

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	

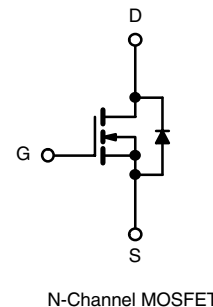
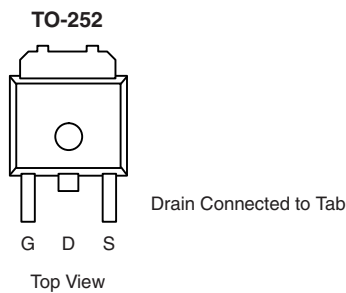
FEATURES

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


RoHS
COMPLIANT

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)	I_D	$T_C = 25$ °C	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	I_S	$T_C = 25$ °C	20 ^c	
		$T_A = 25$ °C	2.5 ^b	
Single Pulse Avalanche Current	I_{AS}	20		
Avalanche Energy	E_{AS}	20	mJ	
Maximum Power Dissipation	P_D	$T_C = 25$ °C	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	R_{thJA}	40	50	°C/W	
Maximum Junction-to-Case	R_{thJC}	3.4	5.3		

Notes:

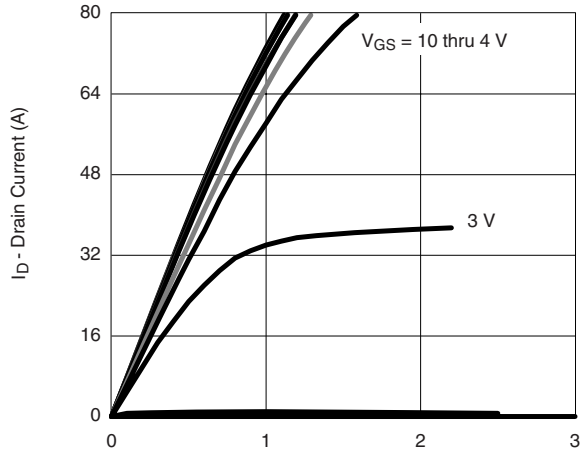
- Based on $T_C = 25$ °C.
- Surface Mounted on 1" x 1" FR4 board.
- Package limited.

SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	40			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		38		mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 5.4		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	0.8		2.2	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 16\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}, T_J = 100\text{ }^\circ\text{C}$			20	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	30			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 15\text{ A}$		0.0125	0.016	Ω
		$V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}$		0.014	0.018	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 15\text{ V}, I_D = 15\text{ A}$		58		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		1655		pF
Output Capacitance	C_{oss}			200		
Reverse Transfer Capacitance	C_{rss}			152		
Total Gate Charge	Q_g	$V_{DS} = 20\text{ V}, V_{GS} = 10\text{ V}, I_D = 30\text{ A}$		39.2	60	nC
				15.6	24	
Gate-Source Charge	Q_{gs}	$V_{DS} = 20\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 30\text{ A}$		4.2		nC
Gate-Drain Charge	Q_{gd}			5.5		
Gate Resistance	R_g		$f = 1\text{ MHz}$		2.1	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 20\text{ V}, R_L = 0.66\text{ }\Omega$ $I_D \cong 30\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$		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	$t_{d(on)}$	$V_{DD} = 20\text{ V}, R_L = 0.66\text{ }\Omega$ $I_D \cong 30\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$		8	16	ns
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	$T_C = 25\text{ }^\circ\text{C}$			20	A
Pulse Diode Forward Current ^a	I_{SM}				50	
Body Diode Voltage	V_{SD}	$I_S = 10\text{ A}$		0.84	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 20\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		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		

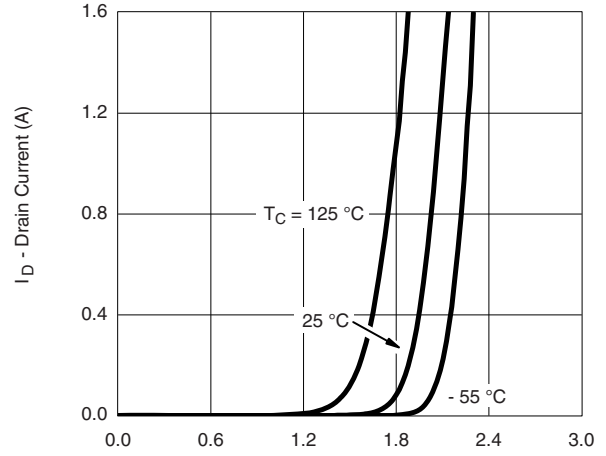
Notes:

