

N-Channel 40-V (D-S), 175 °C MOSFET

PRODUCT SUMMARY

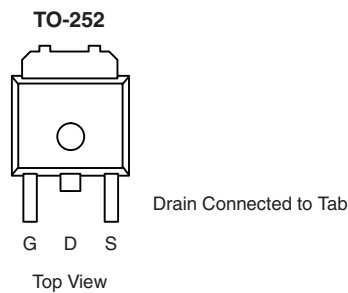
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^{a, c}	Q_g (Typ.)
40	0.016 at $V_{GS} = 10$ V	20	15.6 nC
	0.018 at $V_{GS} = 4.5$ V	20	

FEATURES

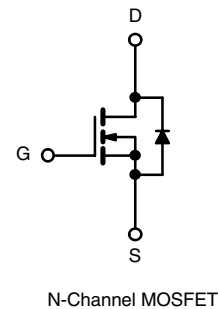
- TrenchFET[®] Power MOSFET
- 100 % R_g and UIS Tested

APPLICATIONS

- LCD TV Inverter
- Secondary Synchronous Rectification



Ordering Information: SUD50N04-16P-E3 (Lead (Pb)-free)



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}	± 16	
Continuous Drain Current ($T_J = 150$ °C)	$T_C = 25$ °C	I_D	20 ^c	A
	$T_C = 100$ °C		20 ^c	
	$T_A = 25$ °C		9.8 ^b	
	$T_A = 100$ °C		6.8 ^b	
Pulsed Drain Current		I_{DM}	50	
Continuous Source-Drain Diode Current	$T_C = 25$ °C	I_S	20 ^c	
	$T_A = 25$ °C		2.5 ^b	
Single Pulse Avalanche Current		I_{AS}	20	mJ
Avalanche Energy		E_{AS}	20	
Maximum Power Dissipation	$T_C = 25$ °C	P_D	35.7	W
	$T_C = 100$ °C		17.8	
	$T_A = 25$ °C		3.1 ^b	
	$T_A = 100$ °C		1.5 ^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	Steady State	R_{thJA}	40	50	°C/W
Maximum Junction-to-Case	Steady State	R_{thJC}	3.4	5.3	

Notes:

- Based on $T_C = 25$ °C.
- Surface Mounted on 1" x 1" FR4 board.
- Package limited.

