

NSM3005NZ

Small Signal BJT and MOSFET

30 V, 500 mA, PNP BJT with 20 V, 224 mA, N-Channel MOSFET

Features

- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Typical Applications

- Portable Devices

Q1 MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	30	V
Collector-Base Voltage	V_{CBO}	40	V
Emitter-Base Voltage	V_{EBO}	5.0	V
Collector Current	I_C	500	mA
Base Current	I_B	50	mA

Q2 MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Value	Unit		
Drain-to-Source Voltage	V_{DSS}	20	V		
Gate-to-Source Voltage	V_{GS}	± 8	V		
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	I_D	224	mA
		$T_A = 85^\circ\text{C}$			
		$t \leq 5 \text{ s}$			
Pulsed Drain Current	$T_p = 10 \mu\text{s}$	I_{DM}	673	mA	
Source Current (Body Diode)		I_S	120	mA	

THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance Junction-to-Ambient (Note 1) Total Power Dissipation @ $T_A = 25^\circ\text{C}$	$R_{\theta JA}$ P_D	245 0.8	$^\circ\text{C/W}$ W
Operating Junction and Storage Temperature	T_J, T_{STG}	-55 to 150	$^\circ\text{C}$
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	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. Surface mounted on FR4 board using 1 in sq pad size (Cu. area = 1.127 in sq [1 oz] including traces).



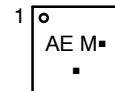
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MARKING DIAGRAM



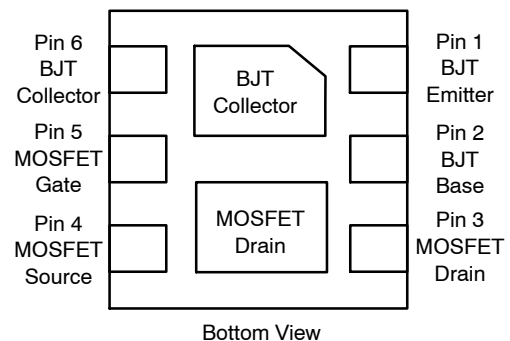
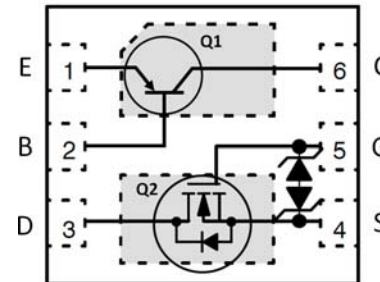
UDFN6
CASE 517AT
 $\mu\text{COOL}^{\text{TM}}$



AE = Specific Device Code
M = Date Code
▪ = Pb-Free Package

(Note: Microdot may be in either location)
*Date Code orientation may vary depending upon manufacturing location.

PIN CONNECTIONS



ORDERING INFORMATION

Device	Package	Shipping†
NSM3005NZTAG	UDFN6 (Pb-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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Q1 ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Collector–Base Breakdown Voltage	V _{(BR)CBO}	I _C = 100 μA	40	–	–	V
Collector–Emitter Breakdown Voltage	V _{(BR)CEO}	I _C = 10 mA	30	–	–	V
Emitter–Base Breakdown Voltage	V _{(BR)EBO}	I _E = 100 μA	5.0	–	–	V
Collector Cutoff Current	I _{CBO}	V _{CB} = 25 V, I _E = 0 A	–	–	1.0	μA
Emitter Cutoff Current	I _{EBO}	V _{EB} = 5.0 V, I _C = 0 A	–	–	10	μA
ON CHARACTERISTICS (Note 2)						
DC Current Gain	h _{FE}	V _{CE} = 3.0 V, I _C = 30 mA	20	–	100	
		V _{CE} = 3.0 V, I _C = 100 mA	20	–	100	
		V _{CE} = 3.0 V, I _C = 500 mA	20	–	100	
Collector–Emitter Saturation Voltage	V _{CE(sat)}	I _C = 500 mA, I _B = 50 mA	–	–	0.4	V
Base–Emitter Saturation Voltage	V _{BE(sat)}	I _C = 500 mA, I _B = 50 mA	–	–	1.1	V
Base–Emitter Turn–On Voltage	V _{BE(on)}	V _{CE} = 1.0 V, I _C = 500 mA	–	–	1.0	V

