N-Channel Enhancement-Mode Vertical DMOS FETs

Ordering Information

BV_{DSS} / BV_{DGS}	$R_{DS(ON)}$ (max)	$V_{GS(th)}$ (max)	Order Number / Package	
			TO-243AA**	TO-236AB*
240V	15Ω	2.0V	TN2124N8	TN2124K1

Product marking for SOT-23:

N1C❋

where ❋ = 2-week alpha date code

* Same as SOT-23. All units shipped on 3,000 piece carrier tape reels.

** Prodcut supplied on 2000 piece carrier tape reels.

Features

- ☐ Free from secondary breakdown
- ☐ Low power drive requirement
- ☐ Ease of paralleling
- ☐ Low C_{ISS} and fast switching speeds
- ☐ Excellent thermal stability
- ☐ Integral Source-Drain diode
- ☐ High input impedance and high gain
- ☐ Complementary N- and P-channel devices

Advanced DMOS Technology

These enhancement-mode (normally-off) transistors utilize a vertical DMOS structure and Supertex's well-proven silicon-gate manufacturing process. This combination produces devices with the power handling capabilities of bipolar transistors and with the high input impedance and positive temperature coefficient inherent in MOS devices. Characteristic of all MOS structures, these devices are free from thermal runaway and thermally-induced secondary breakdown.

Supertex vertical DMOS FETs are ideally suited to a wide range of switching and amplifying applications where high breakdown voltage, high input impedance, low input capacitance, and fast switching speeds are desired.

Applications

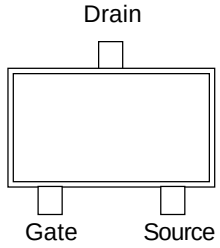
- ☐ Logic level interfaces – ideal for TTL and CMOS
- ☐ Solid state relays
- ☐ Battery operated systems
- ☐ Photo voltaic drives
- ☐ Analog switches
- ☐ General purpose line drivers
- ☐ Telecom switches

Absolute Maximum Ratings

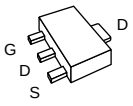
Drain-to-Source Voltage	BV_{DSS}
Drain-to-Gate Voltage	BV_{DGS}
Gate-to-Source Voltage	± 20V
Operating and Storage Temperature	-55°C to +150°C
Soldering Temperature*	300°C

* Distance of 1.6 mm from case for 10 seconds.

Package Options



TO-236AB
(SOT-23)
top view



TO-243AA
(SOT-89)

Note: See Package Outline section for dimensions.

Thermal Characteristics

Package	I_D (continuous)*	I_D (pulsed)	Power Dissipation @ T_A = 25°C	θ_{jc} °C/W	θ_{ja} °C/W	I_{DR}*	I_{DRM}
TO-236AB	134mA	250mA	0.36W	200	350	134mA	250mA
TO-243AA	230mA	1.1A	1.6W†	15	78†	230mA	1.1A

* I_D (continuous) is limited by max rated T_j.

† Mounted on FR5 board. 25mmx25mmx1.57mm. Significant P_D increase possible on ceramic substrate.

Electrical Characteristics (@ 25°C unless otherwise specified)