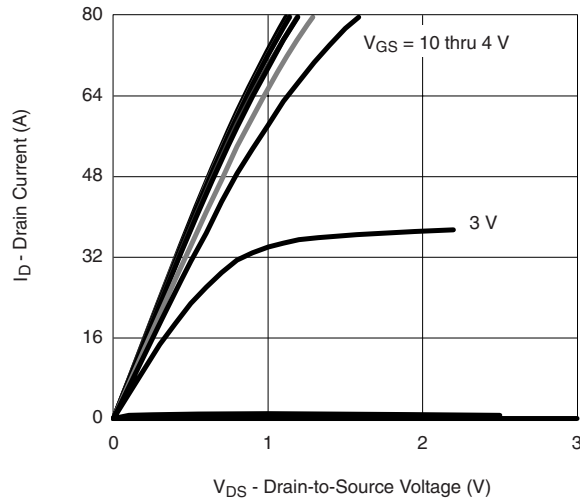
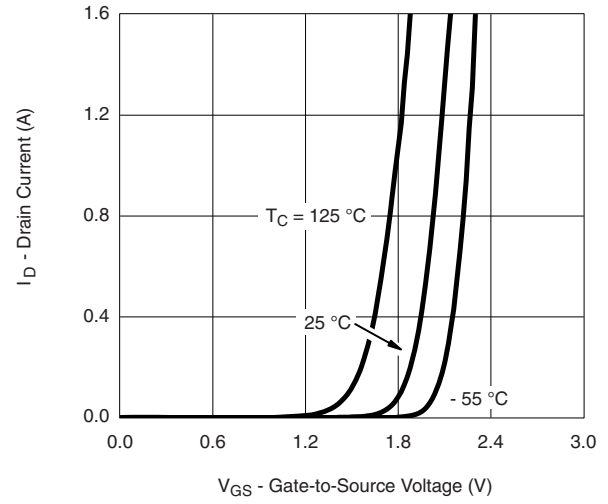
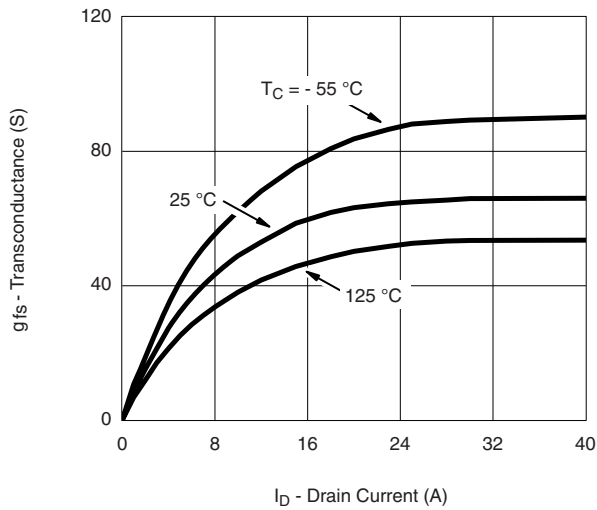
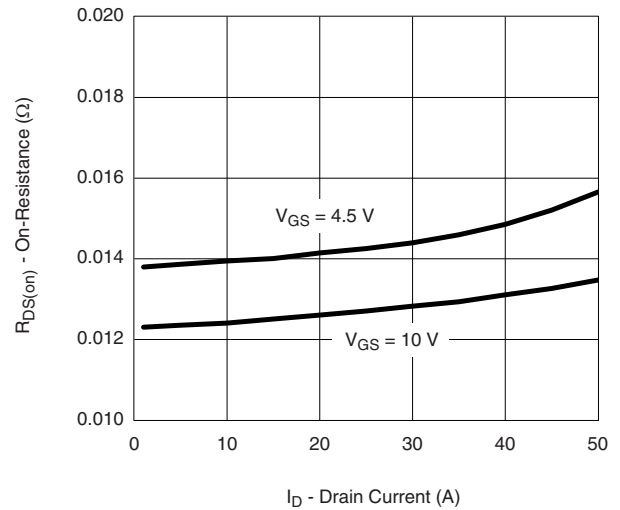
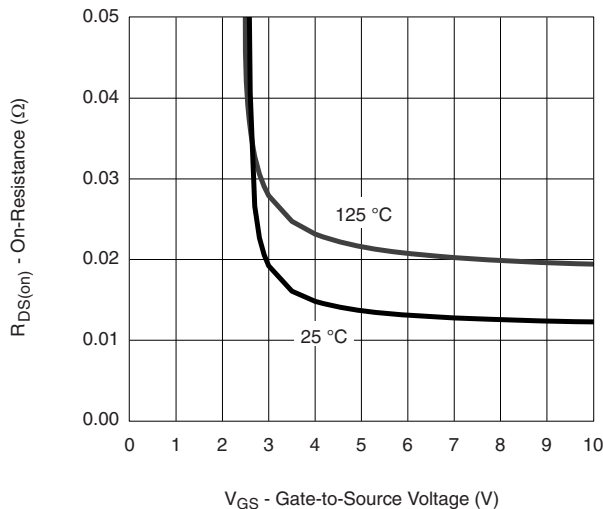
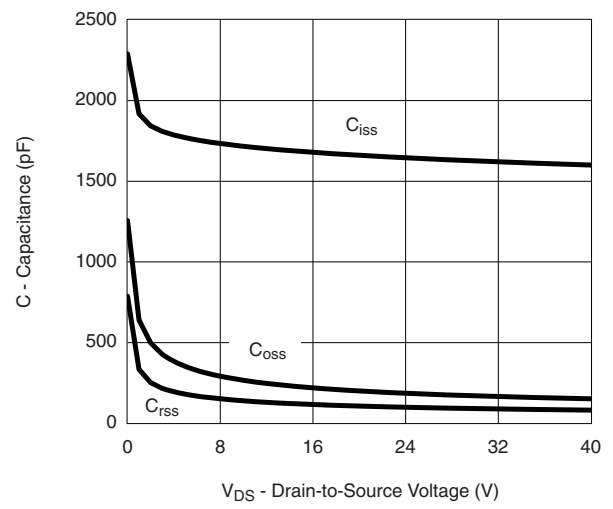
SPECIFICATIONS T _J = 25 °C, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	40			V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = 250 μA		38		mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J			- 5.4		
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	0.8		2.2	V
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 16 V			± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 40 V, V _{GS} = 0 V			1	μA
		V _{DS} = 40 V, V _{GS} = 0 V, T _J = 100 °C			20	
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≥ 5 V, V _{GS} = 10 V	30			A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 10 V, I _D = 15 A		0.0125	0.016	Ω
		V _{GS} = 4.5 V, I _D = 10 A		0.014	0.018	
Forward Transconductance ^a	g _{fs}	V _{DS} = 15 V, I _D = 15 A		58		S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{DS} = 20 V, V _{GS} = 0 V, f = 1 MHz		1655		pF
