



# STPIC6A259

## POWER LOGIC 8-BIT ADDRESSABLE LATCH

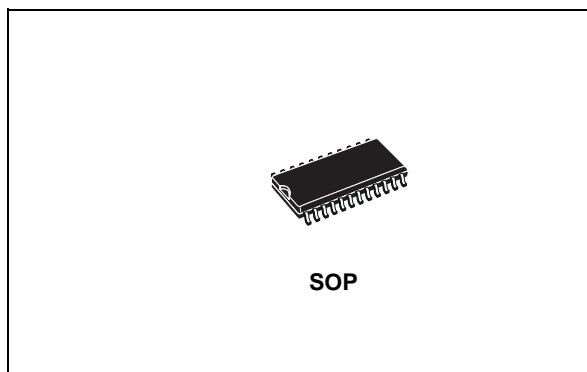
### PRELIMINARY DATA

- LOW  $R_{DS(on)}$ : 1 $\Omega$  TYP
- OUTPUT SHORT-CIRCUIT PROTECTION
- 75mJ AVALANCHE ENERGY
- EIGHT 350mA DMOS OUTPUTS
- 50V SWITCHING CAPABILITY
- FOUR DISTINCT FUNCTION MODES
- LOW POWER CONSUMPTION

### DESCRIPTION

This power logic 8-bit addressable latch controls open-drain DMOS transistor outputs and is designed for general-purpose storage applications in digital systems. Specific uses include working registers, serial-holding registers, and decoders or demultiplexers. This is a multifunctional device capable of operating as eight addressable latches or an 8-line demultiplexer with active-low DMOS outputs. Each open-drain DMOS transistor features an independent chopping current-limiting circuit to prevent damage in the case of a short circuit.

Four distinct modes of operation are selectable by controlling the clear (CLR) and enable (G) inputs and enumerated in the function table. In the addressable-latch mode, data at the data-in (D) terminal is written into the addressed latch. The addressed DMOS-transistor output inverts the data input with all unaddressed DMOS-transistor output remaining in their previous state. In the MOS-transistor outputs remain in their previous states and are unaffected by the data or address inputs. To eliminate the possibility of entering erroneous data in the latch, enable G should be



held high (inactive) while the address lines are changing. In the 8-line demultiplexing mode, the addressed output is inverted with respect to the D input and all other output are high. In the clear mode, all outputs are high and unaffected by the address and data inputs.

Separate power ground (PGND) and logic ground (LGND) terminals are provided to facilitate maximum system flexibility. All PGND terminals are internally connected, and each pGND terminal must be externally connected to the power system ground in order to minimize parasitic impedance. A single-point connection between LGND and PGND must be made externally in a manner that reduces crosstalk between the logi and load circuits.

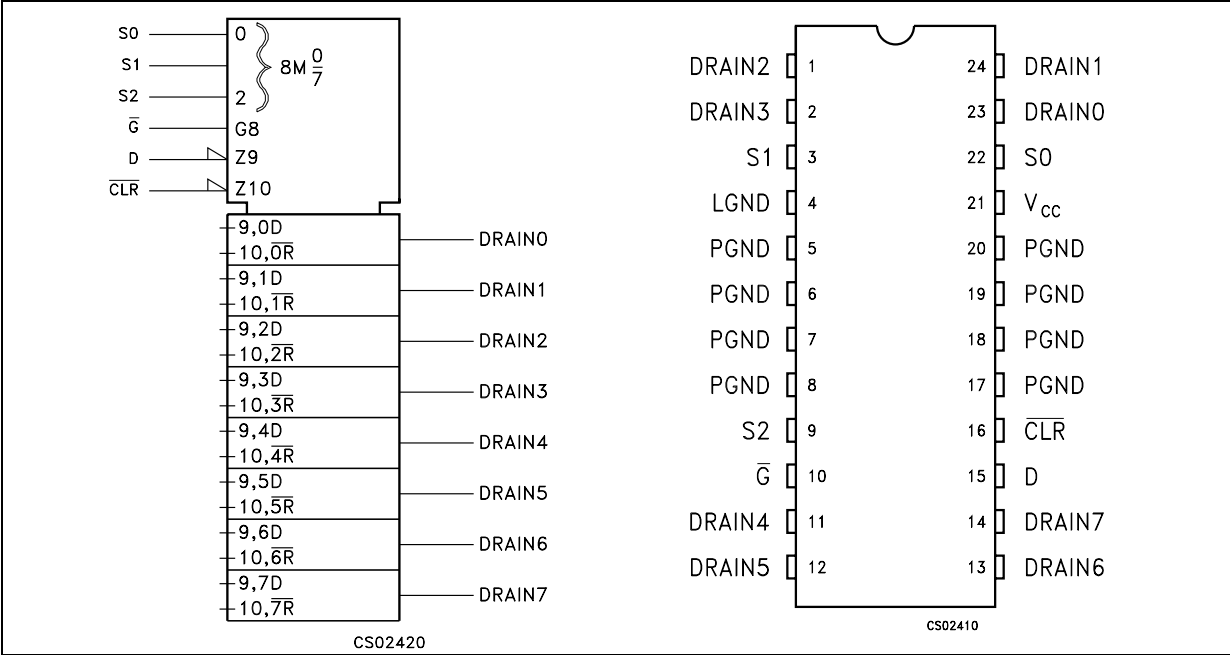
The STPIC6A259 is offered in a thermally enhanced SO-24 package. The STPIC6A259 is characterized for operation over the operating case temperature range -40°C to 125°C.