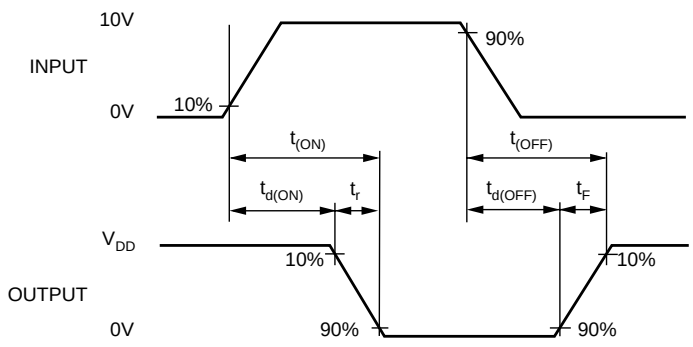
Symbol	Parameter	Min	Typ	Max	Unit	Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	240			V	I_D = 1mA, V_{GS} = 0V
$V_{GS(th)}$	Gate Threshold Voltage	0.8		2.0	V	V_{GS} = V_{DS}, I_D = 1mA
$\Delta V_{GS(th)}$	Change in $V_{GS(th)}$ with Temperature			-5.5	mV/°C	I_D = 1mA, V_{GS} = V_{DS}
I_{GSS}	Gate Body Leakage		0.1	100	nA	V_{GS} = ±20V, V_{DS} = 0V
I_{DSS}	Zero Gate Voltage Drain Current			1	µA	V_{GS} = 0V, V_{DS} = Max Rating
				100	µA	V_{GS} = 0V, V_{DS} = 0.8 Max Rating, T_A = 125°C
$I_{D(ON)}$	ON-State Drain Current	140			mA	V_{GS} = 4.5V, V_{DS} = 25V
$R_{DS(ON)}$	Static Drain-to-Source ON-State Resistance			30	Ω	V_{GS} = 3V, I_D = 25mA
				15	Ω	V_{GS} = 4.5V, I_D = 120mA
$\Delta R_{DS(ON)}$	Change in $R_{DS(ON)}$ with Temperature		0.7	1.0	%/°C	I_D = 120mA, V_{GS} = 4.5V
G_{FS}	Forward Transconductance	100	170		m℧	V_{DS} = 25V, I_D = 120mA
C_{ISS}	Input Capacitance		38	50	pF	V_{GS} = 0V, V_{DS} = 25V, f = 1MHz
C_{OSS}	Common Source Output Capacitance		9	15		
C_{RSS}	Reverse Transfer Capacitance		3	5		
$t_{d(ON)}$	Turn-ON Delay Time		4	7	ns	V_{DD} = 25V, I_D = 140mA, R_{GEN} = 25Ω
t_r	Rise Time		2	5		
$t_{d(OFF)}$	Turn-OFF Delay Time		7	10		
t_f	Fall Time		9	12		
V_{SD}	Diode Forward Voltage Drop			1.8	V	I_{SD} = 120mA, V_{GS} = 0V
t_{rr}	Reverse Recovery Time		400		ns	I_{SD} = 120mA, V_{GS} = 0V

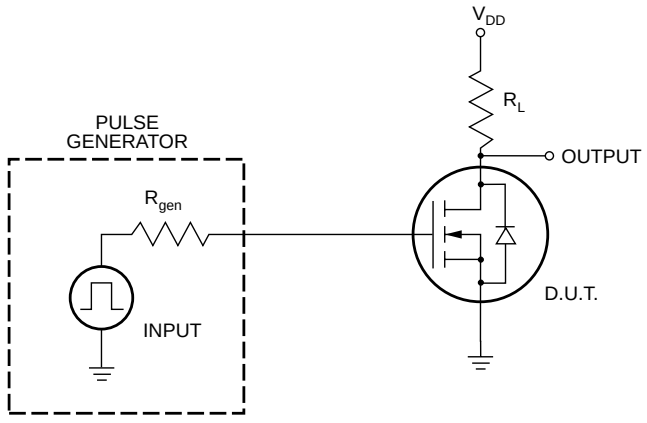
Notes:

1.All D.C. parameters 100% tested at 25°C unless otherwise stated. (Pulse test: 300µs pulse, 2% duty cycle.)

2.All A.C. parameters sample tested.

