GSM6604

20V N & P Pair Enhancement Mode MOSFET

Product Description

GSM6604, N & P Pair enhancement mode MOSFET, uses Advanced Trench Technology to provide excellent RDS(ON), low gate charge.

These devices are particularly suited for low voltage power management, and low in-line power loss are needed in commercial industrial surface mount applications.

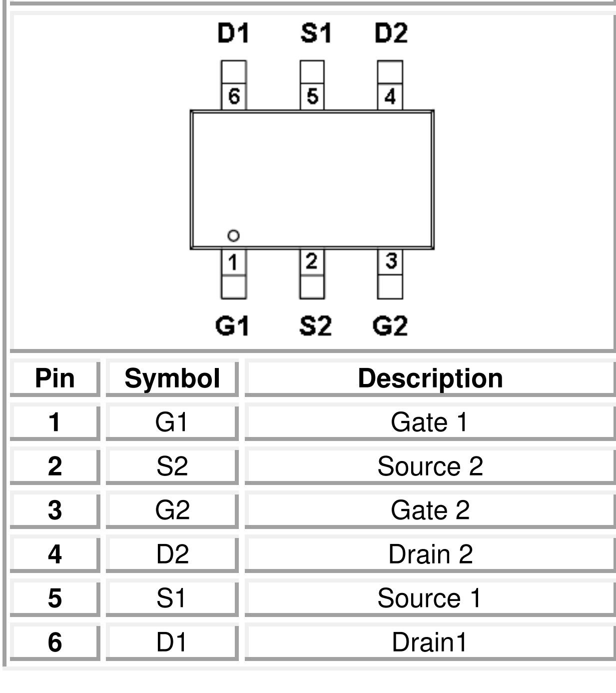
Features

- N-Channel
  20V/3.5A,$R_{DS(ON)}$=52mΩ@V_{GS}=4.5V
  20V/2.6A,$R_{DS(ON)}$=62mΩ@V_{GS}=2.5V
- P-Channel
  -20V/-3.0A,$R_{DS(ON)}$=105mΩ@V_{GS}=-4.5V
  -20V/-2.4A,$R_{DS(ON)}$=150mΩ@V_{GS}=-2.5V
- Super high density cell design for extremely low R_{DS} (ON)
- Exceptional on-resistance and maximum DC current capability
- TSOP-6P package design

Applications

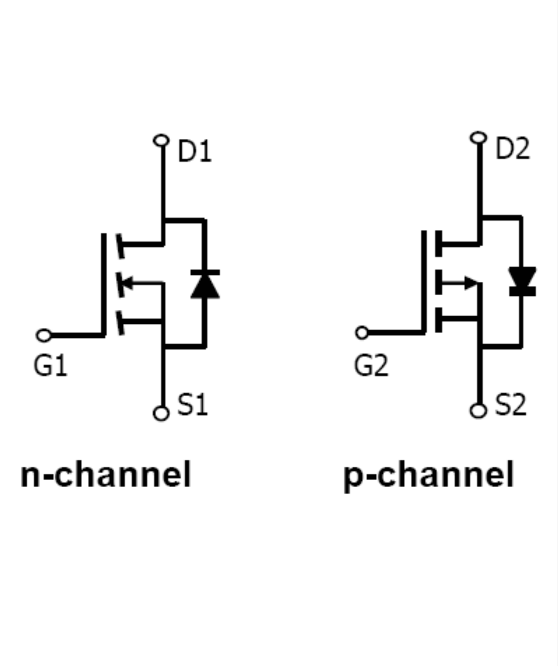
- Power Management in Notebook
- Portable Equipment
- Battery Powered System
- DC/DC Converter
- Load Switch
- DSC
- LCD Display inverter

