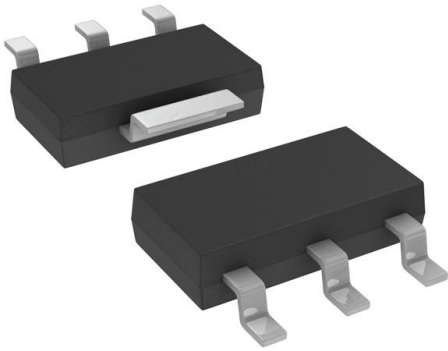


NVF6P02T3G Datasheet

www.digi-electronics.com



<https://www.DiGi-Electronics.com>

DiGi Electronics Part Number	NVF6P02T3G-DG
Manufacturer	onsemi
Manufacturer Product Number	NVF6P02T3G
Description	MOSFET P-CH 20V 10A SOT-223
Detailed Description	P-Channel 20 V 10A (Ta) 8.3W (Ta) Surface Mount SOT-223 (TO-261)



Tel: +00 852-30501935

RFQ Email: Info@DiGi-Electronics.com

DiGi is a global authorized distributor of electronic components.

Purchase and inquiry

Manufacturer Product Number:

NVF6P02T3G

Series:

-

FET Type:

P-Channel

Drain to Source Voltage (Vdss):

20 V

Drive Voltage (Max Rds On, Min Rds On):

2.5V, 4.5V

Vgs(th) (Max) @ Id:

1V @ 250µA

Vgs (Max):

±8V

FET Feature:

-

Operating Temperature:

-55°C ~ 150°C (Tj)

Qualification:

AEC-Q101

Supplier Device Package:

SOT-223 (TO-261)

Base Product Number:

NVF6P02

Manufacturer:

onsemi

Product Status:

Not For New Designs

Technology:

MOSFET (Metal Oxide)

Current - Continuous Drain (Id) @ 25°C:

10A (Ta)

Rds On (Max) @ Id, Vgs:

50mOhm @ 6A, 4.5V

Gate Charge (Qg) (Max) @ Vgs:

20 nC @ 4.5 V

Input Capacitance (Ciss) (Max) @ Vds:

1200 pF @ 16 V

Power Dissipation (Max):

8.3W (Ta)

Grade:

Automotive

Mounting Type:

Surface Mount

Package / Case:

TO-261-4, TO-261AA

Environmental & Export classification

RoHS Status:

ROHS3 Compliant

REACH Status:

REACH Unaffected

HTSUS:

8541.29.0095

Moisture Sensitivity Level (MSL):

1 (Unlimited)

ECCN:

EAR99

MOSFET - Power, P-Channel, SOT-223

-10 A, -20 V

NTF6P02, NVF6P02

Features

- Low $R_{DS(on)}$
- Logic Level Gate Drive
- Diode Exhibits High Speed, Soft Recovery
- Avalanche Energy Specified
- NVF Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable*
- These Devices are Pb-Free and are RoHS Compliant

Typical Applications

- Power Management in Portables and Battery-Powered Products, i.e.: Cellular and Cordless Telephones and PCMCIA Cards

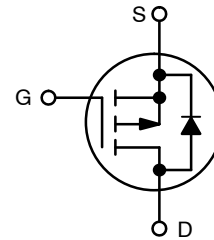
MAXIMUM RATINGS ($T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DSS}	-20	Vdc
Gate-to-Source Voltage	V_{GS}	± 8.0	Vdc
Drain Current (Note 1)			
– Continuous @ $T_A = 25\text{ }^\circ\text{C}$	I_D	-10	Adc
– Continuous @ $T_A = 70\text{ }^\circ\text{C}$	I_D	-8.4	
– Single Pulse ($t_p = 10\text{ }\mu\text{s}$)	I_{DM}	-35	Apk
Total Power Dissipation @ $T_A = 25\text{ }^\circ\text{C}$	P_D	8.3	W
Operating and Storage Temperature Range	T_J, T_{stg}	-55 to +150	$^\circ\text{C}$
Single Pulse Drain-to-Source Avalanche Energy – Starting $T_J = 25\text{ }^\circ\text{C}$ ($V_{DD} = -20\text{ Vdc}$, $V_{GS} = -5.0\text{ Vdc}$, $I_{L(pk)} = -10\text{ A}$, $L = 3.0\text{ mH}$, $R_G = 25\Omega$)	E_{AS}	150	mJ
Thermal Resistance			$^\circ\text{C/W}$
– Junction to Lead (Note 1)	$R_{\theta JL}$	15	
– Junction to Ambient (Note 2)	$R_{\theta JA}$	71.4	
– Junction to Ambient (Note 3)	$R_{\theta JA}$	160	
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	T_L	260	$^\circ\text{C}$

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.