Q2 ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain–to–Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0 V, I _D = 250 μA	20	–	–	V
Drain–to–Source Breakdown Voltage Temperature Coefficient	V _{(BR)DSS} /T _J	I _D = –250 μA, ref to 25°C	–	19	–	mV/°C
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V, V _{DS} = 16 V, T _J = 25°C	–	–	1.0	μA
Gate–to–Source Leakage Current	I _{GSS}	V _{DS} = 0 V, V _{GS} = ±8.0 V	–	–	±2.0	μA
ON CHARACTERISTICS (Note 2)						
Gate Threshold Voltage	V _{GS(TH)}	V _{GS} = V _{DS} , I _D = 250 μA	0.4	–	1.0	V
Negative Threshold Temperature Coefficient	V _{GS(TH)} /T _J	–	–	1.9	–	mV/°C
Drain–to–Source On Resistance	R _{DS(ON)}	V _{GS} = 4.5 V, I _D = 100 mA	–	0.65	1.4	Ω
		V _{GS} = 2.5 V, I _D = 50 mA	–	0.9	1.9	
		V _{GS} = 1.8 V, I _D = 20 mA	–	1.1	2.2	
		V _{GS} = 1.5 V, I _D = 10 mA	–	1.4	4.3	
Forward Transconductance	g _{FS}	V _{DS} = 5.0 V, I _D = 100 mA	–	0.56	–	S

CHARGES AND CAPACITANCES

Input Capacitance	C _{ISS}	f = 1.0 MHz, V _{GS} = 0 V, V _{DS} = 15 V	–	15.8	–	pF
Output Capacitance	C _{OSS}		–	3.5	–	
Reverse Transfer Capacitance	C _{RSS}		–	2.4	–	
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 4.5 V, V _{DS} = 15 V; I _D = 200 mA	–	0.70	–	nC
Threshold Gate Charge	Q _{G(TH)}		–	0.05	–	
Gate–to–Source Charge	Q _{GS}		–	0.14	–	
Gate–to–Drain Charge	Q _{GD}		–	0.10	–	

SWITCHING CHARACTERISTICS, V_{GS} = 4.5 V (Note 3)

Turn–On Delay Time	t _{d(ON)}	V _{GS} = 4.5 V, V _{DD} = 15 V, I _D = 200 mA, R _G = 2 Ω	–	18	–	ns
Rise Time	t _r		–	35	–	
Turn–Off Delay Time	T _{d(OFF)}		–	201	–	
Fall Time	t _f		–	110	–	

DRAIN–SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V _{SD}	V _{GS} = 0 V, I _S = 10 mA	–	0.55	1.0	V
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2. Pulsed Condition: Pulse Width = 300 msec, Duty Cycle ≤ 2%.

3. Switching characteristics are independent of operating junction temperatures.

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TYPICAL CHARACTERISTICS – Q1