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

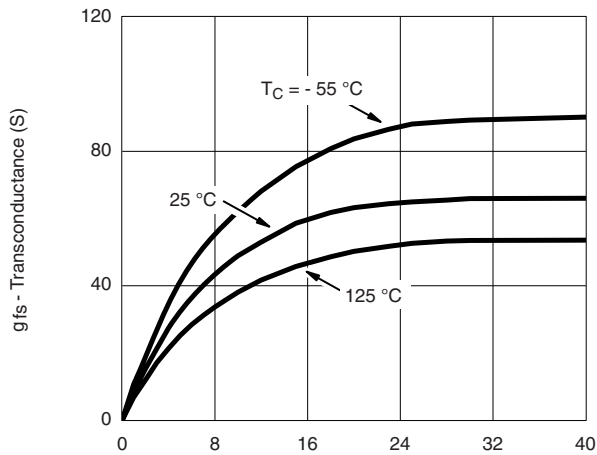
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


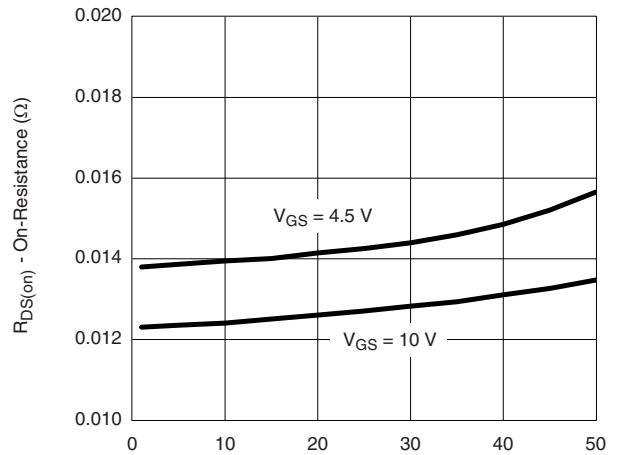
Output Characteristics



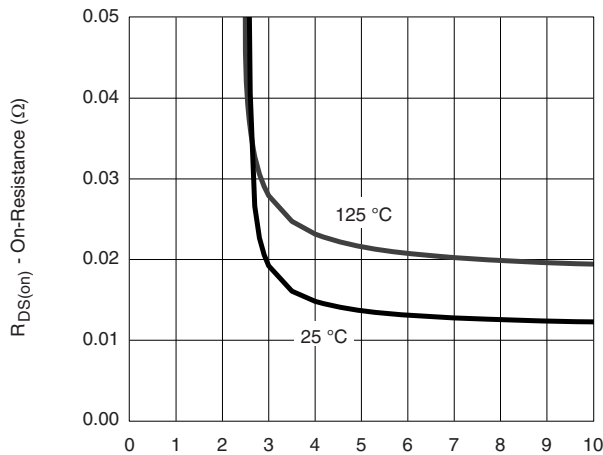
Transfer Characteristics



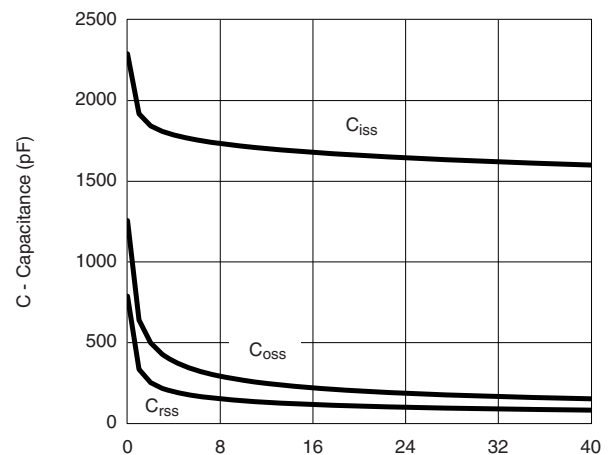