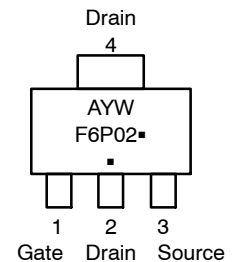
1. Steady State.
2. When surface mounted to an FR4 board using 1" pad size, (Cu. Area 1.127 sq in), Steady State.
3. When surface mounted to an FR4 board using minimum recommended pad size, (Cu. Area 0.412 sq in), Steady State.

-10 AMPERES
-20 VOLTS
 $R_{DS(on)} = 44\text{ m}\Omega$ (Typ.)



P-Channel MOSFET

MARKING DIAGRAM & PIN ASSIGNMENT



A = Assembly Location
 Y = Year
 W = Work Week
 F6P02 = Specific Device Code
 ■ = Pb-Free Package
 (Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping [†]
NTF6P02T3G	SOT-223 (Pb-Free)	4000 / Tape & Reel
NVF6P02T3G*	SOT-223 (Pb-Free)	4000 / Tape & Reel

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, [BRD8011/D](http://www.onsemi.com/BRD8011/D).

NTF6P02, NVF6P02**ELECTRICAL CHARACTERISTICS** ($T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit	
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage (Note 4) ($V_{GS} = 0\text{ Vdc}$, $I_D = -250\text{ }\mu\text{Adc}$)	$V_{(BR)DSS}$	-20	-25	-	Vdc	
Temperature Coefficient (Positive)		-	-11	-	mV/ $^\circ\text{C}$	
Zero Gate Voltage Drain Current ($V_{DS} = -20\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$) ($V_{DS} = -20\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$, $T_J = 125\text{ }^\circ\text{C}$)	I_{DSS}	-	-	-1.0 -10	μAdc	
Gate-Body Leakage Current ($V_{GS} = \pm 8.0\text{ Vdc}$, $V_{DS} = 0\text{ Vdc}$)	I_{GSS}	-	-	± 100	nAdc	
ON CHARACTERISTICS (Note 4)						
Gate Threshold Voltage (Note 4) ($V_{DS} = V_{GS}$, $I_D = -250\text{ }\mu\text{Adc}$)	$V_{GS(th)}$	-0.4	-0.7	-1.0	Vdc	
Threshold Temperature Coefficient (Negative)		-	2.6	-	mV/ $^\circ\text{C}$	
Static Drain-to-Source On-Resistance (Note 4) ($V_{GS} = -4.5\text{ Vdc}$, $I_D = -6.0\text{ Adc}$) ($V_{GS} = -2.5\text{ Vdc}$, $I_D = -4.0\text{ Adc}$) ($V_{GS} = -2.5\text{ Vdc}$, $I_D = -3.0\text{ Adc}$)	$R_{DS(on)}$	-	44 57 57	50 70 -	m Ω	
Forward Transconductance (Note 4) ($V_{DS} = -10\text{ Vdc}$, $I_D = -6.0\text{ Adc}$)	g_{fs}	-	12	-	Mhos	
DYNAMIC CHARACTERISTICS						
Input Capacitance	$(V_{DS} = -16\text{ Vdc}$, $V_{GS} = 0\text{ V}$, $f = 1.0\text{ MHz}$)	C_{iss}	-	900	1200	pF
Output Capacitance		C_{oss}	-	350	500	
Transfer Capacitance		C_{rss}	-	90	150	
Input Capacitance	$(V_{DS} = -10\text{ Vdc}$, $V_{GS} = 0\text{ V}$, $f = 1.0\text{ MHz}$)	C_{iss}	-	940	-	pF
Output Capacitance		C_{oss}	-	410	-	
Transfer Capacitance		C_{rss}	-	110	-	
SWITCHING CHARACTERISTICS (Note 5)						
Turn-On Delay Time	$(V_{DD} = -5.0\text{ Vdc}$, $I_D = -1.0\text{ Adc}$, $V_{GS} = -4.5\text{ Vdc}$, $R_G = 6.0\text{ }\Omega$)	$t_{d(on)}$	-	7.0	12	ns
Rise Time		t_r	-	25	45	
Turn-Off Delay Time		$t_{d(off)}$	-	75	125	
Fall Time		t_f	-	50	85	
Turn-On Delay Time	$(V_{DD} = -16\text{ Vdc}$, $I_D = -6.0\text{ Adc}$, $V_{GS} = -4.5\text{ Vdc}$, $R_G = 2.5\text{ }\Omega$)	$t_{d(on)}$	-	8.0	-	ns
Rise Time		t_r	-	30	-	
Turn-Off Delay Time		$t_{d(off)}$	-	60	-	
Fall Time		t_f	-	60	-	
Gate Charge	$(V_{DS} = -16\text{ Vdc}$, $I_D = -6.0\text{ Adc}$, $V_{GS} = -4.5\text{ Vdc}$) (Note 4)	Q_T	-	15	20	nC
		Q_{gs}	-	1.7	-	
		Q_{gd}	-	6.0	-	
SOURCE-DRAIN DIODE CHARACTERISTICS						
Forward On-Voltage	$(I_S = -3.0\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$) (Note 4) $(I_S = -2.1\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$) $(I_S = -3.0\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$, $T_J = 125\text{ }^\circ\text{C}$)	V_{SD}	-	-0.82 -0.74 -0.68	-1.2 -	Vdc

