

## N-Channel 30-V (D-S) MOSFET

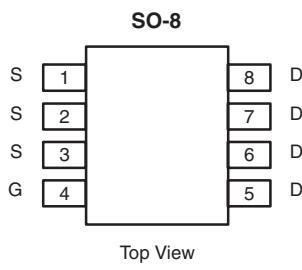
PRODUCT SUMMARY			
$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A) <sup>a</sup>	$Q_g$ (Typ.)
30	0.0032 at $V_{GS} = 10$ V	36	25.5 nC
	0.0042 at $V_{GS} = 4.5$ V	29	

### FEATURES

- Halogen-free According to IEC 61249-2-21 Available
- TrenchFET® Power MOSFET
- 100 %  $R_g$  Tested

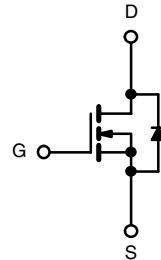


**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
Available



### APPLICATIONS

- Synchronous Buck-Low Side
  - Notebook
  - Server
  - Workstation
- Synchronous Rectifier-POL



**Ordering Information:** Si4324DY-T1-E3 (Lead (Pb)-free)  
Si4324DY-T1-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	$V_{DS}$	30		V
Gate-Source Voltage	$V_{GS}$	$\pm 20$		
Continuous Drain Current ( $T_J = 150$ °C)	$I_D$	36		A
		29		
		24 <sup>b, c</sup>		
		19 <sup>b, c</sup>		
Pulsed Drain Current	$I_{DM}$	70		
Continuous Source-Drain Diode Current	$I_S$	7.0		
		3.0 <sup>b, c</sup>		
Single Pulse Avalanche Current	$I_{AS}$	40		
Avalanche Energy	$E_{AS}$	80	mJ	
Maximum Power Dissipation	$P_D$	7.8		W
		5.0		
		3.5 <sup>b, c</sup>		
		2.2 <sup>b, c</sup>		
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 <sup>b, d</sup>	$R_{thJA}$	29	35	
Maximum Junction-to-Foot (Drain)	Steady State	$R_{thJF}$	13	°C/W

Notes:

- Based on  $T_C = 25$  °C.
- Surface Mounted on 1" x 1" FR4 board.
- $t = 10$  s.
- Maximum under Steady State conditions is 80 °C/W.

