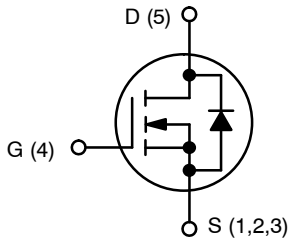
MOSFET - Power, Single N-Channel, STD Gate, DUAL COOL® DFN8 5x6

60 V, 1.5 mΩ, 238 A

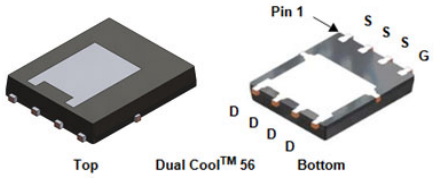
Product Preview

NTMFSC1D6N06C

$V_{(BR)DSS}$	$R_{DS(ON)}$ MAX	I_D MAX
60 V	1.5 mΩ @ 10 V	238 A



N−CHANNEL MOSFET



DFN8 5x6
CASE TBD

Features

- Advanced Dual−sided Cooled Packaging
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Q_G and Capacitance to Minimize Driver Losses
- These Devices are Pb−Free and are RoHS Compliant

Typical Applications

- Synchronous Rectifier
- DC−DC Conversion
- Oring FET and Load Switching

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

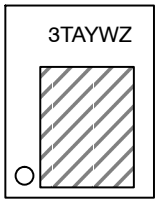
Parameter			Symbol	Value	Unit
Drain−to−Source Voltage			V_{DSS}	60	V
Gate−to−Source Voltage			V_{GS}	±20	V
Continuous Drain Current $R_{\theta JC}$ (Notes 1, 3)	Steady State	T_C = 25°C	I_D	238	A
		T_C = 100°C		168	
Power Dissipation $R_{\theta JC}$ (Note 1)		T_C = 25°C	P_D	170	W
		T_C = 100°C		84	
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2, 3)	Steady State	T_A = 25°C	I_D	35	A
		T_A = 100°C		25	
Power Dissipation $R_{\theta JA}$ (Notes 1, 2)		T_A = 25°C	P_D	3.8	W
		T_A = 100°C		1.9	
Pulsed Drain Current	T_A = 25°C, t_p = 10 μs		I_{DM}	900	A
Operating Junction and Storage Temperature Range			T_J, T_{stg}	−55 to +175	°C
Source Current (Body Diode)			I_S	190	A
Single Pulse Drain−to−Source Avalanche Energy ($I_{L(pk)}$ = 17 A)			E_{AS}	451	mJ
Lead Temperature for Soldering Purposes (1/8″ from case for 10 s)			T_L	260	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. Surface−mounted on FR4 board using a 650 mm^2, 2 oz. Cu pad.
3. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

This document contains information on a product under development. **onsemi** reserves the right to change or discontinue this product without notice.

MARKING DIAGRAM



3T = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
Z = Assembly Lot Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

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THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction−to−Case (Bottom)	$R_{\theta JC}$	0.9	°C/W
Thermal Resistance, Junction−to−Case (Top)	$R_{\theta JC}$	1.4	
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	39	

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 250 μA	60			V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$\Delta V_{(BR)DSS}/\Delta T_J$	I_D = 250 μA, Referenced to 25°C		12.8		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 60 V, T_J = 25°C			10	μA
		V_{DS} = 60 V, T_J = 125°C			250	
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = 20 V			100	nA
ON CHARACTERISTICS (Note 4)						
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 50 A		1.27	1.5	mΩ
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 250 μA	2.0		4.0	V
Gate Threshold Voltage Temperature Coefficient	$\Delta V_{GS(TH)}/\Delta T_J$	V_{GS} = V_{DS}, I_D = 250 μA		−9.4		mV/°C
Forward Transconductance	g_{FS}	V_{DS} = 5 V, I_D = 50 A		157		S
CHARGES, CAPACITANCES & GATE RESISTANCE						
Input Capacitance	C_{ISS}	V_{GS} = 0 V, V_{DS} = 30 V, f = 1 MHz		4860		pF
Output Capacitance	C_{OSS}			2800		
Reverse Transfer Capacitance	C_{RSS}			40		
Output Charge	Q_{OSS}			128		nC
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 10 V, V_{DD} = 30 V, I_D = 50 A		65		
Threshold Gate Charge	$Q_{G(TH)}$			13		
Gate−to−Source Charge	Q_{GS}			22		
Gate−to−Drain Charge	Q_{GD}			11		
Gate Resistance	R_G	f = 1 MHz		2		Ω
Gate Voltage Plateau	V_{GP}			4.6		V
SWITCHING CHARACTERISTICS (Note 5)						
Turn−On Delay Time	$t_{d(ON)}$	Resistive Load, V_{GS} = 0/10 V, V_{DD} = 30 V, I_D = 50 A, R_G = 2.5 Ω		26		ns
Rise Time	t_r			8		
Turn−Off Delay Time	$t_{d(OFF)}$			50		
Fall Time	t_f			9		

