Power MOSFET

3.0 A, 60 V, Logic Level, N-Channel SOT-223

Designed for low voltage, high speed switching applications in power supplies, converters and power motor controls and bridge circuits.

Features

- 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

Applications

- Power Supplies
- Converters
- Power Motor Controls
- Bridge Circuits

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

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DSS}	60	Vdc
Drain-to-Gate Voltage ($R_{GS} = 1.0 \text{ M}\Omega$)	V_{DGR}	60	Vdc
Gate-to-Source Voltage - Continuous - Non-repetitive (t _p ≤ 10 ms)	V _{GS}	± 15 ± 20	Vdc Vpk
$\label{eq:decomposition} \begin{split} & \text{Drain Current} \\ & - \text{Continuous } @ \text{ T}_{A} = 25^{\circ}\text{C (Note 1)} \\ & - \text{Continuous } @ \text{ T}_{A} = 100^{\circ}\text{C (Note 2)} \\ & - \text{Single Pulse (t}_{p} \leq 10 \mu\text{s)} \end{split}$	I _D I _D I _{DM}	3.0 1.4 9.0	Adc Apk
Total Power Dissipation @ T _A = 25°C (Note 1) Total Power Dissipation @ T _A = 25°C (Note 2) Derate above 25°C	P _D	2.1 1.3 0.014	Watts Watts W/°C
Operating and Storage Temperature Range	T _J , T _{stg}	-55 to 175	°C
Single Pulse Drain–to–Source Avalanche Energy – Starting $T_J = 25^{\circ}C$ ($V_{DD} = 25 \text{ Vdc}, V_{GS} = 5.0 \text{ Vdc},$ $I_{L(pk)} = 7.0 \text{ Apk}, L = 3.0 \text{ mH}, V_{DS} = 60 \text{ Vdc})$	E _{AS}	74	mJ
Thermal Resistance -Junction-to-Ambient (Note 1) -Junction-to-Ambient (Note 2)	R _{θJA} R _{θJA}	72.3 114	°C/W
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	TL	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. When surface mounted to an FR4 board using 1" pad size, 1 oz. (Cu. Area 1 $\rm in^2$).
- When surface mounted to an FR4 board using minimum recommended pad size, 2 oz. (Cu. Area 0.272 in²).

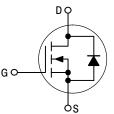


ON Semiconductor®

www.onsemi.com

3.0 A, 60 V $R_{DS(on)} = 120 \text{ m}\Omega$

N-Channel





SOT-223 CASE 318E STYLE 3

AYW

3055L=

MARKING DIAGRAM

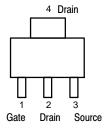
3055L = Device Code

A = Assembly Location Y = Year

W = Work Week
■ Pb-Free Package

(Note: Microdot may be in either location)

