

Dual N-Channel 20 V MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)	Q_g (Typ.)
20	0.0046 at $V_{GS} = 10$ V	19.8 ^a	14.5
	0.006 at $V_{GS} = 4.5$ V	17.3 ^a	

FEATURES

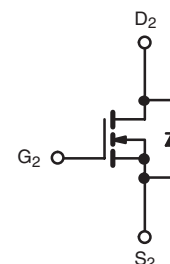
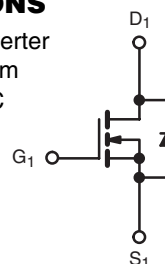
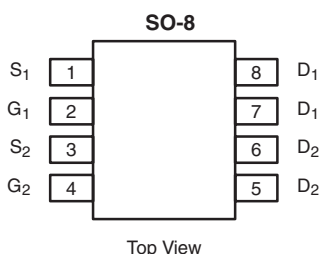
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET[®] Power MOSFET
- 100 % R_g Tested
- 100 % UIS Tested
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- DC/DC Converter
- Fixed Telecom
- Notebook PC



Ordering Information: Si4204DY-T1-GE3 (Lead (Pb)-free and Halogen-free)

N-Channel MOSFET

N-Channel MOSFET

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	20	V
Gate-Source Voltage	V_{GS}	± 20	
Continuous Drain Current ($T_J = 150$ °C)	I_D	$T_C = 25$ °C	19.8
		$T_C = 70$ °C	15.9
		$T_A = 25$ °C	15.5 ^{b, c}
		$T_A = 70$ °C	12.2 ^{b, c}
Pulsed Drain Current (10 μ s Pulse Width)	I_{DM}	50	A
Source-Drain Current Diode Current	I_S	$T_C = 25$ °C	2.7
		$T_A = 25$ °C	1.6 ^{b, c}
Pulsed Source-Drain Current	I_{SM}	50	
Single Pulse Avalanche Current	I_{AS}	20	
Single Pulse Avalanche Energy	E_{AS}	20	
Maximum Power Dissipation	P_D	$T_C = 25$ °C	3.25
		$T_C = 70$ °C	2.10
		$T_A = 25$ °C	2.0 ^{b, c}
		$T_A = 70$ °C	1.25 ^{b, c}
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150	°C

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typ.	Max.	Unit
Maximum Junction-to-Ambient ^{b, d}	R_{thJA}	45	62.5	°C/W
Maximum Junction-to-Foot (Drain)	R_{thJF}	29	38	

Notes:

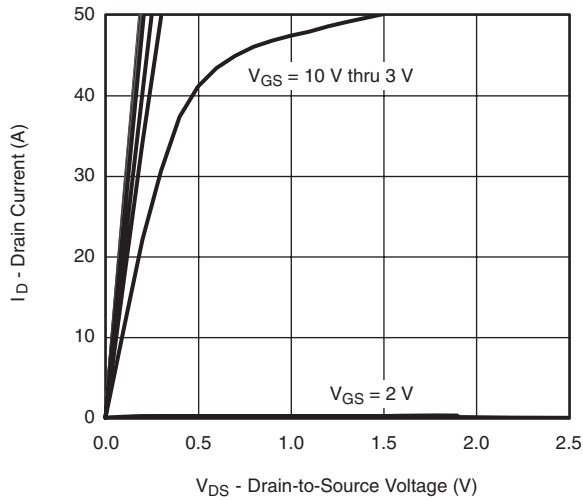
- Based on $T_C = 25$ °C.
- Surface mounted on 1" x 1" FR4 board.
- $t = 10$ s.
- Maximum under steady state conditions is 120 °C/W.

