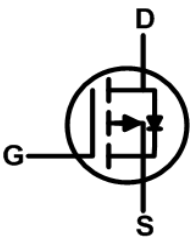
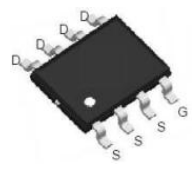



●General Description

The P-ch MOSFET LH13P04 has the low $R_{DS(on)}$, low gate charge, fast switching and excellent avalanche characteristics. This device is suitable for fast charge and lighting.

●Features

- Green Device Available
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- Advanced high cell density Tren ch technology

	$V_{DS} = -40V$ $R_{DS(ON)} = 35m\Omega$ $I_D = -13A$
 <p style="text-align: center;">SOP-8</p>	<p style="text-align: right;">■ RoHS COMPLIANT</p> 

●Ordering Information:

Part Number	LH13P04
Package	SOP-8
Basic Ordering Unit (pcs)	4000
Normal Package Material Ordering Code	LH13P04S-SOP-8-TAP
Halogen Free Ordering Code	LH13P04S-SOP-8-TAP-HF

●Absolute Maximum Ratings (TC =25°C)

PARAMETER	SYMBOL	Value	UNIT
Drain-Source Breakdown Voltage	BV_{DSS}	-40	V
Gate-Source Voltage	V_{GS}	±20	V
Continuous Drain Current ¹	$I_D @T_A=25^\circ C$	-13	A
	$I_D @T_A=100^\circ C$	-6.5	
Pulsed drain current ²	I_{DM}	-20	A
Avalanche Energy ³	E_{AS}	23	mJ
Avalanche Current	I_{AS}	-25	W
Power Dissipation @ $T_A=25^\circ C$ ⁴	P_D	3.1	
Operating Temperature	T_J	-55~+150	°C
Storage Temperature	T_{STG}	-55~+150	°C

●P-Channel Electronic Characteristics

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=-250\mu A$	-40	--	--	V
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.0	-1.5	-3.0	V
Drain-source On Resistance	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-12A$	--	30	35	mΩ
		$V_{GS}=-4.5V, I_D=-6A$	--	48	57	
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=-40V, V_{GS}=0V, T_J=25^\circ C$	--	--	-1	uA
		$V_{DS}=-32V, V_{GS}=0V, T_J=25^\circ C$	--	--	-5	
Gate-to-Source Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	--	--	± 100	nA
Input Capacitance	C_{iss}	$V_{DS}=-15V, V_{GS}=0V, f=1MHz$	--	847	--	pF
Output Capacitance	C_{oss}		--	125	--	
Reverse Transfer Capacitance	C_{rss}		--	40	--	
Turn-on delay time	$T_d(on)$	$V_{DD}=-15V, V_{GS}=-10V, R_G=6\Omega, I_D=-1A$	--	35	--	ns
Rise time	T_r		--	16	--	
Turn -Off Delay Time	$T_d(off)$		--	58	--	
Fall time	T_f		--	8	--	
Total Gate Charge(4.5V)	Q_g	$V_{DS}=-20V, V_{GS}=-4.5V, I_D=-12A$	--	9.8	--	nC
Gate-to-Source Charge	Q_{gs}		--	5.0	--	
Gate-to-Drain Charge	Q_{gd}		--	4.3	--	
Continuous Diode Forward Current	I_S	$V_G=V_D=0V, \text{Force Currnet}$	--	--	-13	A
Pulsed Diode Forward Current	I_{SM}		--	--	-20	A
Diode Forward Voltage	V_{SD}	$T_J=25^\circ C, I_S=-1A, V_{GS}=0V$	--	--	-1.2	V

●Thermal Characteristics

PARAMETER	SYMBOL	MAX	UNIT
Thermal Resistance Junction-case	R_{thJC}	85	$^{\circ}C/W$
Thermal Resistance Junction-ambient	R_{thJA}	50	$^{\circ}C/W$

Notes:

1. The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
2. The data tested by pulsed , pulse width \cong 300us , duty cycle \cong 2%
3. The P-Ch EAS data shows Max. rating . The test condition is $V_{DD}=-15V, V_{GS}=-10V, L=0.1mH, I_{AS}=-13A$
4. The power dissipation is limited by 150 $^{\circ}C$ junction temperature
5. The data is theoretically the same as ID and IDM , in real applications , should be limited by total power dissipation.