### ORDERING CODES

Type	Package	Comments
STPIC6A259M	SO-24 Batwing (Tube)	50parts per tube / 20tube per box
STPIC6A259MTR	SO-24 Batwing (Tape & Reel)	2500 parts per reel

STPIC6A259

LOGIC SYMBOL AND PIN CONFIGURATION



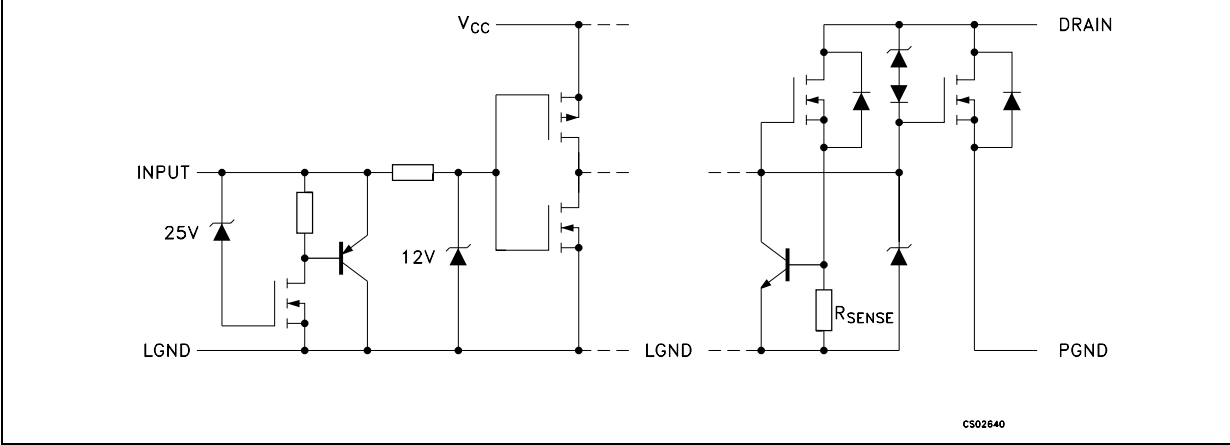
FUNCTIONAL TABLE

INPUTS			OUTPUT OF ADDRESSED DRAIN	EACH OTHER DRAIN	FUNCTION
CLR	G	D			
H	L	H	L	$Q_{io}$	Addressable Latch
H	L	L	H	$Q_{io}$	
H	H	X	$Q_{io}$	$Q_{io}$	Memory
L	L	H	L	H	8-Line Demultiplexer
L	L	L	H	H	
L	H	X	H	H	Clear

FUNCTIONAL TABLE

SELECT INPUTS			DRAIN ADDRESSED
S2	S1	S0	
L	L	L	0
L	L	H	1
L	H	L	2
L	H	H	3
H	L	L	4
H	L	H	5
H	H	L	6
H	H	H	7

INPUT AND OUTPUT EQUIVALENT CIRCUITS



**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
$V_{CC}$	Logic Supply Voltage (See Note 2)	7	V
$V_I$	Logic Input Voltage Range	-0.3 to 7	V
$V_{DS}$	Power DMOS Drain to Source Voltage (See Note 2)	50	V
$I_{DS}$	Continuous Source to Drain Diode Anode Current	1	A
$I_{DS}$	Pulsed Source to Drain Diode Anode Current (See Note 3)	2	A
$I_D$	Pulsed Drain Current, Each Output, All Output ON ( $T_C=25^\circ\text{C}$ )	1.1	A
$I_D$	Continuous Current, Each Output, All Output ON ( $T_C=25^\circ\text{C}$ )	350	mA
$I_D$	Peak Drain Current Single Output ( $T_C=25^\circ\text{C}$ ) (See Note 3)	1.1	A
$E_{AS}$	Single Pulse Avalanche Energy (See Note 6)	75	mJ
$I_{AS}$	Avalanche Current (See Note 4)	600	mA
$P_d$	Continuous total dissipation ( $T_C \leq 25^\circ\text{C}$ )	1750	mW
$P_d$	Continuous total dissipation ( $T_C = 125^\circ\text{C}$ )	350	mW
$T_J$	Operating Virtual Junction Temperature Range	-40 to +150	$^\circ\text{C}$
$T_C$	Operating Case Temperature Range	-40 to +125	$^\circ\text{C}$
$T_{stg}$	Storage Temperature Range	-65 to +150	$^\circ\text{C}$
$T_L$	Lead Temperature 1.6mm (1/16inch) from case for 10 seconds	260	$^\circ\text{C}$

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

**THERMAL DATA**

Symbol	Parameter		Unit
$R_{thj-case}$	Thermal Resistance Junction-case	10	$^\circ\text{C}/\text{W}$
$R_{thj-amb}$	Thermal Resistance Junction-ambient	50	$^\circ\text{C}/\text{W}$

**RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter	Min.	Max.	Unit
$V_{CC}$	Logic Supply Voltage	4.5	5.5	V
$V_{IH}$	High Level Input Voltage	$0.85V_{CC}$	$V_{CC}$	V
$V_{IL}$	Low Level Input Voltage	0	$0.15V_{CC}$	V
$I_{DP}$	Pulse Drain Output Current ( $T_C=25^\circ\text{C}$ , $V_{CC}=5\text{V}$ ) (see note 3, 5)	-1.8	0.6	A
$t_{su}$	Set-up Time, D High Before G $\uparrow$ (see Figure 2)	10		ns
$t_h$	Hold Time, D High Before G $\uparrow$ (see Figure 2)	5		ns
$t_W$	Pulse Duration (see Figure 2)	15		ns
$T_C$	Operating Case Temperature	-40	125	$^\circ\text{C}$

**STPIC6A259****DC CHARACTERISTICS** ( $V_{CC}=5V$ ,  $T_C=25^\circ C$ , unless otherwise specified.)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSX}$	Drain-to-Source breakdown Voltage	$I_D = 1mA$	50			V
$V_{SD}$	Source-to-Drain Diode Forward Voltage	$I_F = 350mA$ (See Note 3)		0.8	1.1	V
$I_{IH}$	High Level Input Current	$V_I = V_{CC}$			1	$\mu A$
$I_{IL}$	Low Level Input Current	$V_I = 0$			-1	$\mu A$
$I_{CC}$	Logic Supply Current	$I_O = 0$		0.5	5	mA
$I_{OK}$	Output Current at Which Chopping Starts	$T_C = 25^\circ C$ (See Note 3 and Figg. 3, 4)	0.6	0.8	1.1	A
$I_{(nom)}$	Nominal Current	$V_{DS(on)} = 0.5V$ $I_{(nom)} = I_D$ $V_{CC} = 5V$ $T_C = 85^\circ C$ (See Note 5, 6, 7)		350		mA
$I_D$	Off-State Drain Current	$V_{DS} = 40V$ $T_C = 25^\circ C$		0.1	1	$\mu A$
		$V_{DS} = 40V$ $T_C = 125^\circ C$		0.2	5	$\mu A$
$R_{DS(on)}$	Termination Resistance (See Note 5, 6 and figg. 9, 10)	$I_D = 350mA$ $T_C = 25^\circ C$		1	1.5	$\Omega$
		$I_D = 350mA$ $T_C = 125^\circ C$		1.7	2.5	$\Omega$

