

N-Channel 60-V (D-S), MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^a	Q_g (Typ.)
60	0.031 at $V_{GS} = 10$ V	9.1	6.5 nC
	0.045 at $V_{GS} = 4.5$ V	7.6	

FEATURES

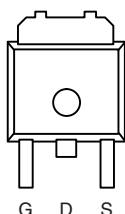
- Halogen-free
- TrenchFET[®] Power MOSFET
- 100 % R_g and UIS Tested


RoHS
COMPLIANT

APPLICATIONS

- DC/DC Converters

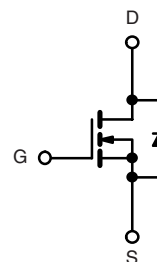
TO-252



Top View

Drain Connected to Tab

Ordering Information: SUD23N06-31-GE3 (Lead (Pb)-free and Halogen-free)



N-Channel MOSFET

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ($T_J = 150$ °C)	I_D	$T_C = 25$ °C	A
		$T_C = 70$ °C	
		$T_A = 25$ °C	
		$T_A = 70$ °C	
Pulsed Drain Current	I_{DM}	50	A
Continuous Source-Drain Diode Current	I_S	$T_C = 25$ °C	
		$T_A = 25$ °C	
Single Pulse Avalanche Current	I_{AS}	20	
Avalanche Energy	E_{AS}	20	mJ
Maximum Power Dissipation	P_D	$T_C = 25$ °C	W
		$T_C = 70$ °C	
		$T_A = 25$ °C	
		$T_A = 70$ °C	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150	°C

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^b	R_{thJA}	18	22	°C/W
Maximum Junction-to-Case	R_{thJC}	3.2	4.0	

Notes:

a. Surface mounted on 1" x 1" FR4 board.