• Typical Characteristics

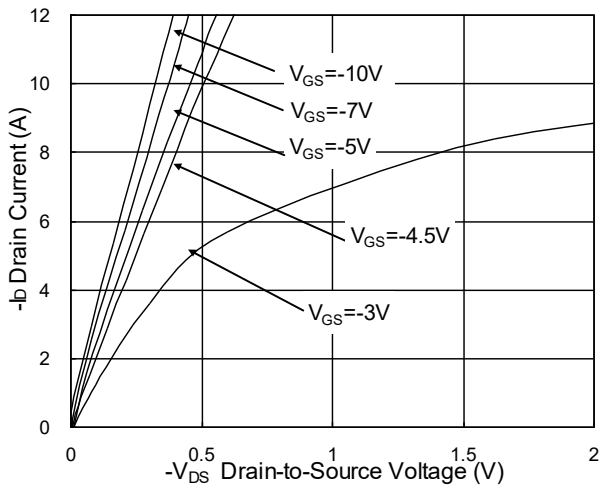


Fig.1 Typical Output Characteristics

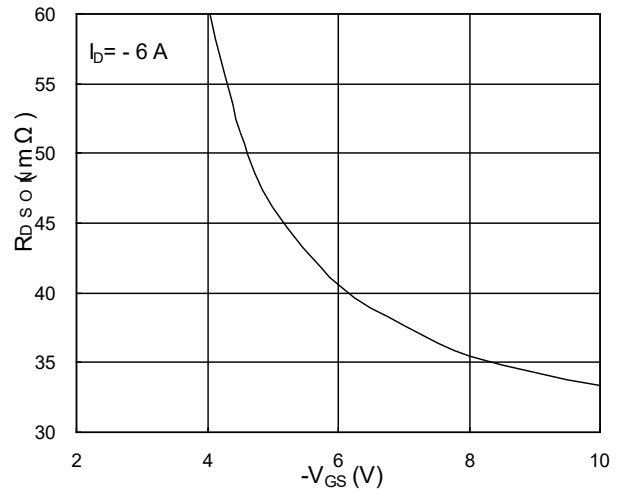


Fig.2 On-Resistance vs. G-S Voltage

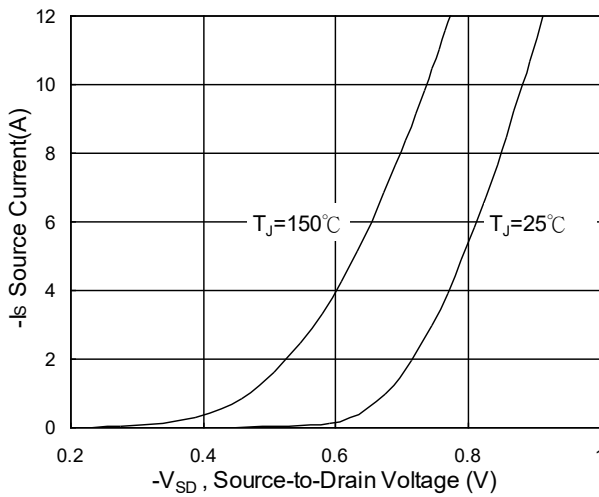


Fig.3 Source Drain Forward Characteristics

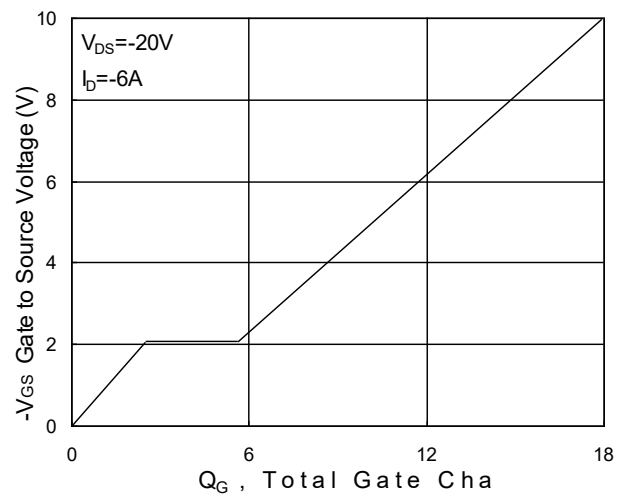


Fig.4 Gate-Charge Characteristics

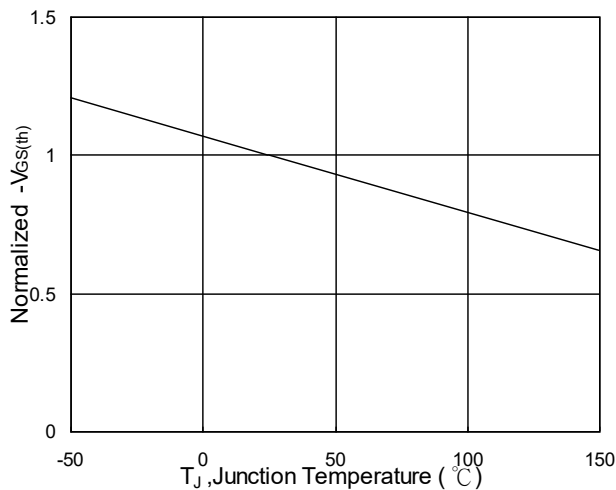


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

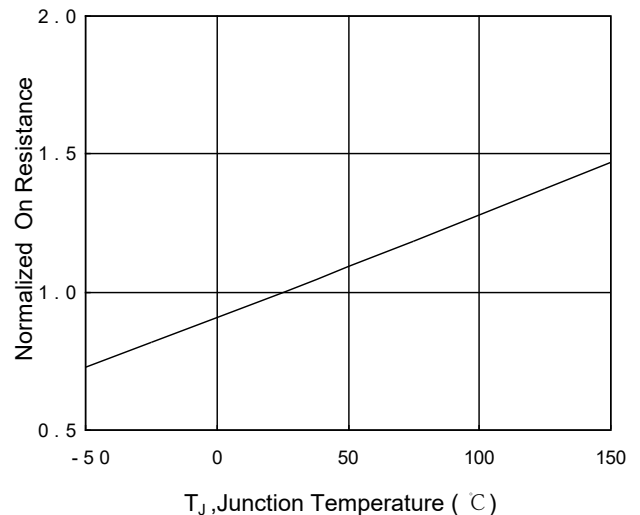


Fig.6 Normalized $R_{DS(on)}$ vs. T_J

•Typical Characteristics (cont.)