**SWITCHING CHARACTERISTICS** ( $V_{CC}=5V$ ,  $T_C=25^\circ C$ , unless otherwise specified.)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{PHL}$	Propagation Dealy Time, High to Low Level Output from D	$C_L = 30pF$ $I_D = 350mA$ (See Figg. 1, 2, 11)		30		ns
$t_{PLH}$	Propagation Dealy Time, Low to High Level Output from D			125		ns
$t_r$	Rise Time, Drain Output			60		ns
$t_f$	Fall Time, Drain Output			30		ns
$t_a$	Reverse Recovery Current Rise Time	$I_F = 350mA$ $di/dt = 20A/\mu s$ (See Note 5, 6 and Fig. 5)		100		ns
$t_{rr}$	Reverse Recovery Time			300		ns

Note 1: All Voltage valuea are with respect to LGND and PGND

Note 2: Each power DMOS source is internally connected to GND

Note 3: Pulse duration  $\leq 100ms$  and duty cycle  $\leq 2\%$

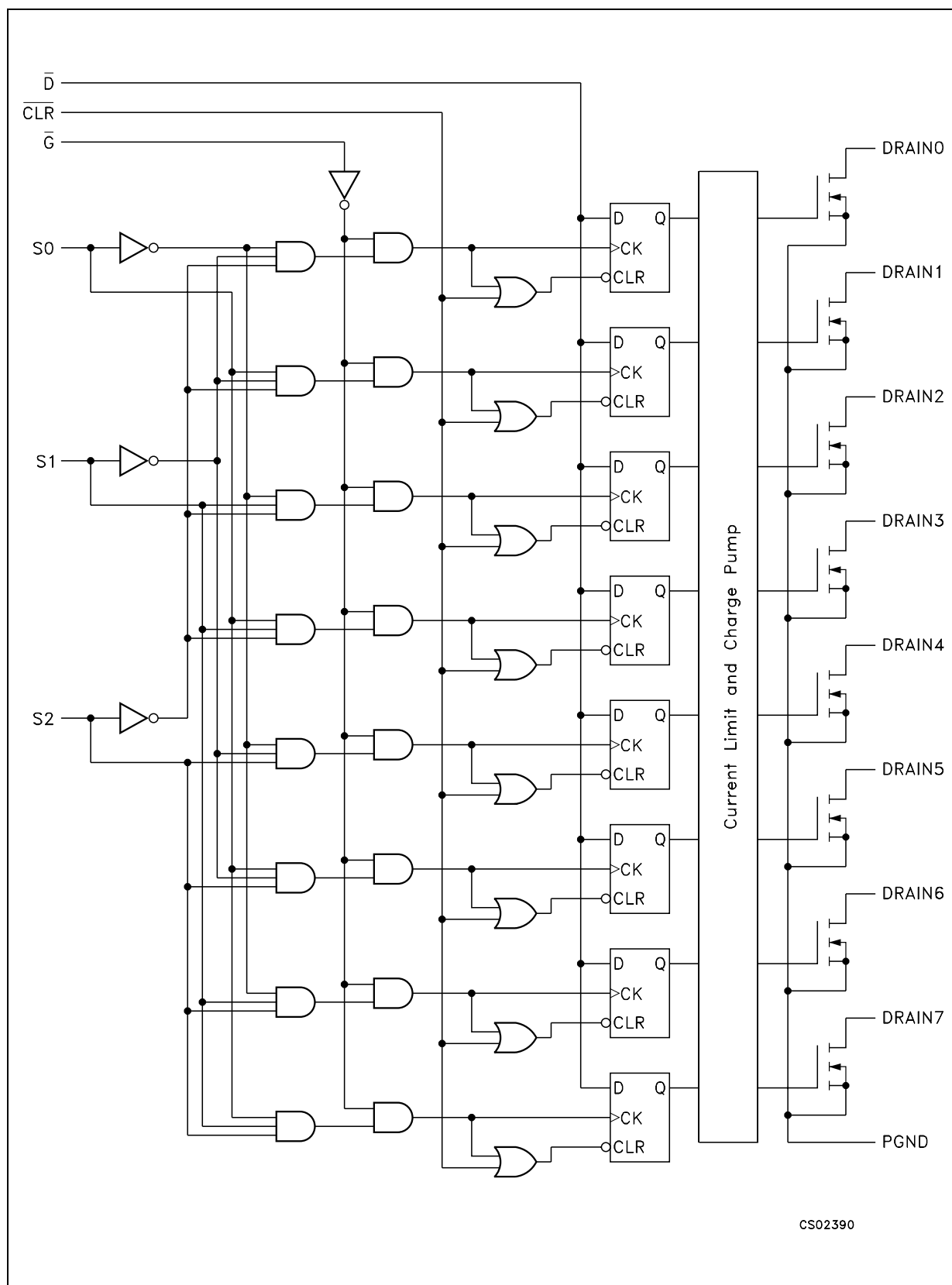
Note 4: Drain Supply Voltage = 15V, starting junction temperature ( $T_{JS}$ ) =  $25^\circ C$ .  $L = 210\mu H$  and  $I_{AS} = 600mA$  (See Fig. 6)

Note 5: Technique should limit  $T_J - T_C$  to  $10^\circ C$  maximum

Note 6: These parameters are measured with voltage sensing contacts separate from the current-carrying contacts.

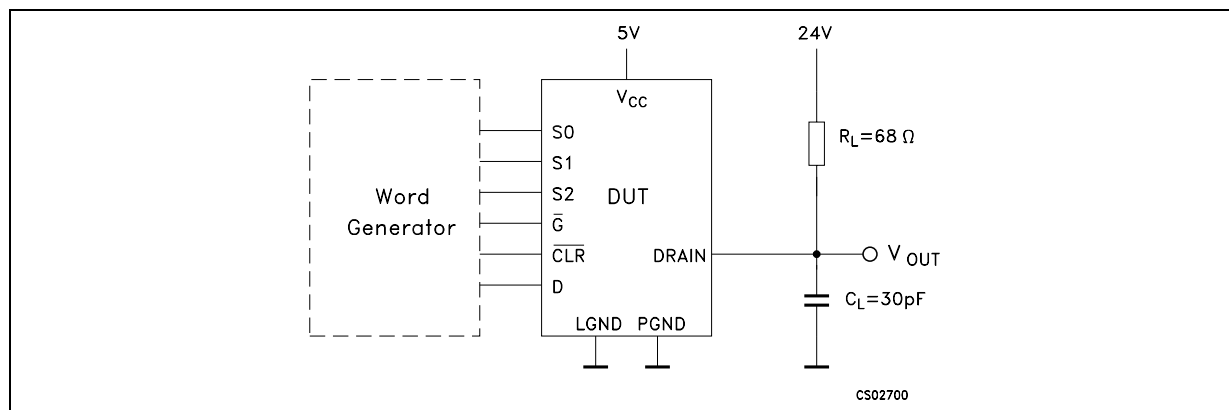
Note 7: Nominal Current is defined for a consistent comparison between devices from different sources. It is the current that produces a voltage drop of 0.5V at  $T_C = 85^\circ C$ .