Packages & Pin Assignments

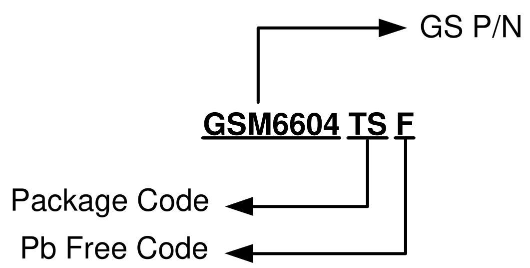


GSM6604TSF (TSOP-6P)

Pin	Symbol	Description
1	G1	Gate 1
2	S2	Source 2
3	G2	Gate 2
4	D2	Drain 2
5	S1	Source 1
6	D1	Drain1

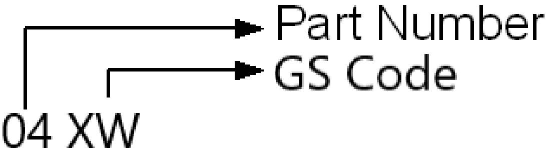


Ordering Information



Part Number	Package	Quantity Reel
GSM6604TSF	TSOP-6P	3000 PCS

Marking Information



Absolute Maximum Ratings

T_A=25ºC Unless otherwise noted

Symbol	Parameter		Typical N-Channel	Typical P-Channel	Unit
V_{DSS}	Drain-Source Voltage		20	-20	V
V_{GSS}	Gate –Source Voltage		±12	±12	V
I_D	Continuous Drain Current(T_J=150℃)	T_A=25℃	3.5	-3.0	A
		T_A=70℃	2.6	-2.4	
I_{DM}	Pulsed Drain Current		15	-15	A
I_S	Continuous Source Current (Diode Conduction)		1.5	-1.5	A
P_D	Power Dissipation	T_A=25℃	2.0		W
		T_A=70℃	1.3		
T_J	Operating Junction Temperature		150		℃
T_{STG}	Storage Temperature Range		-55/150		℃
$R_{θJA}$	Thermal Resistance-Junction to Ambient		120		℃/W

Electrical Characteristics (N-Channel)

(T_A=25ºC unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS}=0V,I_D=250uA	20			V
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS},I_D=250uA	0.3		0.8	V
I_{GSS}	Gate Leakage Current	V_{DS}=0V,V_{GS}=±12V			±100	nA
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=16V,V_{GS}=0V			1	uA
		V_{DS}=16V,V_{GS}=0V, T_J=85ºC			10	
$I_{D(on)}$	On-State Drain Current	V_{DS}≧5V,V_{GS}=4.5V	6			A
		V_{DS}≧5V,V_{GS}=2.5V	4			
$R_{DS(on)}$	Drain-Source On-Resistance	V_{GS}=4.5V,I_D=3.5A		44	52	mΩ
		V_{GS}=2.5V,I_D=2.6A		52	62	
g_{FS}	Forward Transconductance	V_{DS}=5V,I_D=3.6A		10		S
V_{SD}	Diode Forward Voltage	I_S=1.6A,V_{GS}=0V		0.85	1.2	V
Dynamic						
C_{iss}	Input Capacitance	V_{DS}=10V, V_{GS}=0V,f=1MHz		340		pF
C_{oss}	Output Capacitance			115		
C_{rss}	Reverse Transfer Capacitance			33		
Q_g	Total Gate Charge	V_{DS}=10V, V_{GS}=4.5V,I_D=3.6A		4.2	5.0	nC
Q_{gs}	Gate-Source Charge			0.6		
Q_{gd}	Gate-Drain Charge			0.4		
$t_{d(on)}$	Turn-On Time	V_{DD}=10V, R_L=2.8Ω,I_D=3.6A, V_{GEN}=4.5V,R_G=1Ω		8	15	ns
T_r				8	15	
$t_{d(off)}$	Turn-Off Time			25	40	
T_f				8	15	

Electrical Characteristics (P-Channel)