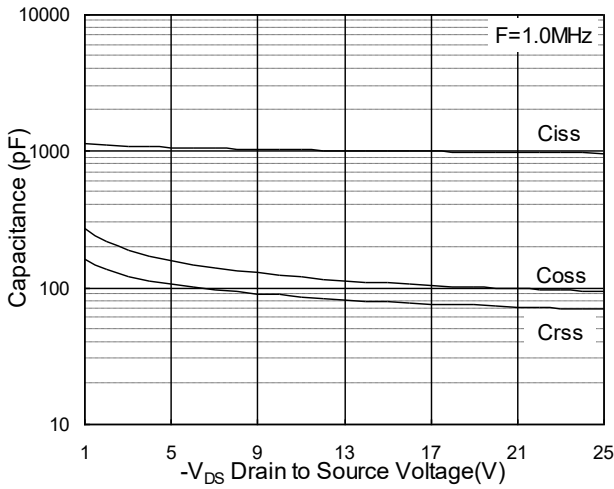


Fig.7 Capacitance

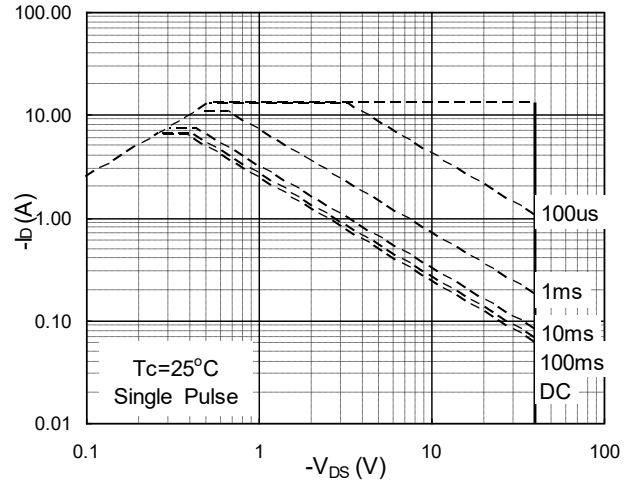


Fig.8 Safe Operating Area

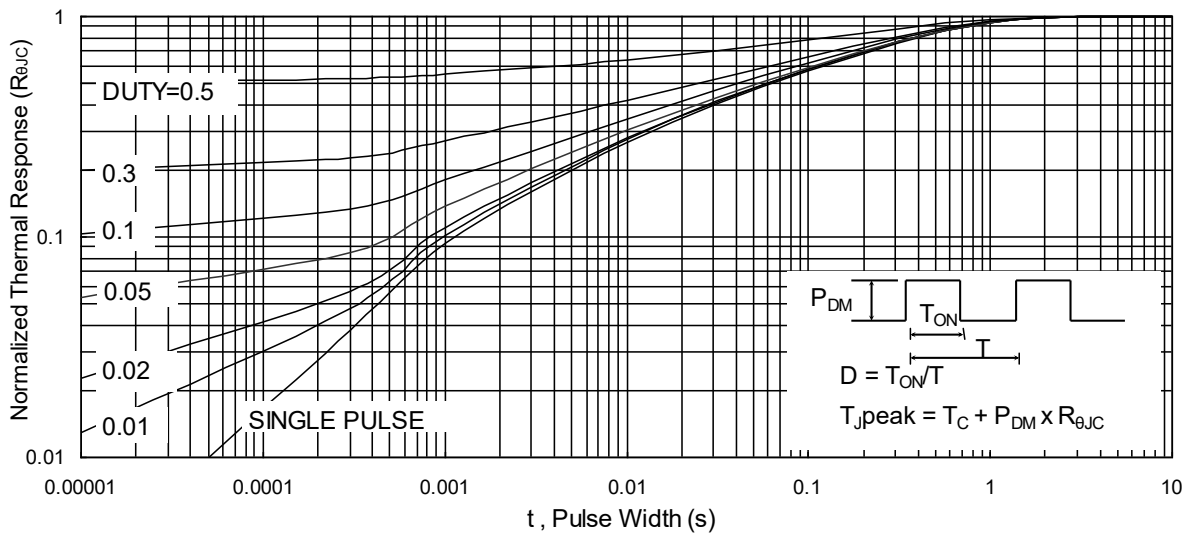


Fig.9 Normalized Maximum Transient Thermal Impedance

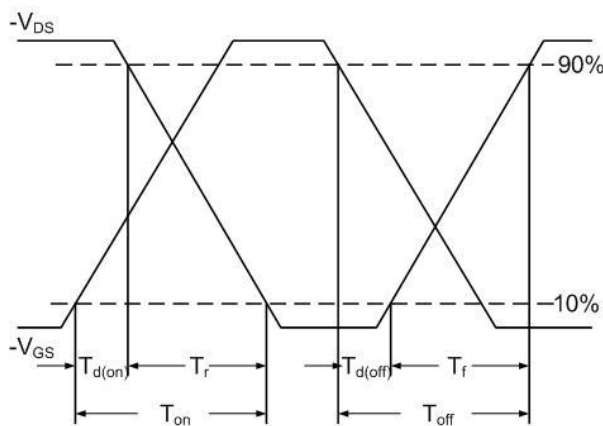


