

NCE40P13S-VB Datasheet

P-Channel 40 V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^a	Q_g (Typ.)
- 40	0.010 at $V_{GS} = - 10$ V	- 16.1	33 nC
	0.014 at $V_{GS} = - 4.5$ V	- 13.3	

FEATURES

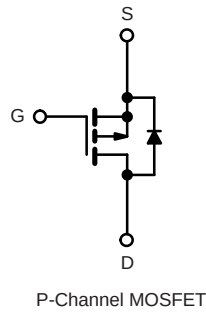
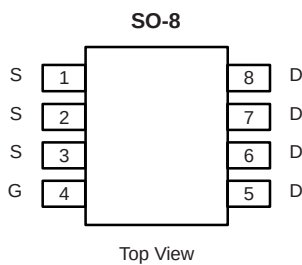
- Halogen-free According to IEC 61249-2-21 Definition
- 100 % R_g Tested
- 100 % UIS Tested
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Load Switch
- POL



ABSOLUTE MAXIMUM RATINGS $T_A = 25^\circ\text{C}$, unless otherwise noted

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	- 40	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current ($T_J = 150^\circ\text{C}$)	$T_C = 25^\circ\text{C}$	I_D	- 16.1	A
	$T_C = 70^\circ\text{C}$		- 12.9	
	$T_A = 25^\circ\text{C}$		- 10.2 ^{b, c}	
	$T_A = 70^\circ\text{C}$		- 8.2 ^{b, c}	
Pulsed Drain Current		I_{DM}	- 50	
Continuous Source-Drain Diode Current	$T_C = 25^\circ\text{C}$	I_S	- 5.3	
	$T_A = 25^\circ\text{C}$		- 2.1 ^{b, c}	
Single Pulse Avalanche Current	L = 0.1 mH	I_{AS}	- 28	mJ
Single Pulse Avalanche Energy		E_{AS}	39	
Maximum Power Dissipation	$T_C = 25^\circ\text{C}$	P_D	6.3	W
	$T_C = 70^\circ\text{C}$		4	
	$T_A = 25^\circ\text{C}$		2.5 ^{b, c}	
	$T_A = 70^\circ\text{C}$		1.6 ^{b, c}	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150	$^\circ\text{C}$

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{b, d}	$t \leq 10$ s	R_{thJA}	37	50	$^\circ\text{C/W}$
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	16	20	

Notes:

a. Based on $T_C = 25^\circ\text{C}$.

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

c. $t = 10$ s.

