

# MT3005S

## N-Channel Power MOSFET

30V, 95A, 4.0mΩ



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### Features

- $R_{DS(on)} = 4.0m\Omega$  at  $V_{GS} = 10V$ ,  $I_D = 30A$
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extr emely Low  $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

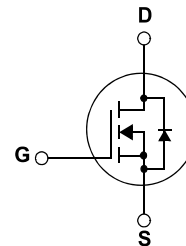
### General Description

This N-Channel MOSFET is produced using MOS-TECH Semiconductor's advanced PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

### Applications

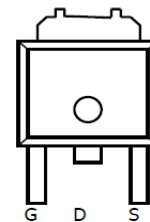
- DC-DC primary bridge
- DC-DC Synchronous rectification
- Hot swap

### Simplified Schematic



### MARKING DIAGRAM & PIN ASSIGNMENT

TO-252  
D-PAK



Top View  
Drain Connected to  
Tab

### MOSFET Maximum Ratings $T_C = 25^\circ C$ unless otherwise noted

Absolute Maximum Ratings $T_A=25^\circ C$ unless otherwise noted			
Parameter	Symbol	Maximum	Units
Drain-Source Voltage	$V_{DS}$	30	V
	$V_{GS}$	$\pm 20$	V
Continuous Drain Current <sup>G</sup>	$I_D$	$T_C=25^\circ C$	95
		$T_C=100^\circ C$	45
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	265	A
Avalanche Current <sup>C</sup>	$I_{AR}$	30	A
Repetitive avalanche energy $L=0.3mH$ <sup>C</sup>	$E_{AR}$	135	mJ
Power Dissipation <sup>B</sup>	$P_D$	$T_C=25^\circ C$	50
		$T_C=100^\circ C$	25
Power Dissipation <sup>A</sup>	$P_{DSM}$	$T_A=25^\circ C$	3
		$T_A=70^\circ C$	2.1
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 125	$^\circ C$

Thermal Characteristics					
Parameter	Symbol	Typ	Max	Units	
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	15	20	$^\circ C/W$	
Maximum Junction-to-Ambient <sup>A</sup>		Steady-State	41	50	$^\circ C/W$
Maximum Junction-to-Case <sup>B</sup>	$R_{\theta JC}$	2.1	3	$^\circ C/W$	

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
MT3005S	MT3005S	TO-252	-	-	2500

**Electrical Characteristics**  $T_C = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$	30			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=20\text{V}$ , $V_{GS}=0\text{V}$			1	$\mu\text{A}$
				$T_J=55^\circ\text{C}$	5	
$I_{GSS}$	Gate-Body leakage current	$V_{DS}=0\text{V}$ , $V_{GS}=\pm 20\text{V}$			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$ , $I_D=250\mu\text{A}$	1	1.4	2.5	V
$I_{D(ON)}$	On state drain current	$V_{GS}=10\text{V}$ , $V_{DS}=5\text{V}$	150			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}$ , $I_D=30\text{A}$		4	4.5	m $\Omega$
				$T_J=125^\circ\text{C}$	7.5	
			$V_{GS}=4.5\text{V}$ , $I_D=20\text{A}$	5.5	6.5	
$g_{FS}$	Forward Transconductance	$V_{DS}=5\text{V}$ , $I_D=20\text{A}$		49		S
$V_{SD}$	Diode Forward Voltage	$I_S=1\text{A}$ , $V_{GS}=0\text{V}$		0.74	1	V
$I_S$	Maximum Body-Diode Continuous Current				50	A
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	Input Capacitance	$V_{GS}=0\text{V}$ , $V_{DS}=12.5\text{V}$ , $f=1\text{MHz}$		2050	2460	pF
$C_{oss}$	Output Capacitance			485		pF
$C_{rss}$	Reverse Transfer Capacitance			280		pF
$R_g$	Gate resistance	$V_{GS}=0\text{V}$ , $V_{DS}=0\text{V}$ , $f=1\text{MHz}$		0.86	1.5	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}$ , $V_{DS}=12.5\text{V}$ , $I_D=20\text{A}$		34	41	nC
$Q_g(4.5\text{V})$	Total Gate Charge			17	22	nC
$Q_{gs}$	Gate Source Charge			5		nC
$Q_{gd}$	Gate Drain Charge			3.5		nC
$t_{D(on)}$	Turn-On Delay Time			7.5		ns
$t_r$	Turn-On Rise Time	$V_{GS}=10\text{V}$ , $V_{DS}=12.5\text{V}$ , $R_L=0.68\Omega$ , $R_{GEN}=3\Omega$		11		ns
$t_{D(off)}$	Turn-Off Delay Time			27		ns
$t_f$	Turn-Off Fall Time			8		ns
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F=20\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		30	36	ns
$Q_{rr}$	Body Diode Reverse Recovery Charge	$I_F=20\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		19		nC