PIN ASSIGNMENT



ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

OFF CHARACTERISTICS Drain-to-Source Breakdown Voltage (Note 3) (V _{GS} = 0 Vdc, I _D = 250 µAdc) Temperature Coefficient (Positive) V(BR)DSS	Unit	Max	Тур	Min	Symbol	Characteristic				
(V _{SS} = 0 Vdc, I _D = 250 μAdc) Temperature Coefficient (Positive) Zero Gate Voltage Drain Current (V _{DS} = 60 Vdc, V _{SS} = 0 Vdc) (V _{DS} = 60 Vdc, V _{SS} = 0 Vdc) (V _{DS} = 60 Vdc, V _{SS} = 0 Vdc, T _J = 150°C) Gate-Body Leakage Current (V _{SS} = ± 15 Vdc, V _{DS} = 0 Vdc) (V _{DS} = V _{SS} , I _D = 250 μAdc) Threshold Temperature Coefficient (Negative) Static Drain-to-Source On-Resistance (Note 3) (V _{SS} = 5.0 Vdc, I _D = 1.5 Adc) (V _{SS} = 5.0 Vdc, I _D = 1.5 Adc, T _J = 150°C) Static Drain-to-Source On-Resistance (Note 3) (V _{SS} = 5.0 Vdc, I _D = 1.5 Adc, T _J = 150°C) Static Drain-to-Source On-Resistance (Note 3) (V _{SS} = 5.0 Vdc, I _D = 1.5 Adc, T _J = 150°C) Static Drain-to-Source On-Resistance (Note 3) (V _{SS} = 5.0 Vdc, I _D = 1.5 Adc, T _J = 150°C) Static Drain-to-Source On-Resistance (Note 3) (V _{SS} = 5.0 Vdc, I _D = 1.5 Adc, T _J = 150°C) Forward Transconductance (Note 3) (V _{DS} = 5.0 Vdc, I _D = 1.5 Adc, T _J = 150°C) Forward Transconductance (Note 3) (V _{DS} = 25 Vdc, V _{CS} = 0 V, I _D = 3.0 Adc) (V _{SS} = 5.0 Vdc, I _D = 3.0 Adc, V _{CS} = 0 V, I _D = 3.0 Adc, V _{CS} = 0 V, I _D = 3.0 Adc, V _{CS} = 0 V, I _D = 3.0 Adc, V _{CS} = 0 V, I _D = 3.0 Adc, V _{CS} = 0 V, I _D = 3.0 Adc, V _{CS} = 0 V, I _D = 3.0 Adc, V _{CS} = 0 V, I _D = 3.0 Adc, V _{CS} = 0 V, I _D = 3.0 Adc, V _{CS} = 0 V, I _D = 3.0 Adc, V _{CS} = 0 V, I _D = 3.0 Adc, V _{CS} = 0 V, I _D = 3.0 Adc, V _{CS} = 0 V, I _D = 3.0 Adc, V _{CS} = 0 V, I _D = 3.0 Adc, V _{CS} = 0 V, I _D = 3.0 Adc, V _{CS} = 0 V, I _D = 3.0 Adc, V _{CS} = 0 V, I _D = 3.0 Adc, V _{CS} = 0 V, I _D = 3.0 Adc, V _{CS} = 0 V, I _D = 3.0 Adc, V _{CS} = 0 V, I _D = 3.0 Adc, V _{CS} = 0 V, I _D = 3.0 Adc, V _{CS} = 0 V, I _D = 3.0 Adc, V _{CS} = 0 V, I _D = 3.0 Adc, V _{CS} = 0 V, I _D = 3.0 Adc, V _{CS} = 0 V, I _D = 3.0 Adc, V _{CS} = 0 V, I _D = 3.0 Adc, V _{CS} = 0 V, I _D = 3.0 Adc, V _{CS} = 0 V, I _D = 3.0 Adc, V _{CS} = 0 Vdc, I _D = 3.0 Adc, V _{CS} = 0 Vdc, I _D = 3.0 Adc, V _{CS} = 0 Vdc, I _D = 3.0 Adc, V _{CS} = 0 Vdc, I _D = 3.0 Adc, V _{CS} = 0 Vdc, I _D = 3.0 Adc, V _{CS} = 0 Vdc, I _D = 3.0 Adc, V _{CS} = 0 Vdc, I							OFF CHARACTERISTICS			
(V _{DS} = 60 Vdc, V _{QS} = 0 Vdc, U _{SS} = 150°C) (Date Body Leakage Current (V _{GS} = ± 15 Vdc, V _{DS} = 0 Vdc) (Date Body Leakage Current (V _{GS} = ± 15 Vdc, V _{DS} = 0 Vdc) (Date Body Leakage Current (V _{GS} = ± 15 Vdc, V _{DS} = 0 Vdc) (Date Body Leakage Current (V _{GS} = ± 15 Vdc, V _{DS} = 0 Vdc) (Date Threshold Veltage (Note 3) (V _{DS} = V _{QS} , I _D = 250 μAdc) Threshold Temperature Coefficient (Negative) Static Drain-to-Source On-Resistance (Note 3) (V _{GS} = 5.0 Vdc, I _D = 1.5 Adc) Static Drain-to-Source On-Resistance (Note 3) (V _{SS} = 5.0 Vdc, I _D = 3.0 Adc) (V _{SS} = 5.0 Vdc, I _D = 3.0 Adc, I _D = 1.5 Adc, T _J = 150°C) Forward Transconductance (Note 3) (V _{DS} = 7.0 Vdc, I _D = 3.0 Adc) (V _{SS} = 5.0 Vdc, I _D = 1.5 Adc, T _J = 150°C) Forward Transconductance (Note 3) (V _{DS} = 25 Vdc, V _{GS} = 0 V, I _D = 3.0 Adc) (V _{DS} = 25 Vdc, V _{DS} = 0 V, I _D = 3.0 Adc) Transfer Capacitance (V _{DS} = 25 Vdc, V _{DS} = 0 V, I _D = 3.0 Adc, V _{DS} = - 40 60 SWITCHING CHARACTERISTICS (Note 4) Turn-On Delay Time (V _{DD} = 30 Vdc, I _D = 3.0 Adc, V _{DS} = 5.0 Vdc, I _D = - 7.6 15 Fall Time (V _{DD} = 30 Vdc, I _D = 3.0 Adc, V _{DS} = 5.0 Vdc, V _{DS} = 0 Vdc, V	Vdc mV/°C	_ _			V _{(BR)DSS}	Drain–to–Source Breakdown Voltage (Note 3) (V _{GS} = 0 Vdc, I _D = 250 μAdc)				
Continue	μAdc				I _{DSS}	$(V_{DS} = 60 \text{ Vdc}, V_{GS} = 0 \text{ Vdc})$			= 60 Vdc, V _{GS} = 0 Vdc)	
Cate Threshold Voltage (Note 3)	nAdc	- ± 100 nAdd			I _{GSS}	_S = ± 15 Vdc, V _{DS} = 0 Vdc)	Gate-Body Leakage Current (V _G			
1.0							ON CHARACTERISTICS (Note 3)			
	Vdc mV/°C				V _{GS(th)}	Gate Threshold Voltage (Note 3) (V _{DS} = V _{GS} , I _D = 250 μAdc)				
	mΩ	120	92	-	R _{DS(on)}	` '				
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Vdc	0.43 -		-	V _{DS(on)}	$(V_{GS} = 5.0 \text{ Vdc}, I_D = 3.0 \text{ Adc})$				
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Mhos	-	5.7	_	9 _{fs}	(V _{DS} = 7.0 Vdc, I _D = 3.0 Adc)	Forward Transconductance (Note 3)			
							DYNAMIC CHARACTERISTICS			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	pF	440	313	_	C _{iss}		Input Capacitance			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		160	112	_	C _{oss}		Output Capacitance			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		60	40	_	C _{rss}	,	Transfer Capacitance			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$						ote 4)	SWITCHING CHARACTERISTICS (N			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	ns	25	11	-	t _{d(on)}		Turn-On Delay Time			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	1	70	35	_	t _r		Rise Time			
		45	22	-	t _{d(off)}		Turn-Off Delay Time			
	1	60	27	_	t _f	, , ,	Fall Time			
$V_{GS} = 5.0 \text{ Vdc}) \text{ (Note 3)} \qquad \begin{array}{c ccccccccccccccccccccccccccccccccccc$	nC	15	7.6	-	Q _T		Gate Charge			
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		_	1.4	-	Q ₁					
Forward On–Voltage		_	4.0	-	Q_2	VGS = 0.0 Vd0) (Note 0)				
						ERISTICS	SOURCE-DRAIN DIODE CHARACTE			
$(I_S = 3.0 \text{ Adc}, V_{GS} = 0 \text{ Vdc},$ $t_a - 21 - t_a$	Vdc			- -	V _{SD}	$(I_S = 3.0 \text{ Adc}, V_{GS} = 0 \text{ Vdc},$	Forward On-Voltage			
(IS = 0.0 Auto, VGS = 0 Vuc,	ns	_	35	_	t _{rr}		Reverse Recovery Time			
dl /dt 100 A/vo/ (Note 2)		_	21	-	t _a	$(I_S = 3.0 \text{ Adc}, V_{GS} = 0 \text{ Vdc},$				
		_	14	_	t _b					
Reverse Recovery Stored Charge Q _{RR} - 0.044 -	μС	_	0.044	_	Q _{RR}		Reverse Recovery Stored Charge			