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

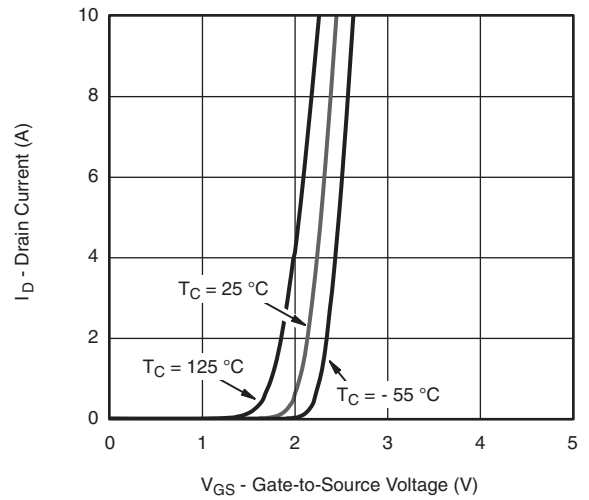
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	20			V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = 250 μA		20		mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J	I _D = 250 μA		- 5.8		
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	1.0		2.4	V
Gate-Body Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V			100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 20 V, V _{GS} = 0 V			1	μA
		V _{DS} = 20 V, V _{GS} = 0 V, T _J = 55 °C			10	
On-State Drain Current ^b	I _{D(on)}	V _{DS} = 5 V, V _{GS} = 10 V	20			A
Drain-Source On-State Resistance ^b	R _{DS(on)}	V _{GS} = 10 V, I _D = 10 A		0.0038	0.0046	Ω
		V _{GS} = 4.5 V, I _D = 8 A		0.0047	0.0060	
Forward Transconductance ^b	g _{fs}	V _{DS} = 15 V, I _D = 10 A		50		S
Dynamic ^a						
Input Capacitance	C _{iss}	V _{DS} = 10 V, V _{GS} = 0 V, I _D = 1 MHz		2110		pF
Output Capacitance	C _{oss}			926		
Reverse Transfer Capacitance	C _{rss}			235		
Total Gate Charge	Q _g	V _{DS} = 10 V, V _{GS} = 10 V, I _D = 10 A		30	45	nC
		V _{DS} = 10 V, V _{GS} = 4.5 V, I _D = 10 A		14.5	22	
Gate-Source Charge	Q _{gs}			4.5		
Gate-Drain Charge	Q _{gd}			3.9		
Gate Resistance	R _g	f = 1 MHz	0.4	1.4	2.8	Ω
Turn-On Delay Time	t _{d(on)}	V _{DD} = 10 V, R _L = 1 Ω I _D ≅ 10 A, V _{GEN} = 10 V, R _g = 1 Ω		8	16	ns
Rise Time	t _r			15	30	
Turn-Off Delay Time	t _{d(off)}			24	45	
Fall Time	t _f			9	18	
Turn-On Delay Time	t _{d(on)}	V _{DD} = 10 V, R _L = 1 Ω I _D ≅ 10 A, V _{GEN} = 4.5 V, R _g = 1 Ω		18	35	
Rise Time	t _r			24	45	
Turn-Off Delay Time	t _{d(off)}			26	50	
Fall Time	t _f			13	26	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C			2.7	A
Pulse Diode Forward Current ^a	I _{SM}				50	
Body Diode Voltage	V _{SD}	I _S = 3 A		0.70	1.2	V
Body Diode Reverse Recovery Time	t _{rr}	N-Channel I _F = 10 A, dI/dt = 100 A/μs, T _J = 25 °C		20	40	ns
Body Diode Reverse Recovery Charge	Q _{rr}			10	20	nC
Reverse Recovery Fall Time	t _a			11		nS
Reverse Recovery Rise Time	t _b			9		

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.

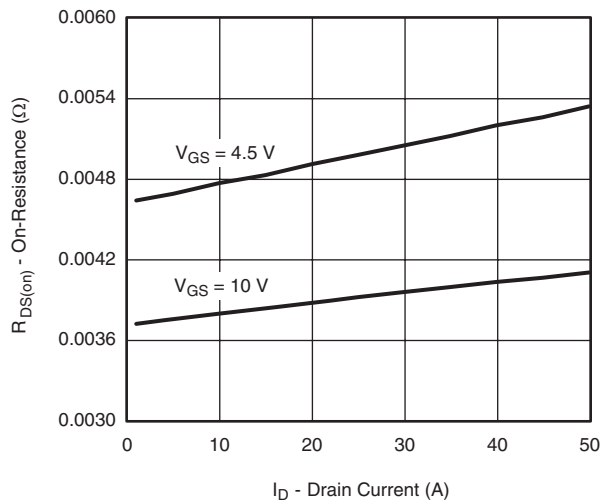
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