A: The value of  $R_{\theta JA}$  is measured with the device mounted on 1 in <sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The Power dissipation  $P_{DSM}$  is based on  $R_{\theta JA}$  and the maximum allowed junction temperature of  $150^\circ\text{C}$ . The value in any given application depends on the user's specific board design, and the maximum temperature of  $175^\circ\text{C}$  may be used if the PCB allows it.

B: 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 setting the upper dissipation limit for cases where additional heatsinking is used.

C: Repetitive rating, pulse width limited by junction temperature  $T_{J(MAX)}=175^\circ\text{C}$ .

D: The  $R_{\theta JA}$  is the sum of the thermal impedance from junction to case  $R_{\theta JC}$  and case to ambient.

E: The static characteristics in Figures 1 to 6 are obtained using  $<300 \mu\text{s}$  pulses, duty cycle 0.5% max.

F: These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of  $T_{J(MAX)}=175^\circ\text{C}$ .

G: The maximum current rating is limited by bond-wires.

H: These tests are performed with the device mounted on 1 in <sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The SOA curve provides a single pulse rating. Rev1: March 2006

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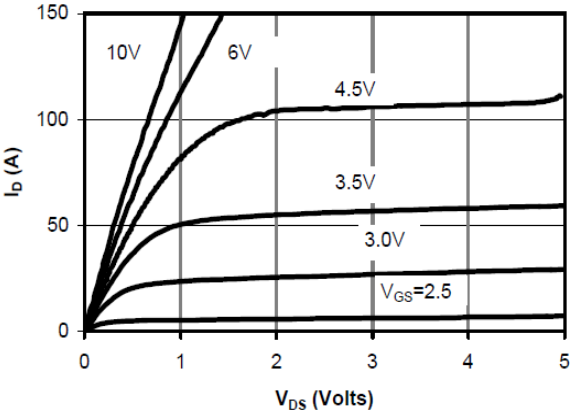


