

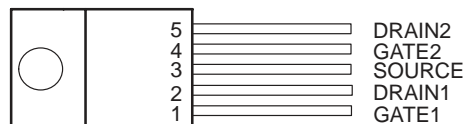
TPIC2202

2-CHANNEL COMMON-SOURCE POWER DMOS ARRAY

SLIS017 – SEPTEMBER 1992

- Two 7.5-A Independent Output Channels, Continuous Current Per Channel
- Low $r_{DS(on)}$. . . 0.09 Ω Typical
- Output Voltage . . . 60 V
- Pulsed Current . . . 15 A Per Channel
- Avalanche Energy . . . 120 mJ

KC PACKAGE
(TOP VIEW)

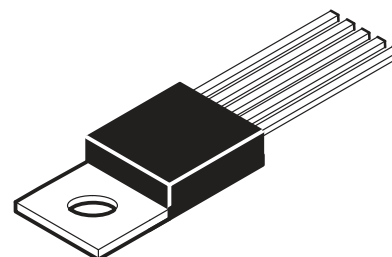
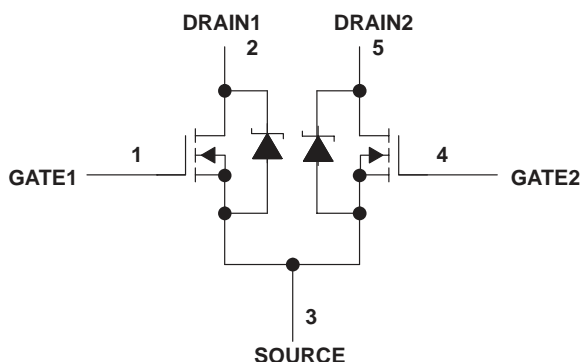


The tab is electrically connected to SOURCE.

description

The TPIC2202 is a monolithic power DMOS array that consists of two independent N-channel enhancement-mode DMOS transistors connected in a common-source configuration with open drains.

schematic



absolute maximum ratings over operating case temperature range (unless otherwise noted)

Drain-source voltage, V_{DS}	60 V
Gate-source voltage, V_{GS}	± 20 V
Continuous source-drain diode current	7.5 A
Pulsed drain current, each output, all outputs on, I_D (see Note 1)	15 A
Continuous drain current, each output, all outputs on	7.5 A
Single-pulse avalanche energy, E_{AS} (see Figure 4)	120 mJ
Continuous power dissipation at (or below) $T_A = 25^\circ\text{C}$ (see Note 2)	2 W
Continuous power dissipation at (or below) $T_C = 75^\circ\text{C}$, all outputs on (see Note 2)	31 W
Operating virtual junction temperature range, T_J	-40°C to 150°C
Operating case temperature range, T_C	-40°C to 125°C
Storage temperature range, T_{stg}	-40°C to 125°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°C

- NOTES: 1. Pulse duration = 10 ms, duty cycle = 6%
2. For operation above 25°C free-air temperature, derate linearly at the rate of 16 mW/ $^\circ\text{C}$. For operation above 75°C case temperature, and with all outputs conducting, derate linearly at the rate of 0.42 W/ $^\circ\text{C}$. To avoid exceeding the design maximum virtual junction temperature, these ratings should not be exceeded.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.



Copyright © 1992, Texas Instruments Incorporated

TPIC2202

2-CHANNEL COMMON-SOURCE POWER DMOS ARRAY

SLIS017 – SEPTEMBER 1992

electrical characteristics, $T_C = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$V_{(BR)DS}$ Drain-source breakdown voltage	$I_D = 1\ \mu\text{A}$, $V_{GS} = 0$	60			V
V_{TGS} Gate-source threshold voltage	$I_D = 1\ \text{mA}$, $V_{DS} = V_{GS}$	1.2	1.75	2.4	V
$V_{DS(on)}$ Drain-source on-state voltage	$I_D = 7.5\ \text{A}$, $V_{GS} = 15\ \text{V}$, See Notes 3 and 4		0.68	0.94	V
I_{DSS} Zero-gate-voltage drain current	$V_{DS} = 48\ \text{V}$, $V_{GS} = 0$	$T_C = 25^\circ\text{C}$	0.07	1	μA
		$T_C = 125^\circ\text{C}$	1.3	10	
I_{GSSF} Forward gate current, drain short circuited to source	$V_{GS} = 20\ \text{V}$, $V_{DS} = 0$		10	100	nA
I_{GSSR} Reverse gate current, drain short circuited to source	$V_{GS} = -20\ \text{V}$, $V_{DS} = 0$		10	100	nA
$r_{DS(on)}$ Static drain-source on-state resistance	$V_{GS} = 15\ \text{V}$, $I_D = 7.5\ \text{A}$, See Notes 3 and 4 and Figures 5 and 6	$T_C = 25^\circ\text{C}$	0.09	0.125	Ω
		$T_C = 125^\circ\text{C}$	0.15	0.21	
g_{fs} Forward transconductance	$V_{DS} = 15\ \text{V}$, $I_D = 5\ \text{A}$, See Notes 3 and 4	2.5	4.7		S
C_{iss} Short-circuit input capacitance, common source	$V_{DS} = 25\ \text{V}$, $V_{GS} = 0$, $f = 300\ \text{kHz}$		490		pF
C_{oss} Short-circuit output capacitance, common source			285		
C_{rss} Short-circuit reverse transfer capacitance, common source			90		