(T_A=25ºC unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS}=0V,I_D=-250uA	-20			V
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS},I_D=-250uA	-0.5		-1.0	V
I_{GSS}	Gate Leakage Current	V_{DS}=0V,V_{GS}=±12V			±100	nA
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=-16V,V_{GS}=0V			-1	uA
		V_{DS}=-16V,V_{GS}=0V, T_J=85ºC			-30	uA
$I_{D(on)}$	On-State Drain Current	$V_{DS}\leqq$-5V,V_{GS}=-4.5V	-6			A
		$V_{DS}\leqq$-5V,V_{GS}=-2.5V	-3			A
$R_{DS(on)}$	Drain-Source On-Resistance	V_{GS}=-4.5V,I_D=-3.0A		96	105	mΩ
		V_{GS}=-2.5V,I_D=-2.4A		138	150	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V,I_D=-2.8A		6.5		S
V_{SD}	Diode Forward Voltage	I_S=-1.25A,V_{GS}=0V		-0.75	-1.3	V
Dynamic						
C_{iss}	Input Capacitance	V_{DS}=-6V, V_{GS}=0V,f=1MHz		415		pF
C_{oss}	Output Capacitance			223		pF
C_{rss}	Reverse Transfer Capacitance			87		pF
Q_g	Total Gate Charge	V_{DS}=-6V, V_{GS}=-4.5V,I_D=-2.8A		5.8	10	nC
Q_{gs}	Gate-Source Charge			0.85		nC
Q_{gd}	Gate-Drain Charge			1.7		nC
$t_{d(on)}$	Turn-On Time	V_{DD}=-6V, R_L=6Ω,I_D=-1.0A, V_{GEN}=-4.5V,R_G=6Ω		13	25	ns
T_r				36	60	ns
$t_{d(off)}$	Turn-Off Time			42	70	ns
T_f				34	60	ns

Typical Performance Characteristics (N-Channel)

V_{GS} = 5 thru 2 V
V_{GS} = 1.5 V
V_{GS} = 1 V
I_D - Drain Current (A)
V_{DS} - Drain-to-Source Voltage (V)

Output Characteristics

T_C = 25 °C
T_C = 125 °C
T_C = - 55 °C
I_D - Drain Current (A)
V_{GS} - Gate-to-Source Voltage (V)

Transfer Characteristics

T_C = 25 °C
T_C = 125 °C
T_C = - 55 °C
I_D - Drain Current (A)
V_{GS} - Gate-to-Source Voltage (V)

Transfer Characteristics

V_{GS} = 2.5 V
V_{GS} = 4.5 V
$R_{DS(on)}$ - On-Resistance (Ω)
I_D - Drain Current (A)

On-Resistance vs. Drain Current

C_{iss}
C_{oss}
C_{rss}
C - Capacitance (pF)
V_{DS} - Drain-to-Source Voltage (V)

Capacitance

I_D = 3.6 A
V_{DS} = 10 V
V_{DS} = 15 V
V_{DS} = 5 V
V_{GS} - Gate-to-Source Voltage (V)
Q_g - Total Gate Charge (nC)

Gate Charge

Typical Performance Characteristics (N-Channel Continue)

$R_{DS(on)}$ - On-Resistance (Normalized)

V_{GS} = 2.5 V, I_D = 3.1 A

V_{GS} = 4.5 V, I_D = 3.8 A

T_J - Junction Temperature (°C)

On-Resistance vs. Junction Temperature

I_S - Source Current (A)

T_J = 150 °C

T_J = 25 °C

T_J = - 55 °C

V_{SD} - Source-to-Drain Voltage (V)

Source-Drain Diode Forward Voltage

$R_{DS(on)}$ - On-Resistance (Ω)

T_J = 125 °C

T_J = 25 °C

V_{GS} - Gate-to-Source Voltage (V)

On-Resistance vs. Gate-to-Source Voltage

$V_{GS(th)}$ Variance (V)

I_D = 1 mA

I_D = 250 µA

T_J - Temperature (°C)

Threshold Voltage

Normalized Effective Transient Thermal Impedance

Duty Cycle = 0.5

0.2

0.1

0.05

0.02

Single Pulse

Notes:

P_{DM}

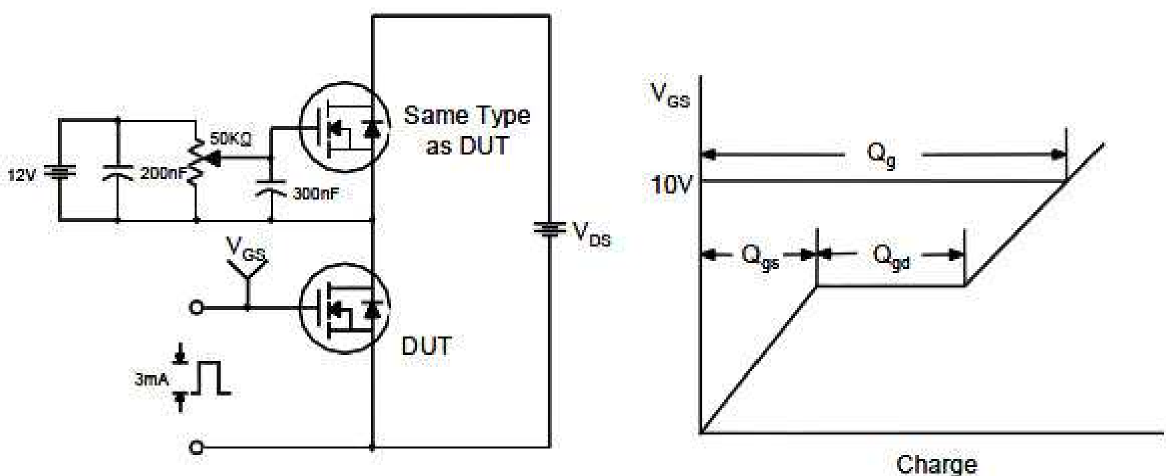
1. Duty Cycle, D = $\frac{t_1}{t_2}$
2. Per Unit Base = R_{thJA} = 70 °C/W
3. $T_{JM} - T_A = P_{DM}Z_{thJA}^{(t)}$
4. Surface Mounted

Square Wave Pulse Duration (s)

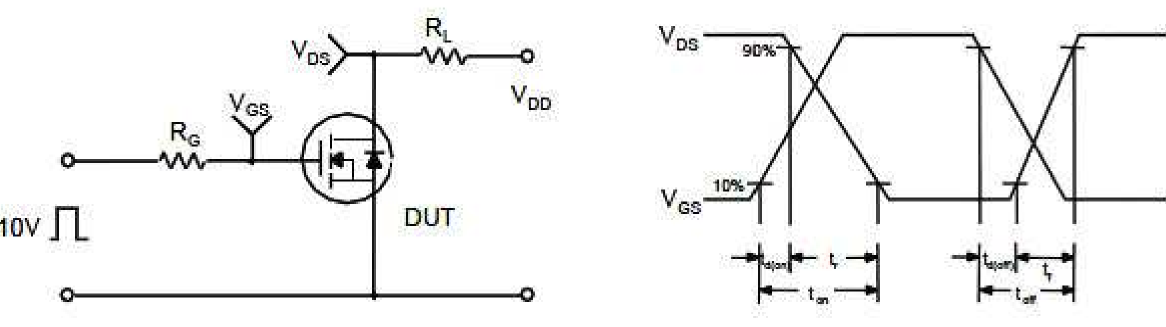
Normalized Thermal Transient Impedance, Junction-to-Ambient