Fig 1: On-Region Characteristics

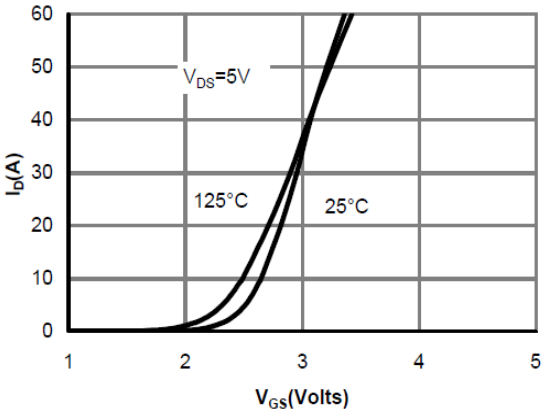


Figure 2: Transfer Characteristics

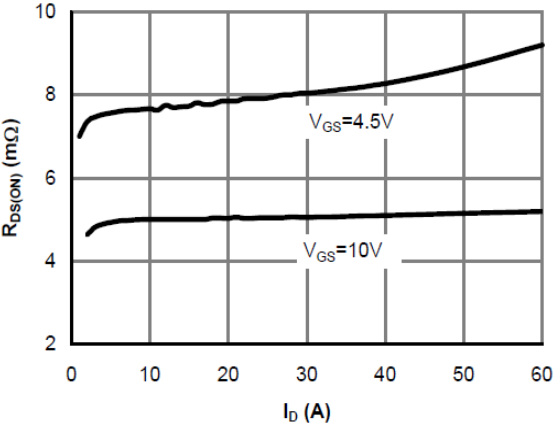


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

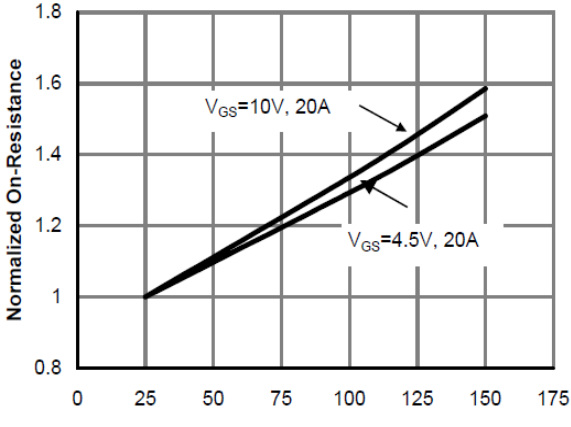


Figure 4: On-Resistance vs. Junction Temperature

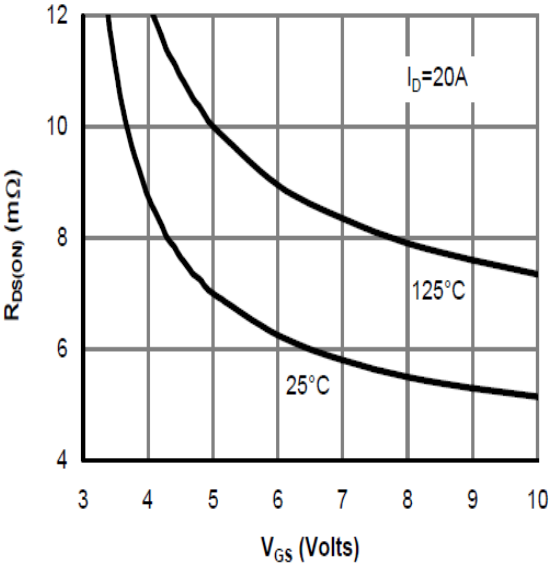


Figure 5: On-Resistance vs. Gate-Source Voltage