Transconductance



On-Resistance vs. Drain Current

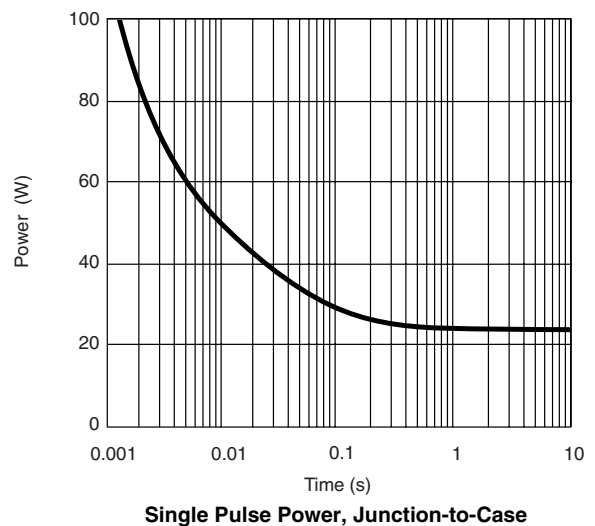
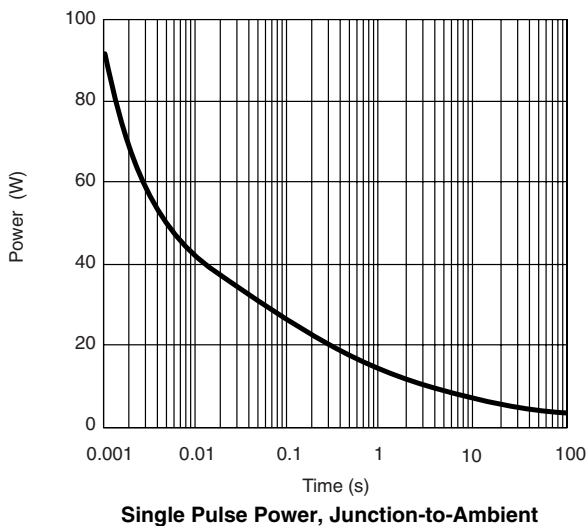
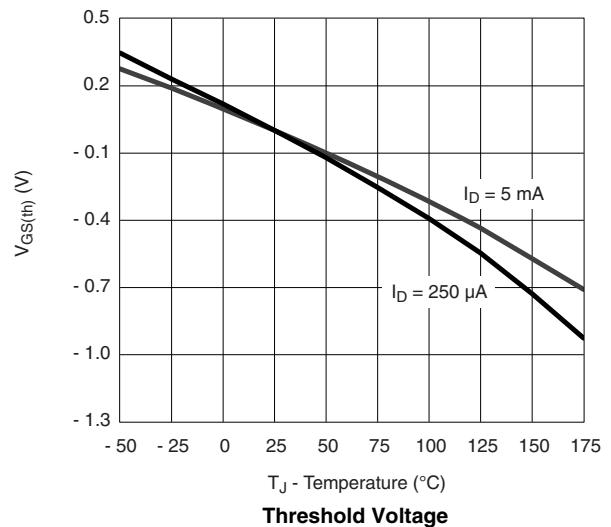
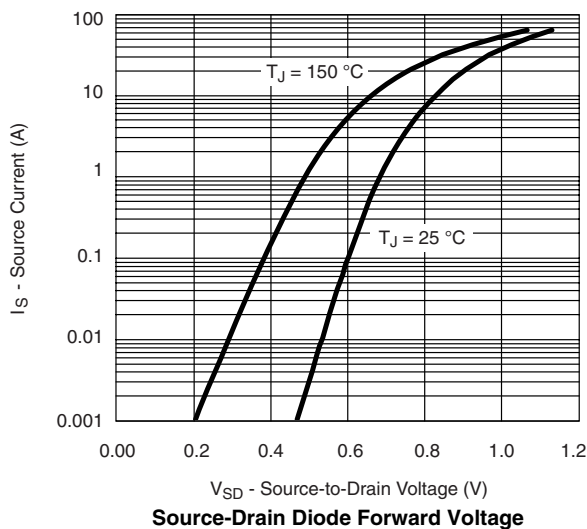
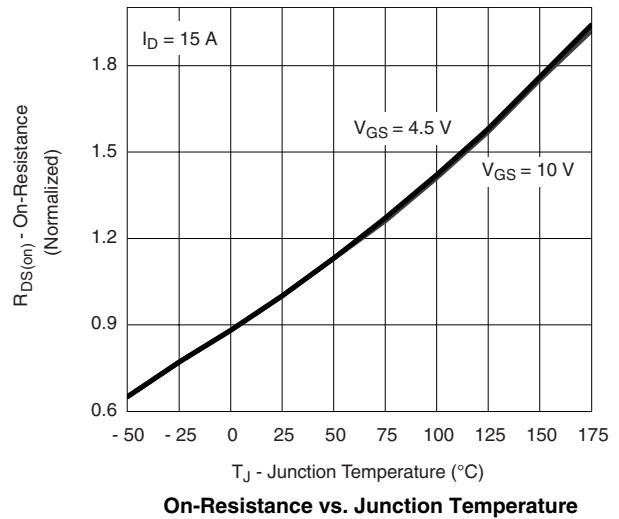
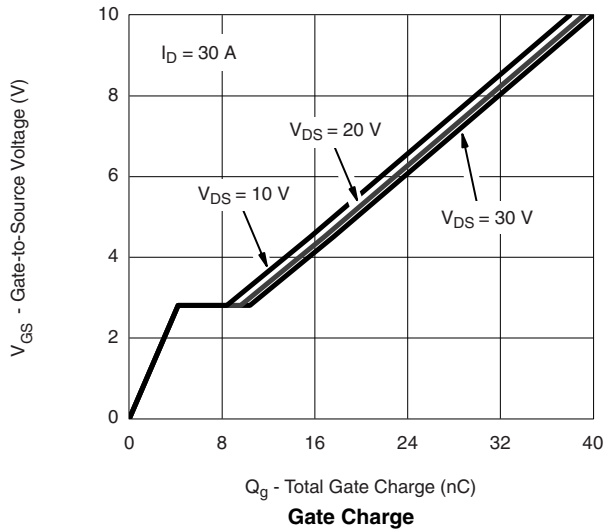