NOTES: 3. Technique should limit $T_J - T_C$ to 10°C maximum.

4. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts.

source-drain diode characteristics, $T_C = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{SD} Forward on voltage	$I_S = 7.5\ \text{A}$, $V_{GS} = 0$, $di/dt = 100\ \text{A}/\mu\text{s}$, $V_{DS} = 48\ \text{V}$, See Figure 1		0.8	1.3	V
t_{rr} Reverse recovery time			200		ns
Q_{RR} Total source-drain diode charge			1.5		μC

resistive-load switching characteristics, $T_C = 25^\circ\text{C}$

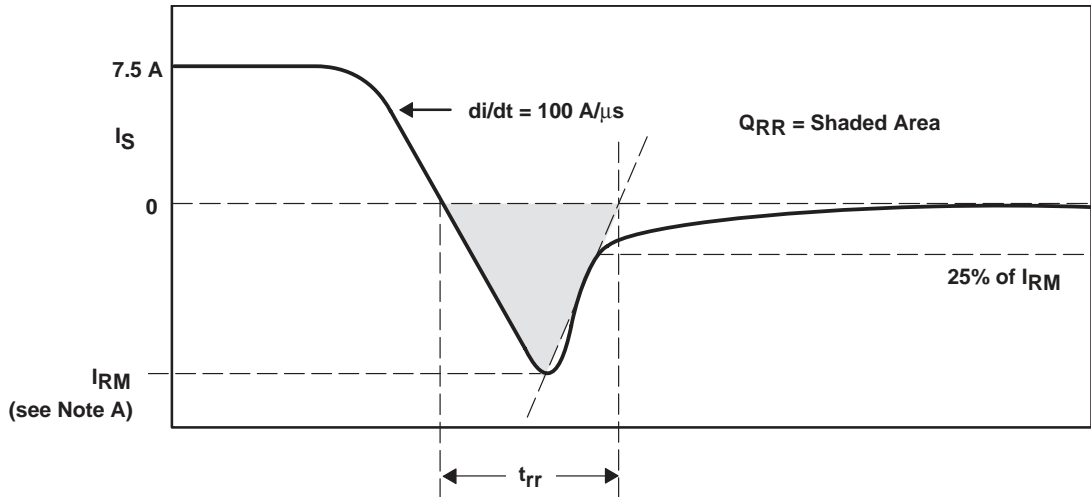
PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$t_{d(on)}$ Turn-on delay time	$V_{DD} = 25\ \text{V}$, $R_L = 6.7\ \Omega$, $t_{en} = 10\ \text{ns}$, $t_{dis} = 10\ \text{ns}$, See Figure 2		12		ns
$t_{d(off)}$ Turn-off delay time			100		
t_r Rise time			43		
t_f Fall time			5		
Q_g Total gate charge	$V_{DD} = 48\ \text{V}$, $I_D = 2.5\ \text{A}$, $V_{GS} = 10\ \text{V}$, See Figure 3		13.6	18	nC
Q_{gs} Gate-source charge			8.3	11	
Q_{gd} Gate-drain charge			5.3	7	
L_D Internal drain inductance			7		nH
L_S Internal source inductance			7		

thermal resistance

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$R_{\theta JA}$ Junction-to-ambient thermal resistance	All outputs with equal power			62.5	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$ Junction-to-case thermal resistance	All outputs with equal power			2.4	$^\circ\text{C}/\text{W}$
	One output dissipating power			3.3	$^\circ\text{C}/\text{W}$