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
SOURCE−TO−DRAIN DIODE CHARACTERISTICS						
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 50 A, T_J = 25°C		0.81	1.2	V
		V_{GS} = 0 V, I_S = 50 A, T_J = 125°C		0.67		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, I_S = 50 A dI/dt = 100 A/μs		82		ns
Charge Time	t_a			41		
Discharge Time	t_b			41		
Reverse Recovery Charge	Q_{RR}			139		nC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
5. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

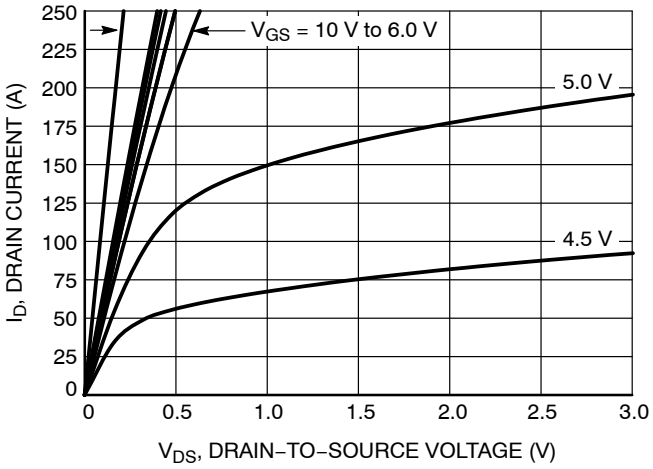

Figure 1. On−Region Characteristics

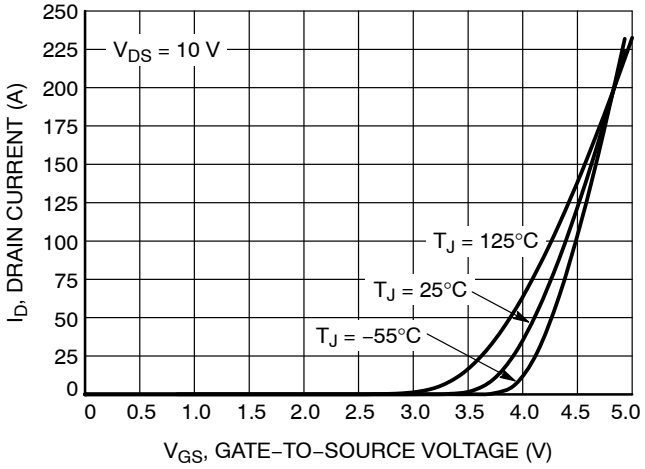

Figure 2. Transfer Characteristics

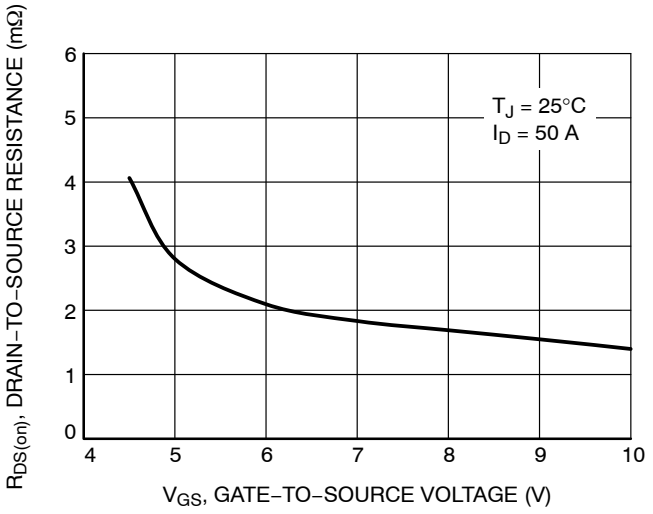

Figure 3. On−Resistance vs. Gate−to−Source Voltage

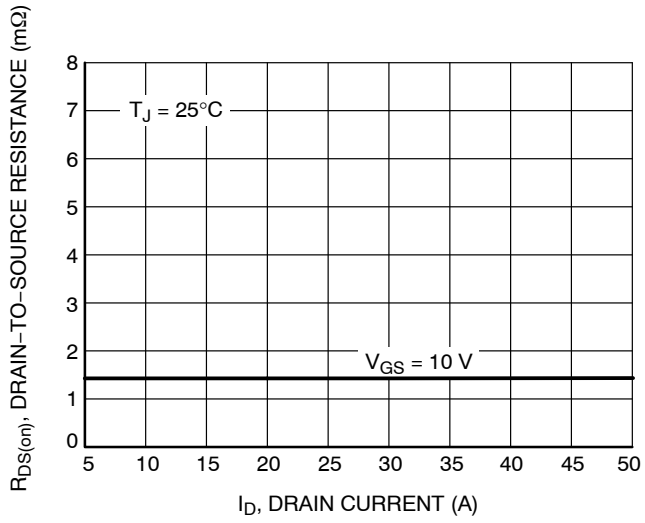

Figure 4. On−Resistance vs. Drain Current and Gate Voltage

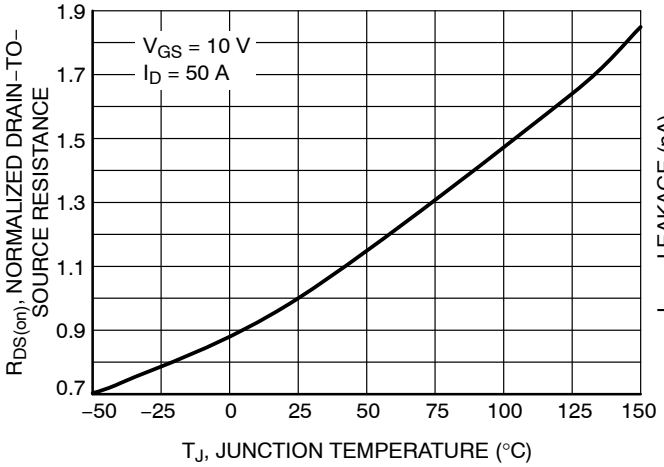

Figure 5. On−Resistance Variation with Temperature