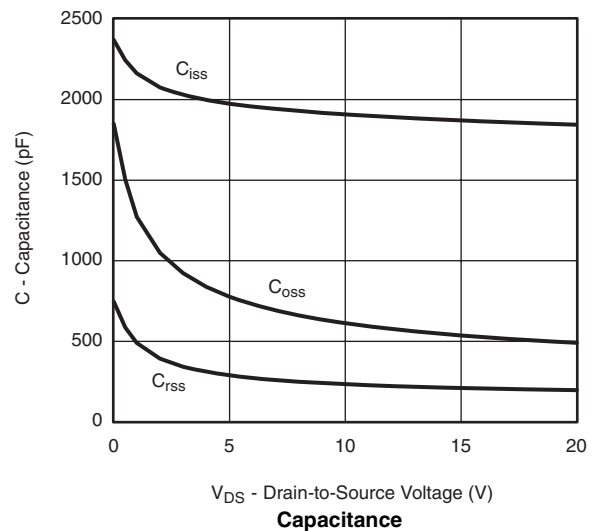
Output Characteristics



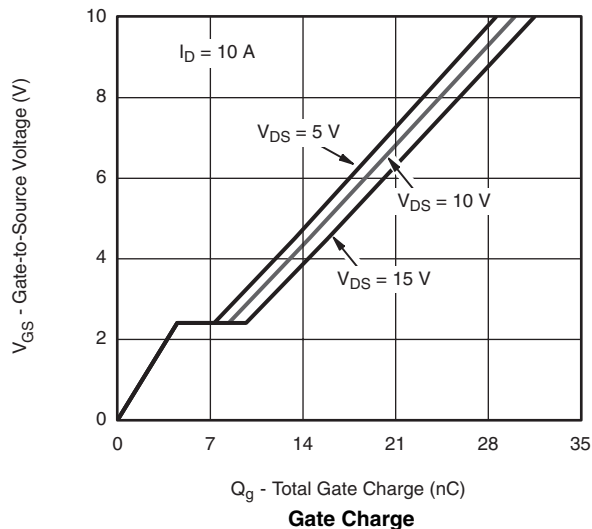
Transfer Characteristics



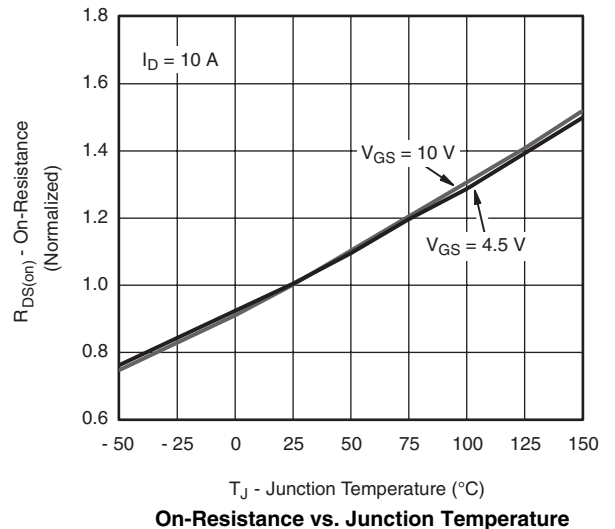
On-Resistance vs. Drain Current and Gate Voltage



