Maximum Power Dissipation	P_D	79	W
		39.5	
		3.3 ^b	
		1.6 ^b	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to 175	°C

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^b	R_{thJA}	37	45	°C/W
Maximum Junction-to-Case	R_{thJC}	1.5	1.9	

Notes:

a. Package limited.

b. Surface Mounted on 1" x 1" FR4 board.

SUD40N02-3m3P

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**SPECIFICATIONS** $T_J = 25^\circ\text{C}$, unless otherwise noted

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0 \text{ V}$, $I_D = 250 \mu\text{A}$	20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250 \mu\text{A}$		21		mV/ $^\circ\text{C}$
$V_{GS(\text{th})}$ Temperature Coefficient	$\Delta V_{GS(\text{th})}/T_J$			- 6.9		
Gate-Source Threshold Voltage	$V_{GS(\text{th})}$	$V_{DS} = V_{GS}$, $I_D = 250 \mu\text{A}$	1		3	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0 \text{ V}$, $V_{GS} = \pm 20 \text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 20 \text{ V}$, $V_{GS} = 0 \text{ V}$			1	μA
		$V_{DS} = 20 \text{ V}$, $V_{GS} = 0 \text{ V}$, $T_J = 100^\circ\text{C}$			20	
On-State Drain Current ^a	$I_{D(\text{on})}$	$V_{DS} \geq 5 \text{ V}$, $V_{GS} = 10 \text{ V}$	30			A
Drain-Source On-State Resistance ^a	$r_{DS(\text{on})}$	$V_{GS} = 10 \text{ V}$, $I_D = 20 \text{ A}$		0.0027	0.0033	Ω
		$V_{GS} = 4.5 \text{ V}$, $I_D = 20 \text{ A}$		0.0036	0.0044	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 15 \text{ V}$, $I_D = 20 \text{ A}$		100		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = 10 \text{ V}$, $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$		6520		pF
Output Capacitance	C_{oss}			1430		
Reverse Transfer Capacitance	C_{rss}			770		
Total Gate Charge	Q_g	$V_{DS} = 10 \text{ V}$, $V_{GS} = 10 \text{ V}$, $I_D = 50 \text{ A}$		105	160	nC
				50	75	
Gate-Source Charge	Q_{gs}	$V_{DS} = 10 \text{ V}$, $V_{GS} = 4.5 \text{ V}$, $I_D = 50 \text{ A}$		17		
Gate-Drain Charge	Q_{gd}			14		
Gate Resistance	R_g	$f = 1 \text{ MHz}$		1.2	1.9	Ω
Turn-On Delay Time	$t_{d(\text{on})}$	$V_{DD} = 10 \text{ V}$, $R_L = 0.2 \Omega$ $I_D \geq 50 \text{ A}$, $V_{GEN} = 4.5 \text{ V}$, $R_g = 1 \Omega$		40	60	ns
Rise Time	t_r			30	45	
Turn-Off Delay Time	$t_{d(\text{off})}$			67	101	
Fall Time	t_f			33	50	
Turn-On Delay Time	$t_{d(\text{on})}$	$V_{DD} = 10 \text{ V}$, $R_L = 0.2 \Omega$ $I_D \geq 50 \text{ A}$, $V_{GEN} = 10 \text{ V}$, $R_g = 1 \Omega$		13	20	
Rise Time	t_r			7	11	
Turn-Off Delay Time	$t_{d(\text{off})}$			40	60	
Fall Time	t_f			9	14	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25^\circ\text{C}$			40	A
Pulse Diode Forward Current ^a	I_{SM}				100	
Body Diode Voltage	V_{SD}	$I_S = 20 \text{ A}$		0.81	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 50 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$, $T_J = 25^\circ\text{C}$		38	57	ns
Body Diode Reverse Recovery Charge	Q_{rr}			34	51	
Reverse Recovery Fall Time	t_a			18		ns
Reverse Recovery Rise Time	t_b			20		

Notes:

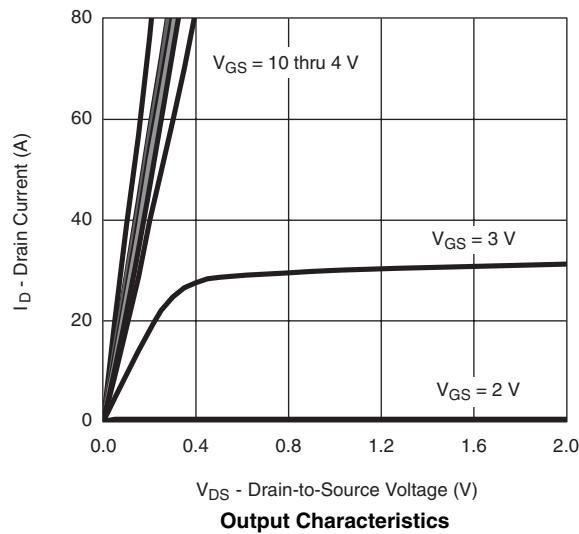
a. Pulse test; pulse width $\leq 300 \mu\text{s}$, duty cycle $\leq 2\%$.