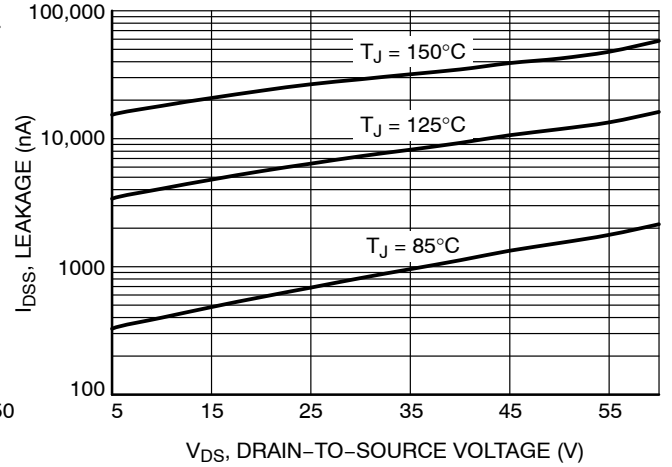

Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

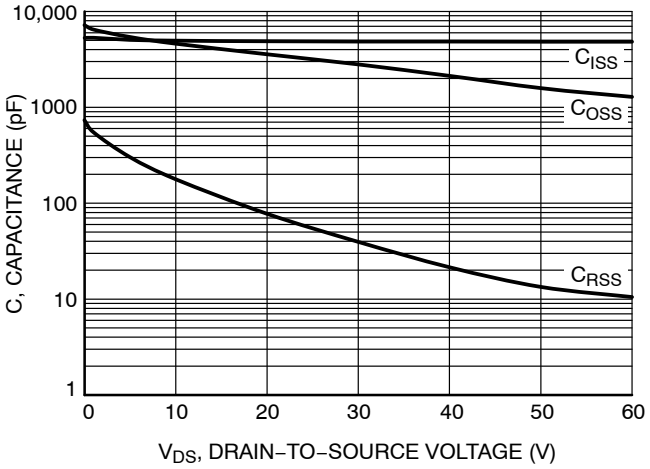

Figure 7. Capacitance Variation

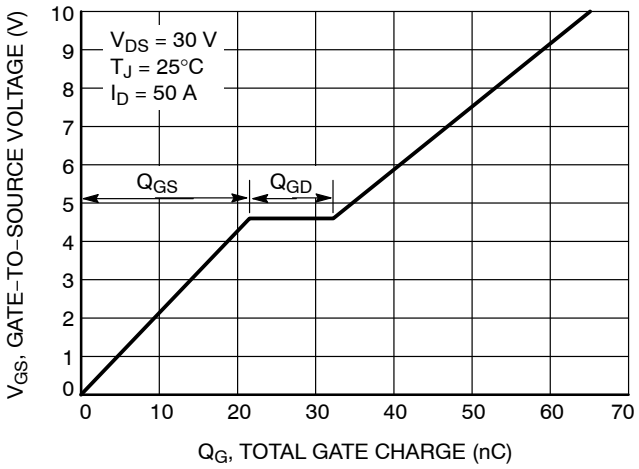

Figure 8. Gate Charge Characteristics

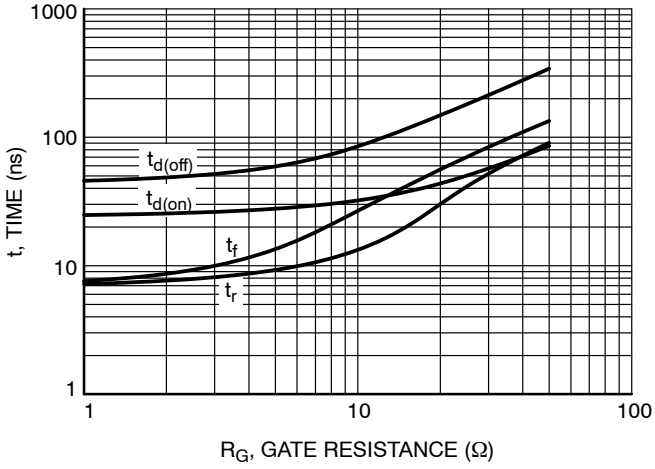

Figure 9. Resistive Switching Time Variation vs. Gate Resistance

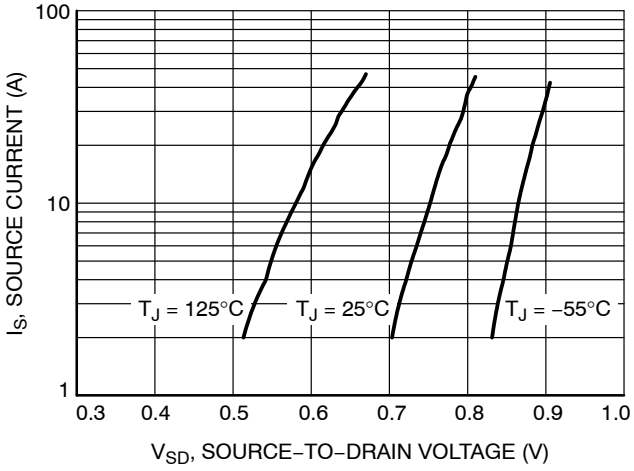

Figure 10. Diode Forward Voltage vs. Current

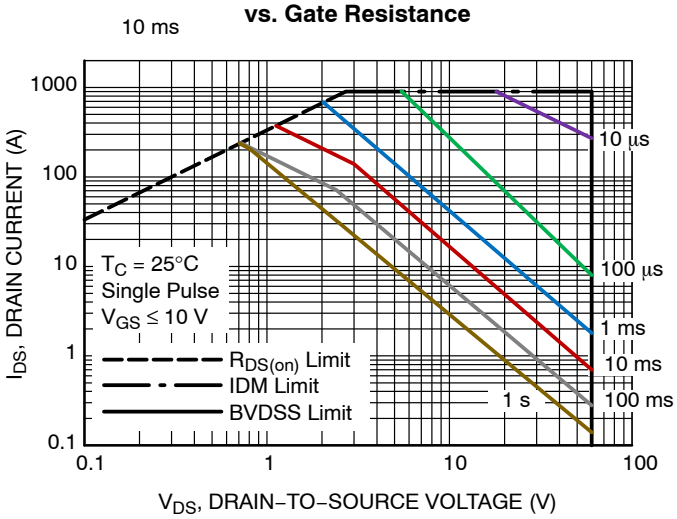