## LOGIC DIAGRAM

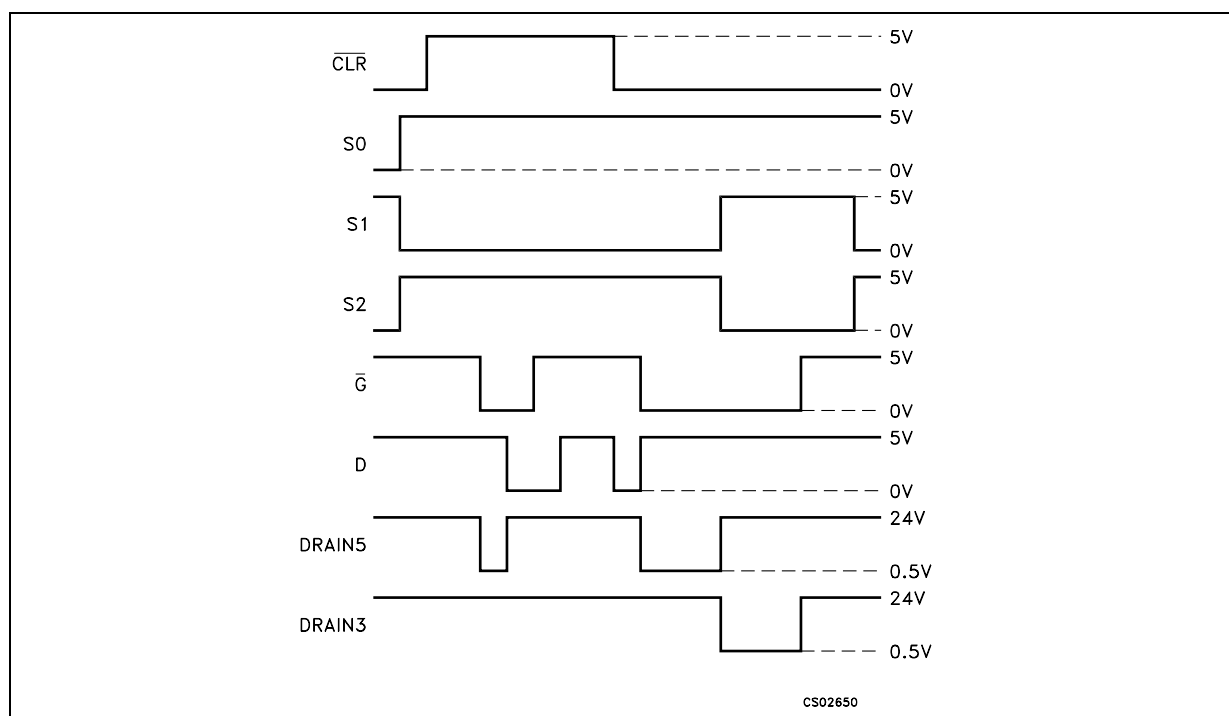


## STPIC6A259

### TYPICAL OPERATION MODE TEST CIRCUITS



### TYPICAL OPERATION MODE WAVEFORMS

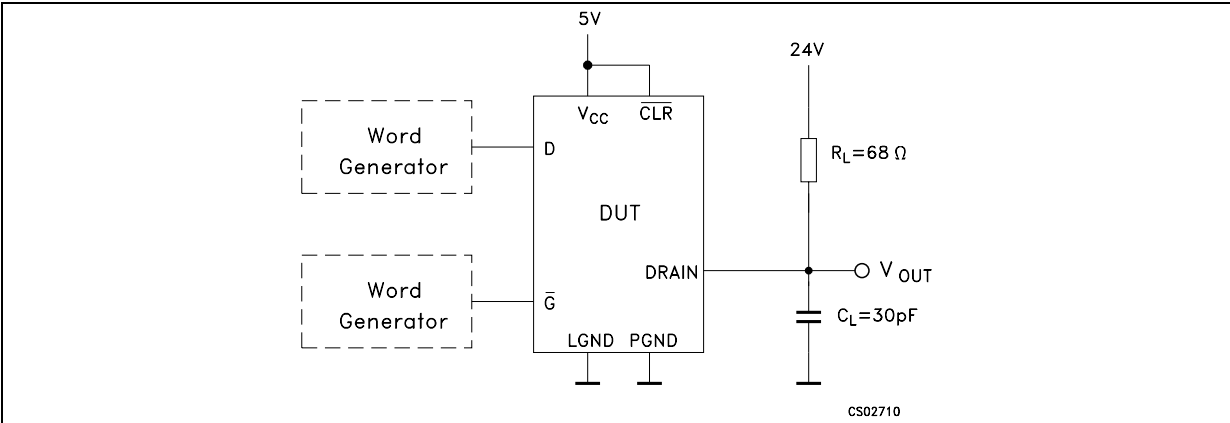


**NOTE:**

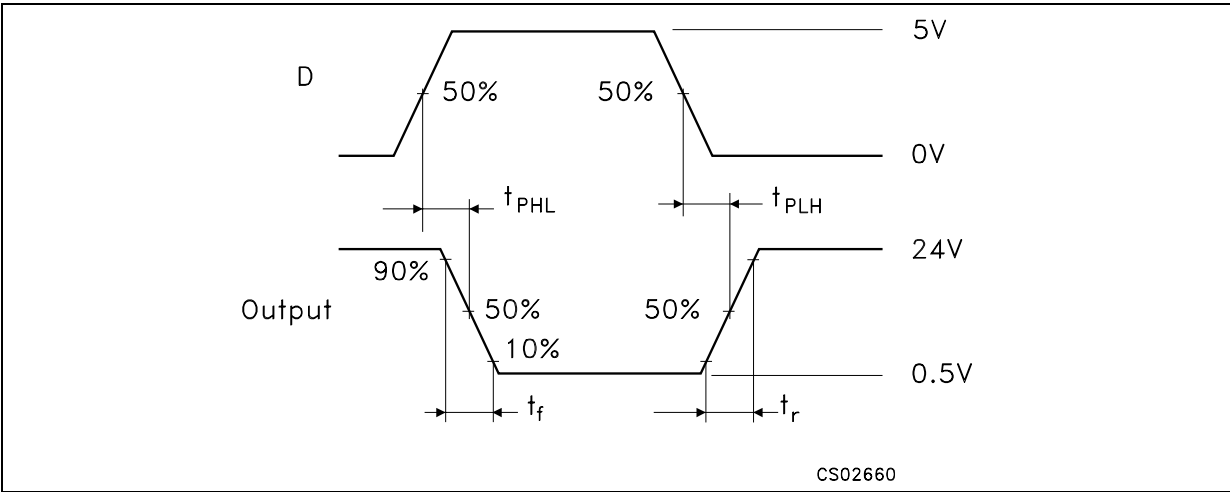
A) The word generator has the following characteristics:  $t_r \leq 10\text{ns}$ ,  $t_f \leq 10\text{ns}$ ,  $t_w = 300\text{ns}$ , pulse repetition rate (PRR) = 5KHz,  $Z_O = 50\Omega$