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

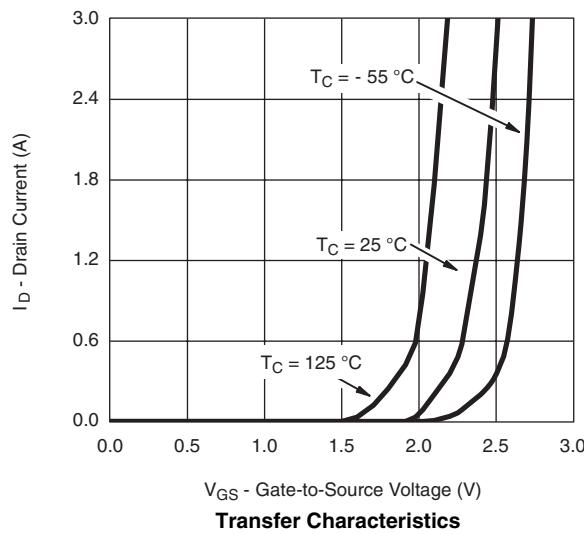
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



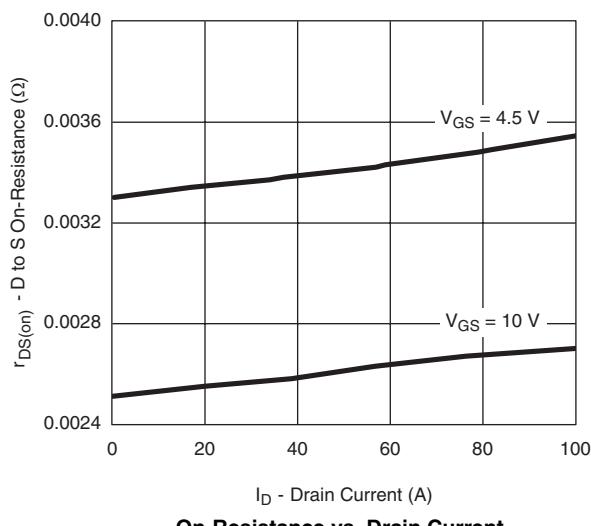
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



