



## **Ordering Information**

BV <sub>DSS</sub> /	R <sub>DS(ON)</sub> (max)	V <sub>GS(th)</sub> (max)	Order Number/Package				
BV <sub>DGS</sub>			TO-236AB*	TO-92	Die		
-40V	6.0Ω	-2.0V	TP2104K1	TP2104N3	TP2104ND		

Product marking for SOT-23:

P1L\*

where \* = 2-week alpha date code

### **Features**

- Free from secondary breakdown
- Low power drive requirement
- Ease of paralleling
- Low C<sub>iss</sub> and fast switching speeds
- Excellent thermal stability
- Integral Source-Drain diode
- High input impedance and high gain
- Complementary N- and P-channel devices

## **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

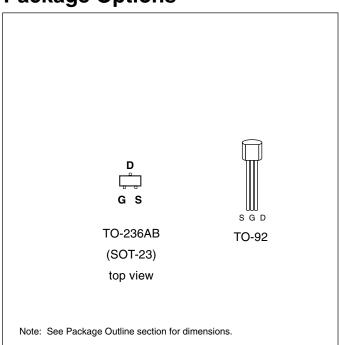
<sup>\*</sup> Distance of 1.6 mm from case for 10 seconds.

## **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's 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.

## **Package Options**



11/12/01

<sup>\*</sup>Same as SOT-23. All units shipped on 3,000 piece carrier tape reels.

## **Thermal Characteristics**

Package	I <sub>D</sub> (continuous)*	I <sub>D</sub> (pulsed)	Power Dissipation @ T <sub>A</sub> = 25°C	$ heta_{ m jc}$ $^{\circ}$ C/W			I <sub>DRM</sub>
SOT-23	-0.16A	-0.8A	0.36W	200	350	-0.16A	-0.8A
TO-92	-0.25A	-1.0A	0.74W	125	170	-0.25A	-1.0A

<sup>\*</sup> I<sub>D</sub> (continuous) is limited by max rated T<sub>j</sub>.

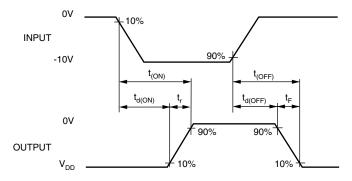
# Electrical Characteristics (@ 25°C unless otherwise specified)

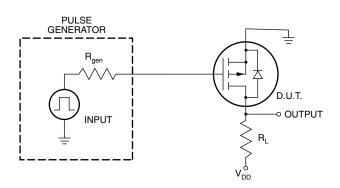
Symbol	Parameter	Min	Тур	Max	Unit	Conditions	
BV <sub>DSS</sub>	Drain-to-Source Breakdown Voltage	-40			V	$V_{GS} = 0V, I_{D} = -1.0mA$	
V <sub>GS(th)</sub>	Gate Threshold Voltage	-1.0		-2.0	V	$V_{GS} = V_{DS}$ , $I_D = -1.0$ mA	
$\Delta V_{GS(th)}$	Change in V <sub>GS(th)</sub> with Temperature		5.8	6.5	mV/°C	$V_{GS} = V_{DS, I_D} = -1.0 \text{mA}$	
I <sub>GSS</sub>	Gate Body Leakage		-1.0	-100	nA	$V_{GS} = \pm 20V, V_{DS} = 0V$	
I <sub>DSS</sub>	Zero Gate Voltage Drain Current			-10	μΑ	$V_{GS} = 0V$ , $V_{DS} = Max$ Rating	
				-1	mA	$V_{GS} = 0V$ , $V_{DS} = 0.8$ Max Rating $T_A = 125$ °C	
I <sub>D(ON)</sub>	ON-State Drain Current	-0.6			Α	V <sub>GS</sub> = -10V, V <sub>DS</sub> = -25V	
R <sub>DS(ON)</sub>	Static Drain-to-Source			10.0	Ω	$V_{GS} = -4.5V, I_{D} = -50mA$	
	ON-State Resistance			6.0	Ω	$V_{GS} = -10V, I_D = -0.5A$	
$\Delta R_{DS(ON)}$	Change in R <sub>DS(ON)</sub> with Temperature		0.55	1.0	%/°C	$V_{GS} = -10V, I_D = -0.5A$	
G <sub>FS</sub>	Forward Transconductance	150	200		mъ	$V_{DS} = -25V, I_{D} = -0.5A$	
C <sub>ISS</sub>	Input Capacitance		35	60	pF	$V_{GS} = 0V, V_{DS} = -25V$ f = 1 MHz	
C <sub>oss</sub>	Common Source Output Capacitance		22	30			
C <sub>RSS</sub>	Reverse Transfer Capacitance		8	10			
t <sub>d(ON)</sub>	Turn-ON Delay Time		4	6			
t <sub>r</sub>	Rise Time		4	8	ns	$V_{DD} = -25V$ $I_{D} = -0.5A$ $R_{GEN} = 25\Omega$	
t <sub>d(OFF)</sub>	Turn-OFF Delay Time		5	9			
t <sub>f</sub>	Fall Time		5	8		GEN -	
V <sub>SD</sub>	Diode Forward Voltage Drop		-1.2	-2.0	V	$V_{GS} = 0V, I_{SD} = -0.5A$	
t <sub>rr</sub>	Reverse Recovery Time		400		ns	$V_{GS} = 0V, I_{SD} = -0.5A$	