B) C<sub>L</sub> includes probe and jig capacitance.

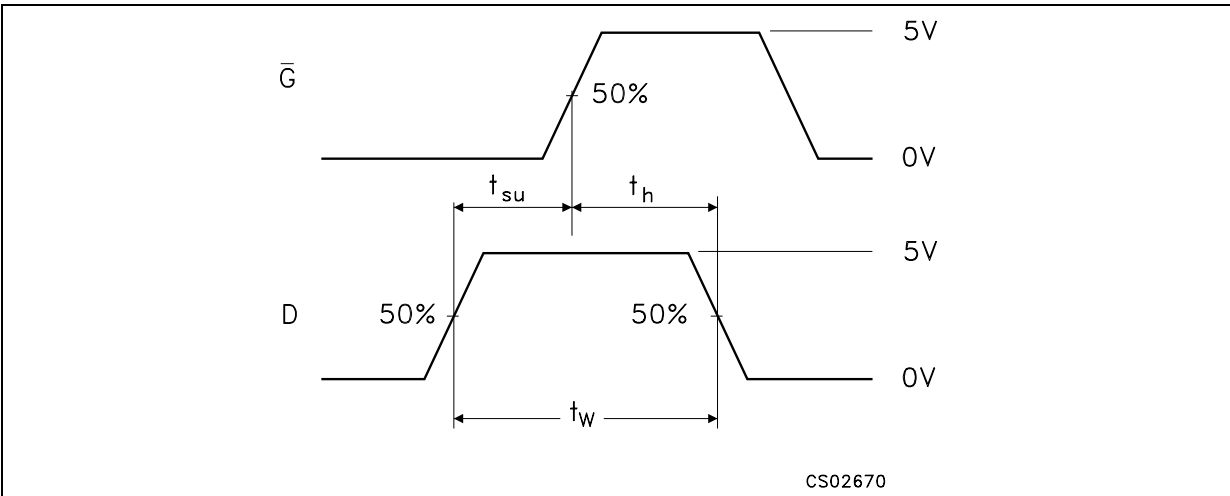
TYPICAL OPERATION MODE TEST CIRCUITS



SWITCHING TIME WAVEFORM



INPUT SETUP AND HOLD WAVEFORM

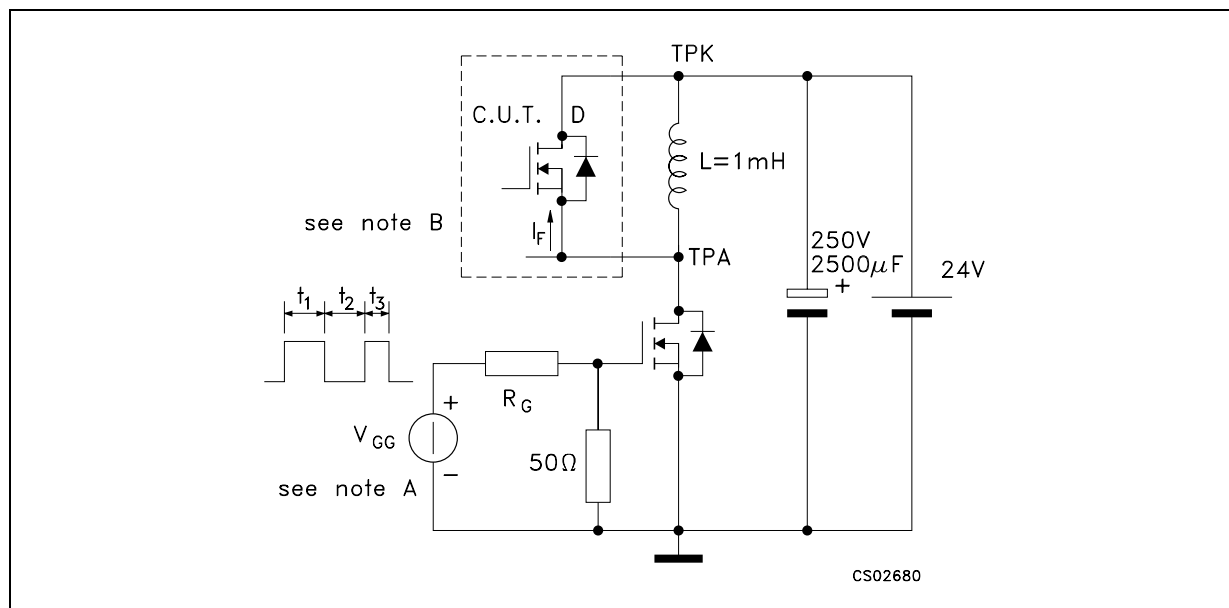


NOTE:  
A) The word generator has the following characteristics: t<sub>r</sub> ≤ 10ns, t<sub>f</sub> ≤ 10ns, t<sub>w</sub> = 300ns, pulse repetition rate (PRR) = 5KHz, Z<sub>O</sub> = 50 $\Omega$   
B) C<sub>L</sub> includes probe and jig capacitance.