Fig.10 Switching Time Waveform

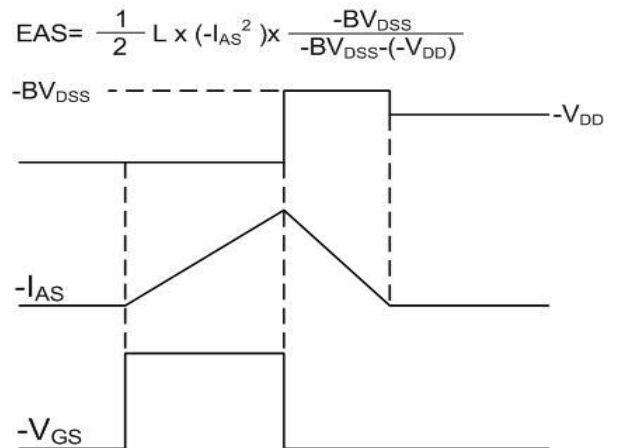


Fig.11 Unclamped Inductive Waveform

●Dimensions (SOP-8)

UNIT:mm

SYMBOL	min	max	SYMBOL	min	max
A	1.30	1.60	e	1.27BSC	
A1	1.35	1.85	L	0.40	1.30
b	0.30	0.60			
C	0.15	0.35			
D	4.60	5.20			
E	3.70	4.10			
E1	5.70	6.30			