Output Capacitance	C _{oss}			200		
Reverse Transfer Capacitance	C _{rss}			152		
Total Gate Charge	Q _g	V _{DS} = 20 V, V _{GS} = 10 V, I _D = 30 A		39.2	60	nC
Gate-Source Charge	Q _{gs}	V _{DS} = 20 V, V _{GS} = 4.5 V, I _D = 30 A		15.6	24	
Gate-Drain Charge	Q _{gd}			4.2		
Gate Resistance	R _g			5.5		
Gate Resistance	R _g	f = 1 MHz		2.1	3.2	Ω
Turn-On Delay Time	t _{d(on)}	V _{DD} = 20 V, R _L = 0.66 Ω I _D ≅ 30 A, V _{GEN} = 4.5 V, R _g = 1 Ω		19	30	ns
Rise Time	t _r			120	180	
Turn-Off Delay Time	t _{d(off)}			40	60	
Fall Time	t _f			36	55	
Turn-On Delay Time	t _{d(on)}	V _{DD} = 20 V, R _L = 0.66 Ω I _D ≅ 30 A, V _{GEN} = 10 V, R _g = 1 Ω		8	16	
Rise Time	t _r			22	35	
Turn-Off Delay Time	t _{d(off)}			24	36	
Fall Time	t _f			8	16	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C			20	A
Pulse Diode Forward Current ^a	I _{SM}				50	
Body Diode Voltage	V _{SD}	I _S = 10 A		0.84	1.2	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = 20 A, dI/dt = 100 A/μs, T _J = 25 °C		25	38	ns
Body Diode Reverse Recovery Charge	Q _{rr}			22	33	nC
Reverse Recovery Fall Time	t _a			15		ns
Reverse Recovery Rise Time	t _b			10		