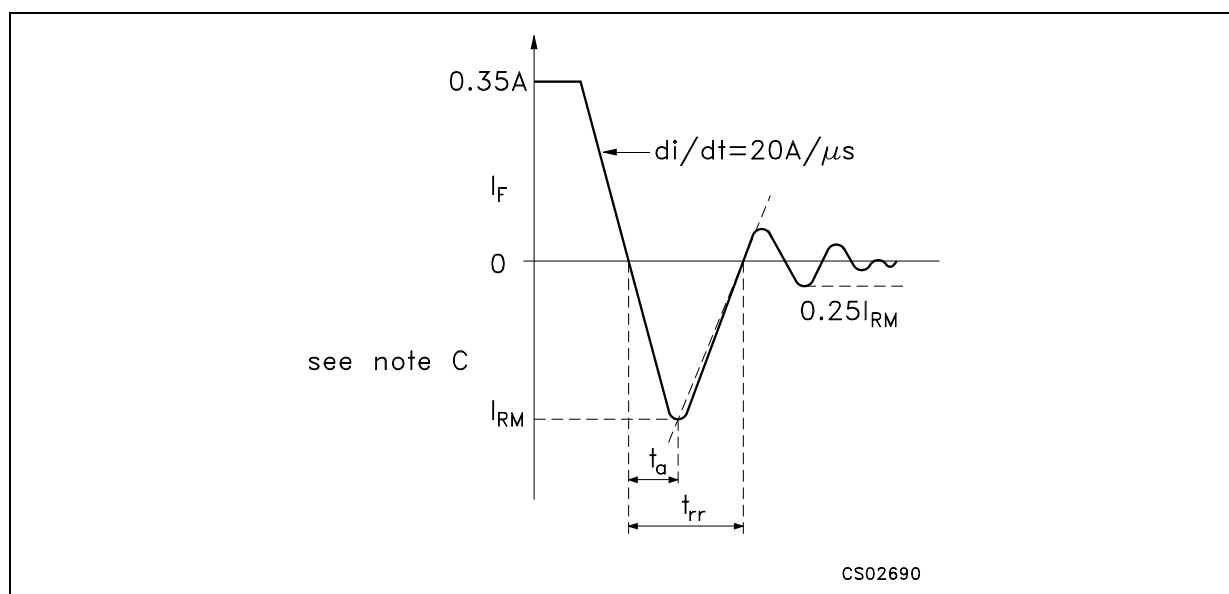


## STPIC6A259

### REVERSE RECOVERY CURRENT TEST CIRCUITS



### SOURCE DRAIN DIODE WAVEFORM



NOTE:

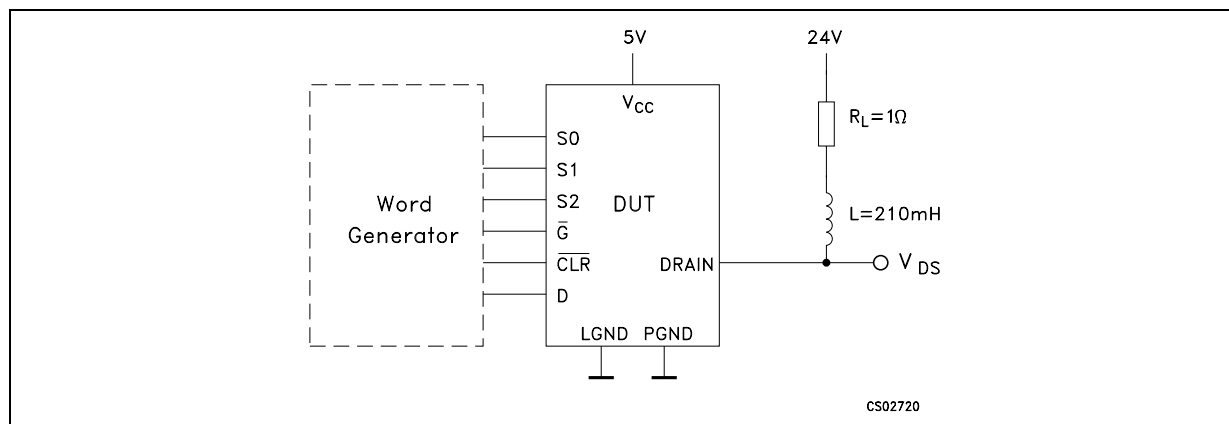
A) The  $V_{GG}$  amplitude and  $R_G$  are adjusted for  $di/dt = 20A/\mu s$ . A  $V_{GG}$  double-pulse train is used to set  $I_F = 0.35A$ , where  $t_1 = 10\mu s$ ,  $t_2 = 7\mu s$  and  $t_3 = 3\mu s$ .

B) The Drain terminal under test is connected to the TPK test point. All other terminals are connected together and connected to the TPA test point.

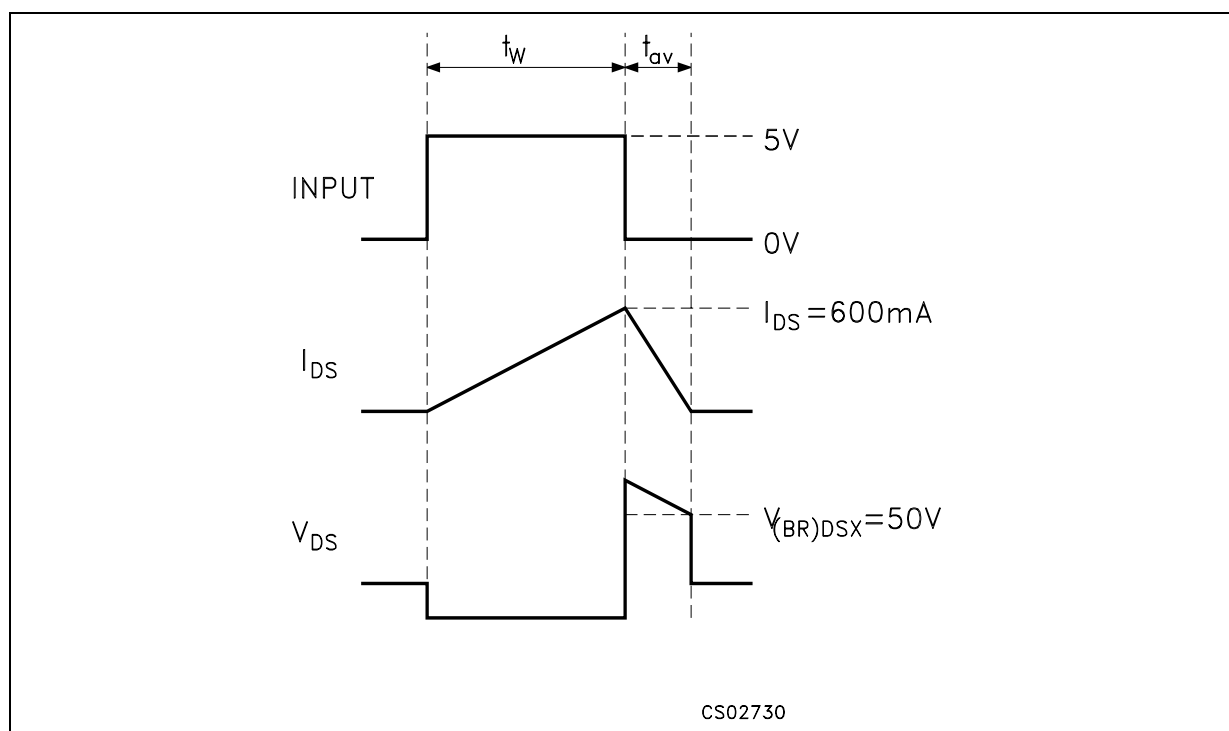
C)  $I_{RM}$  = maximum recovery current.