On-Resistance vs. Gate-to-Source Voltage

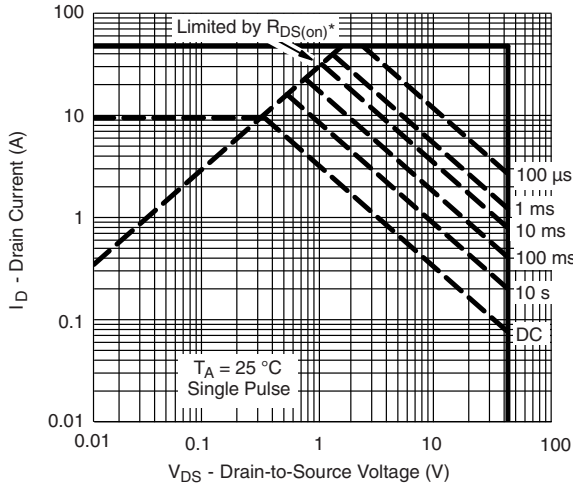


Capacitance

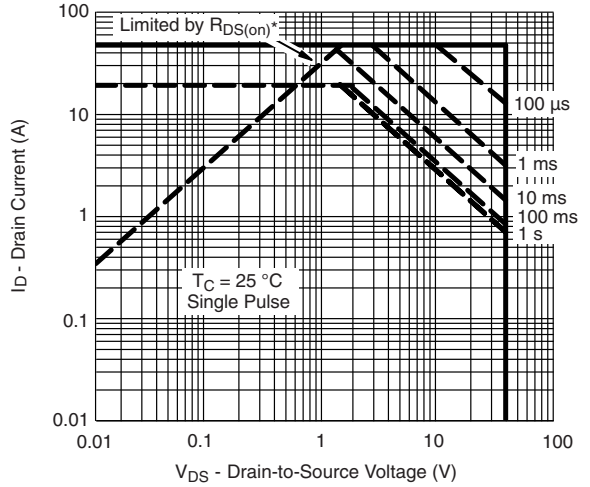
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