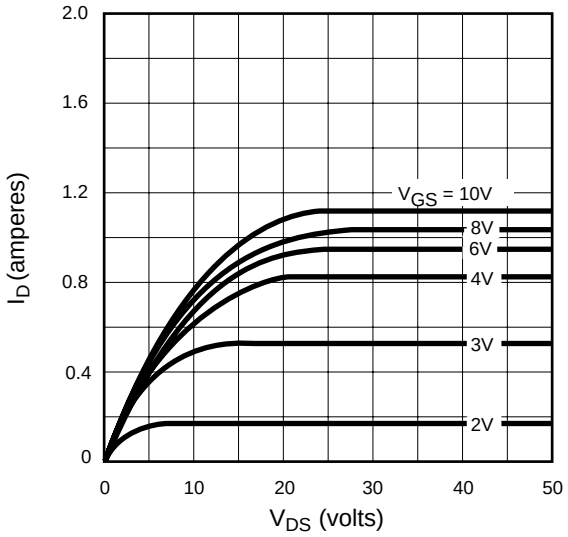
Switching Waveforms and Test Circuit



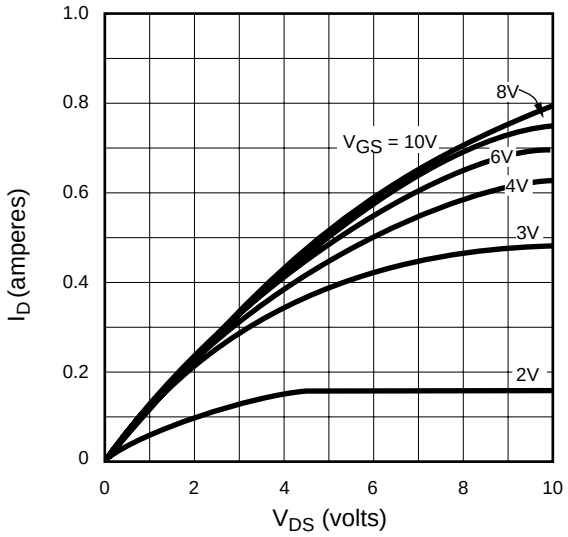


Typical Performance Curves

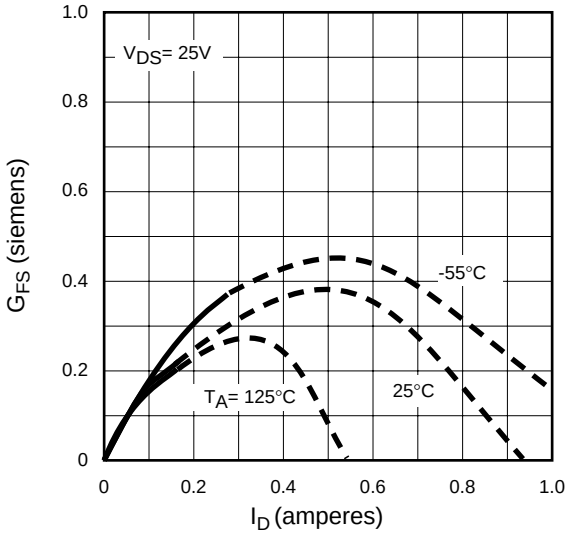
Output Characteristics



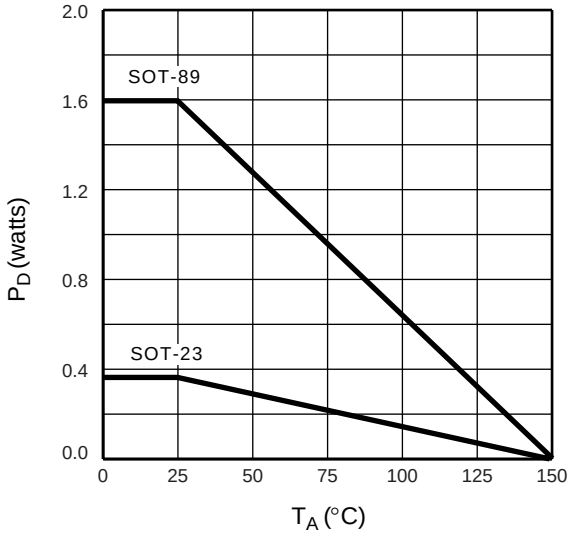
Saturation Characteristics



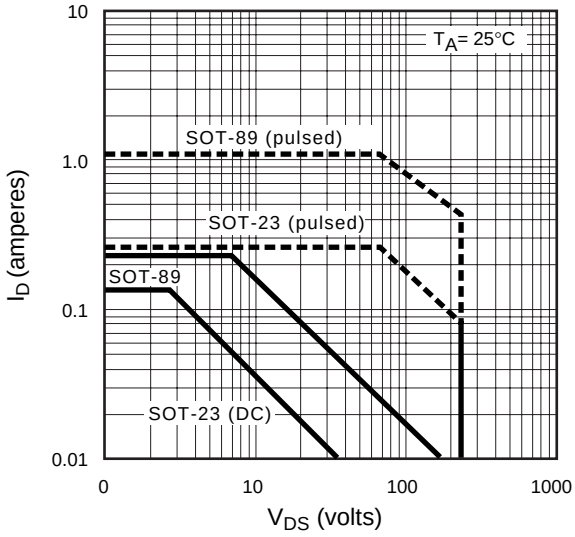
Transconductance vs. Drain Current