NTF6P02, NVF6P02**ELECTRICAL CHARACTERISTICS** ($T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit	
SOURCE-DRAIN DIODE CHARACTERISTICS						
Reverse Recovery Time	$(I_S = -3.0\text{ A dc}, V_{GS} = 0\text{ Vdc},$ $dI_S/dt = 100\text{ A}/\mu\text{s})$ (Note 4)	t_{rr}	-	42	-	ns
		t_a	-	17	-	
		t_b	-	25	-	
Reverse Recovery Stored Charge	Q_{RR}	-	0.036	-	μC	

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 $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2.0\%$.
5. Switching characteristics are independent of operating junction temperatures.

NTF6P02, NVF6P02

TYPICAL ELECTRICAL CHARACTERISTICS

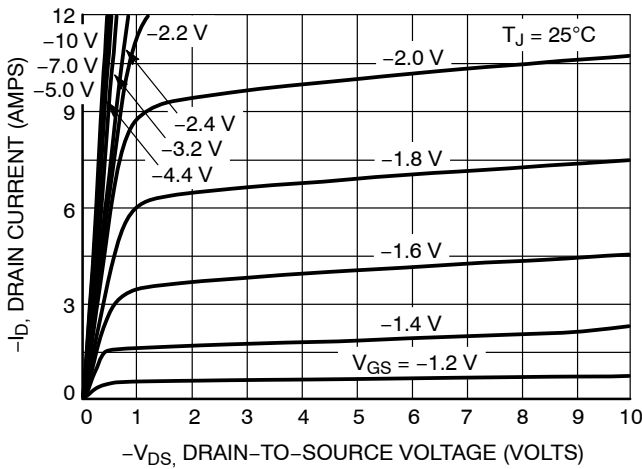


Figure 1. On-Region Characteristics

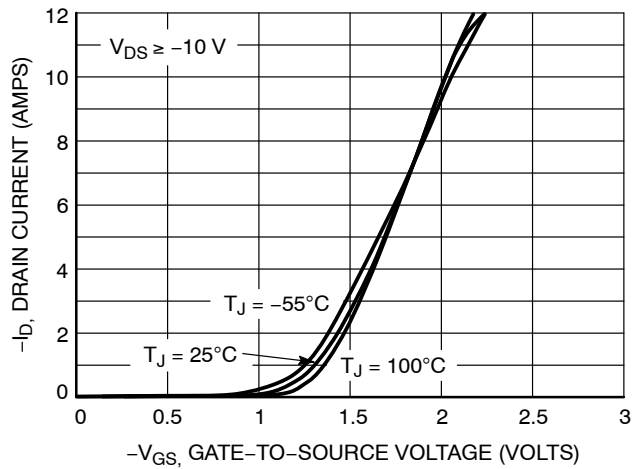


Figure 2. Transfer Characteristics

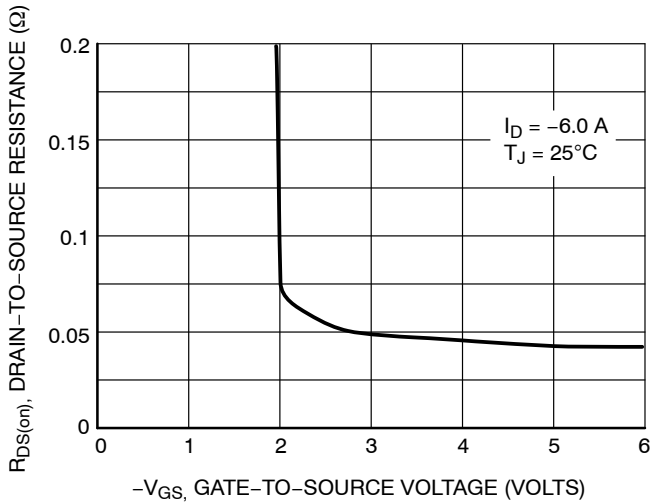


Figure 3. On-Resistance versus Gate-to-Source Voltage

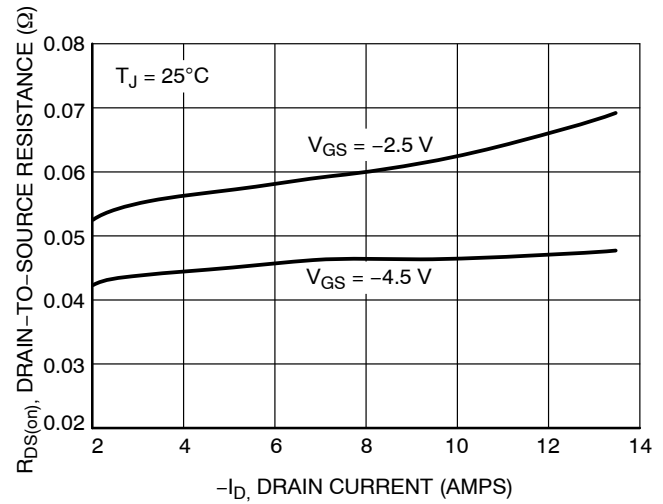


Figure 4. On-Resistance versus Drain Current and Gate Voltage