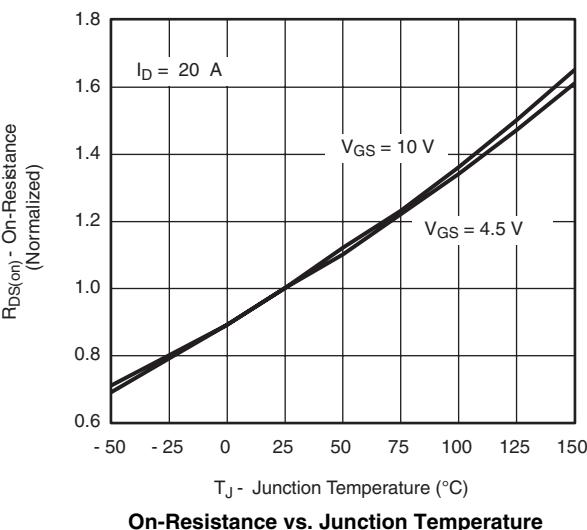
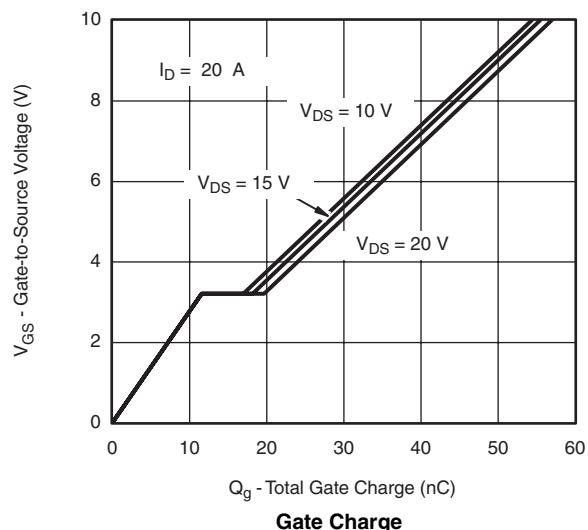
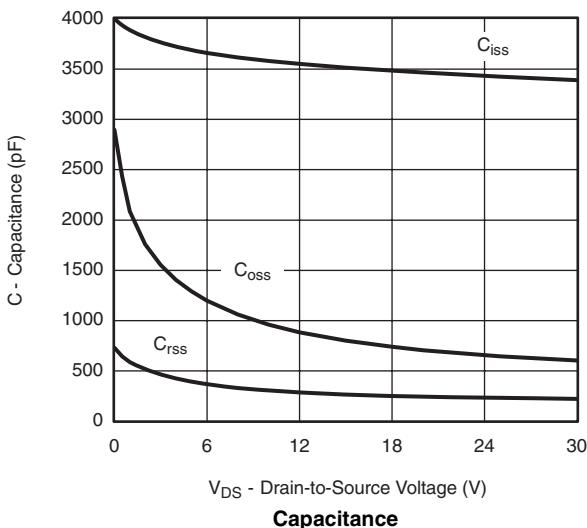
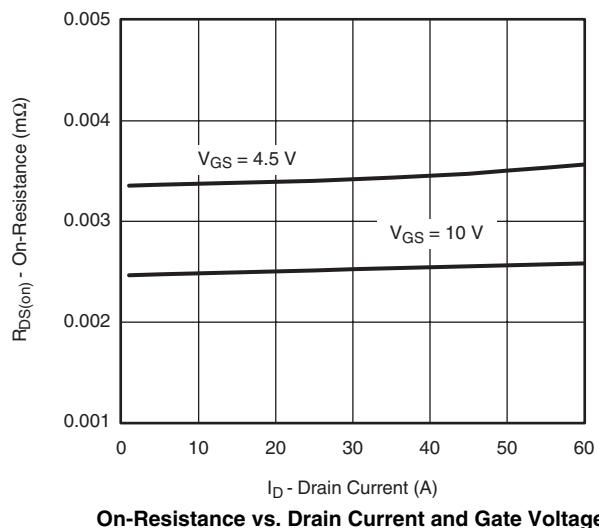
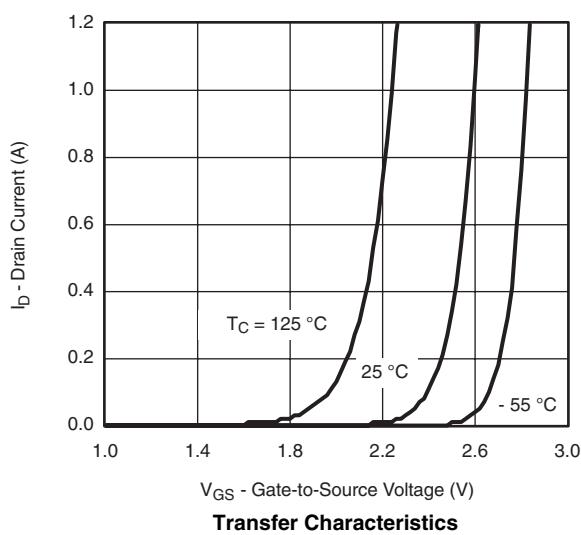
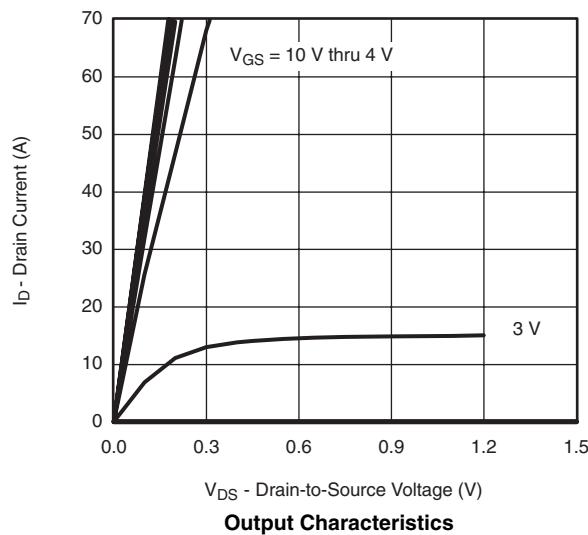
**SPECIFICATIONS**  $T_J = 25^\circ\text{C}$ , unless otherwise noted