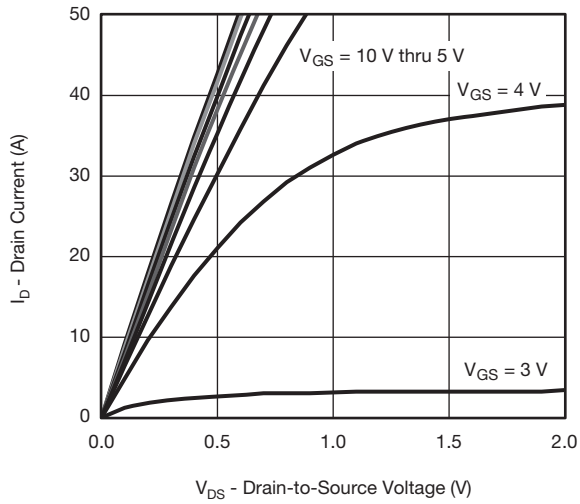
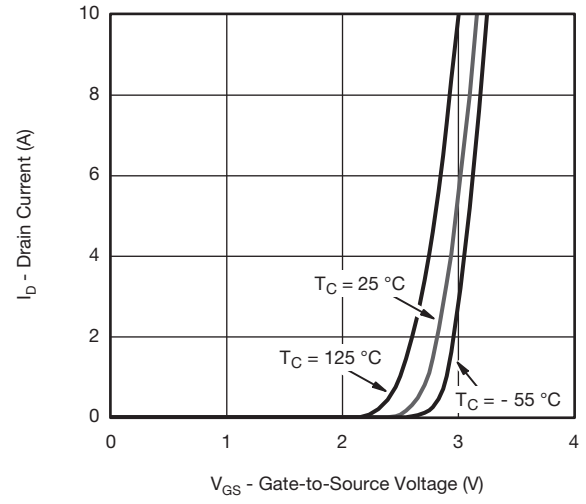
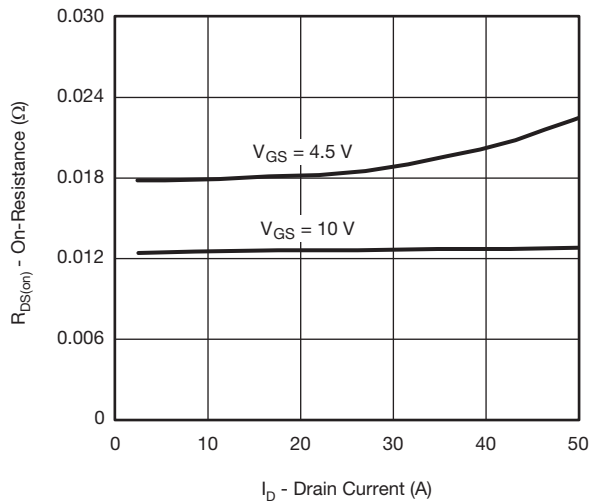
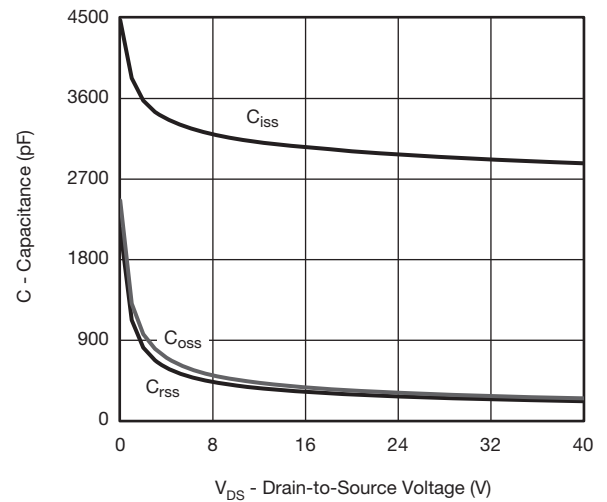
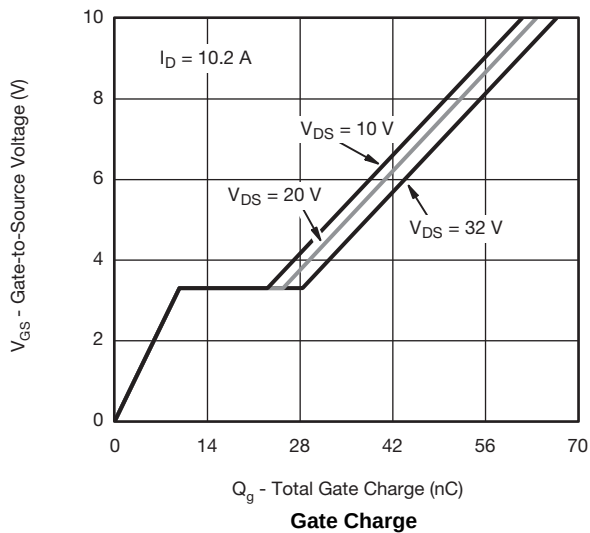
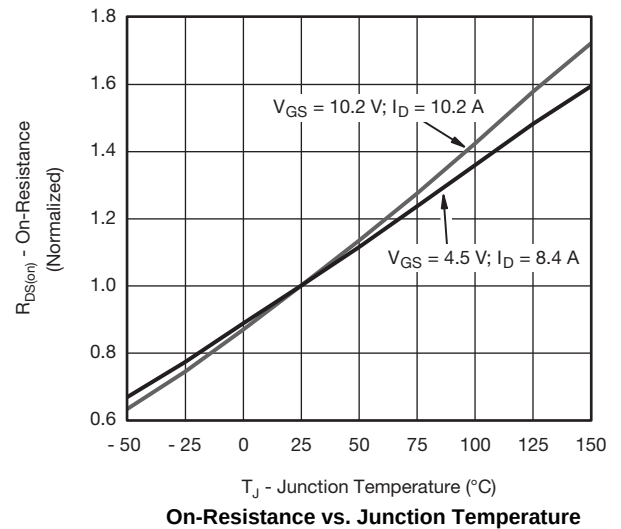
d. Maximum under steady state conditions is 85°C/W .