Typical Performance Characteristics **(N-Channel Continue)**

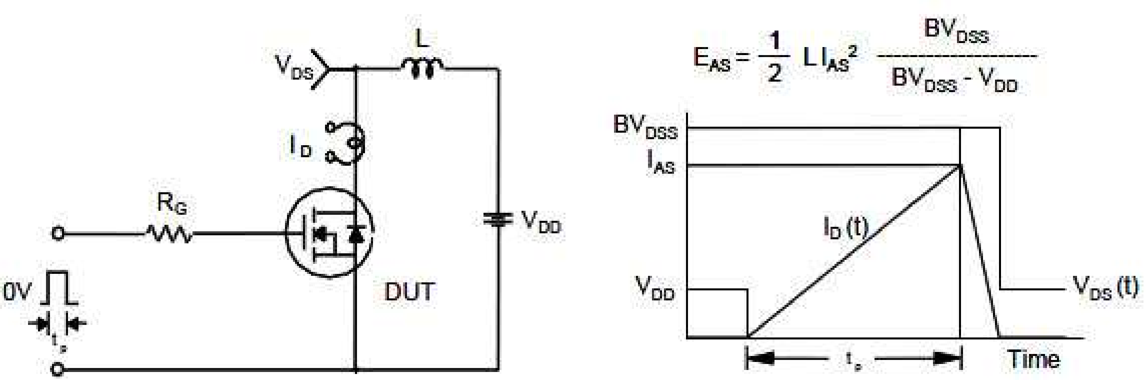
Gate Charge Test Circuit & Waveform



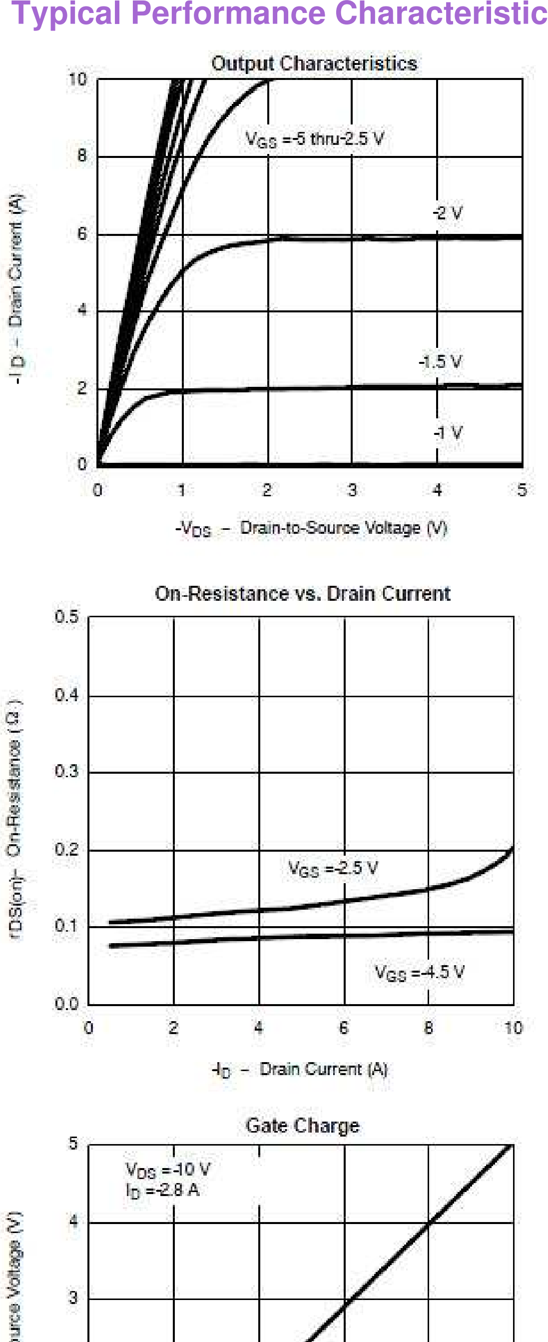
Resistive Switching Test Circuit & Waveforms