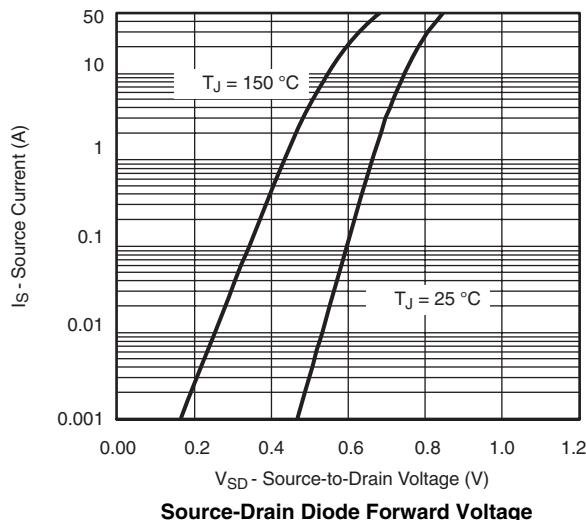
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$	30			V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250 \mu\text{A}$		34		$\text{mV}/^\circ\text{C}$
$V_{GS(\text{th})}$ Temperature Coefficient	$\Delta V_{GS(\text{th})}/T_J$			- 6.4		
Gate-Source Threshold Voltage	$V_{GS(\text{th})}$	$V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$	1.4		2.5	V
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0 \text{ V}$ , $V_{GS} = \pm 20 \text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 30 \text{ V}$ , $V_{GS} = 0 \text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 30 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $T_J = 55^\circ\text{C}$			10	
On-State Drain Current <sup>a</sup>	$I_{D(\text{on})}$	$V_{DS} \geq 5 \text{ V}$ , $V_{GS} = 10 \text{ V}$	30			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(\text{on})}$	$V_{GS} = 10 \text{ V}$ , $I_D = 20 \text{ A}$		0.0025	0.0032	$\Omega$
		$V_{GS} = 4.5 \text{ V}$ , $I_D = 15 \text{ A}$		0.0034	0.0042	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15 \text{ V}$ , $I_D = 20 \text{ A}$		80		S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{DS} = 15 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $f = 1 \text{ MHz}$		3510		$\text{pF}$
Output Capacitance	$C_{oss}$			795		
Reverse Transfer Capacitance	$C_{rss}$			265		
Total Gate Charge	$Q_g$	$V_{DS} = 15 \text{ V}$ , $V_{GS} = 10 \text{ V}$ , $I_D = 20 \text{ A}$		55.5	85	$\text{nC}$
		$V_{DS} = 15 \text{ V}$ , $V_{GS} = 4.5 \text{ V}$ , $I_D = 20 \text{ A}$		25.5	40	
Gate-Source Charge	$Q_{gs}$			11.6		
Gate-Drain Charge	$Q_{gd}$			6.6		
Gate Resistance	$R_g$	$f = 1 \text{ MHz}$	0.6	1.25	1.9	$\Omega$
Turn-on Delay Time	$t_{d(\text{on})}$	$V_{DD} = 15 \text{ V}$ , $R_L = 1.5 \Omega$ $I_D \geq 10 \text{ A}$ , $V_{GEN} = 4.5 \text{ V}$ , $R_g = 1 \Omega$		30	45	$\text{ns}$
Rise Time	$t_r$			185	280	
Turn-Off Delay Time	$t_{d(\text{off})}$			30	45	
Fall Time	$t_f$			13	20	
Turn-on Delay Time	$t_{d(\text{on})}$			17	26	
Rise Time	$t_r$			90	140	
Turn-Off Delay Time	$t_{d(\text{off})}$			37	56	
Fall Time	$t_f$			10	16	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25^\circ\text{C}$			7	$\text{A}$
Pulse Diode Forward Current <sup>a</sup>	$I_{SM}$				70	
Body Diode Voltage	$V_{SD}$	$I_S = 3 \text{ A}$		0.72	1.1	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = 13 \text{ A}$ , $dl/dt = 100 \text{ A}/\mu\text{s}$ , $T_J = 25^\circ\text{C}$		40	60	$\text{ns}$
Body Diode Reverse Recovery Charge	$Q_{rr}$			40	60	$\text{nC}$
Reverse Recovery Fall Time	$t_a$			21		$\text{ns}$
Reverse Recovery Rise Time	$t_b$			19		