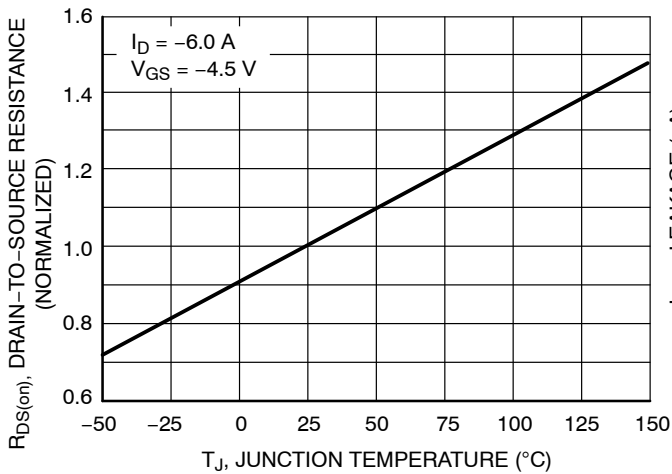


Figure 5. On-Resistance Variation with Temperature

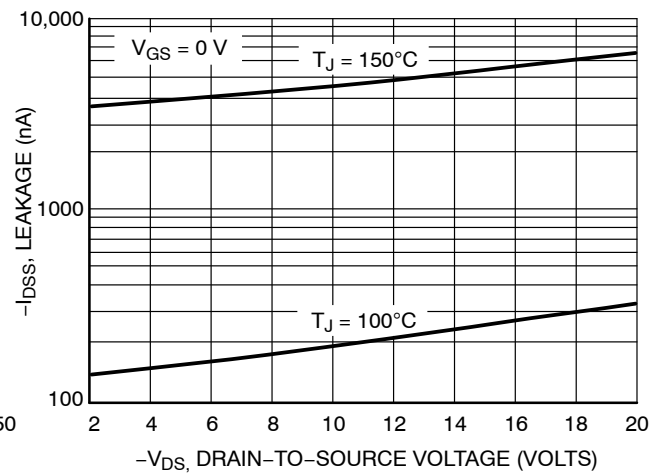


Figure 6. Drain-to-Source Leakage Current versus Voltage

NTF6P02, NVF6P02

TYPICAL ELECTRICAL CHARACTERISTICS

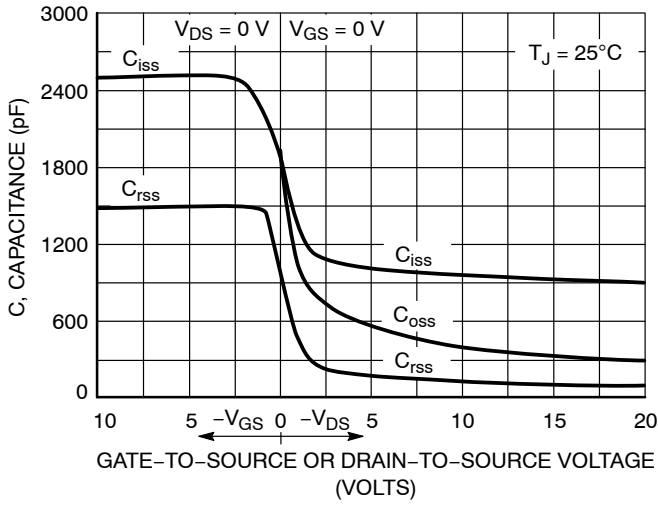


Figure 7. Capacitance Variation

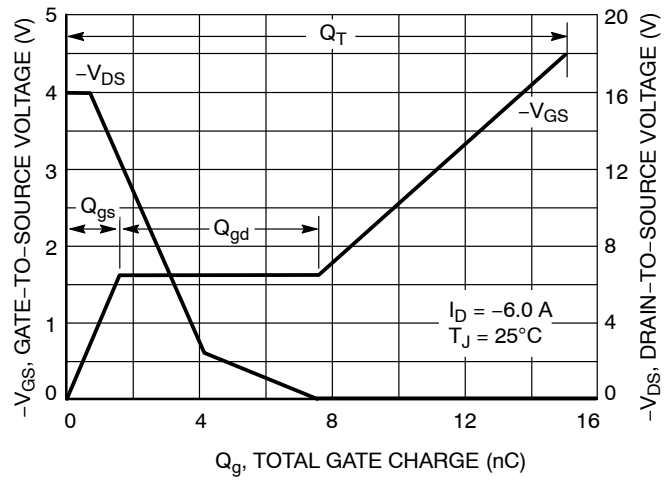


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

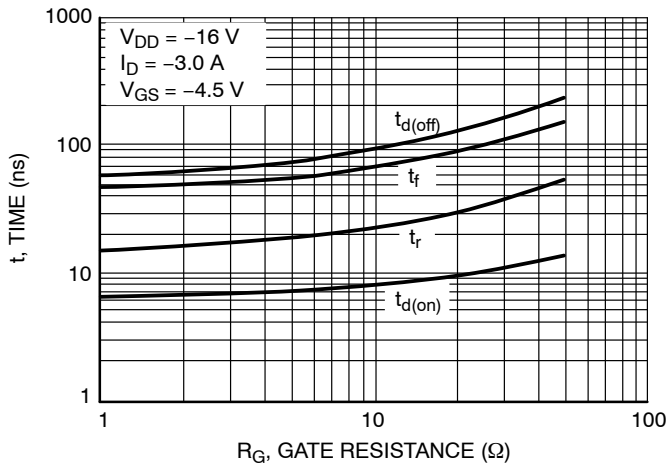