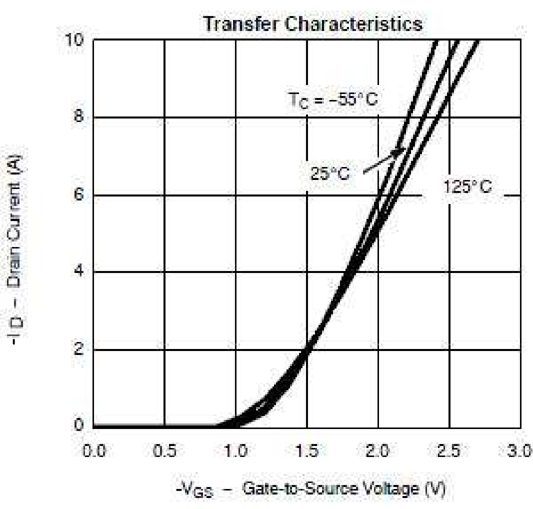


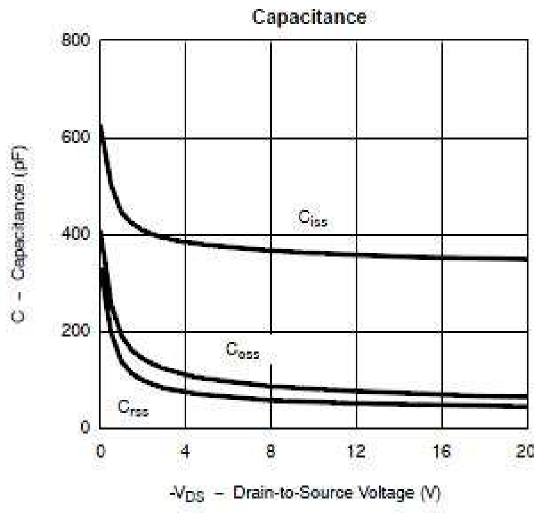
Unclamped Inductive Switching Test Circuit & Waveforms

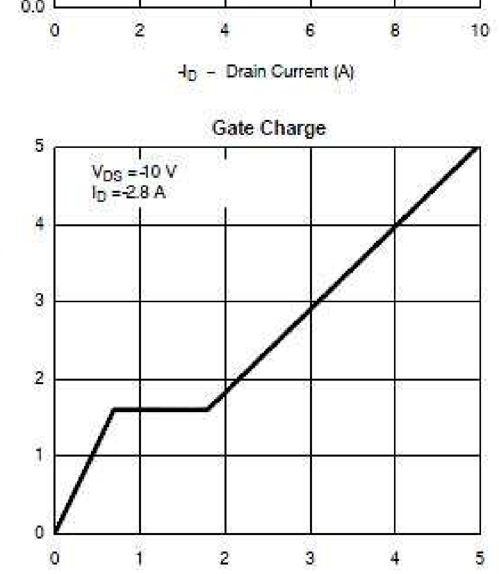


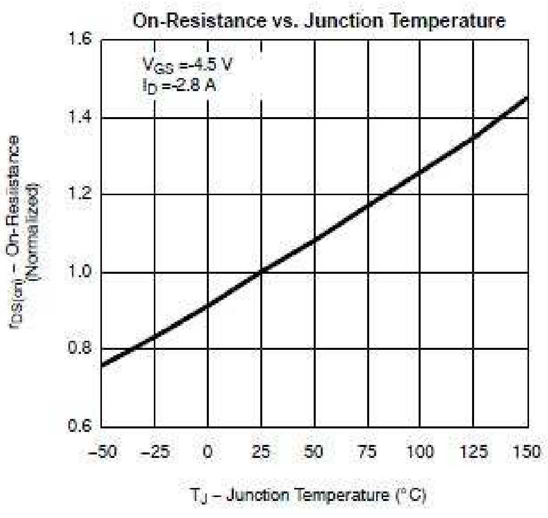
Typical Performance Characteristics (P-Channel)











Typical Performance Characteristics **(P-Channel Continue)**

Source-Drain Diode Forward Voltage

T_J = 150°C

T_J = 25°C

-I S – Source Current (A)

-V_{SD} – Source-to-Drain Voltage (V)