Figure 11. Safe Operating Area

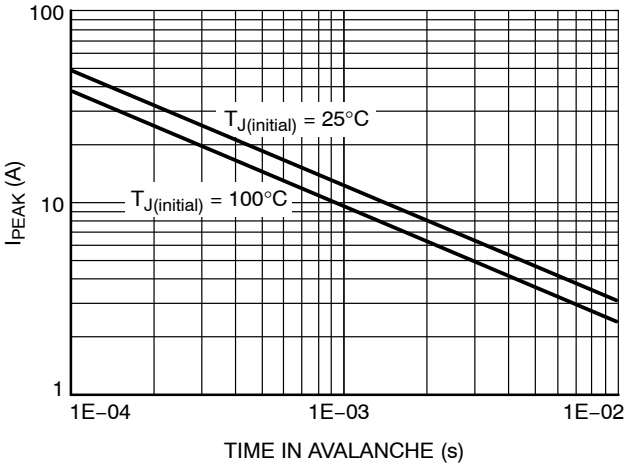

Figure 12. I_{PEAK} vs. Time in Avalanche

TYPICAL CHARACTERISTICS

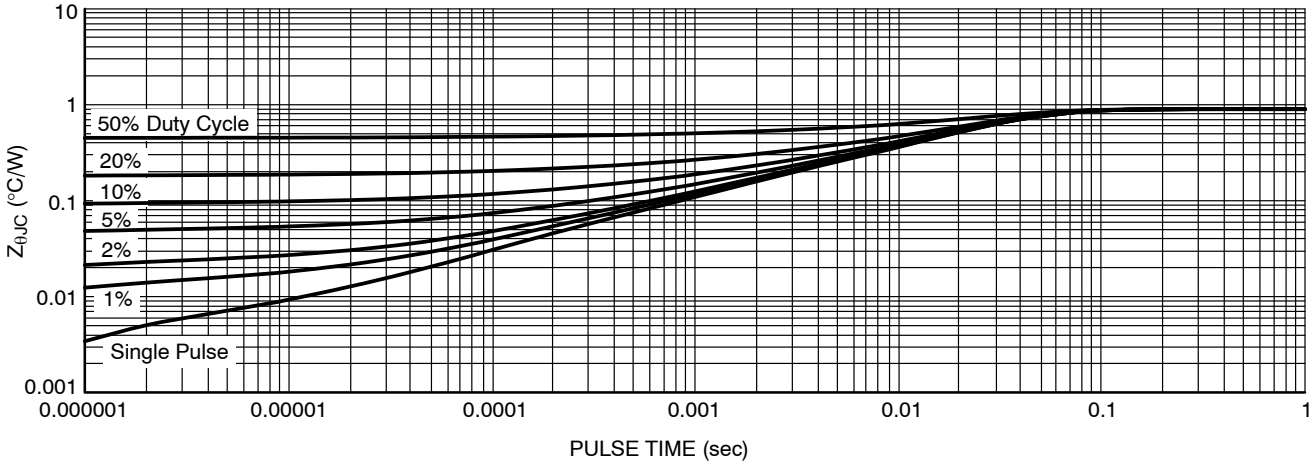

Figure 13. Thermal Characteristics

ORDERING INFORMATION

Device	Device Marking	Package	Shipping†
NTMFSC1D6N06CTWG	3T	DFN8 5x6 (Pb−Free/Halogen Free)	3000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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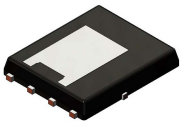