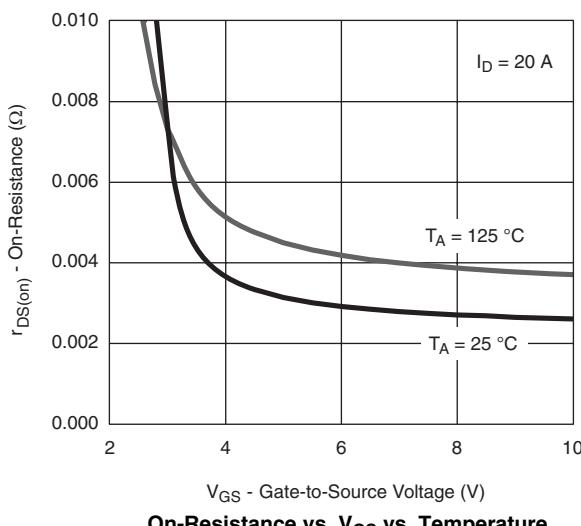
Output Characteristics



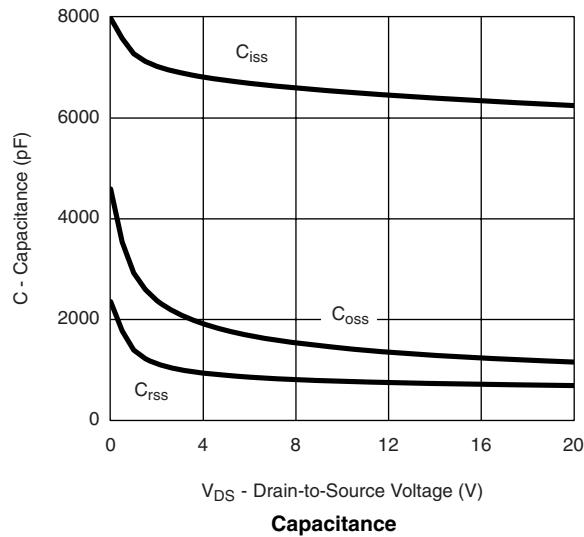
Transfer Characteristics



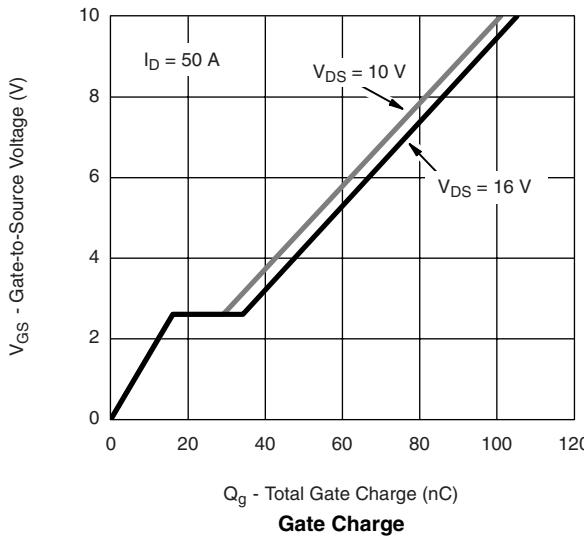
On-Resistance vs. Drain Current



On-Resistance vs. V_{GS} vs. Temperature



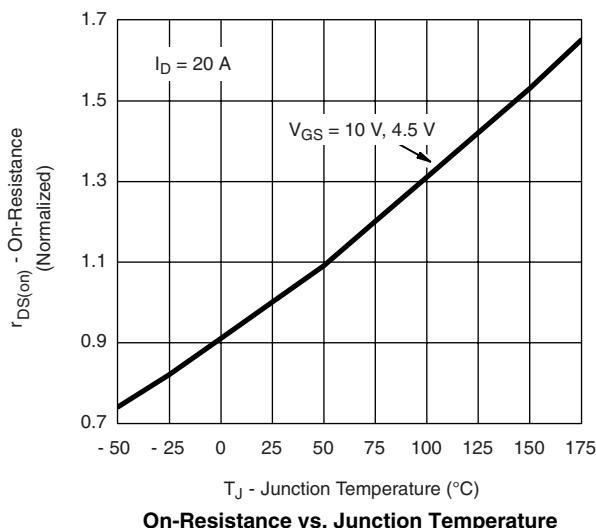
Capacitance



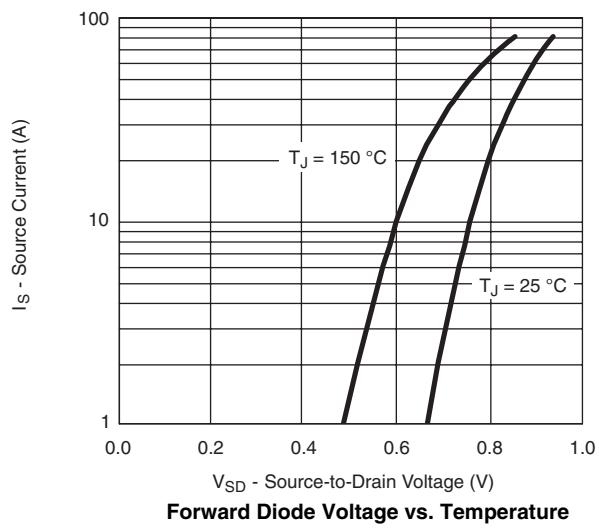
Gate Charge

SUD40N02-3m3P

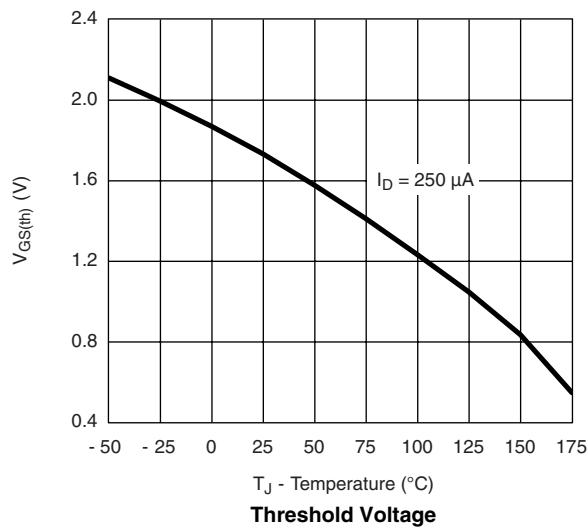
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**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted

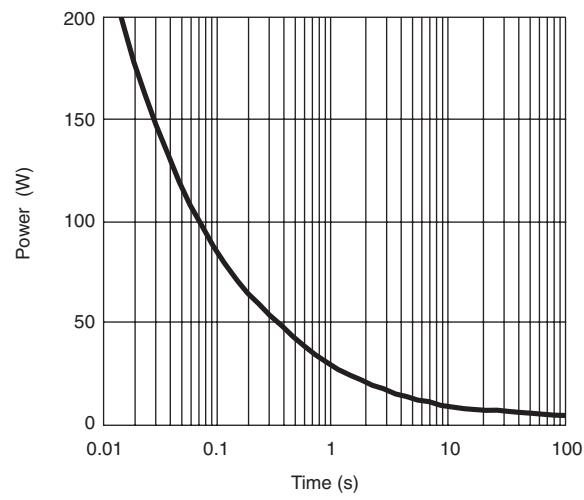
On-Resistance vs. Junction Temperature



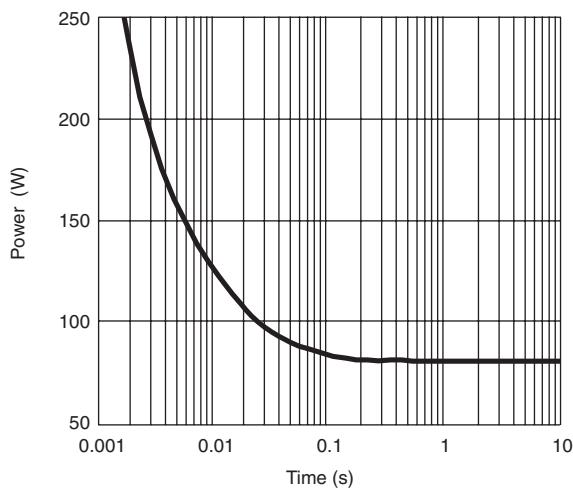
Forward Diode Voltage vs. Temperature



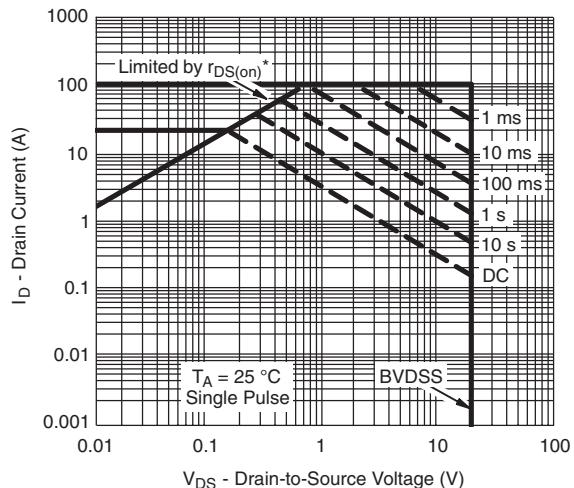
Threshold Voltage



Single Pulse Power, Junction-to-Ambient