On-Resistance vs. Gate-to-Source Voltage

I_D = -2.8 A

$r_{DS(on)}$ – On-Resistance (Ω)

-V_{GS} – Gate-to-Source Voltage (V)

Threshold Voltage

I_D = -250 µA

-VGS(th) Variance (V)

T_J – Temperature (°C)

Single Pulse Power

T_A = 25°C

Power (W)

Time (sec)

Normalized Thermal Transient Impedance, Junction-to-Ambient

Duty Cycle = 0.5

0.2

0.1

0.05

0.02

Single Pulse

Normalized Effective Transient Thermal Impedance

Notes:

P_{DM}

t_1

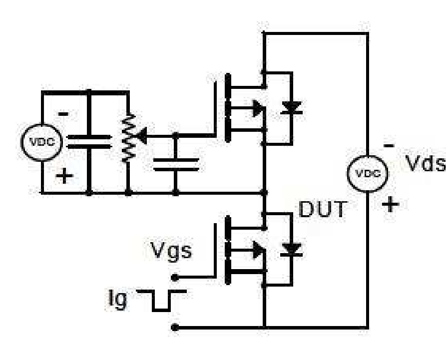
t_2

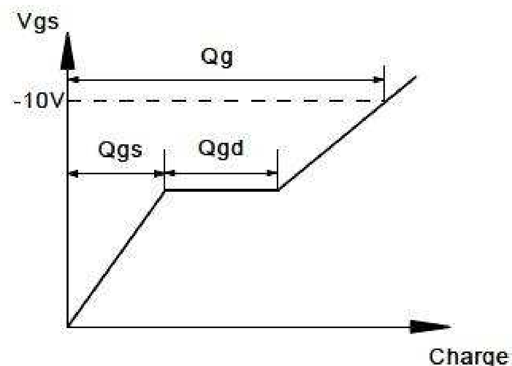
1. Duty Cycle, D = $\frac{t_1}{t_2}$
2. Per Unit Base = R_{thJA} = 62.5°C/W
3. $T_{JM} - T_A = P_{DM}Z_{thJA}^{(t)}$
4. Surface Mounted

GSM6604

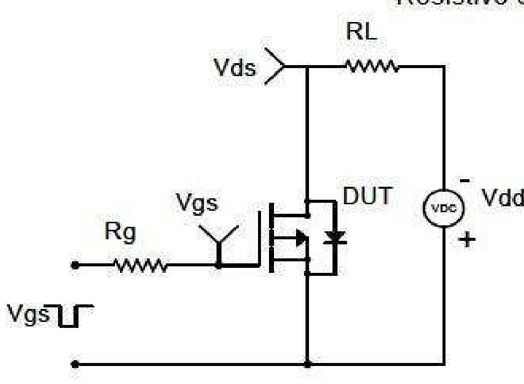
Typical Performance Characteristics (P-Channel Continue)