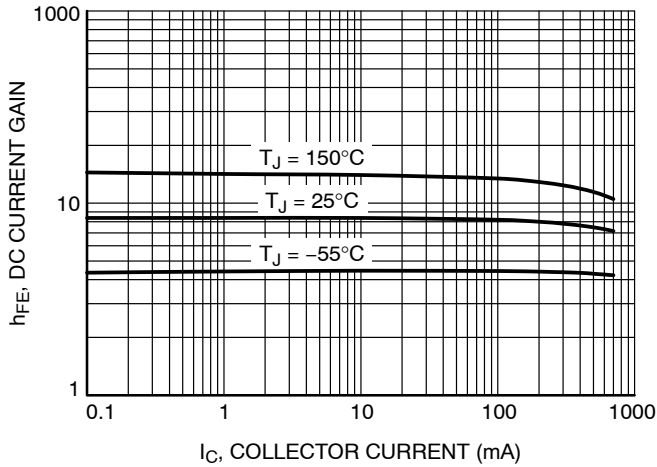


Figure 1. PNP DC Current Gain vs. Collector Current

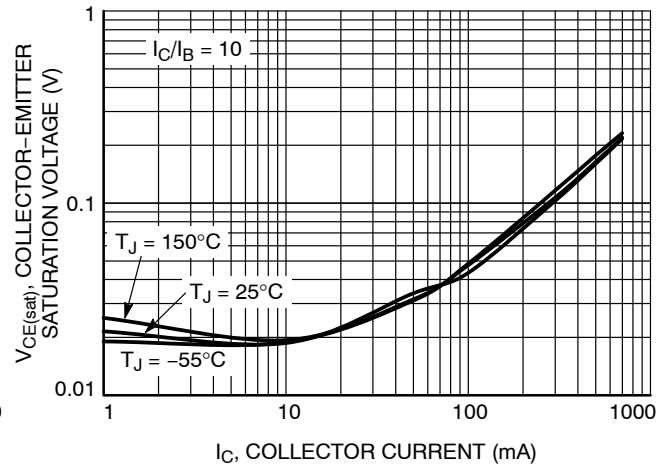


Figure 2. PNP VCE vs. IC

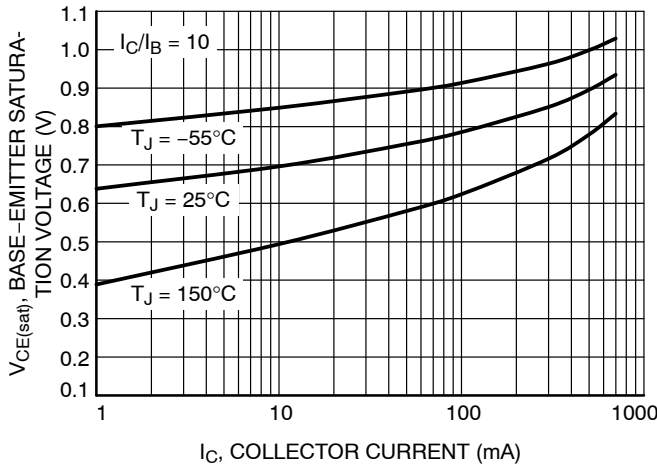


Figure 3. PNP VBE(sat) vs. IC

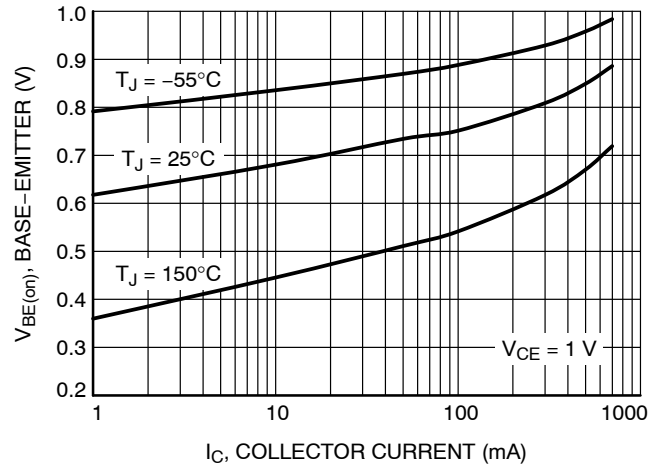


Figure 4. PNP VBE(on) vs. IC

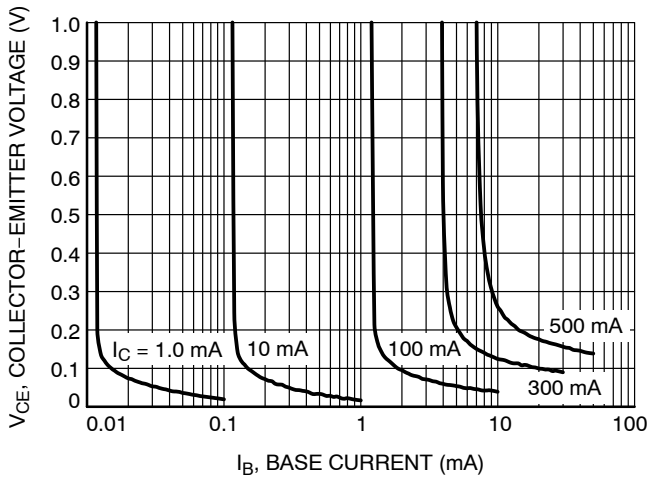


Figure 5. PNP VCE vs. IB

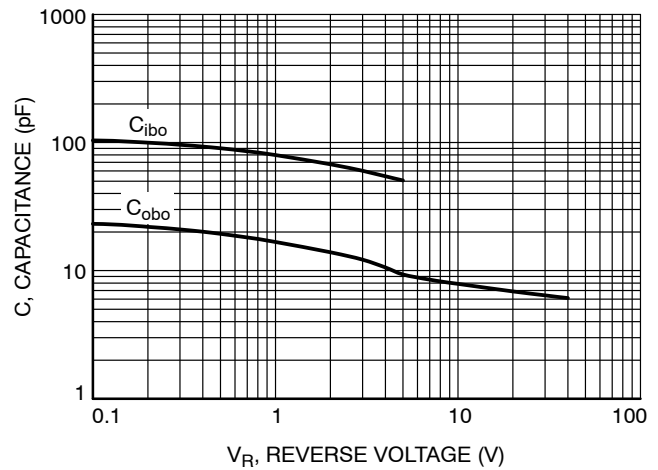


Figure 6. PNP Capacitance

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TYPICAL CHARACTERISTICS – Q2