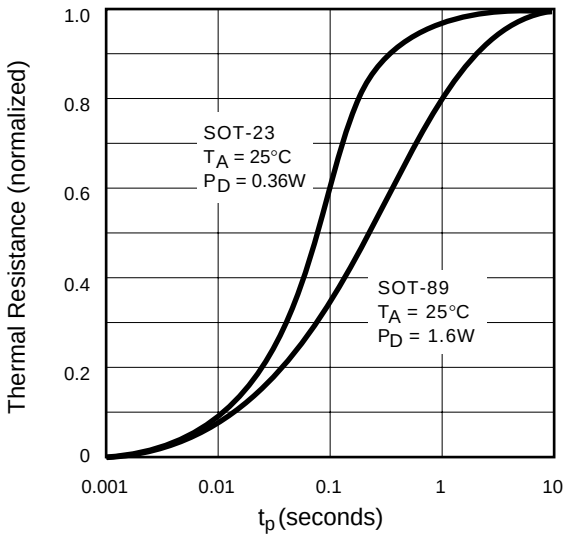
Power Dissipation vs. Temperature



Maximum Rated Safe Operating Area

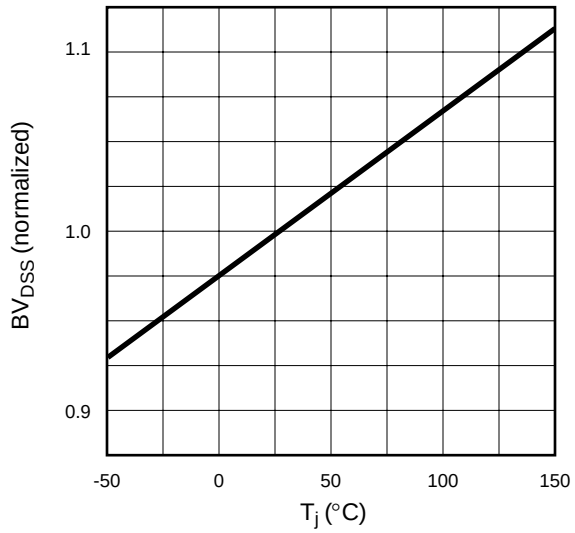


Thermal Response Characteristics

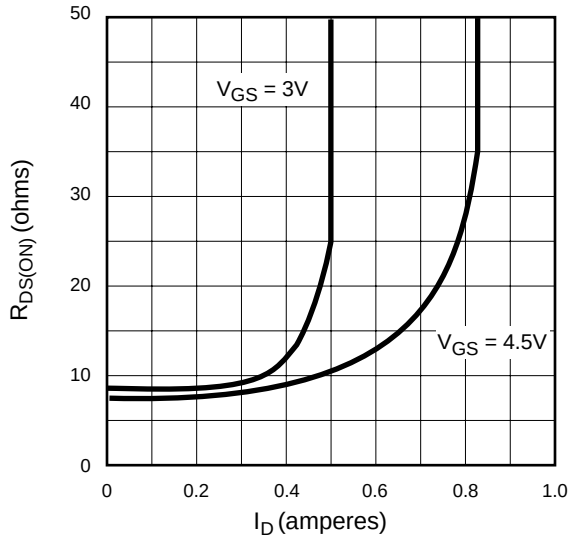


Typical Performance Curves

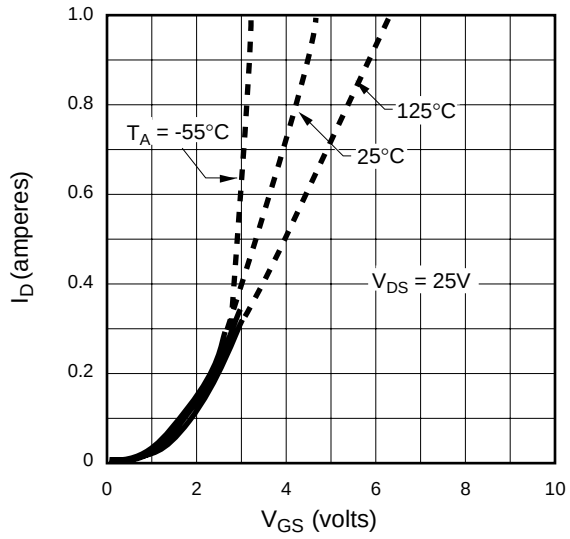
BV_{DSS} Variation with Temperature