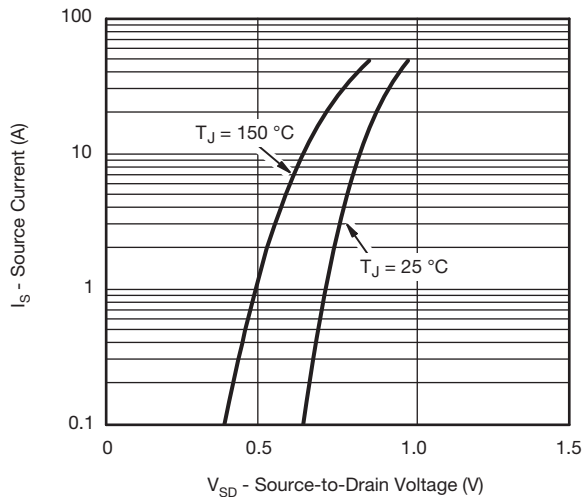
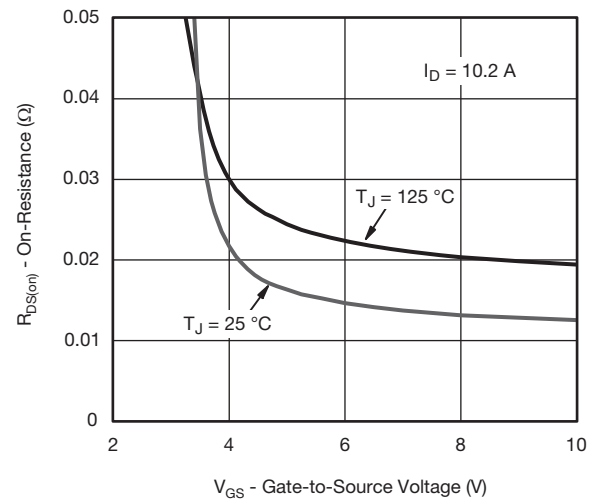
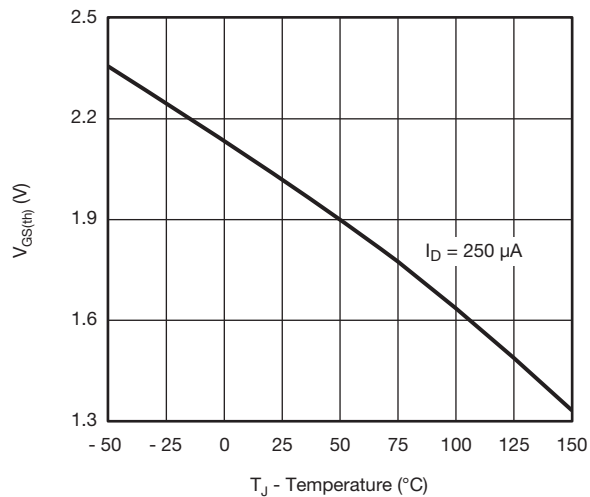
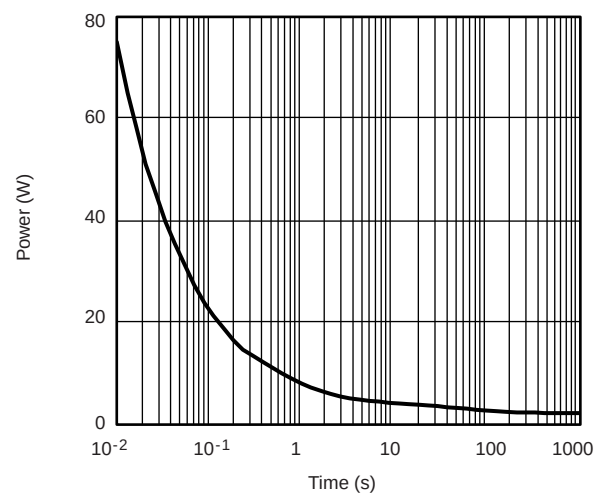
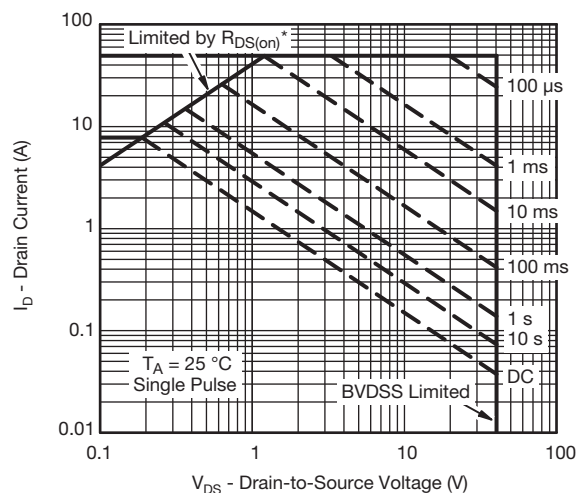
SPECIFICATIONS T _J = 25 °C, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = - 250 μA	- 40			V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = - 250 μA		- 36		mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J			5		
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = - 250 μA	- 1.2		- 2.5	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} = - 40 V, V _{GS} = 0 V			- 1	μA
		V _{DS} = - 40 V, V _{GS} = 0 V, T _J = 55 °C			- 5	
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≤ - 5 V, V _{GS} = - 10 V	- 25			A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = - 10 V, I _D = - 10.2 A		0.010		Ω
		V _{GS} = - 4.5 V, I _D = - 8.4 A		0.014		
Forward Transconductance ^a	g _{fs}	V _{DS} = - 15 V, I _D = - 10.2 A		37		S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{DS} = - 20 V, V _{GS} = 0 V, f = 1 MHz		3007		pF
Output Capacitance	C _{oss}			335		