Notes:

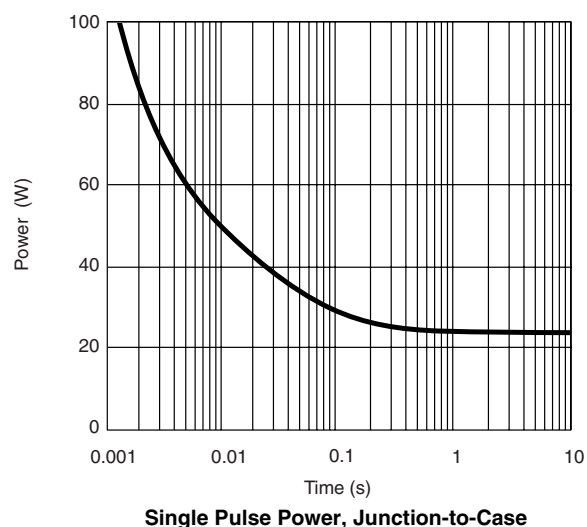
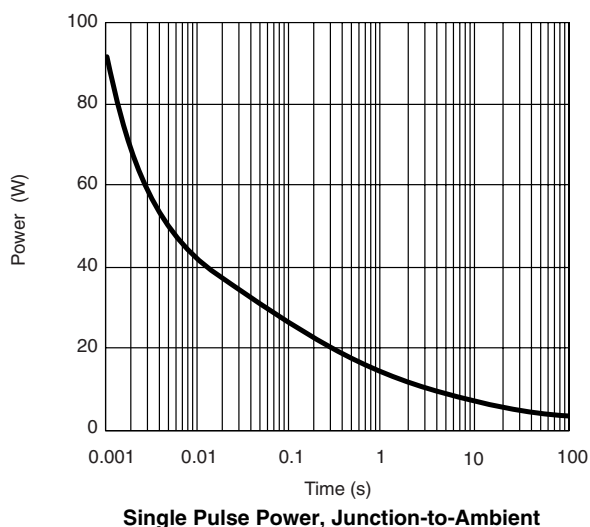
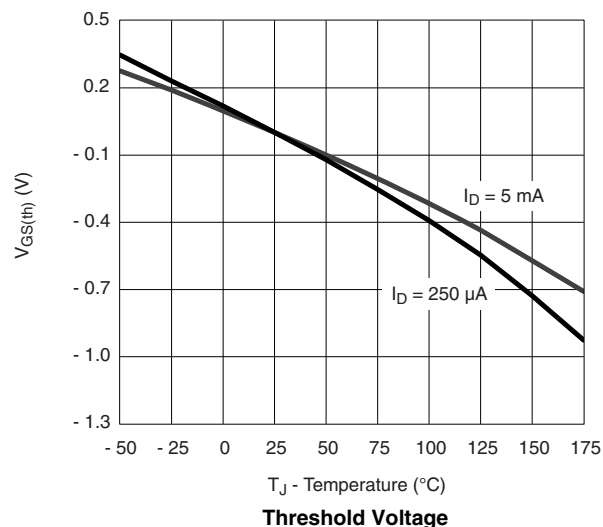
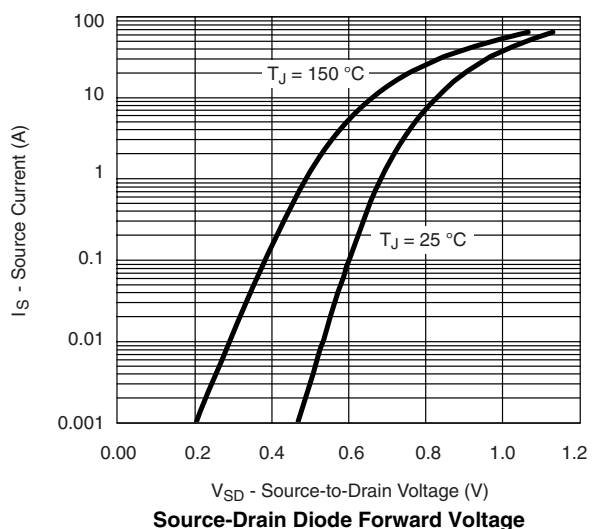
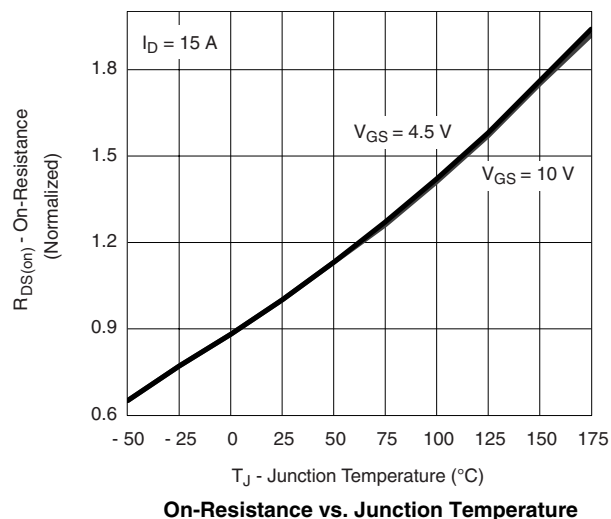
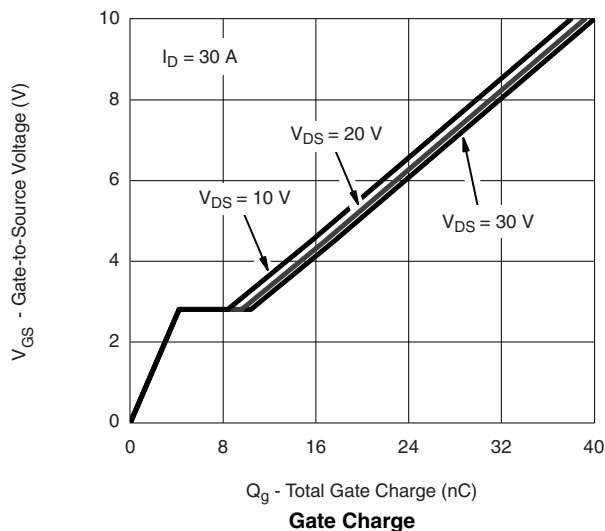
a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