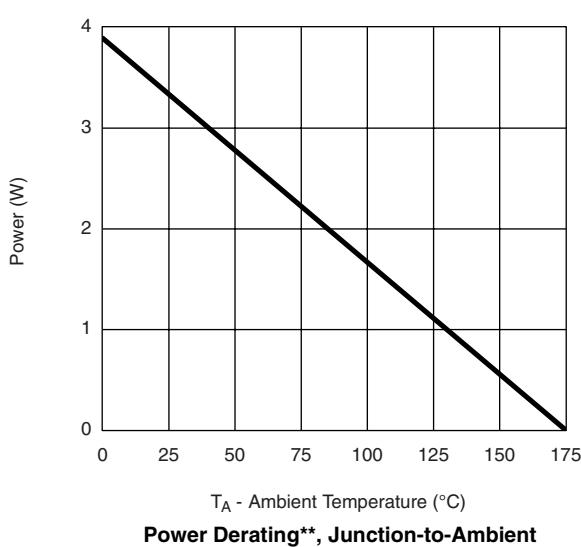
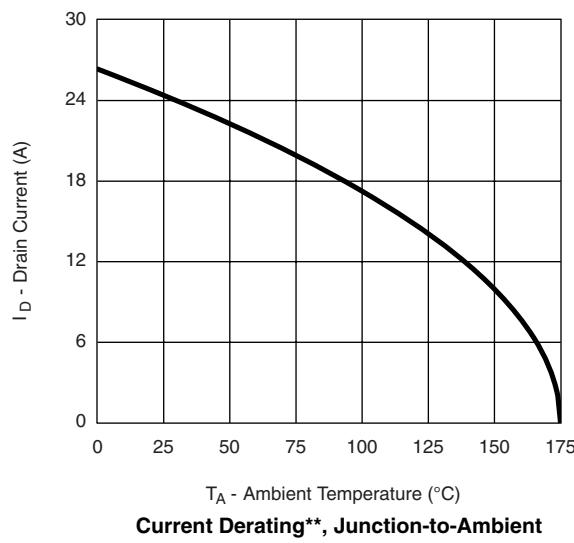
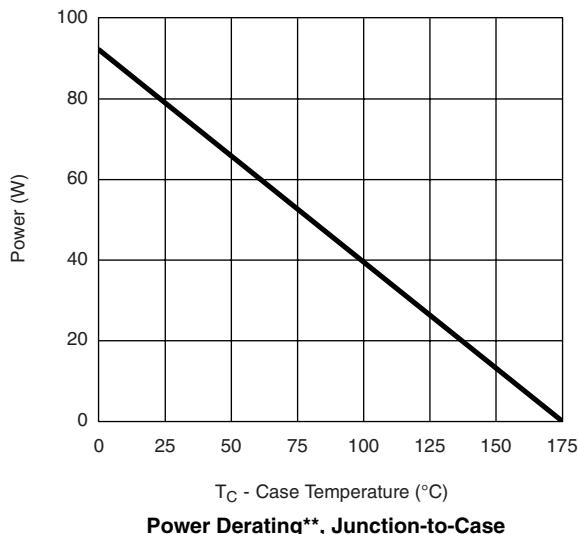
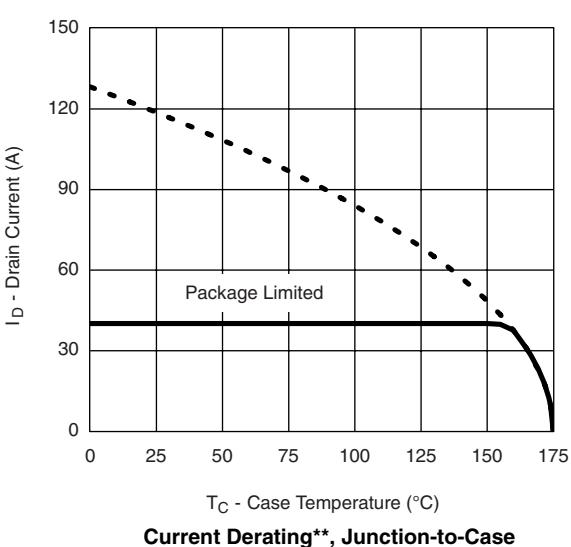
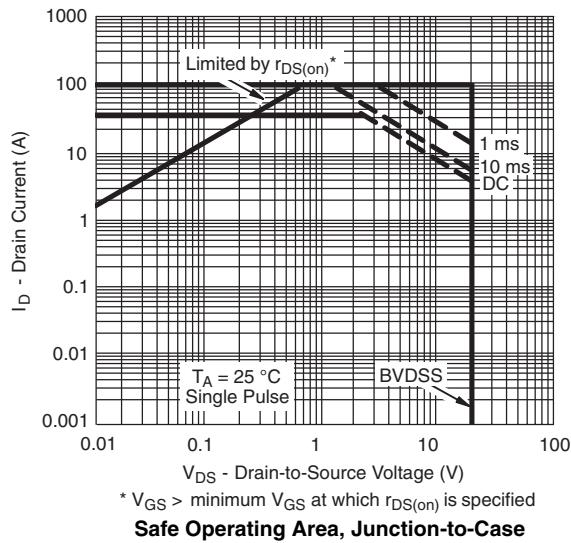
Single Pulse Power, Junction-to-Case