Reverse Transfer Capacitance	C _{rss}			291		
Total Gate Charge	Q _g	V _{DS} = - 20 V, V _{GS} = - 10 V, I _D = - 10.2 A		64	95	nC
		V _{DS} = - 20 V, V _{GS} = - 4.5 V, I _D = - 10.2 A		33	50	
Gate-Source Charge	Q _{gs}			9.8		
Gate-Drain Charge	Q _{gd}			15.7		
Gate Resistance	R _g	f = 1 MHz	0.4	2	4	Ω
Turn-On Delay Time	t _{d(on)}	V _{DD} = - 20 V, R _L = 2.4 Ω I _D ≅ - 8.2 A, V _{GEN} = - 4.5 V, R _g = 1 Ω		57	86	ns
Rise Time	t _r			50	75	
Turn-Off Delay Time	t _{d(off)}			40	60	
Fall Time	t _f			17	26	
Turn-On Delay Time	t _{d(on)}	V _{DD} = - 20 V, R _L = 2.4 Ω I _D ≅ - 8.2 A, V _{GEN} = - 10 V, R _g = 1 Ω		13	20	
Rise Time	t _r			11	20	
Turn-Off Delay Time	t _{d(off)}			45	68	
Fall Time	t _f			9	18	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C			- 5.3	A
Pulse Diode Forward Current	I _{SM}				- 50	
Body Diode Voltage	V _{SD}	I _S = - 8.2 A, V _{GS} = 0 V		- 0.8	- 1.2	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = - 8.2 A, dI/dt = 100 A/μs, T _J = 25 °C		36	54	ns
Body Diode Reverse Recovery Charge	Q _{rr}			41	62	nC
Reverse Recovery Fall Time	t _a			20		ns
Reverse Recovery Rise Time	t _b			16		