## SINGLE PULSE AVALANCHE ENERGY TEST CIRCUITS



## SINGLE PULSE AVALANCHE ENERGY WAVEFORM



## NOTE:

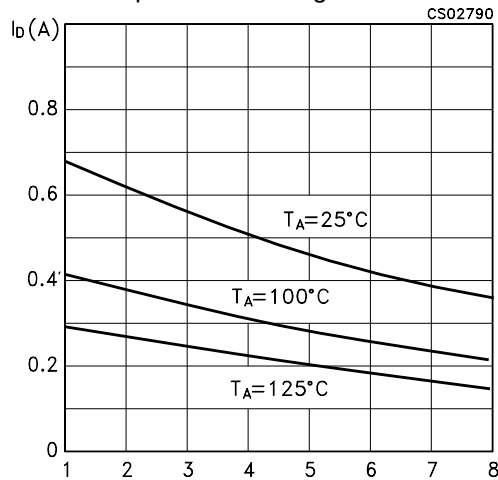
A) The word generator has the following characteristics:  $t_r \leq 10\text{ns}$ ,  $t_f \leq 10\text{ns}$ ,  $Z_O = 50\Omega$

B) Input pulse duration, t<sub>W</sub> is increased until peak current I<sub>AS</sub> = 600 mA. Energy test level is defined as  $E_{AS} = (I_{AS} \times V_{(BR)DSX} \times t_{AV})/2 = 75\text{mJ}$ .

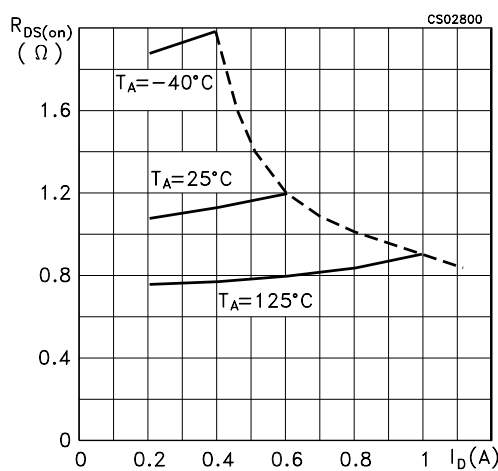
## STPIC6A259

### TYPICAL PERFORMANCE CHARACTERISTICS (unless otherwise specified $T_j = 25^\circ\text{C}$ )

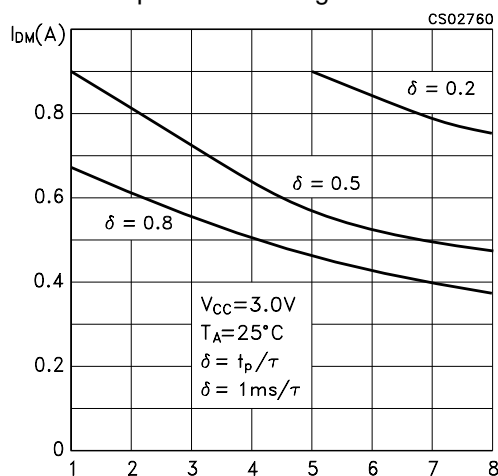
**Figure 1 :** Maximum Continuous Drain Current vs Number of Outputs Conducting Simultaneously



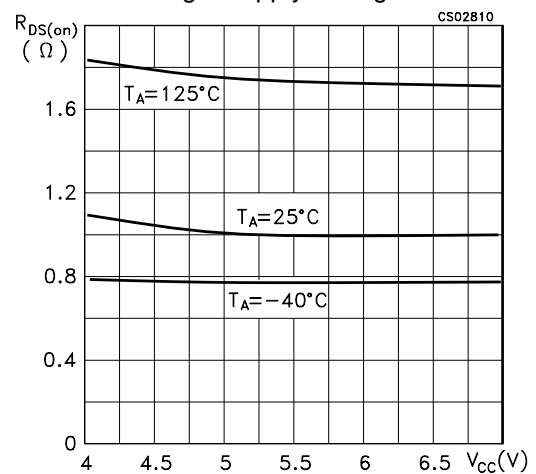
**Figure 2 :** Static Drain-Source ON-State Resistance vs Drain Current



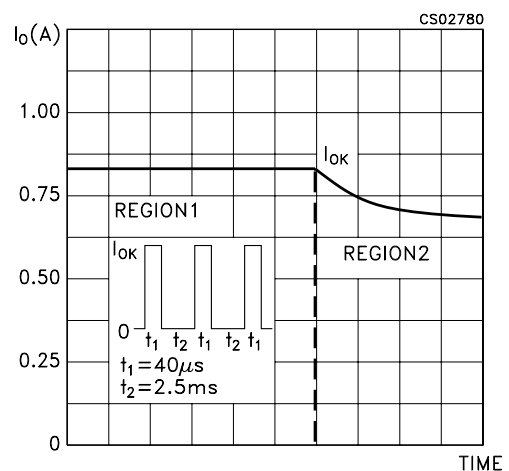
**Figure 3 :** Maximum Peak Drain Current vs Number of Outputs Conducting Simultaneously