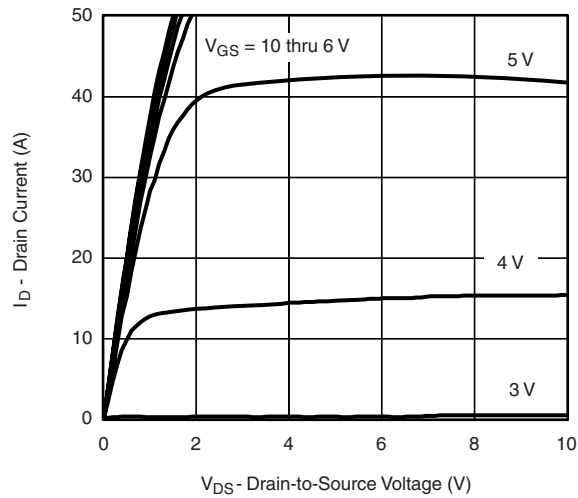
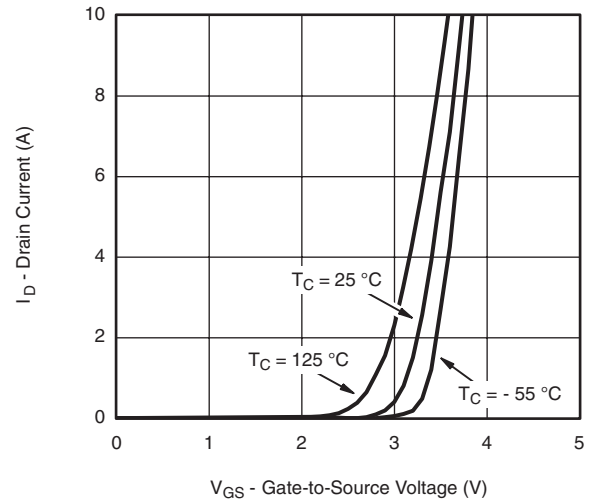
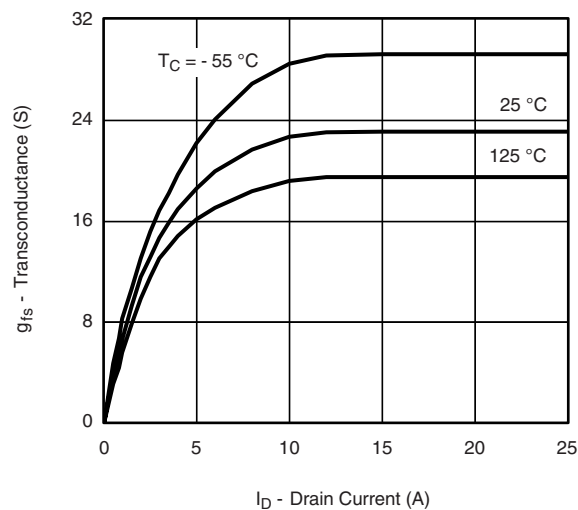
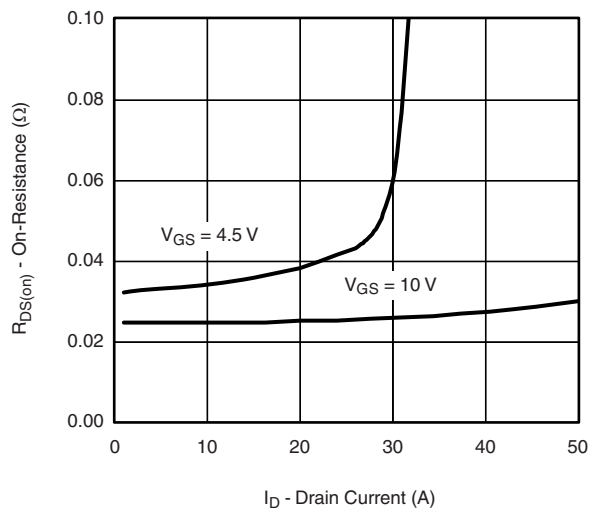
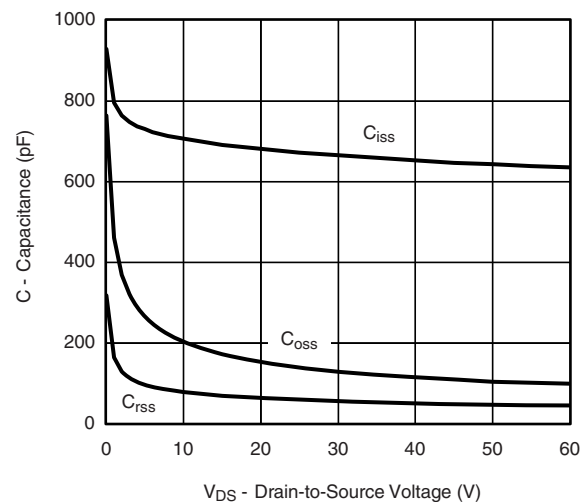
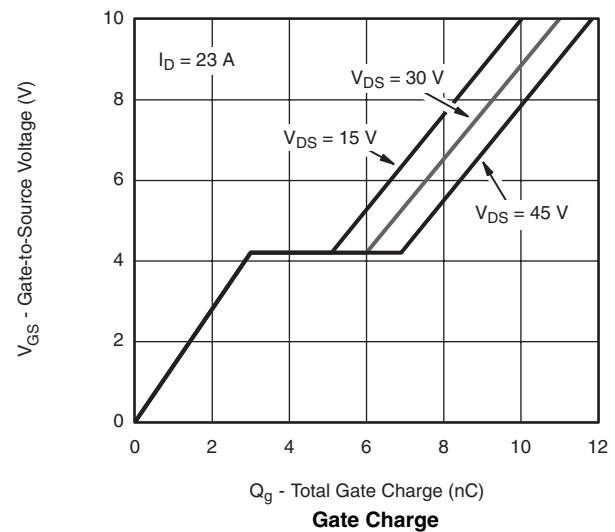
SPECIFICATIONS T _J = 25 °C, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	60			V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = 250 μA		65		mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J			- 6.3		
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	1.0		3.0	V
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 60 V, V _{GS} = 0 V			1	μA
		V _{DS} = 60 V, V _{GS} = 0 V, T _J = 70 °C			20	
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≥ 5 V, V _{GS} = 10 V	50			A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 10 V, I _D = 15 A		0.025	0.031	Ω
		V _{GS} = 4.5 V, I _D = 10 A		0.037	0.045	
Forward Transconductance ^a	g _{fs}	V _{DS} = 15 V, I _D = 15 A		20		S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{DS} = 25 V, V _{GS} = 0 V, f = 1 MHz		670		pF
Output Capacitance	C _{oss}			140		