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.

^{3.} Pulse Test: Pulse Width $\leq 300~\mu s,$ Duty Cycle $\leq 2.0\%.$

^{4.} Switching characteristics are independent of operating junction temperatures.

TYPICAL ELECTRICAL CHARACTERISTICS

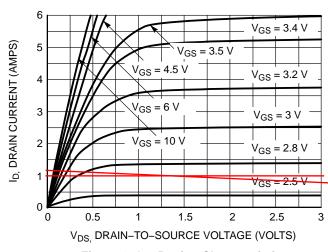


Figure 1. On-Region Characteristics

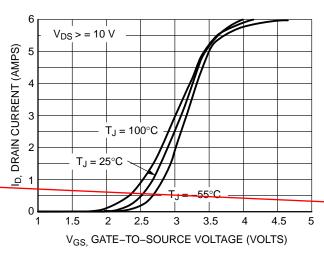


Figure 2. Transfer Characteristics

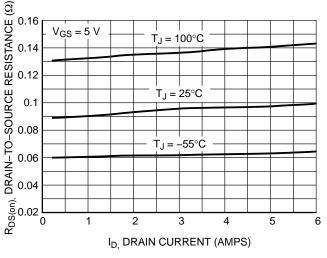


Figure 3. On-Resistance vs. Gate-to-Source Voltage

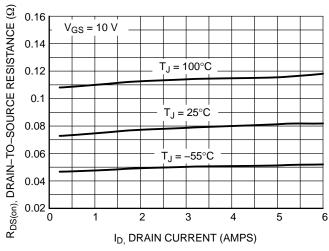


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

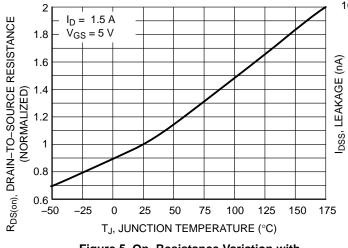


Figure 5. On–Resistance Variation with Temperature

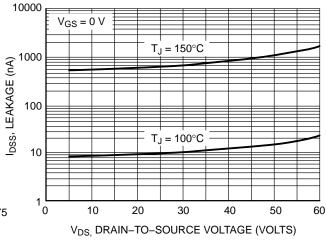


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL ELECTRICAL CHARACTERISTICS