Notes:

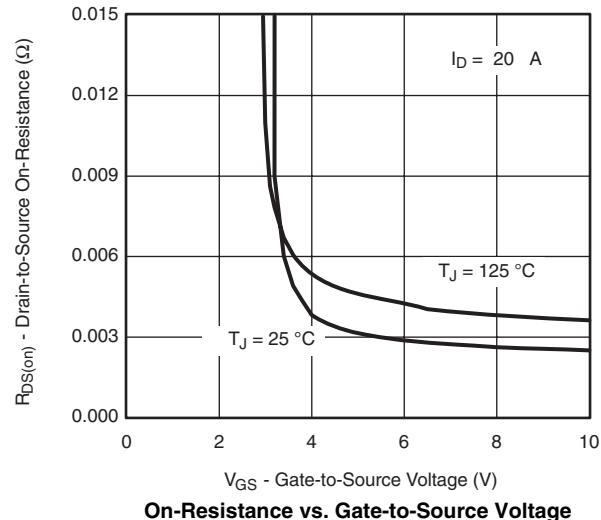
a. Pulse test; pulse width  $\leq 300 \mu\text{s}$ , duty cycle  $\leq 2\%$   
b. Guaranteed by design, not subject to production testing.

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.

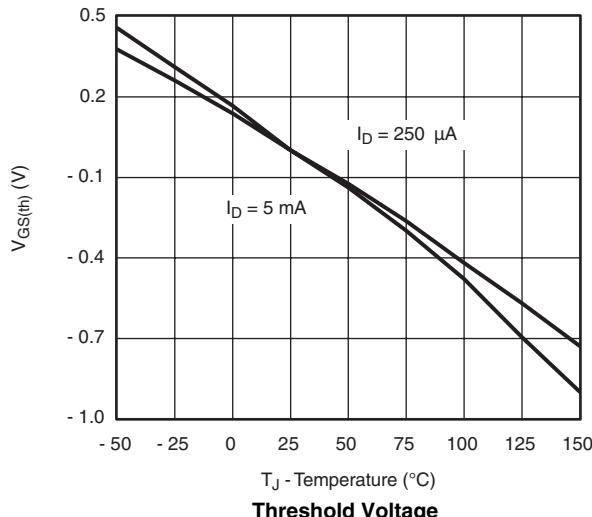
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted


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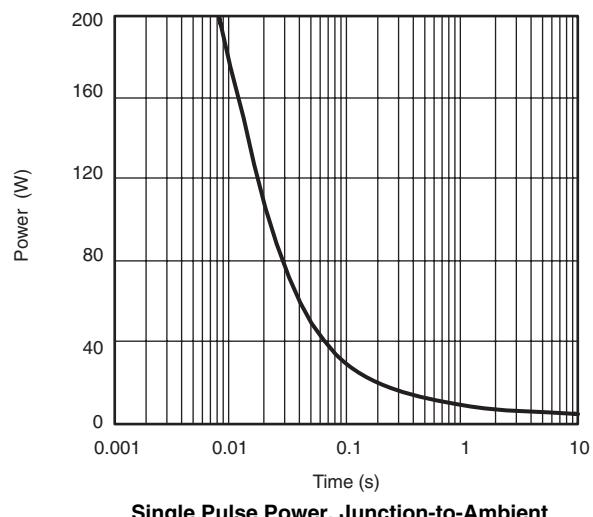
Source-Drain Diode Forward Voltage



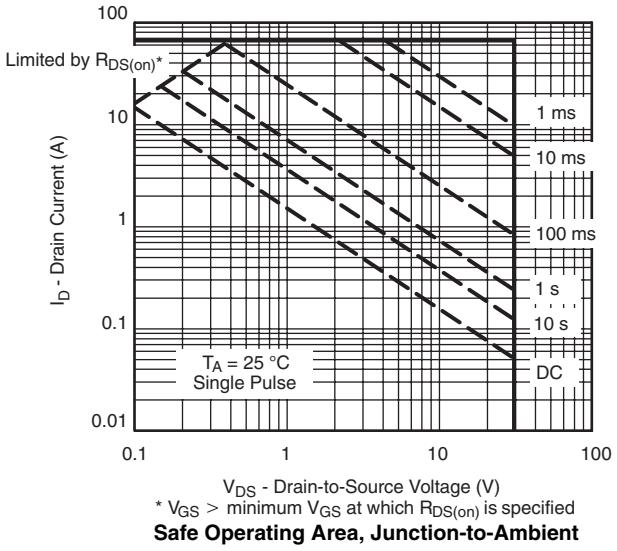
On-Resistance vs. Gate-to-Source Voltage