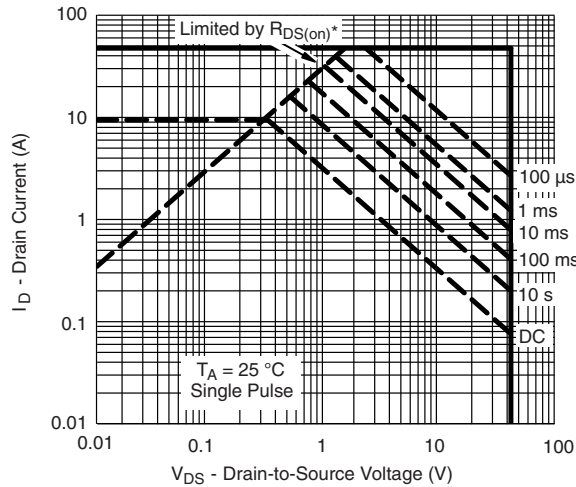
b. Guaranteed by design, not subject to production testing.

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.

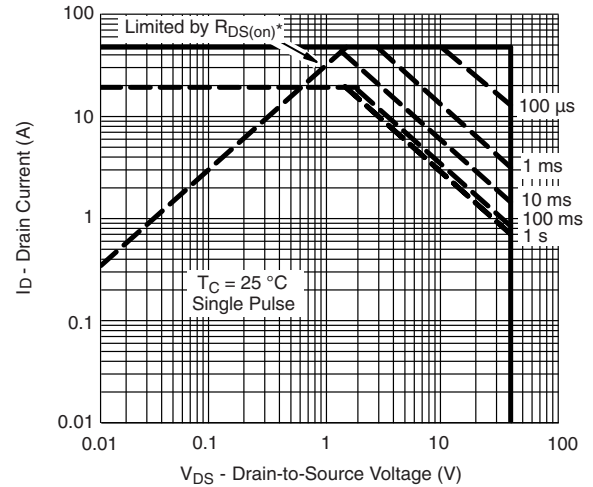
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted**Output Characteristics****Transfer Characteristics****Transconductance****On-Resistance vs. Drain Current****On-Resistance vs. Gate-to-Source Voltage****Capacitance**