Safe Operating Area, Junction-to-Ambient



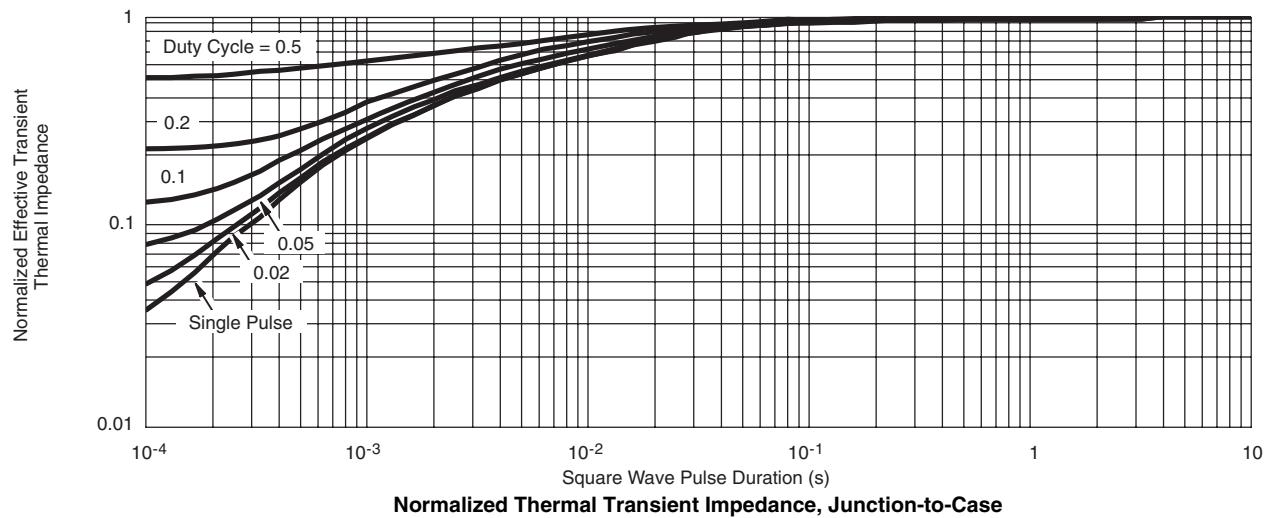
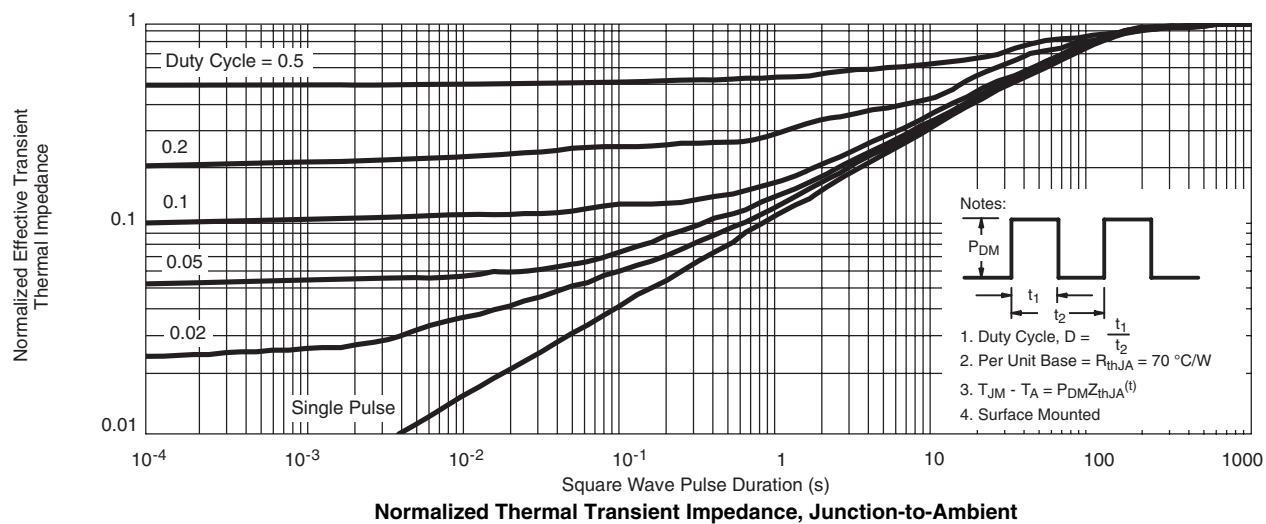
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



** The power dissipation P_D is based on $T_{J(max)} = 175^\circ\text{C}$, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

SUD40N02-3m3P

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

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