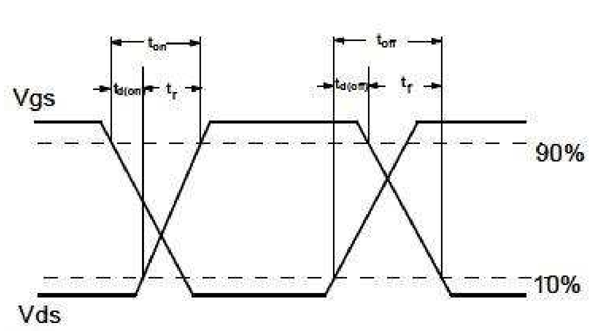
Gate Charge Test Circuit & Waveform



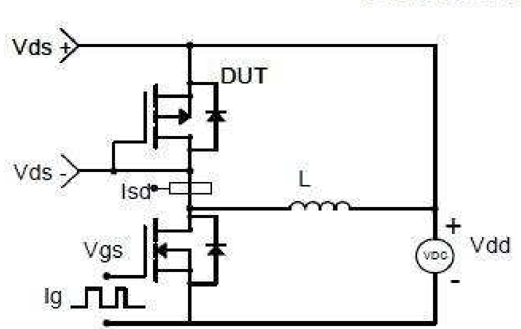


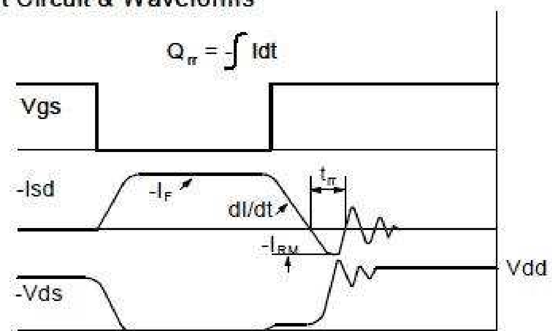
Resistive Switching Test Circuit & Waveforms





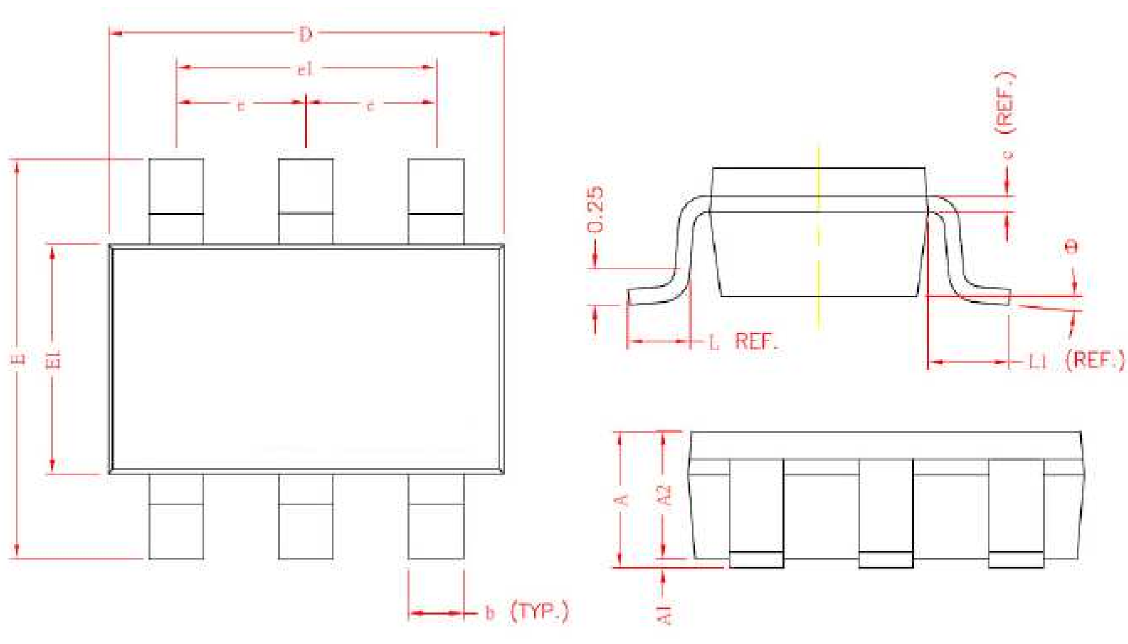
Diode Recovery Test Circuit & Waveforms





Package Dimension

TSOP-6P



Dimensions				
Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	-	1.45	-	0.057
A1	0.00	0.10	0.000	0.004
A2	0.70	1.35	0.028	0.053
c	0.12 (REF)		0.005 (REF)	
D	2.70	3.10	0.106	0.122
E	2.60	3.00	0.102	0.118
E1	1.40	1.80	0.055	0.071
L	0.45 (REF)		0.018 (REF)	
L1	0.60 (REF)		0.024 (REF)	
θ	0°	10°	0°	10°
b	0.30	0.50	0.012	0.020
e	0.95 (REF)		0.037 (REF)	
e1	1.90 (REF)		0.075 (REF)	

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