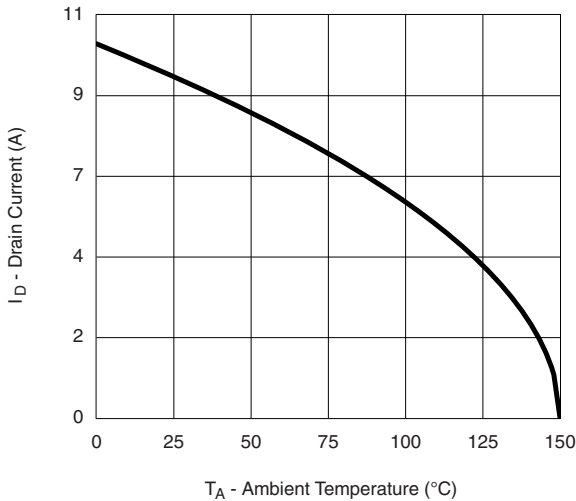
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



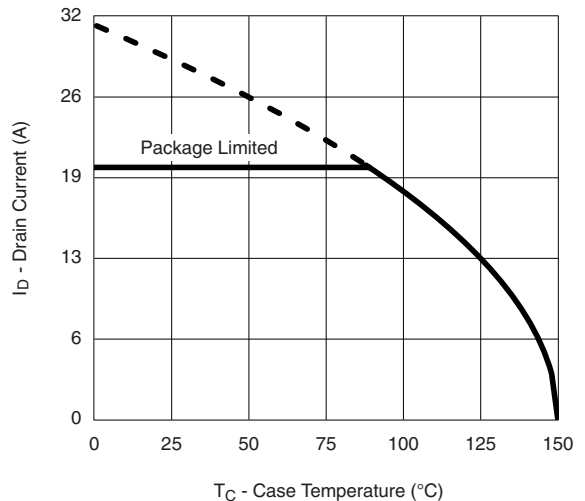
* V_{GS} > minimum V_{GS} at which R_{DS(on)} is specified
Safe Operating Area, Junction-to-Ambient



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



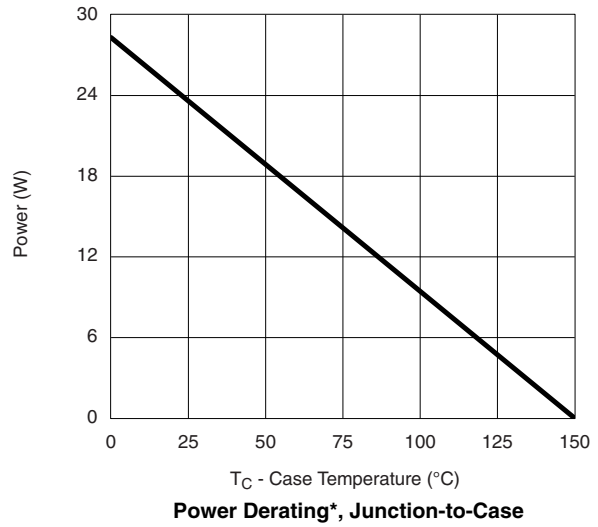
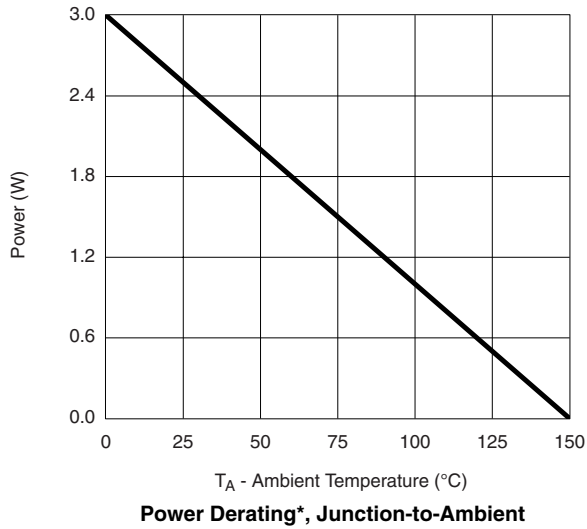
Current Derating, Junction-to-Ambient**