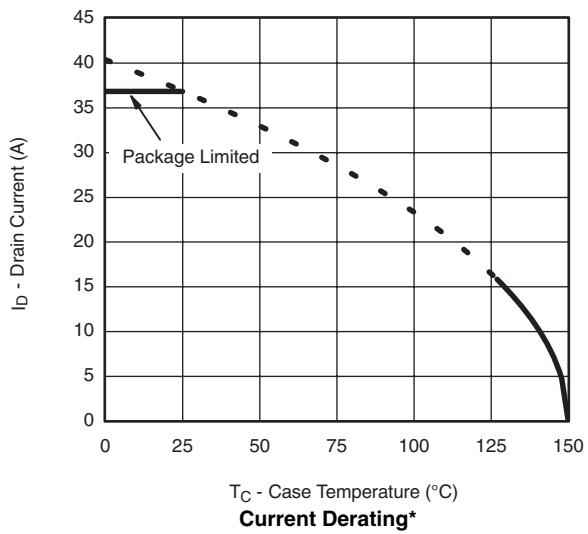
Threshold Voltage

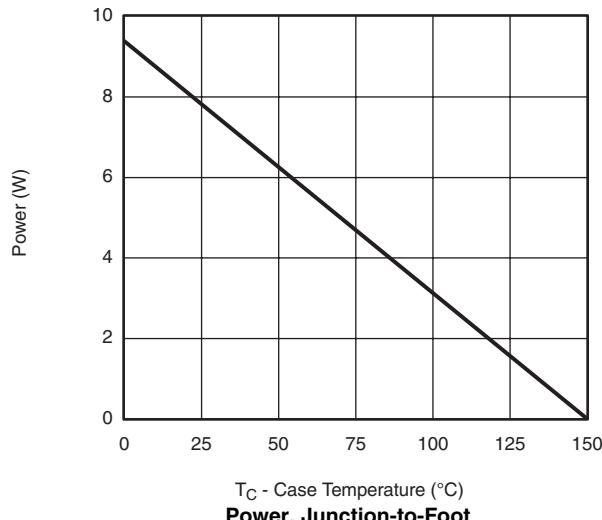


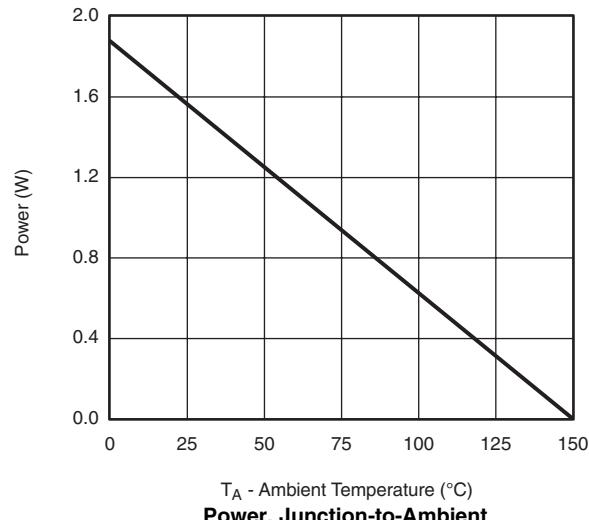
Single Pulse Power, Junction-to-Ambient



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

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 $T_C$  - Case Temperature (°C)