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.

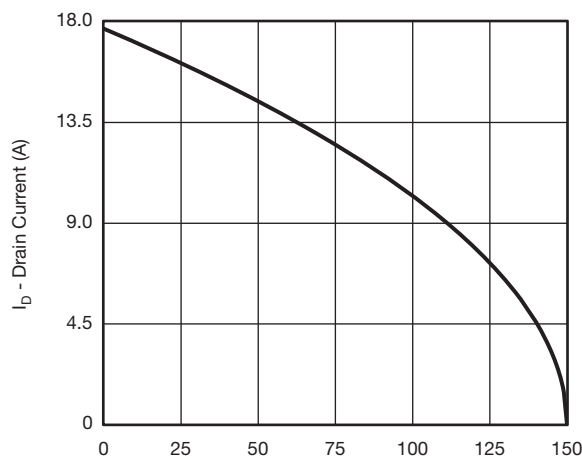
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

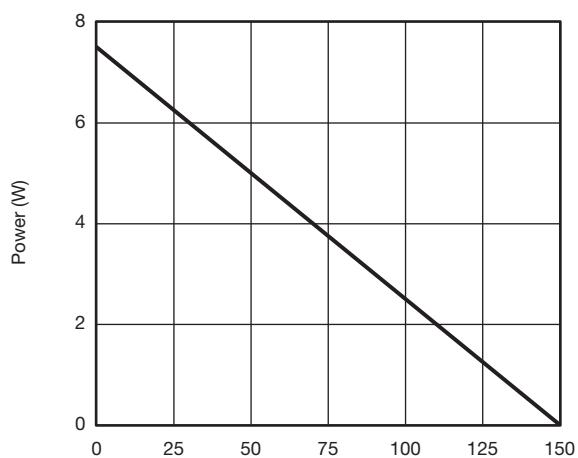
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

Output Characteristics

Transfer Characteristics

On-Resistance vs. Drain Current

Capacitance

Gate Charge

On-Resistance vs. Junction Temperature

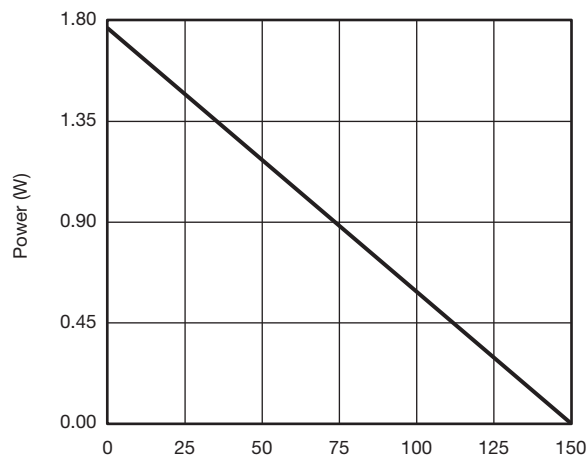
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