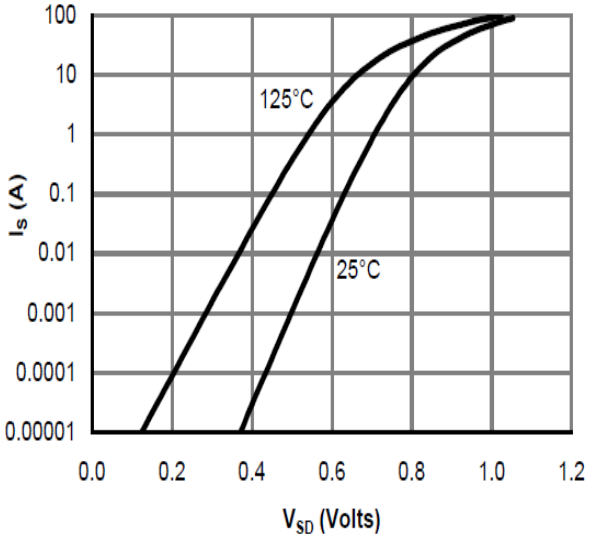


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

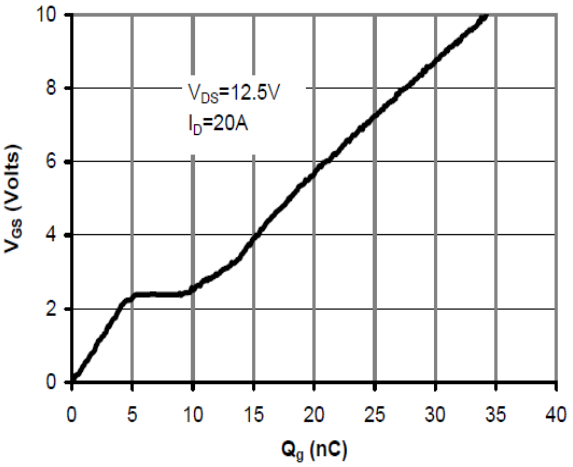


Figure 7: Gate-Charge Characteristics

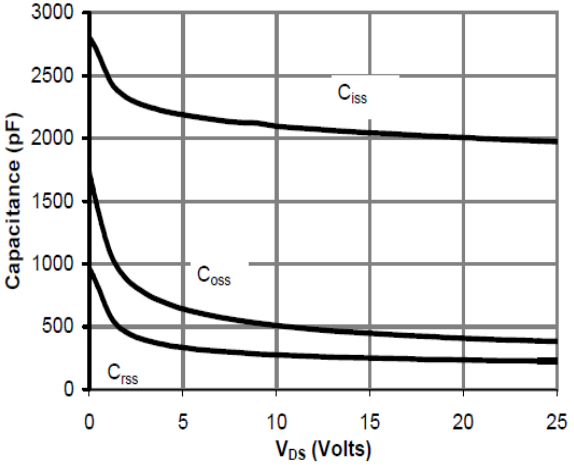


Figure 8: Capacitance Characteristics

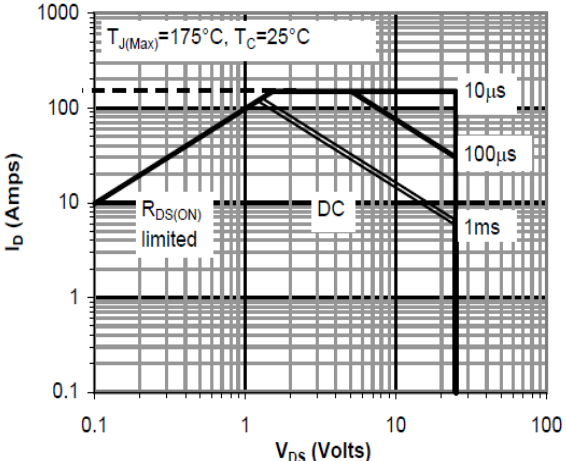


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