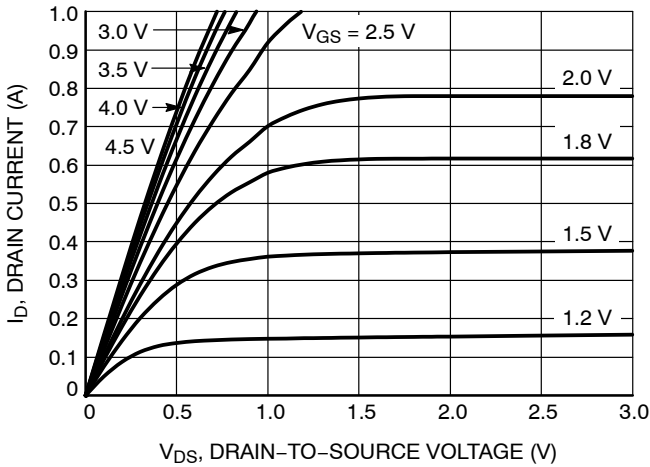


Figure 7. On-Region Characteristics

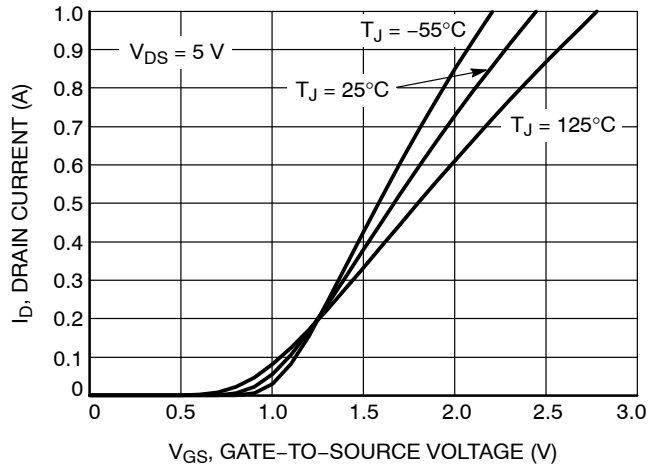


Figure 8. Transfer Characteristics

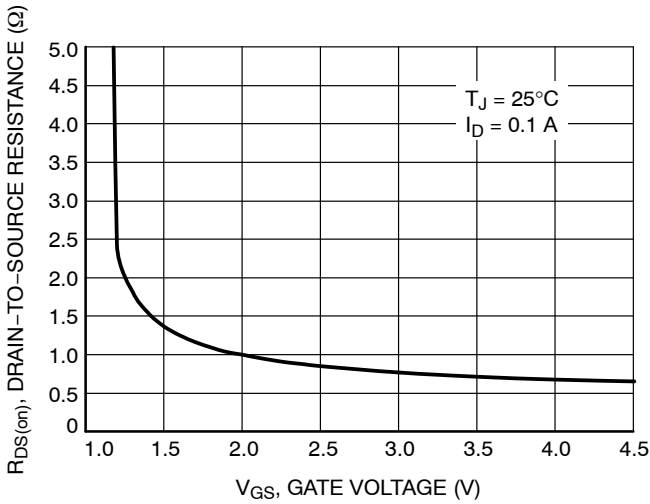


Figure 9. On-Resistance vs. Gate-to-Source Voltage

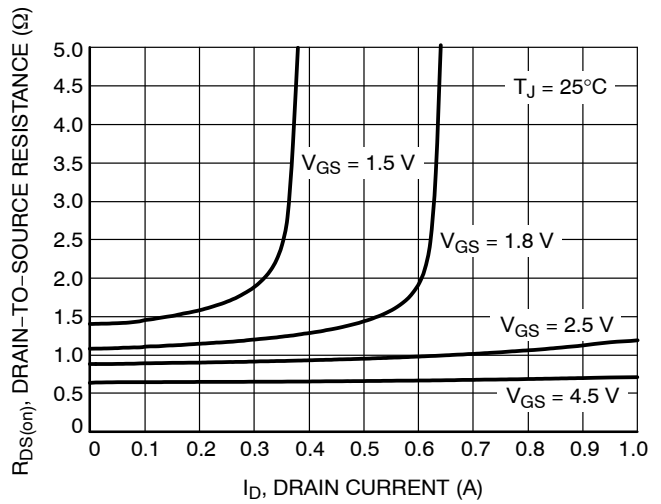


Figure 10. On-Resistance vs. Drain Current and Gate Voltage

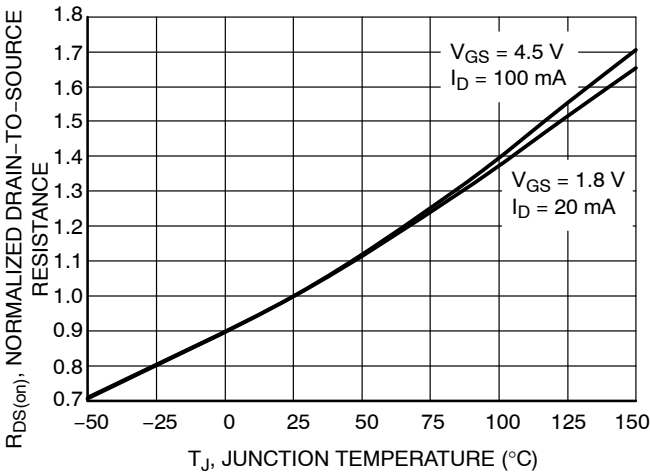


Figure 11. On-Resistance Variation with Temperature