Figure 9. Resistive Switching Time Variation versus Gate Resistance

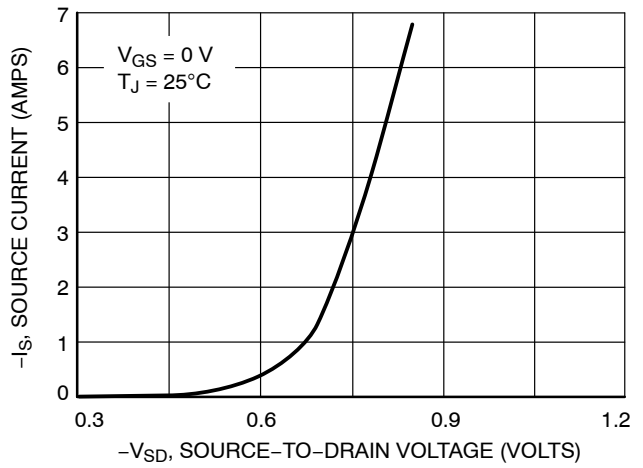


Figure 10. Diode Forward Voltage versus Current

NTF6P02, NVF6P02

TYPICAL ELECTRICAL CHARACTERISTICS

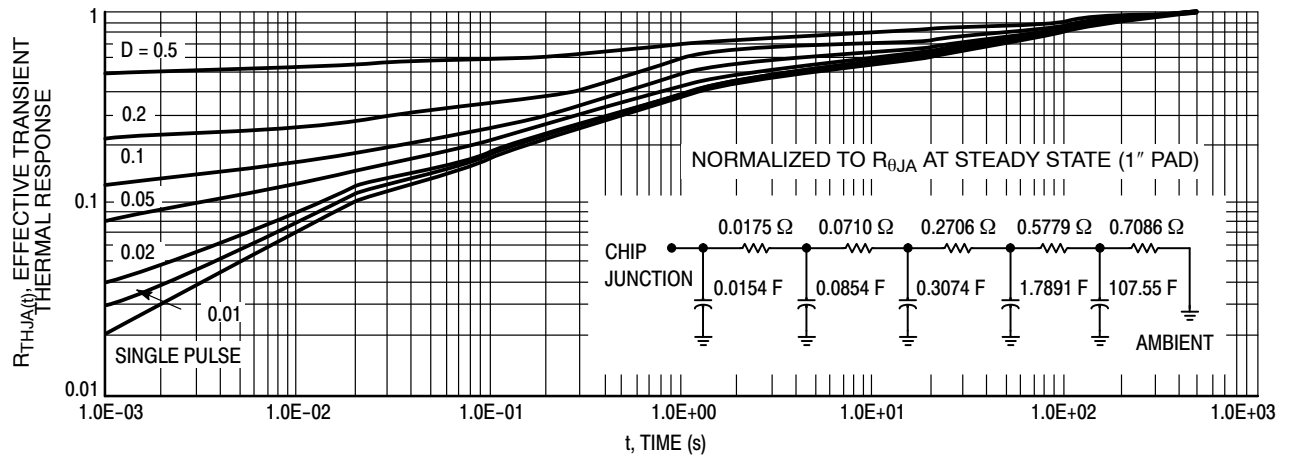


Figure 11. FET Thermal Response



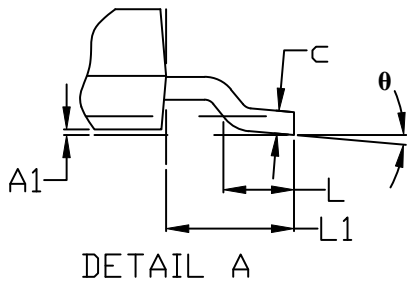
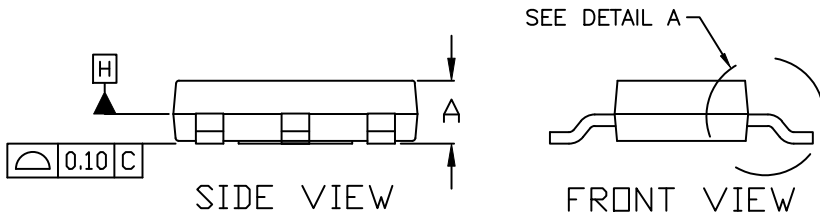
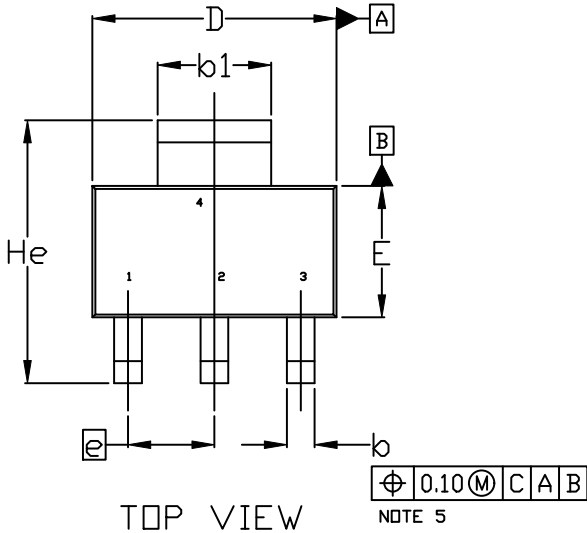
**MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS**