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

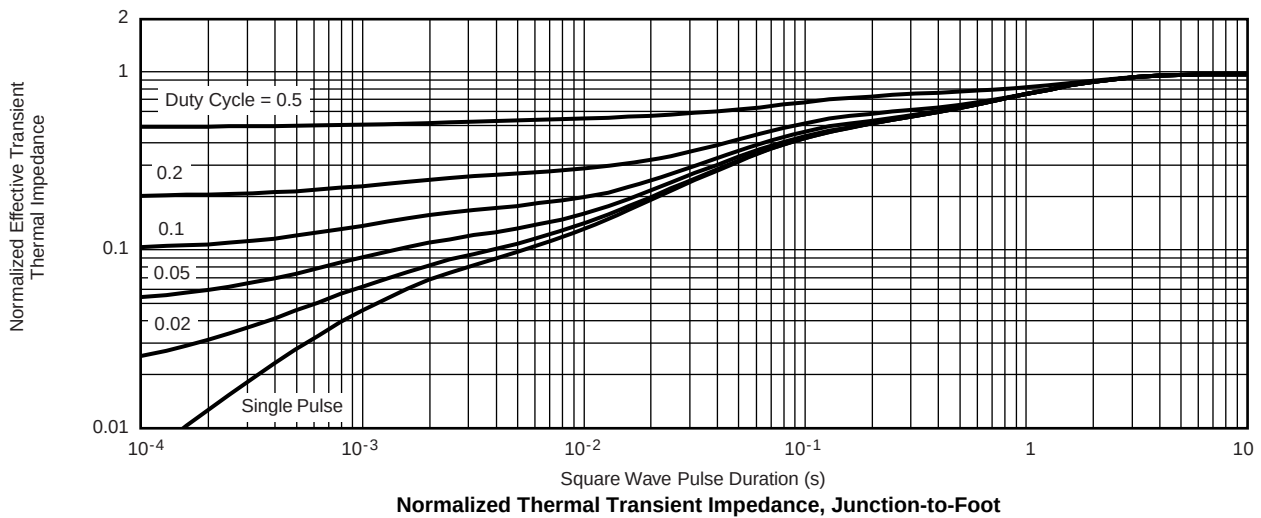
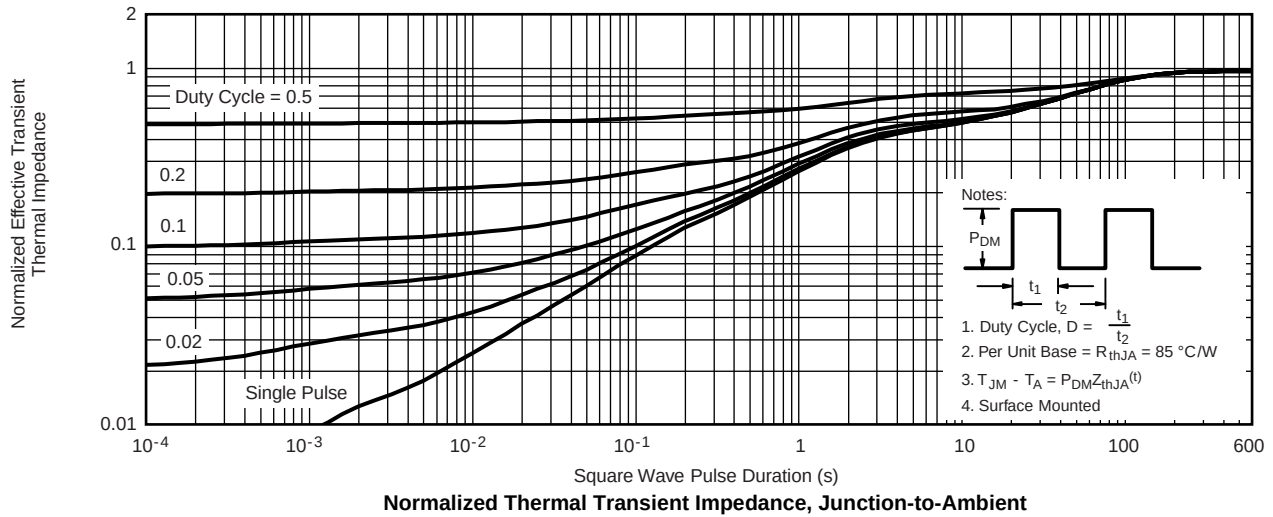
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

 T_C - Case Temperature (°C)

Current Derating*

 T_C - Case Temperature (°C)

Power, Junction-to-Foot

 T_A - Ambient Temperature (°C)