**Figure 4 :** Static Drain-Source ON-State Resistance vs Logic Supply Voltage



**Figure 5 :** Chopping Mode Characteristics



**Figure 6 :** Output Current vs Case Temperature

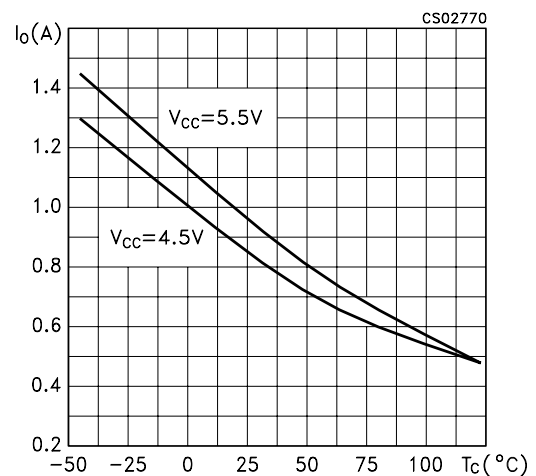


Figure 7 : Switching Time vs Case Temperature

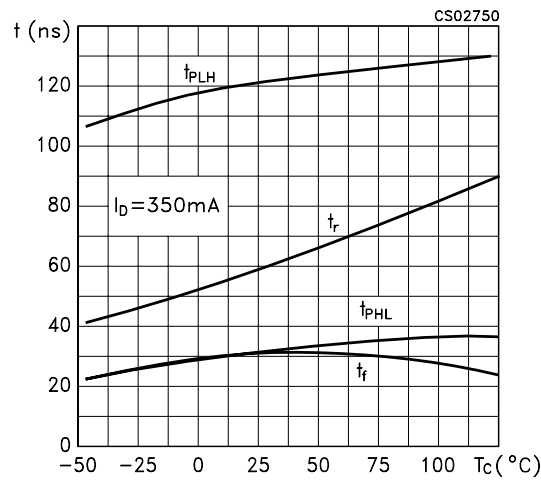
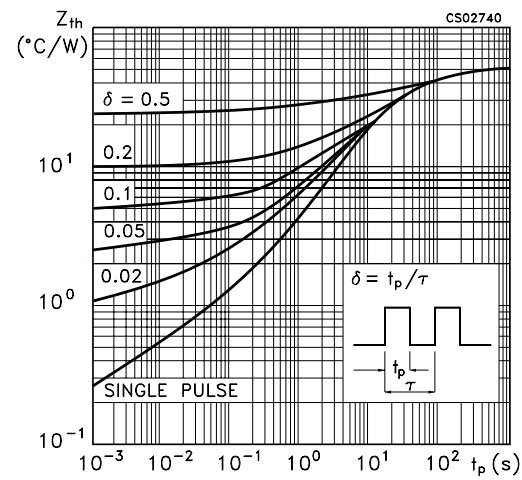


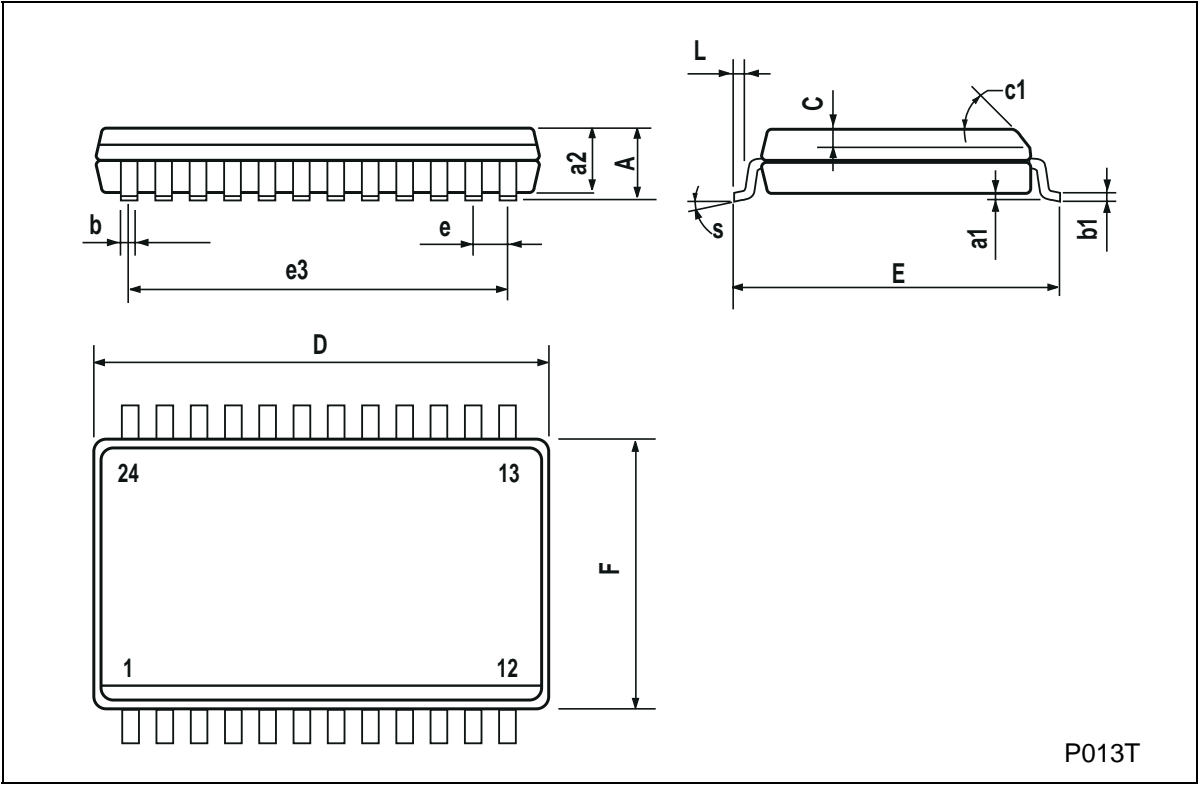
Figure 8 : Switching Time vs Case Temperature



STPIC6A259

SO-24 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			2.65			0.104
a1	0.10		0.20	0.004		0.007
a2			2.45			0.096
b	0.35		0.49	0.013		0.019
b1	0.23		0.32	0.009		0.012
C		0.50			0.020	
c1	45 (typ.)					
D	15.20		15.60	0.598		0.614
E	10.00		10.65	0.393		0.420
e		1.27			0.05	
e3		13.97			0.55	
F	7.40		7.60	0.291		0.299
L	0.50		1.27	0.19		0.050
S	8 (max.)					



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