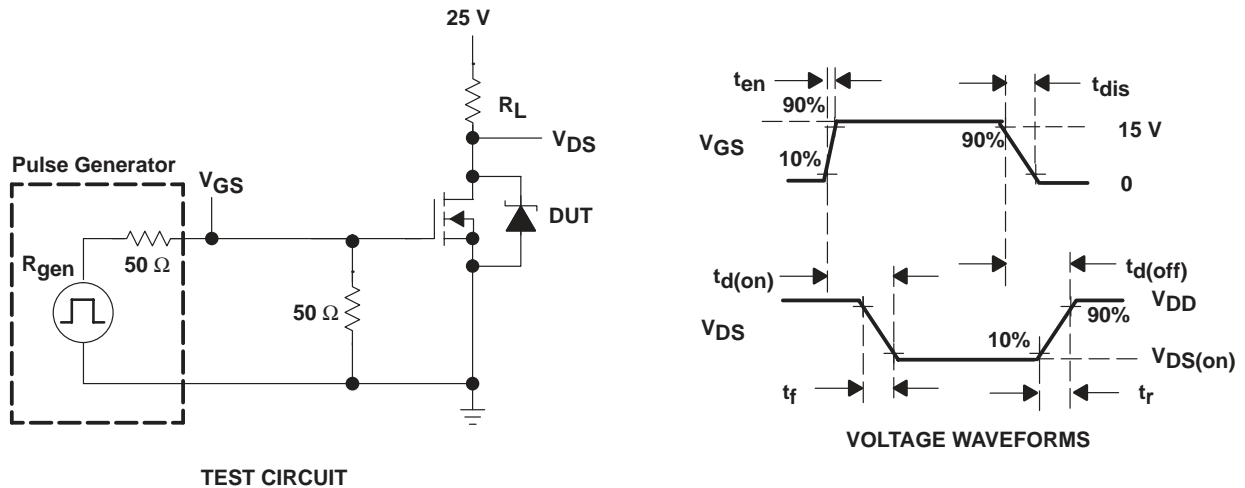


PARAMETER MEASUREMENT INFORMATION



NOTE A: I_{RM} = maximum recovery current

Figure 1. Reverse-Recovery-Current Waveforms of Source-Drain Diode



TEST CIRCUIT

Figure 2. Test Circuit and Voltage Waveforms, Resistive Switching

TPIC2202 2-CHANNEL COMMON-SOURCE POWER DMOS ARRAY

SLIS017 – SEPTEMBER 1992

PARAMETER MEASUREMENT INFORMATION

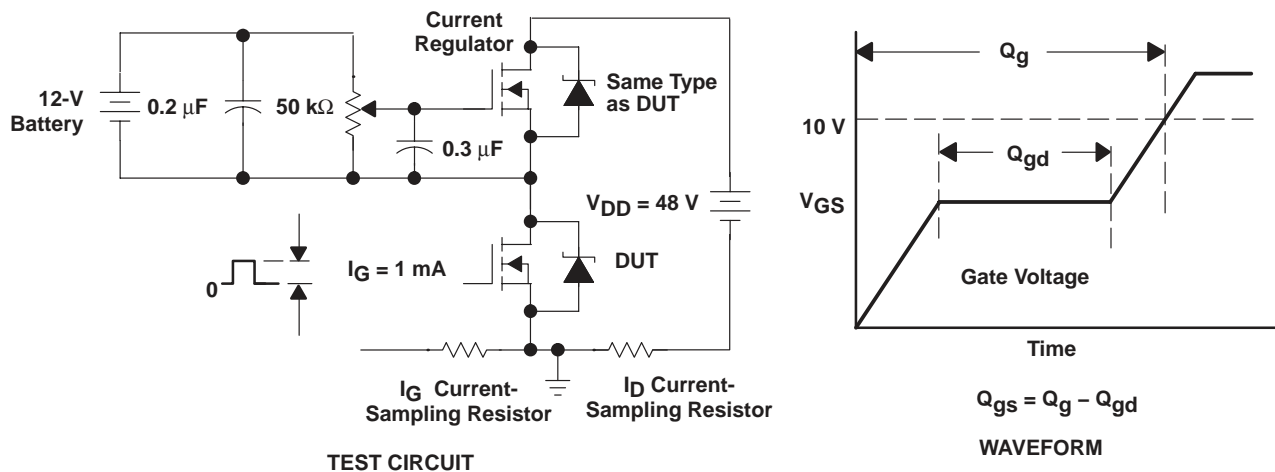
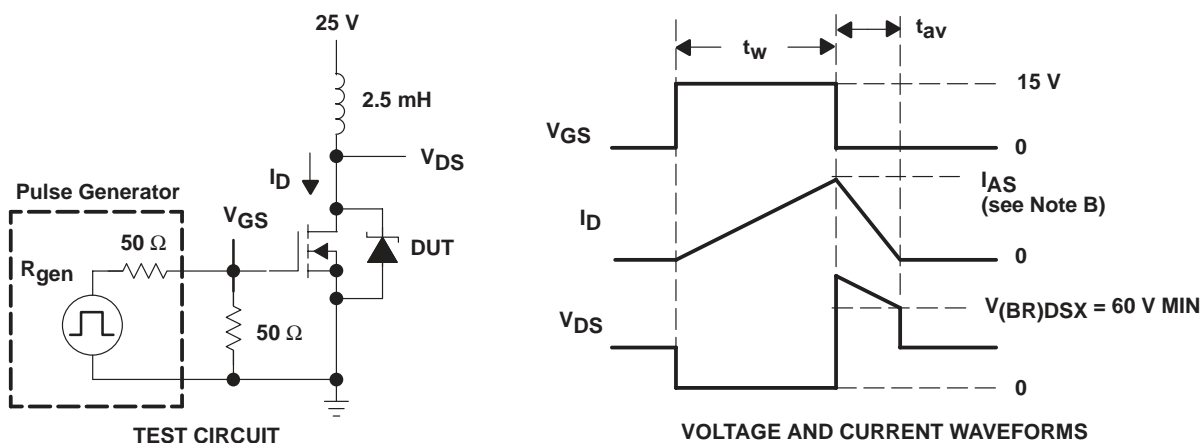