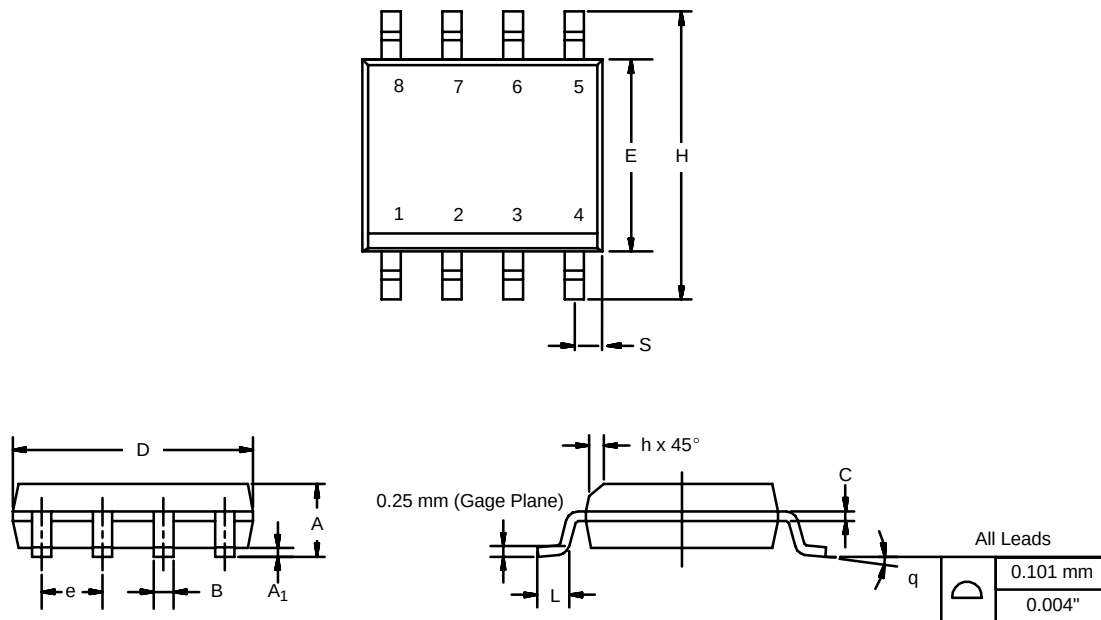
Power, Junction-to-Ambient

* 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.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


SOIC (NARROW): 8-LEAD

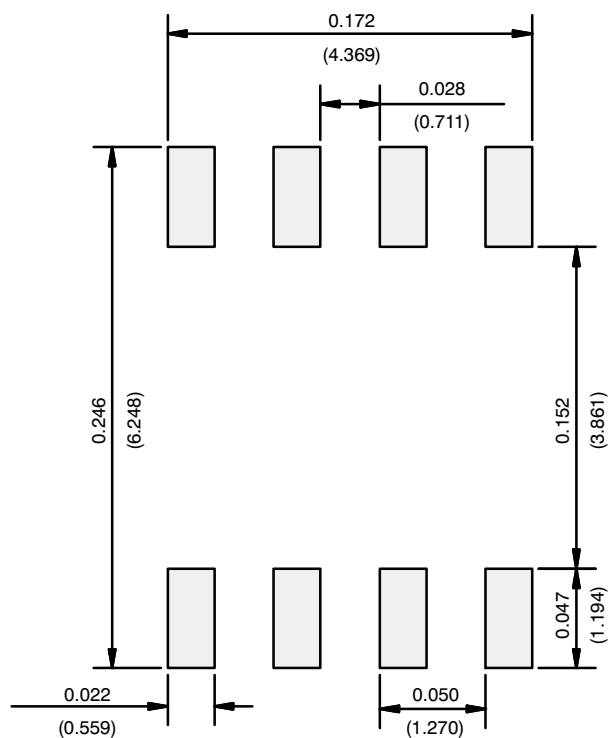
JEDEC Part Number: MS-012



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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