#### Notes:

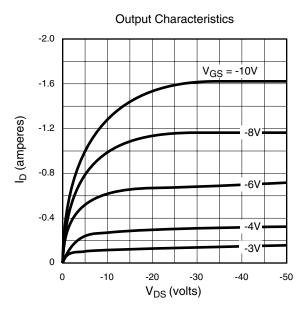
- 1. All D.C. parameters 100% tested at 25°C unless otherwise stated. (Pulse test:  $300\mu s$  pulse, 2% duty cycle.)
- 2. All A.C. parameters sample tested.

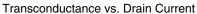
# **Switching Waveforms and Test Circuit**

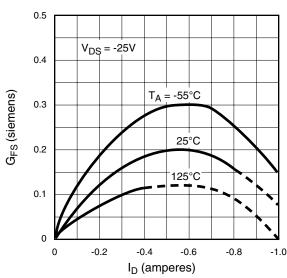




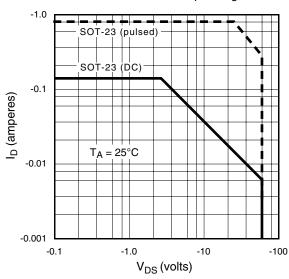
# **Typical Performance Curves**



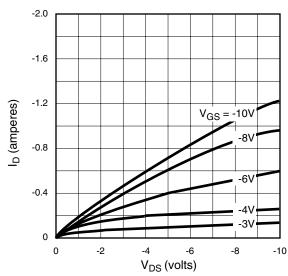




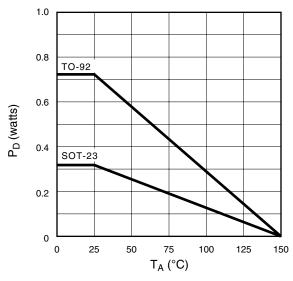
### Maximum Rated Safe Operating Area



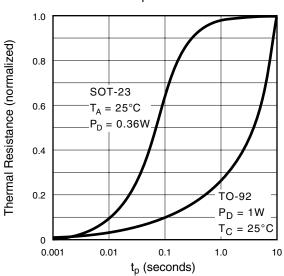
#### **Saturation Characteristics**



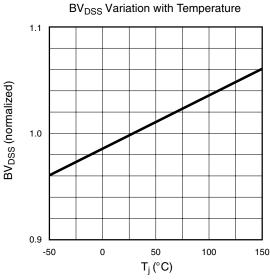
### Power Dissipation vs. Temperature



### Thermal Response Characteristics



# **Typical Performance Curves**



**Transfer Characteristics** 

 $T_A = -55^{\circ}C$ 

25°C

-8

-10

-6

 $V_{DS} = -25V$ 

-2.0

-1.6

-1.2

-0.8

-0.4

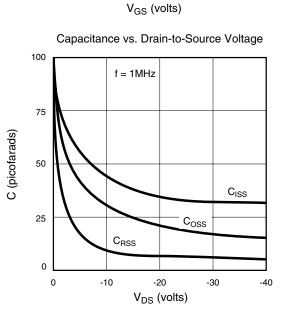
0

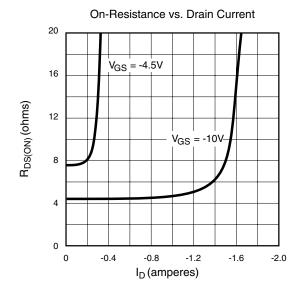
0

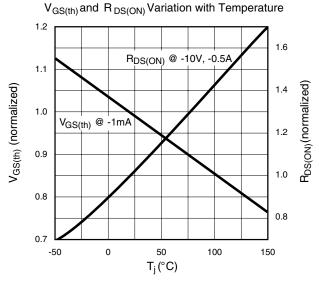
-2

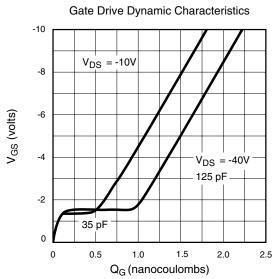
I<sub>D</sub> (amperes)











11/12/01