Reverse Transfer Capacitance	C _{rss}			60		
Total Gate Charge	Q _g	V _{DS} = 30 V, V _{GS} = 10 V, I _D = 23 A		11	17	nC
Gate-Source Charge	Q _{gs}	V _{DS} = 30 V, V _{GS} = 4.5 V, I _D = 23 A		6.5	13	
Gate-Drain Charge	Q _{gd}			3.0		
Gate Resistance	R _g			3.0		
Gate Resistance	R _g	f = 1 MHz		1.6	3.2	Ω
Turn-On Delay Time	t _{d(on)}	V _{DD} = 30 V, R _L = 1.3 Ω I _D ≅ 23 A, V _{GEN} = 4.5 V, R _g = 1 Ω		18	30	ns
Rise Time	t _r			250	400	
Turn-Off Delay Time	t _{d(off)}			35	55	
Fall Time	t _f			68	110	
Turn-On Delay Time	t _{d(on)}	V _{DD} = 30 V, R _L = 1.3 Ω I _D ≅ 23 A, V _{GEN} = 10 V, R _g = 1 Ω		8	15	
Rise Time	t _r			15	25	
Turn-Off Delay Time	t _{d(off)}			30	45	
Fall Time	t _f			25	40	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C			20.8	A
Pulse Diode Forward Current ^a	I _{SM}				50	
Body Diode Voltage	V _{SD}	I _S = 15 A		1.0	1.5	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = 15 A, dI/dt = 100 A/μs, T _J = 25 °C		30	60	ns
Body Diode Reverse Recovery Charge	Q _{rr}			35	70	nC
Reverse Recovery Fall Time	t _a			20		ns
Reverse Recovery Rise Time	t _b			10		