Current Derating, Junction-to-Case**

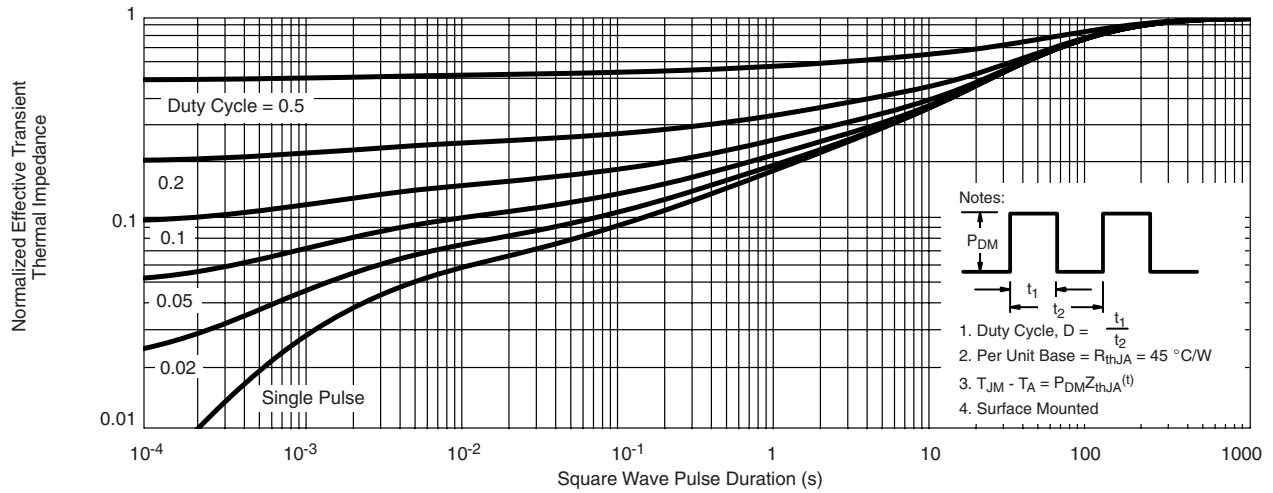
** The power dissipation P_D is based on T_{J(max)} = 175 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

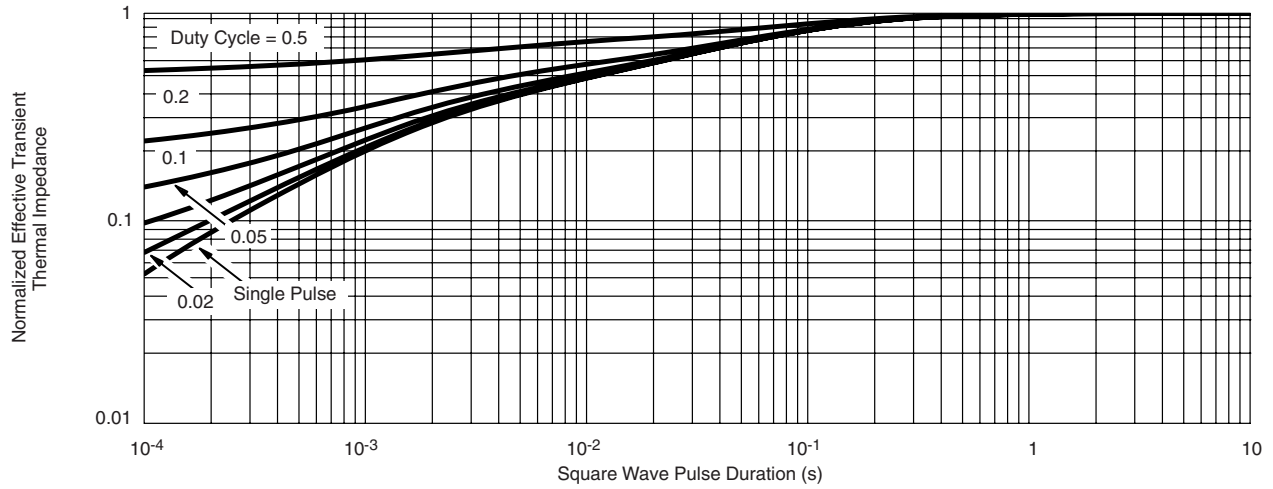


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TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

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