Figure 3. Gate Charge Test Circuit and Waveform

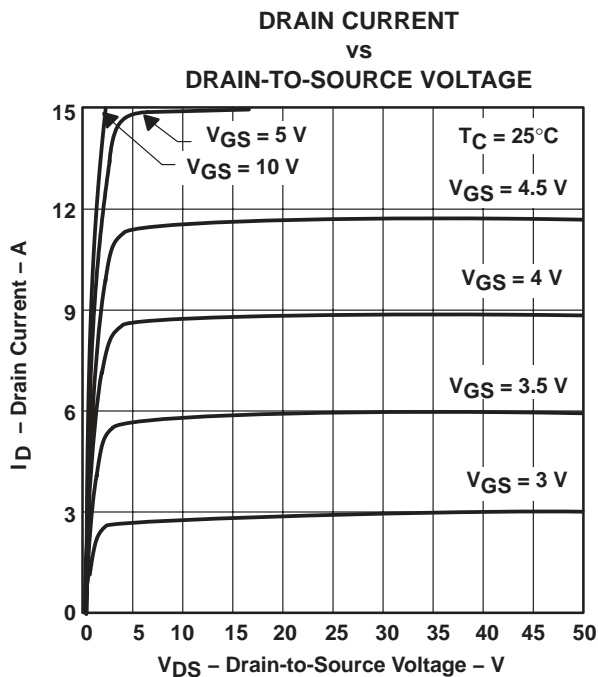
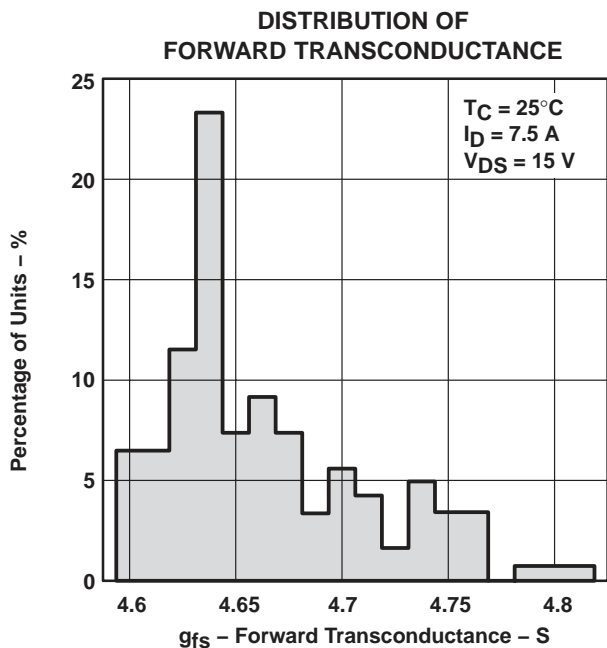
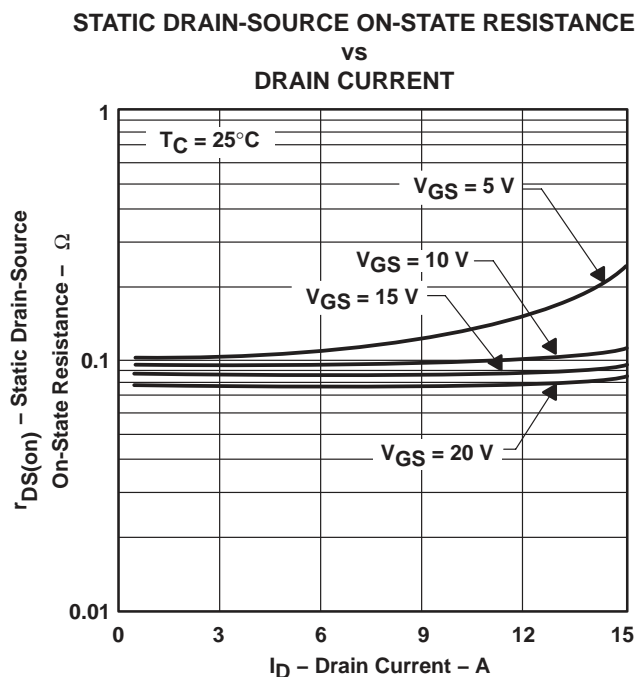
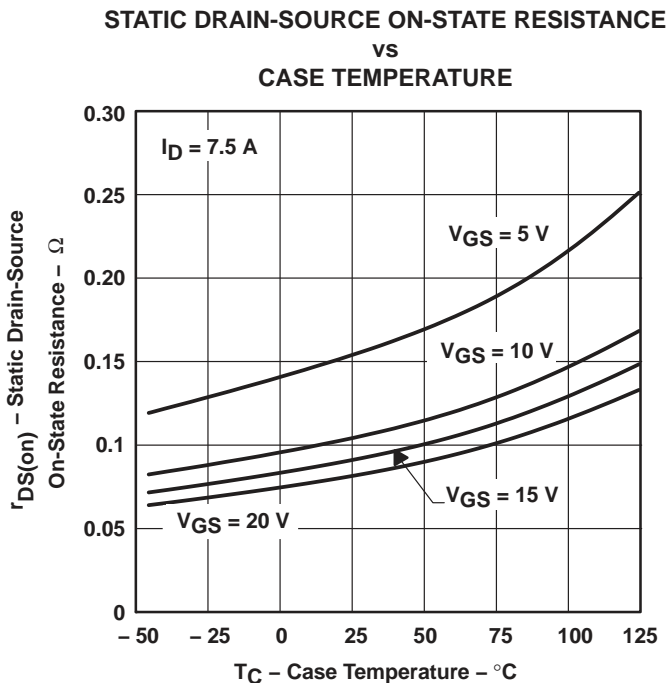