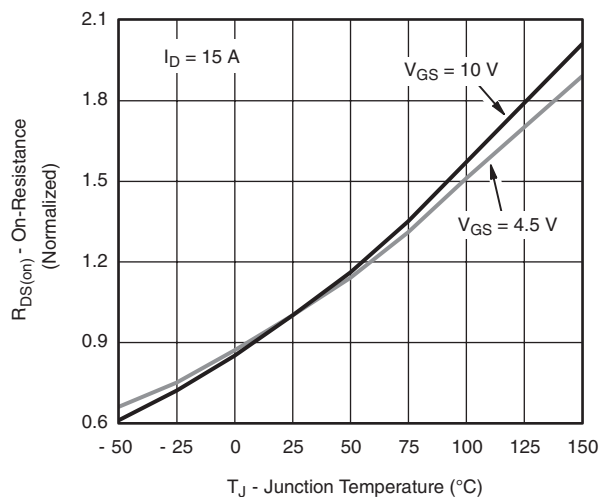
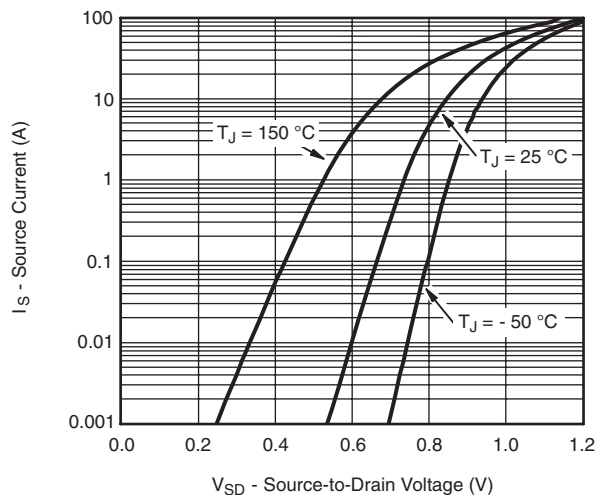
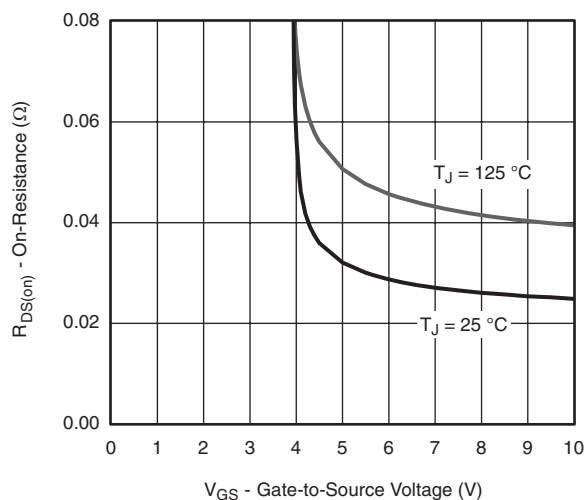
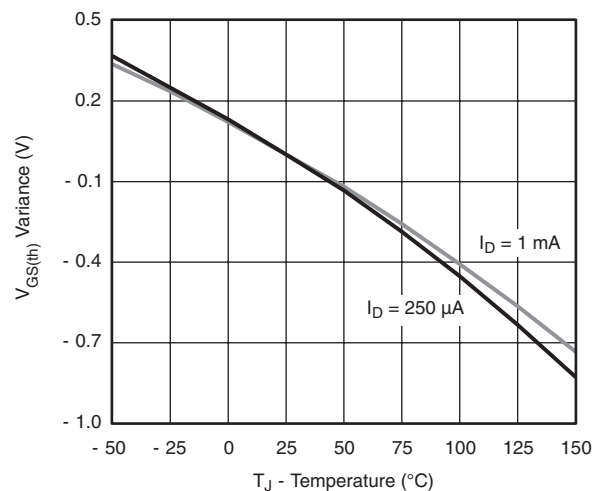
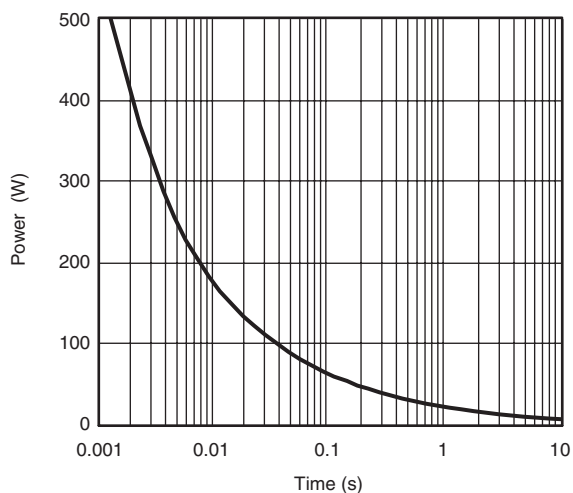
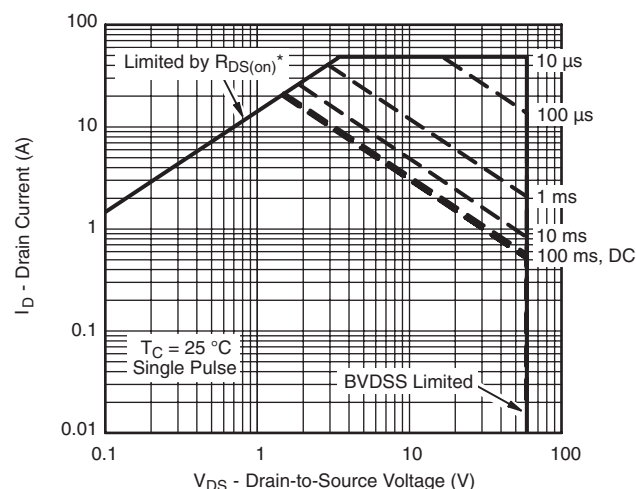
Notes:

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

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

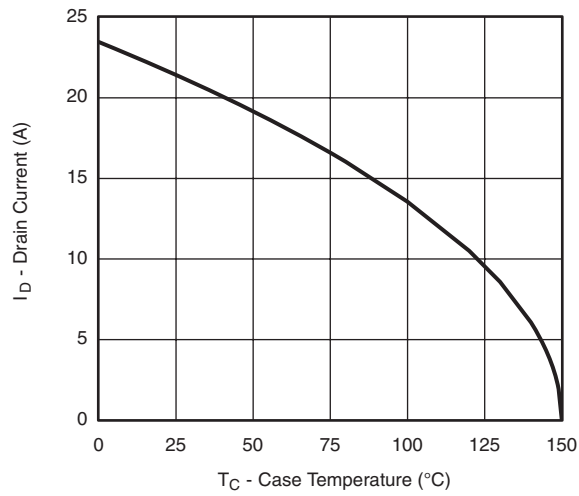
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

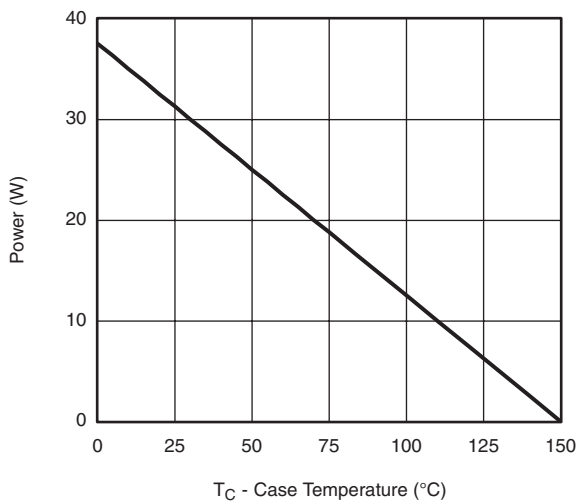
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted**On-Resistance vs. Junction Temperature****Source-Drain Diode Forward Voltage****On-Resistance vs. Gate-to-Source Voltage****Threshold Voltage****Single Pulse Power, Junction-to-Ambient*** $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified**Single Pulse Power, Junction-to-Case**



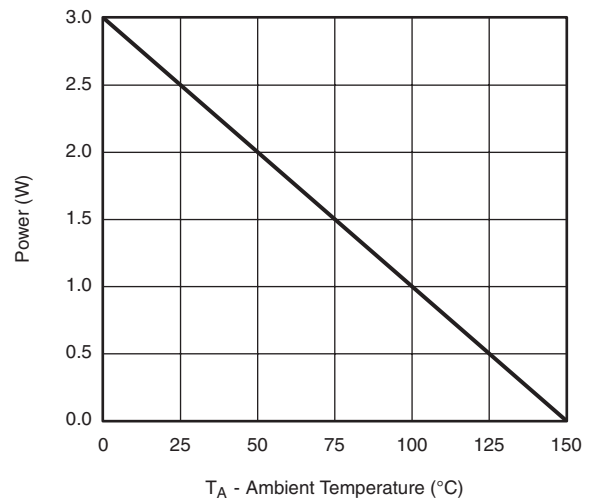
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Current Derating*, Junction-to-Case