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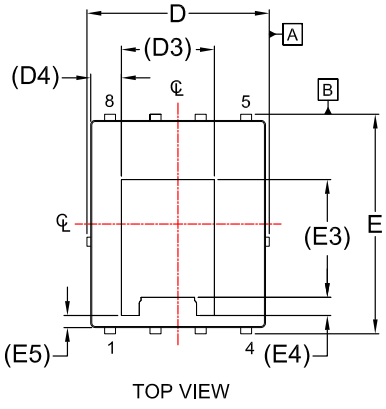
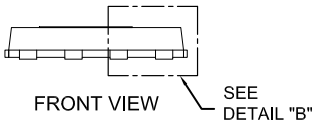
CASE 506EG
ISSUE D

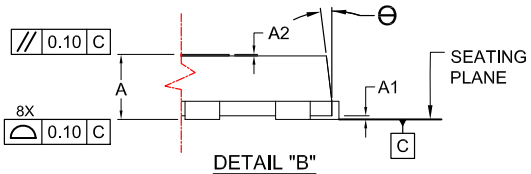
DATE 25 AUG 2020

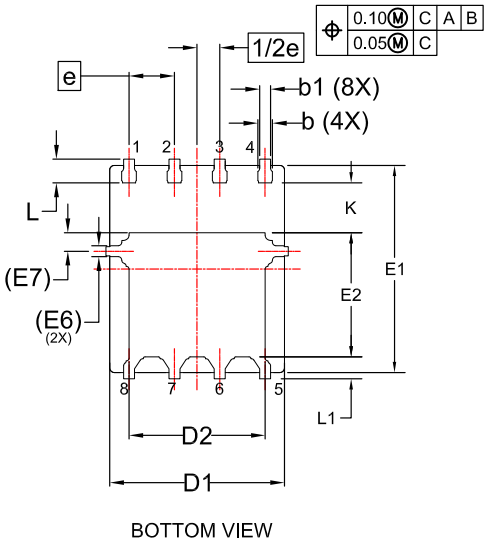


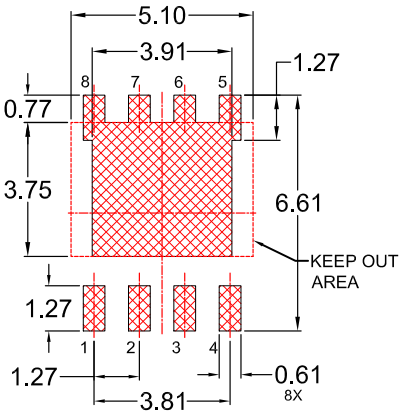
NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
4. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
5. SEATING PLANE IS DEFINED BY THE TERMINALS. "A1" IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.





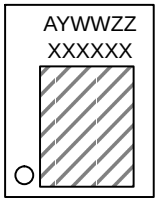




*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.85	0.90	0.95
A1	-	-	0.05
A2	-	-	0.05
b	0.31	0.41	0.51
b1	0.21	0.31	0.41
c	0.20	0.25	0.30
D	4.90	5.00	5.10
D1	4.80	4.90	5.00
D2	3.67	3.82	3.97
D3	2.60 REF		
D4	0.86 REF		
E	6.05	6.15	6.25
E1	5.70	5.80	5.90
E2	3.38	3.48	3.58
E3	3.30 REF		
E4	0.50 REF		
E5	0.34 REF		
E6	0.30 REF		
E7	0.52 REF		
e	1.27 BSC		
1/2e	0.635 BSC		
K	1.30	1.40	1.50
L	0.56	0.66	0.76
L1	0.52	0.62	0.72
Θ	0°	---	12°

GENERIC MARKING DIAGRAM*



XXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
ZZ = Assembly Lot Code

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “▪”, may or may not be present. Some products may not follow the Generic Marking.

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DESCRIPTION:	**DFN8 5x6.15, 1.27P, DUAL COOL**	**PAGE 1 OF 1**

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