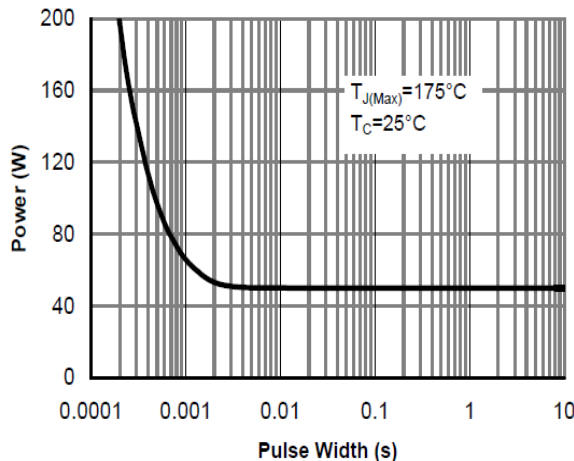


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

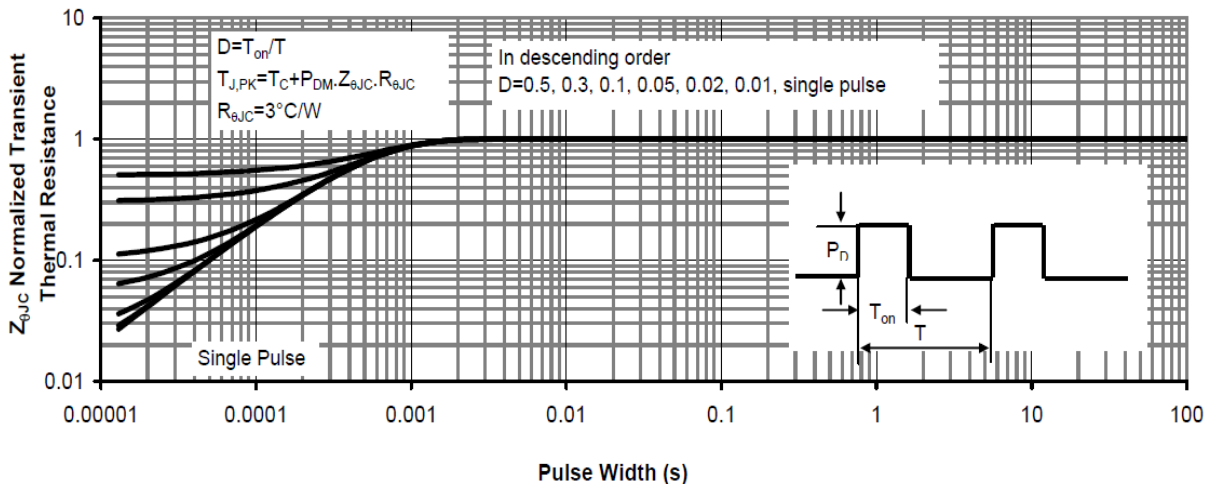


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

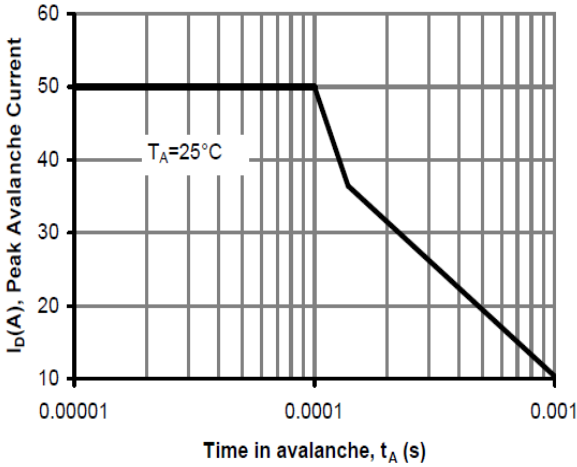


Figure 12: Single Pulse Avalanche capability

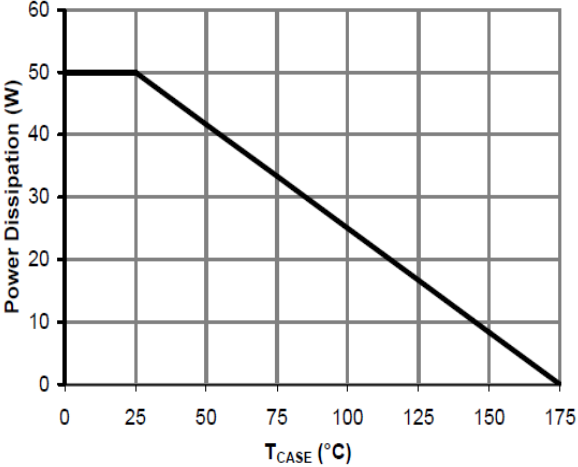


Figure 13: Power De-rating (Note B)