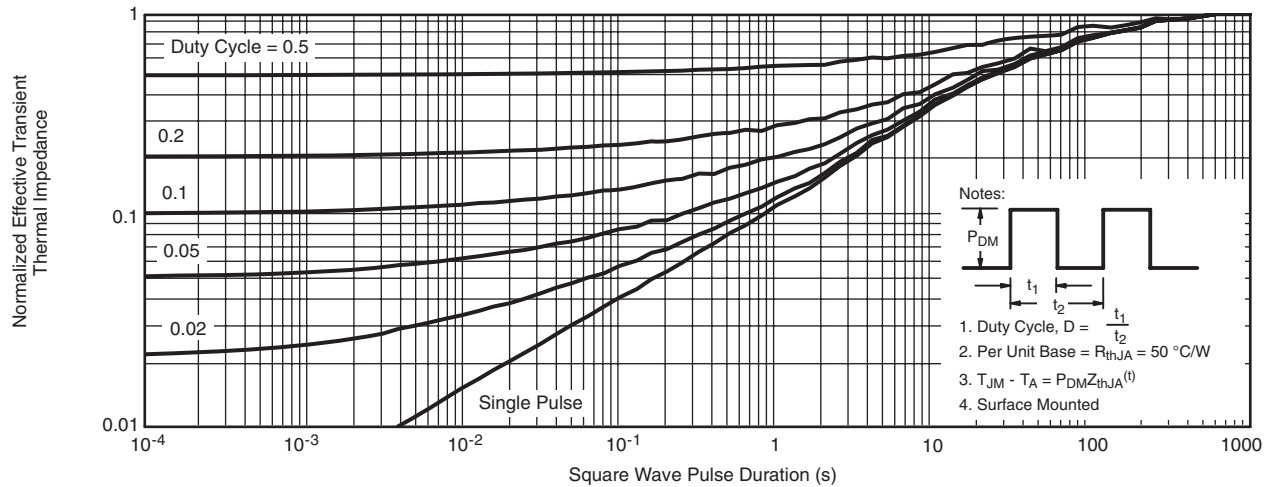
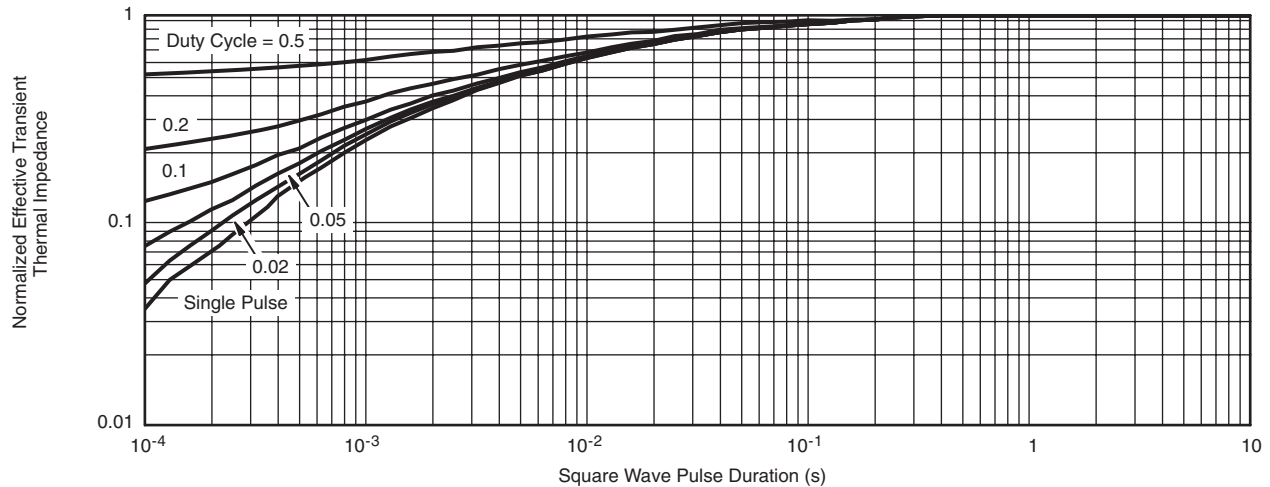


Power, Junction-to-Case



Power, Junction-to-Ambient

* The power dissipation P_D is based on $T_{J(max)} = 150$ °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**Normalized Thermal Transient Impedance, Junction-to-Ambient****Normalized Thermal Transient Impedance, Junction-to-Case**

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