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

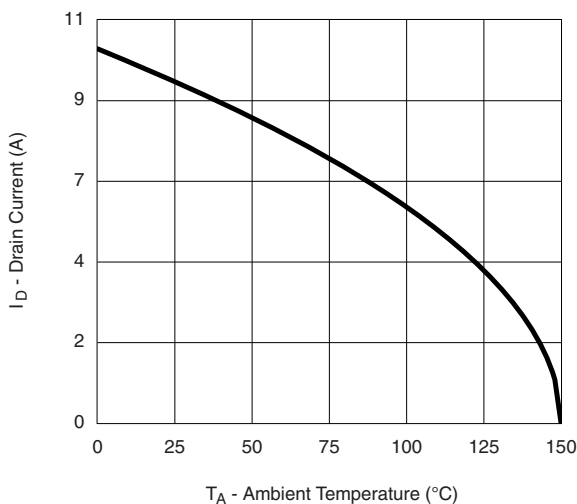


TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


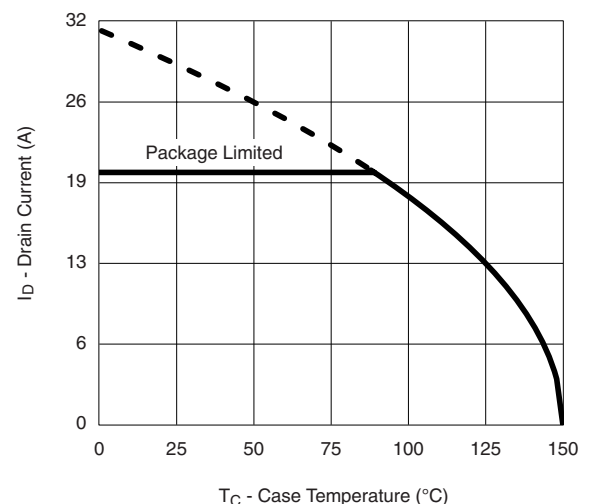
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified
Safe Operating Area, Junction-to-Ambient



* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified
Safe Operating Area, Junction-to-Case

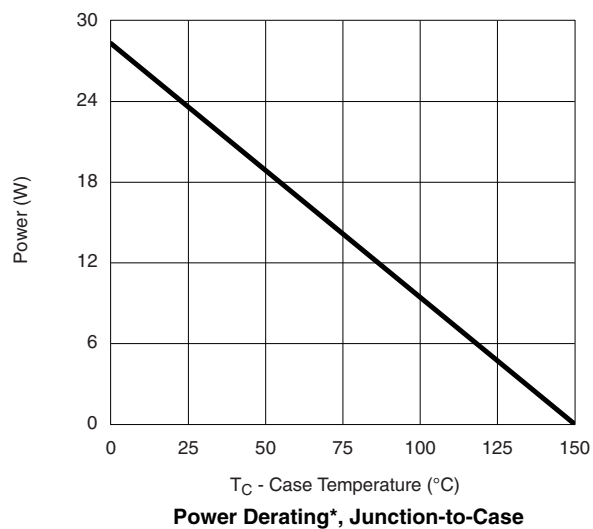
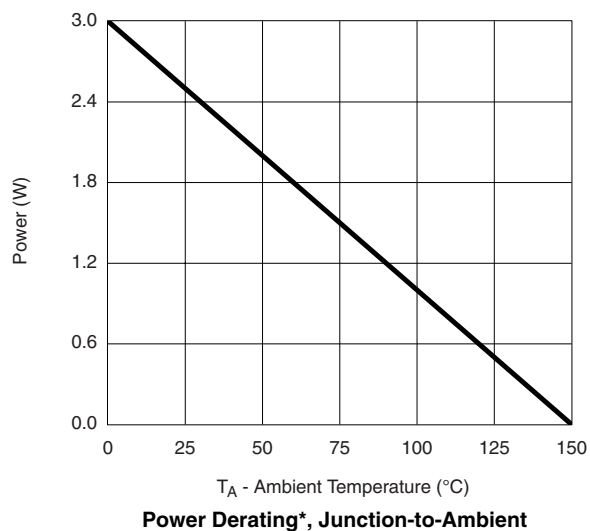