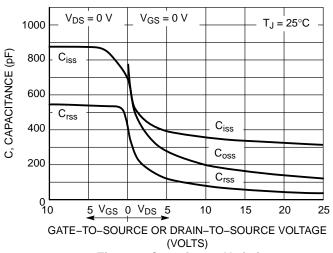


Figure 7. Capacitance Variation

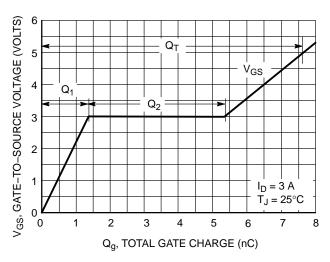


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

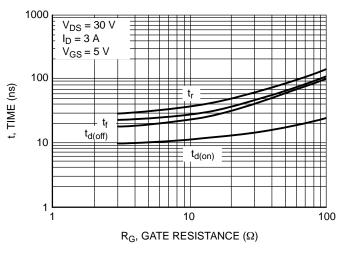


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

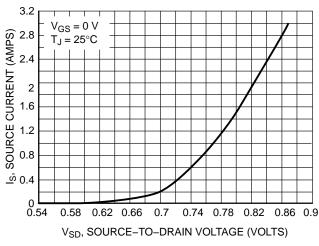


Figure 10. Diode Forward Voltage vs. Current

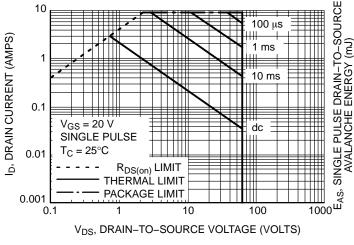


Figure 11. Maximum Rated Forward Biased Safe Operating Area

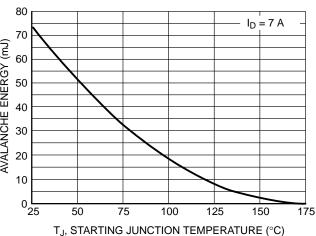


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

TYPICAL ELECTRICAL CHARACTERISTICS

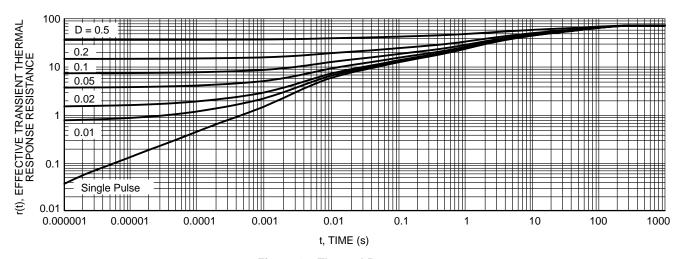


Figure 13. Thermal Response

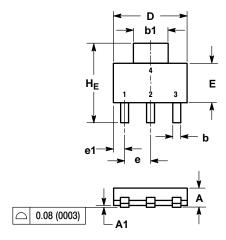
ORDERING INFORMATION

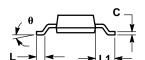
Device	Package	Shipping [†]
NTF3055L108T1G	SOT-223 (TO-261) (Pb-Free)	1000 / Tape & Reel
NVF3055L108T1G	SOT-223 (TO-261) (Pb-Free)	1000 / Tape & Reel

[†]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.

PACKAGE DIMENSIONS

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





NOTES:

- DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
- 2. CONTROLLING DIMENSION: INCH.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
Α	1.50	1.63	1.75	0.060	0.064	0.068
A1	0.02	0.06	0.10	0.001	0.002	0.004
b	0.60	0.75	0.89	0.024	0.030	0.035
b1	2.90	3.06	3.20	0.115	0.121	0.126
С	0.24	0.29	0.35	0.009	0.012	0.014
D	6.30	6.50	6.70	0.249	0.256	0.263
E	3.30	3.50	3.70	0.130	0.138	0.145
е	2.20	2.30	2.40	0.087	0.091	0.094
e1	0.85	0.94	1.05	0.033	0.037	0.041
L	0.20			0.008		
L1	1.50	1.75	2.00	0.060	0.069	0.078
HE	6.70	7.00	7.30	0.264	0.276	0.287
θ		-			_	

STYLE 3:

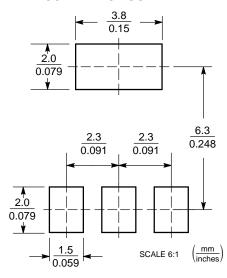
PIN 1. GATE 2. DRAIN

3. SOURCE

10° 0°

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SOLDERING FOOTPRINT*



*For additional information on our Pb–Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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