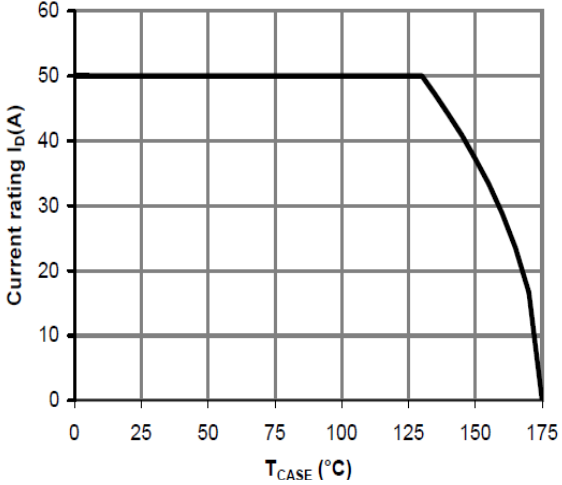


Figure 14: Current De-rating (Note B)

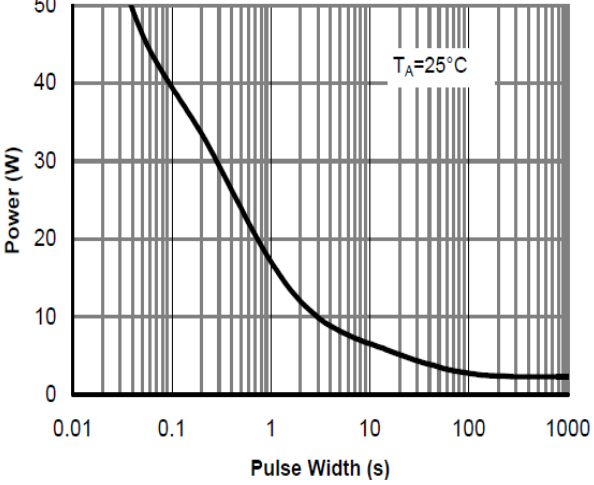


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

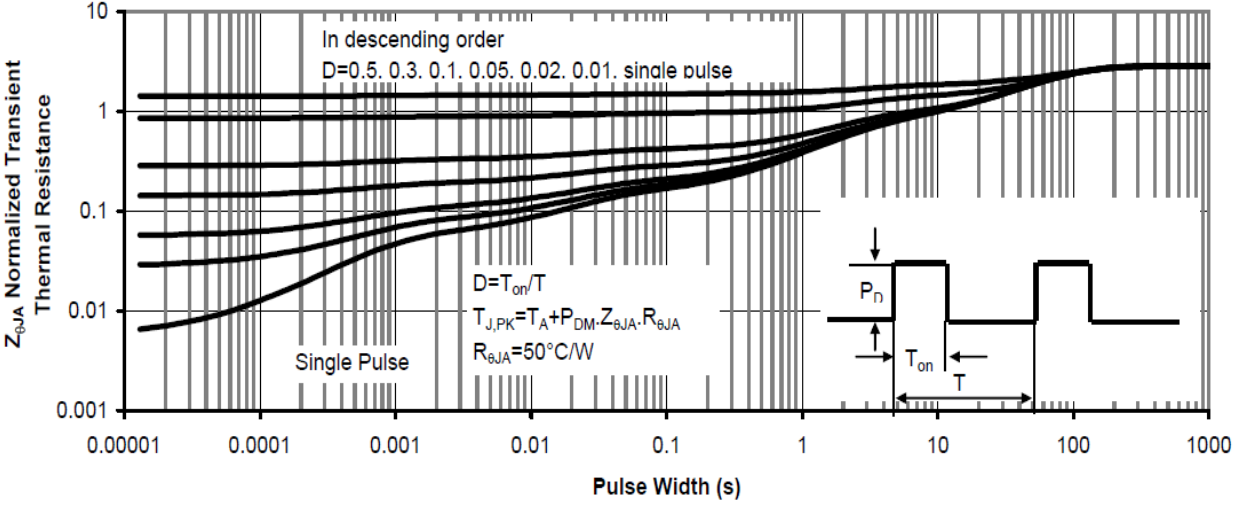


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

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