SCALE 1:1

SOT-223 (TO-261)
CASE 318E-04
ISSUE R

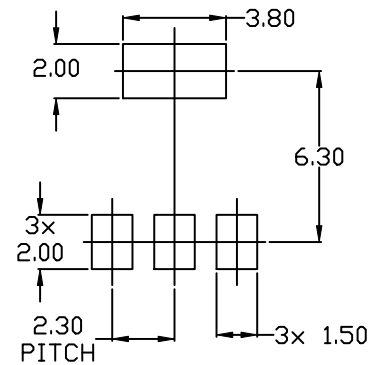
DATE 02 OCT 2018



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSIONS D & E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.200MM PER SIDE.
4. DATUMS A AND B ARE DETERMINED AT DATUM H.
5. A1 IS DEFINED AS THE VERTICAL DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT OF THE PACKAGE BODY.
6. POSITIONAL TOLERANCE APPLIES TO DIMENSIONS b AND b1.

MILLIMETERS			
DIM	MIN.	NOM.	MAX.
A	1.50	1.63	1.75
A1	0.02	0.06	0.10
b	0.60	0.75	0.89
b1	2.90	3.06	3.20
c	0.24	0.29	0.35
D	6.30	6.50	6.70
E	3.30	3.50	3.70
e	2.30 BSC		
L	0.20	---	---
L1	1.50	1.75	2.00
He	6.70	7.00	7.30
θ	0°	---	10°



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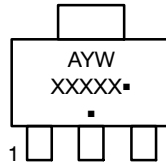
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SOT-223 (TO-261)
CASE 318E-04
ISSUE R

DATE 02 OCT 2018

- | | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <p>STYLE 1:
 PIN 1. BASE
 2. COLLECTOR
 3. EMITTER
 4. COLLECTOR</p> | <p>STYLE 2:
 PIN 1. ANODE
 2. CATHODE
 3. NC
 4. CATHODE</p> | <p>STYLE 3:
 PIN 1. GATE
 2. DRAIN
 3. SOURCE
 4. DRAIN</p> | <p>STYLE 4:
 PIN 1. SOURCE
 2. DRAIN
 3. GATE
 4. DRAIN</p> | <p>STYLE 5:
 PIN 1. DRAIN
 2. GATE
 3. SOURCE
 4. GATE</p> |
| <p>STYLE 6:
 PIN 1. RETURN
 2. INPUT
 3. OUTPUT
 4. INPUT</p> | <p>STYLE 7:
 PIN 1. ANODE 1
 2. CATHODE
 3. ANODE 2
 4. CATHODE</p> | <p>STYLE 8:
 CANCELLED</p> | <p>STYLE 9:
 PIN 1. INPUT
 2. GROUND
 3. LOGIC
 4. GROUND</p> | <p>STYLE 10:
 PIN 1. CATHODE
 2. ANODE
 3. GATE
 4. ANODE</p> |
| <p>STYLE 11:
 PIN 1. MT 1
 2. MT 2
 3. GATE
 4. MT 2</p> | <p>STYLE 12:
 PIN 1. INPUT
 2. OUTPUT
 3. NC
 4. OUTPUT</p> | <p>STYLE 13:
 PIN 1. GATE
 2. COLLECTOR
 3. EMITTER
 4. COLLECTOR</p> | | |

GENERIC MARKING DIAGRAM*



- A = Assembly Location
- Y = Year
- W = Work Week
- XXXXX = Specific Device Code
- = Pb-Free Package

(Note: Microdot may be in either location)

*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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