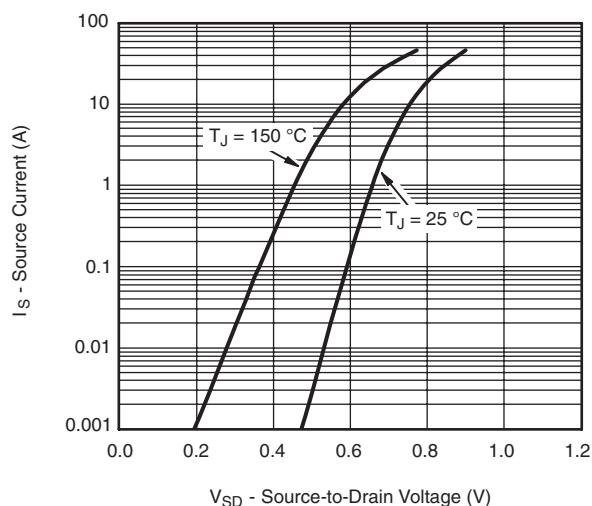
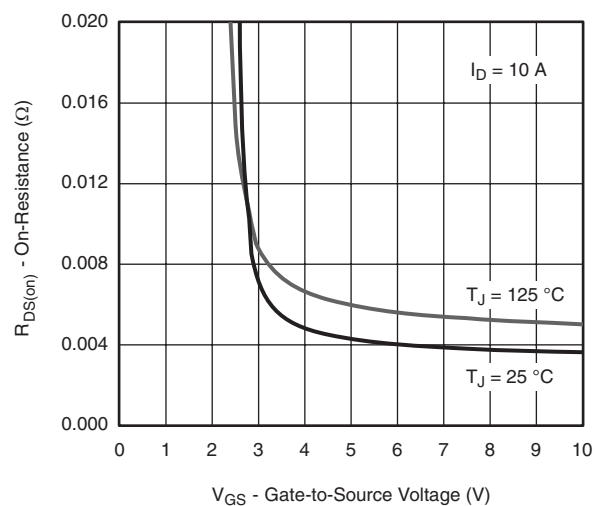
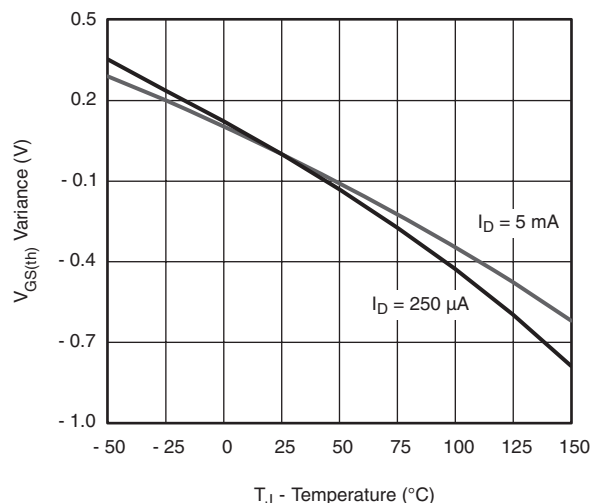
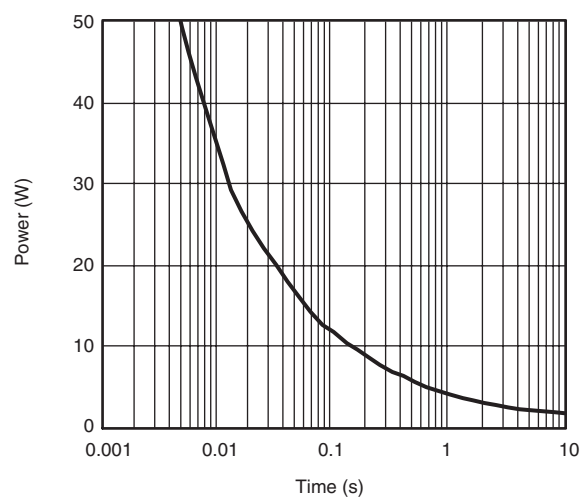
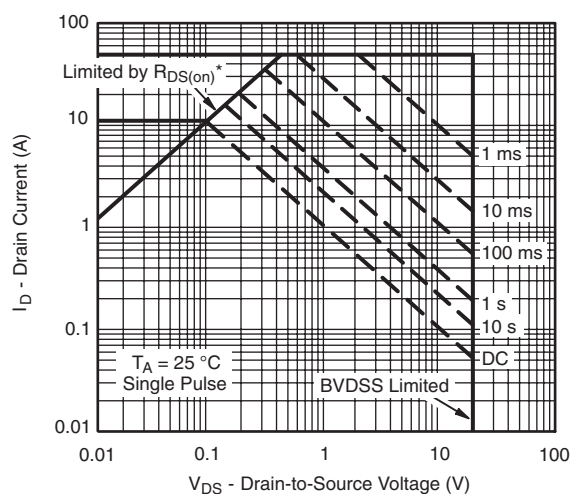
Capacitance