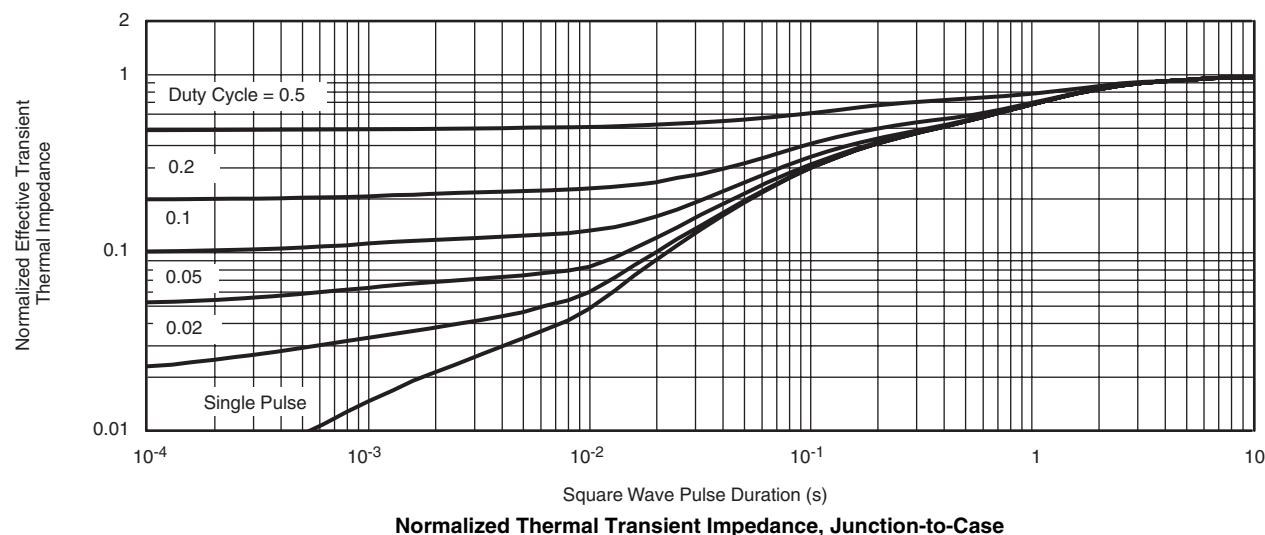
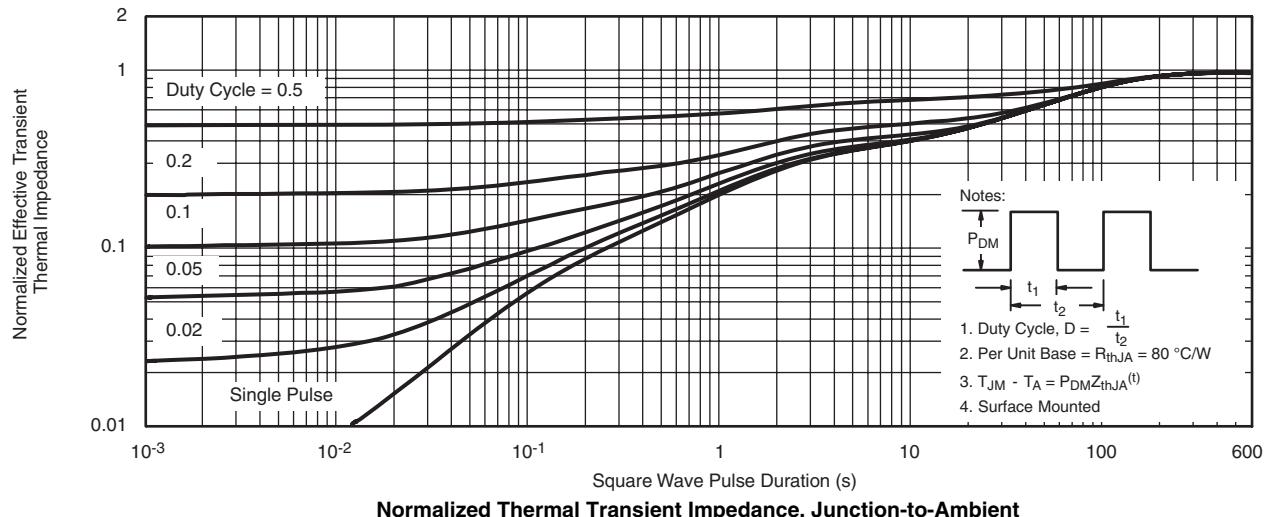
**Current Derating\***

 $T_C$  - Case Temperature (°C)

**Power, Junction-to-Foot**

 $T_A$  - Ambient Temperature (°C)

**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.

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