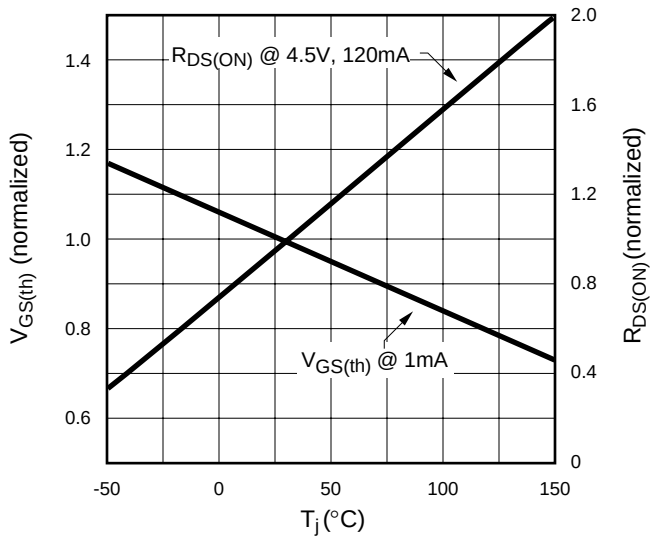
On-Resistance vs. Drain Current



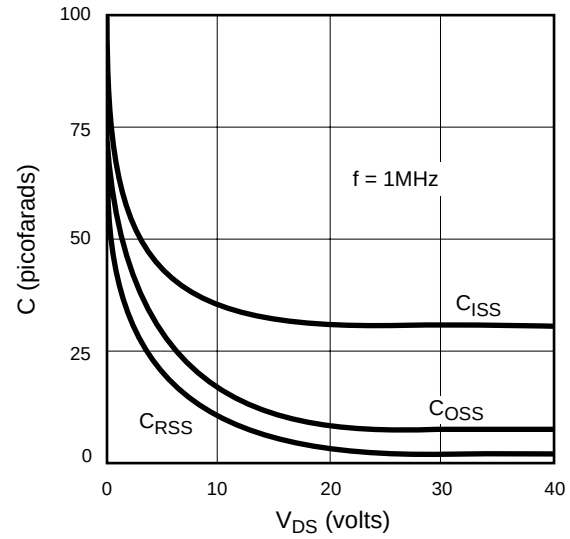
Transfer Characteristics



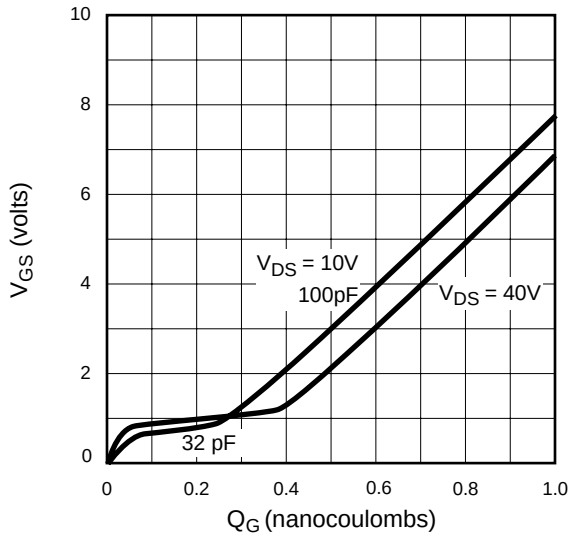
V_{TH} and R_{DS} Variation with Temperature



Capacitance vs. Drain-to-Source Voltage



Gate Drive Dynamic Characteristics



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