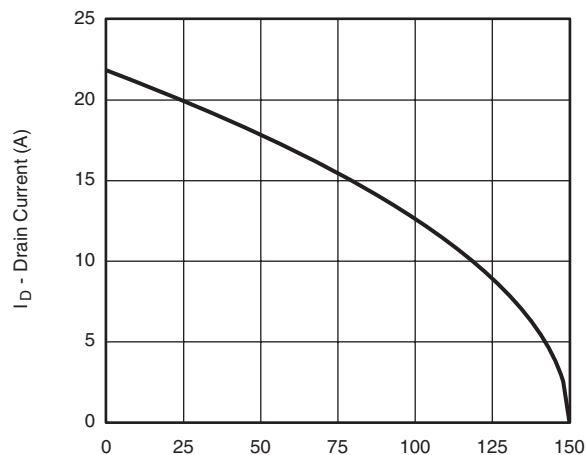
Gate Charge



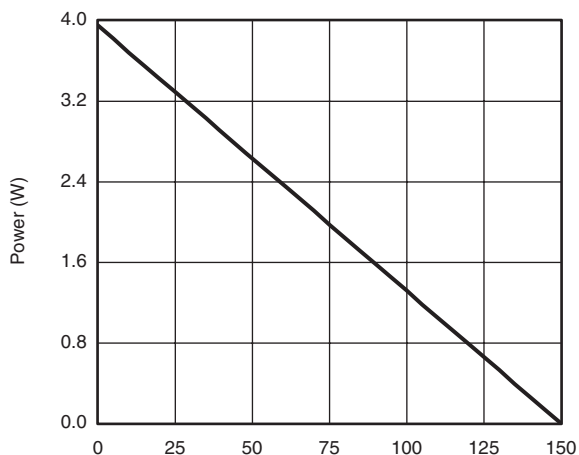
On-Resistance vs. Junction Temperature

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

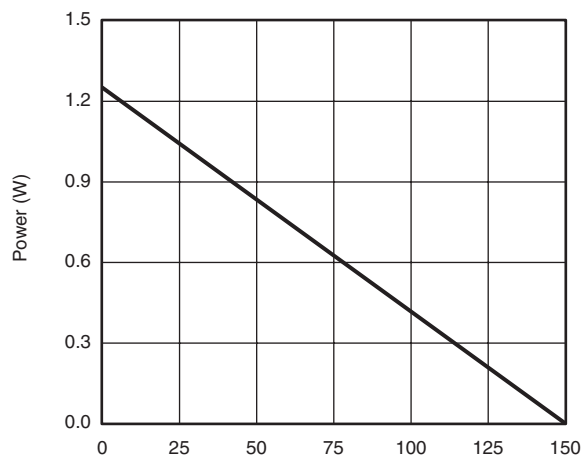
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