Current Derating, Junction-to-Ambient**

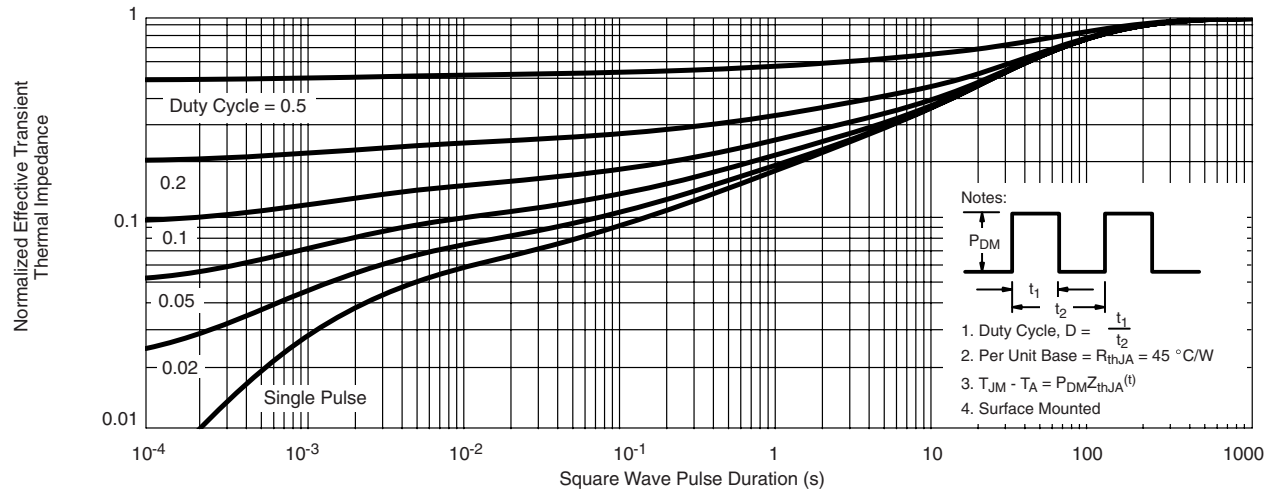
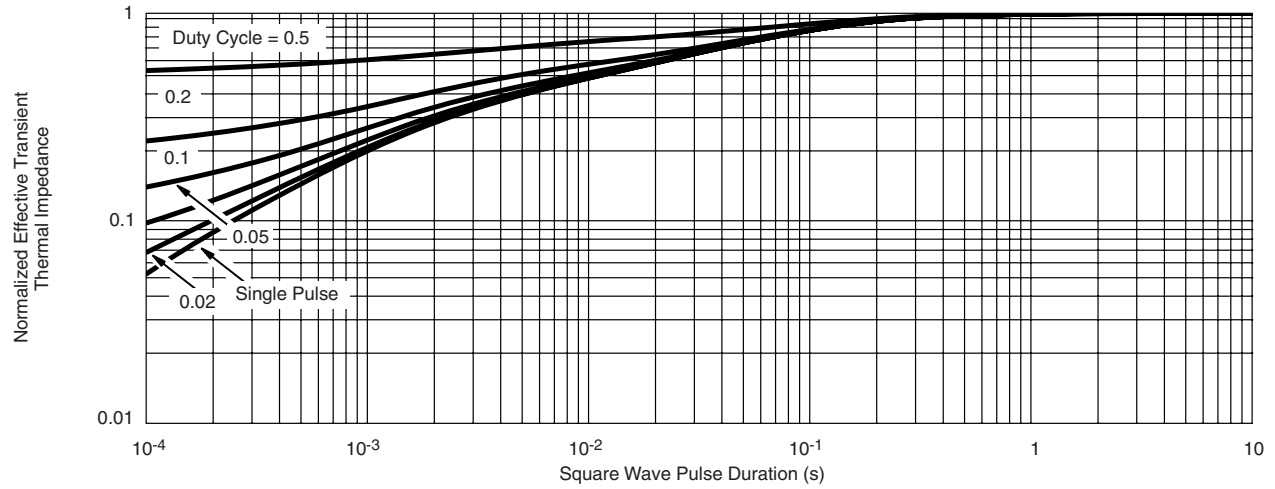


Current Derating, Junction-to-Case**

** 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.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

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**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted**Normalized Thermal Transient Impedance, Junction-to-Ambient****Normalized Thermal Transient Impedance, Junction-to-Case**

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