- NOTES: A. The pulse generator has the following characteristics: $t_r \leq 10$ ns, $t_f \leq 10$ ns, $Z_O = 50 \Omega$.
 B. Input pulse duration (t_w) is increased until peak current $I_{AS} = 7.5$ A.

$$\text{Energy test level is defined as } E_{AS} = \frac{I_{AS} \times V_{(BR)DSX} \times t_{av}}{2} = 120 \text{ mJ min.}$$

Figure 4. Single-Pulse Avalanche Energy Test Circuit and Waveforms

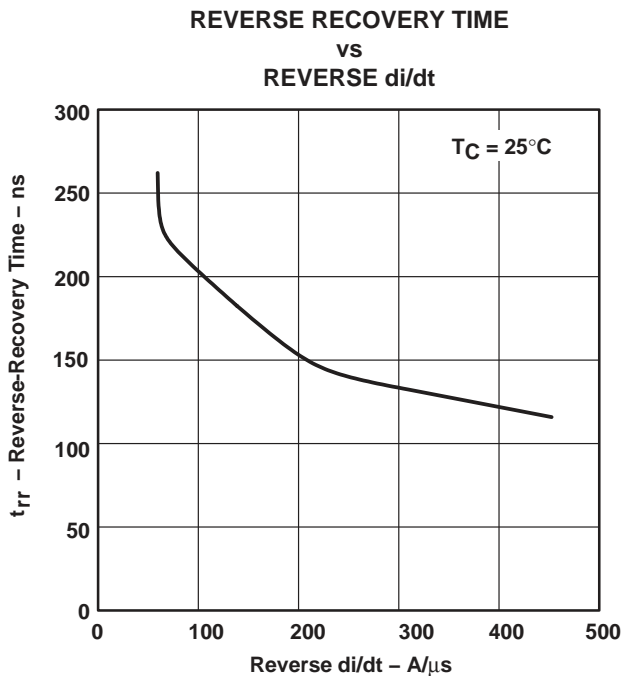
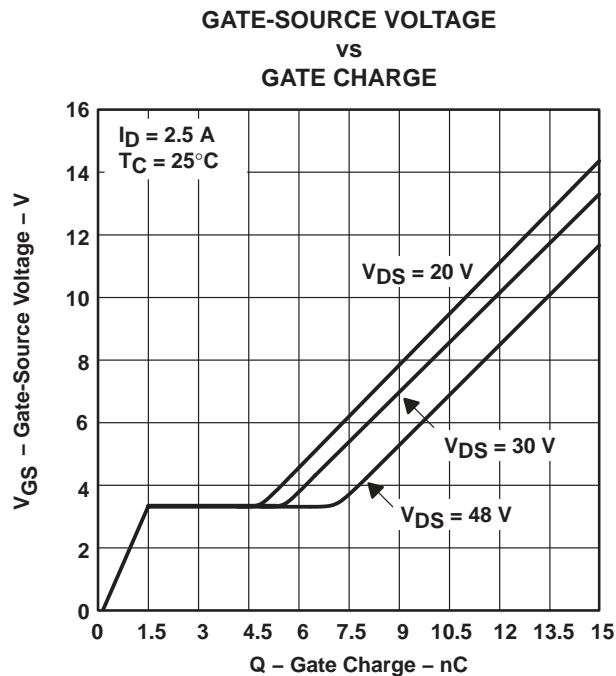
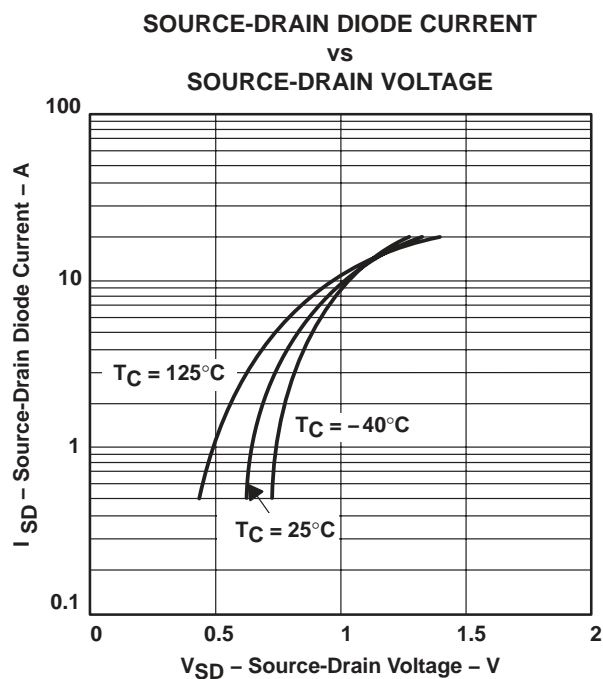
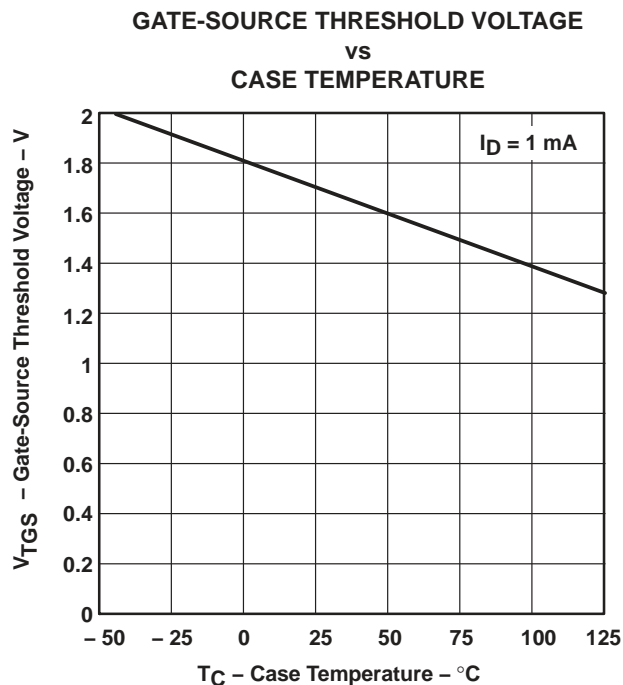
TYPICAL CHARACTERISTICS