T_C - Case Temperature (°C)
Current Derating*

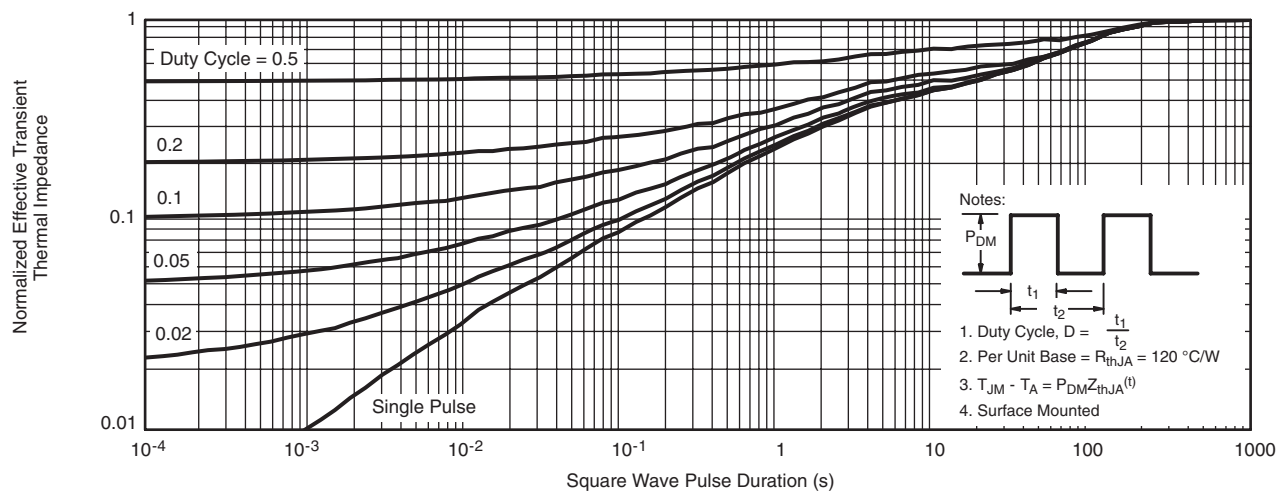
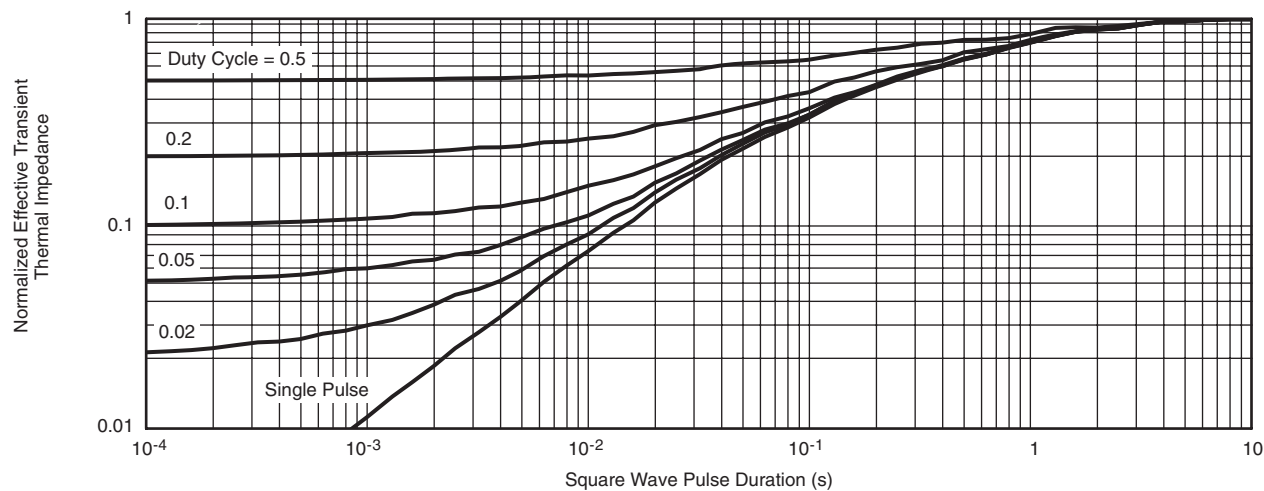


T_C - Case Temperature (°C)
Power Derating, Junction-to-Foot



T_A - Ambient Temperature (°C)
Power Derating, 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-Foot**

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SOIC (NARROW): 8-LEAD

JEDEC Part Number: MS-012



DIM	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	1.35	1.75	0.053	0.069
A ₁	0.10	0.20	0.004	0.008
B	0.35	0.51	0.014	0.020
C	0.19	0.25	0.0075	0.010
D	4.80	5.00	0.189	0.196
E	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
h	0.25	0.50	0.010	0.020
L	0.50	0.93	0.020	0.037
q	0°	8°	0°	8°
S	0.44	0.64	0.018	0.026
ECN: C-06527-Rev. I, 11-Sep-06				
DWG: 5498				

RECOMMENDED MINIMUM PADS FOR SO-8



Recommended Minimum Pads
Dimensions in Inches/(mm)

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