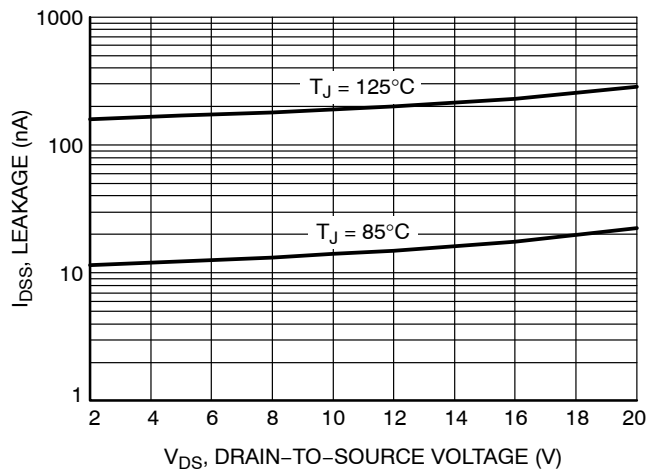


Figure 12. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS – Q2

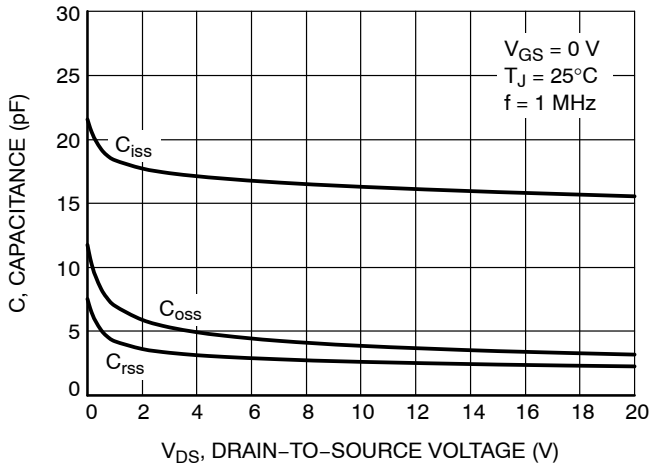


Figure 13. Capacitance Variation

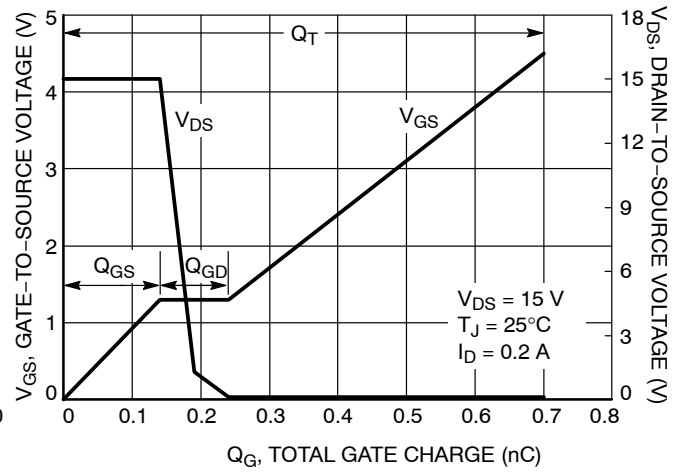


Figure 14. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

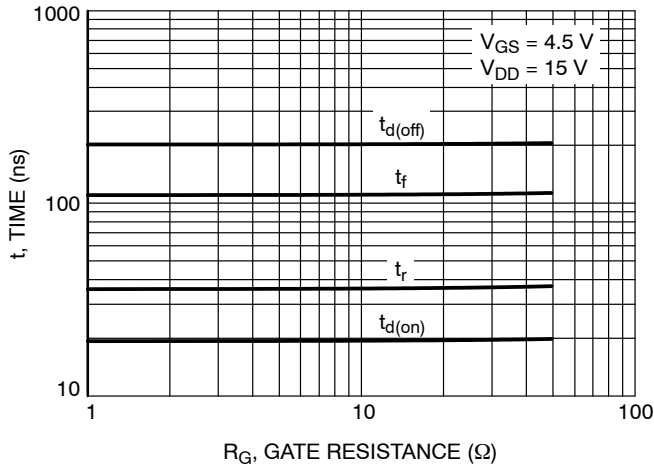


Figure 15. Resistive Switching Time Variation vs. Gate Resistance