TPIC2202 2-CHANNEL COMMON-SOURCE POWER DMOS ARRAY

SLIS017 – SEPTEMBER 1992

TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS

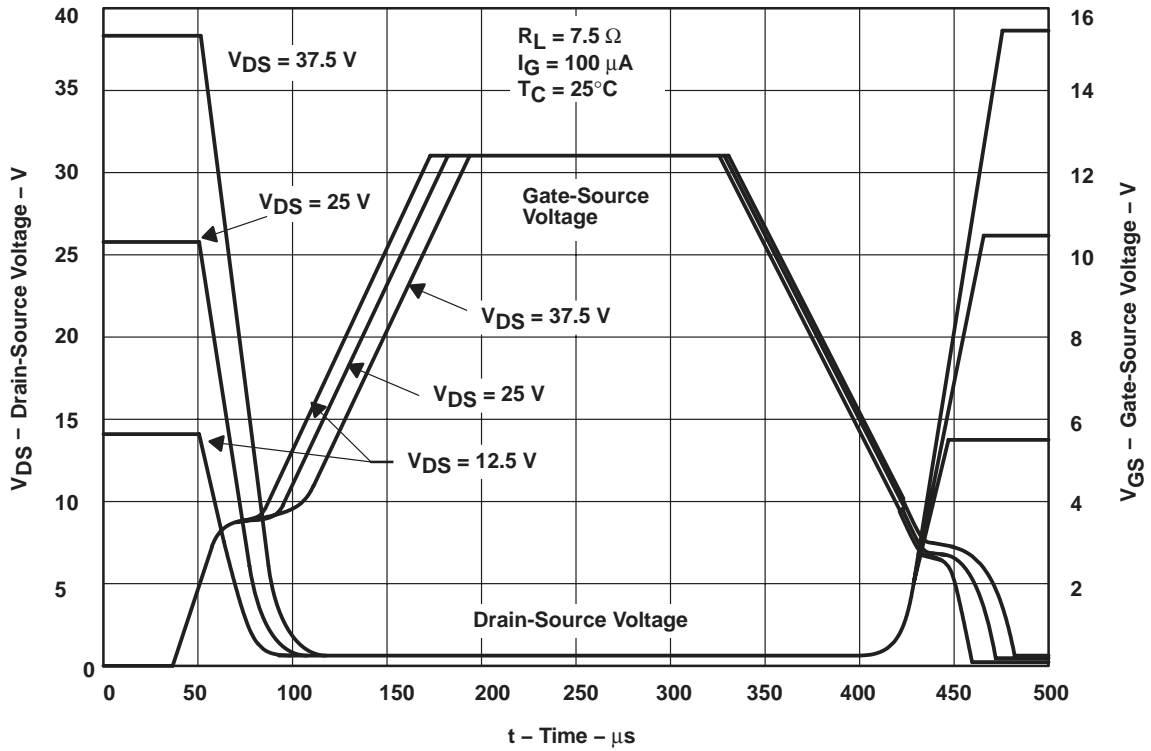


Figure 13. Resistive Switching Waveforms

TPIC2202 2-CHANNEL COMMON-SOURCE POWER DMOS ARRAY

SLIS017 – SEPTEMBER 1992

THERMAL INFORMATION

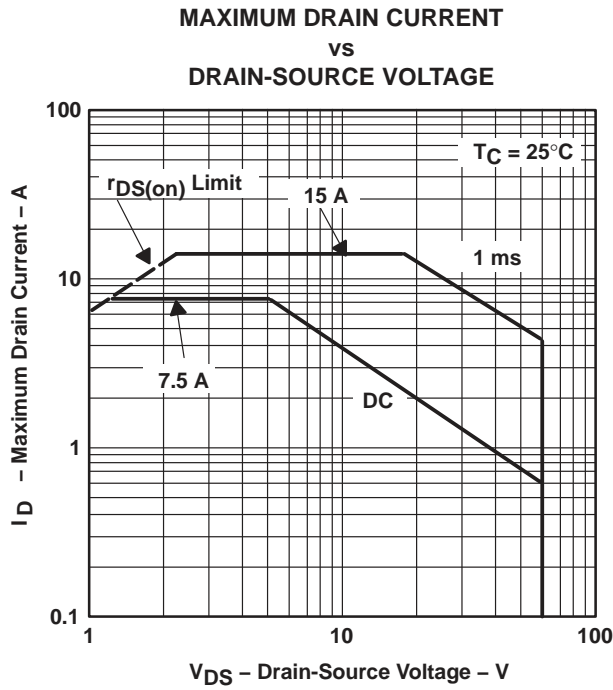


Figure 14

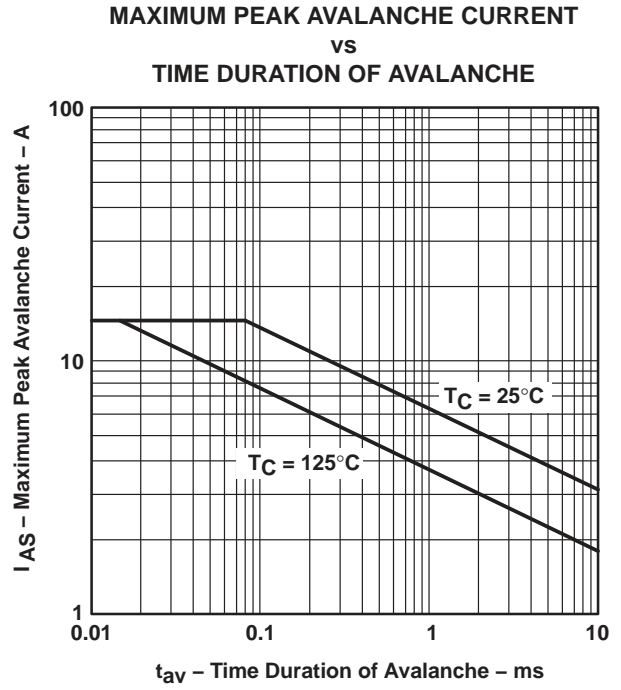
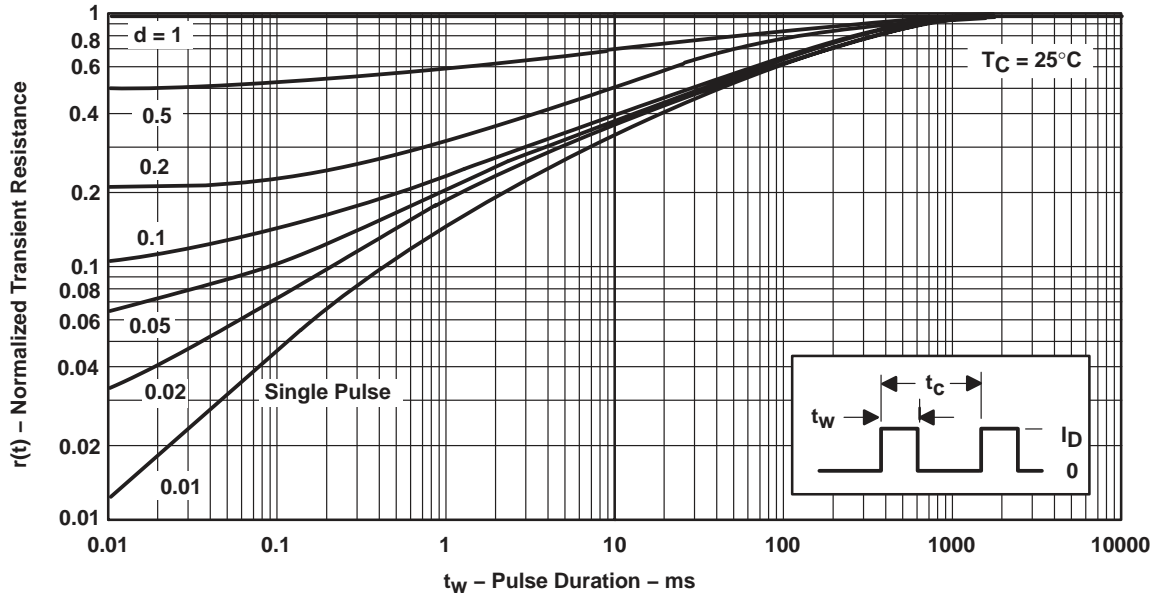


Figure 15

THERMAL INFORMATION

**NORMALIZED TRANSIENT THERMAL IMPEDANCE
 VS
 SQUARE-WAVE PULSE DURATION**



NOTES: $Z_{\theta JC}(t) = r(t) R_{\theta JC}$
 t_w = pulse duration
 t_c = period
 d = duty cycle = t_w/t_c

Figure 16

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products

Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
RF/IF and ZigBee® Solutions	www.ti.com/lprf

Applications

Audio	www.ti.com/audio
Automotive	www.ti.com/automotive
Broadband	www.ti.com/broadband
Digital Control	www.ti.com/digitalcontrol
Medical	www.ti.com/medical
Military	www.ti.com/military
Optical Networking	www.ti.com/opticalnetwork
Security	www.ti.com/security
Telephony	www.ti.com/telephony
Video & Imaging	www.ti.com/video
Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2009, Texas Instruments Incorporated