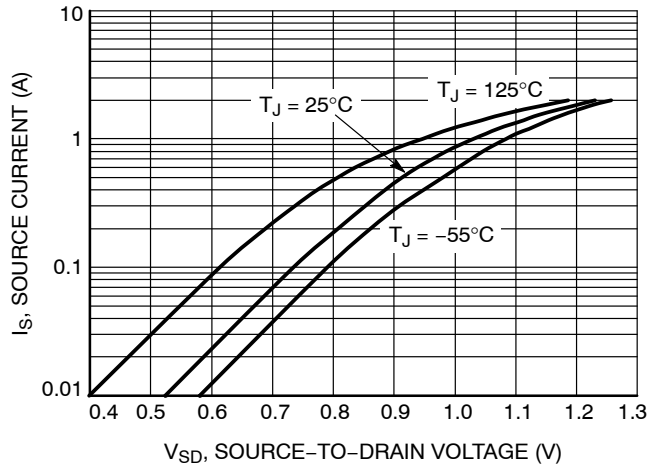


Figure 16. Diode Forward Voltage vs. Current

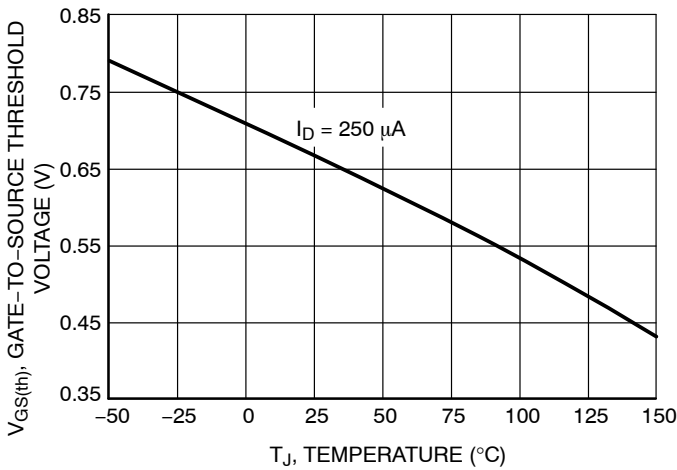
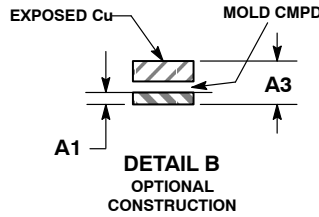
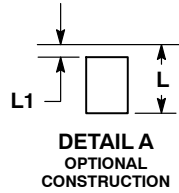
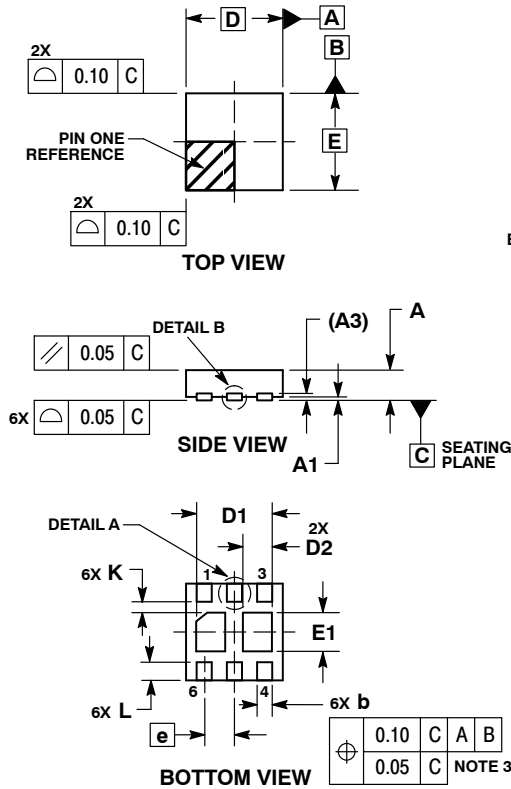


Figure 17. Threshold Voltage

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PACKAGE DIMENSIONS

UDFN6 1.6x1.6, 0.5P CASE 517AT ISSUE O

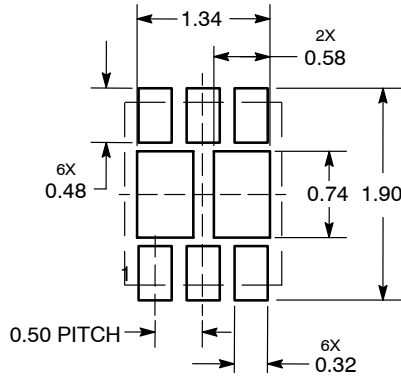


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

MILLIMETERS		
DIM	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A3	0.13	REF
b	0.20	0.30
D	1.60	BSC
E	1.60	BSC
e	0.50	BSC
D1	1.14	1.34
D2	0.38	0.58
E1	0.54	0.74
K	0.20	---
L	0.15	0.35
L1	---	0.10

SOLDERMASK DEFINED MOUNTING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*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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