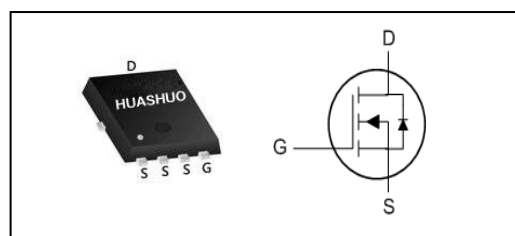


**Description**

- Advanced Trench Technology
  - Low Gate Charge
  - 100% UIS Tested
  - Low Gate Charge
- 
- SMPS Synchronous Rectification
  - DC/DC Converters
  - Or-ing

**Product Summary**

$V_{DS}$	40	V
$R_{DS(ON),typ}$	4.7	m $\Omega$
$I_D$	49	A

**PRPAK5X6 Pin Configuration**

**Absolute Maximum Ratings**

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	40	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D@T_C=25^\circ C$	Continuous Drain Current <sup>1</sup>	49	A
$I_D@T_C=100^\circ C$	Continuous Drain Current <sup>1</sup>	29	A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	90	A
EAS	Single Pulse Avalanche Energy <sup>3</sup>	68	mJ
$I_{AS}$	Avalanche Current	37	A
$P_D@T_C=25^\circ C$	Total Power Dissipation <sup>4</sup>	22	W
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ C$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ C$

**Thermal Data**

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-ambient (Steady State) <sup>1</sup>	---	65	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	---	6	$^\circ C/W$



**Electrical Characteristics ( $T_J=25\text{ }^\circ\text{C}$ , unless otherwise noted)**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	40	---	---	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance <sup>2</sup>	$V_{GS}=10V, I_D=15A$	---	4.7	6.5	m $\Omega$
		$V_{GS}=4.5V, I_D=15A$	---	7.5	10.5	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	1.2	1.9	2.2	V
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=32V, V_{GS}=0V, T_J=25^\circ C$	---	---	1	uA
		$V_{DS}=32V, V_{GS}=0V, T_J=55^\circ C$	---	---	5	
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	$\pm 100$	nA
$R_g$	Gate Resistance	$V_{DS}=0V, V_{GS}=0V, f=1MHz$	---	1.9	---	$\Omega$
$Q_g$	Total Gate Charge	$V_{DS}=20V, V_{GS}=10V, I_D=15A$	---	20	---	nC
$Q_{gs}$	Gate-Source Charge		---	3.5	---	
$Q_{gd}$	Gate-Drain Charge		---	4.2	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=20V, V_{GS}=10V, R_G=3\Omega, I_D=15A$	---	12	---	ns
$T_r$	Rise Time		---	9.6	---	
$T_{d(off)}$	Turn-Off Delay Time		---	21	---	
$T_f$	Fall Time		---	16	---	
$C_{iss}$	Input Capacitance	$V_{DS}=20V, V_{GS}=0V, f=1MHz$	---	950	---	pF
$C_{oss}$	Output Capacitance		---	493	---	
$C_{riss}$	Reverse Transfer Capacitance		---	48	---	

**Diode Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$I_S$	Continuous Source Current <sup>1,5</sup>	$V_G=V_D=0V, \text{Force Current}$	---	---	45	A
$V_{SD}$	Diode Forward Voltage <sup>2</sup>	$V_{GS}=0V, I_S=1A, T_J=25^\circ C$	---	---	1.2	V

Note :

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- 2.The data tested by pulsed , pulse width  $\leq 300\mu s$  , duty cycle  $\leq 2\%$
- 3.The EAS data shows Max. rating . The test condition is  $V_{DD}=25V, V_{GS}=10V, L=0.1mH, I_{AS}=37A$
- 4.The power dissipation is limited by 150 $^\circ\text{C}$  junction temperature
- 5.The data is theoretically the same as  $I_D$  and  $I_{DM}$  , in real applications , should be limited by total power dissipation.



Typical Characteristics

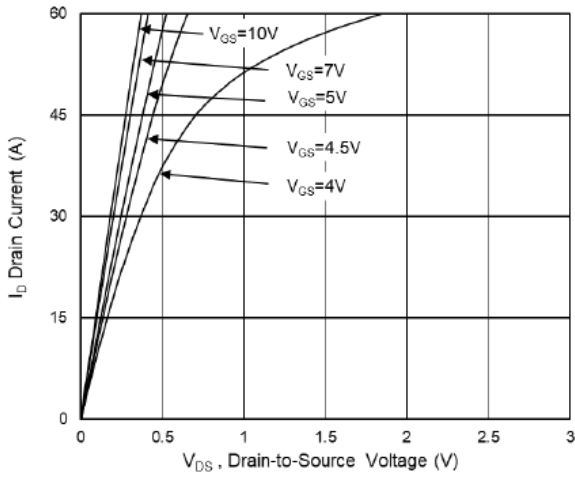


Fig.1 Typical Output Characteristics

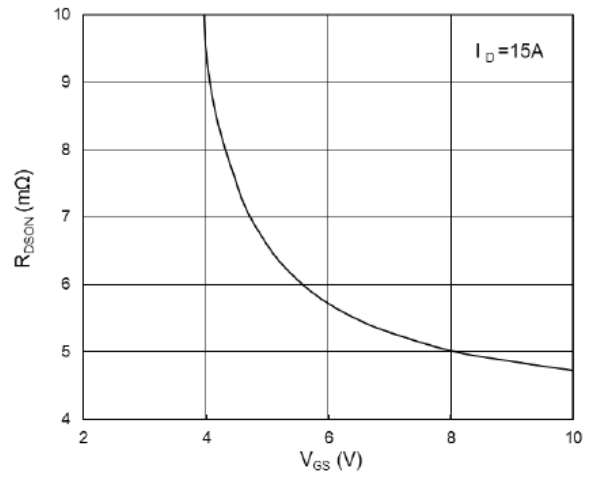


Fig.2 On-Resistance vs. G-S Voltage

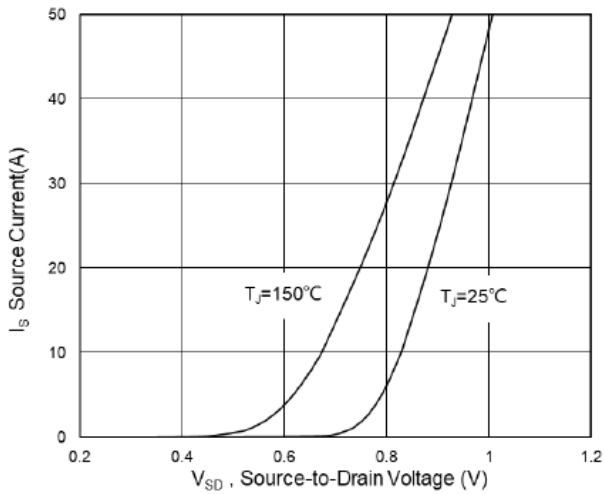


Fig.3 Source Drain Forward Characteristics

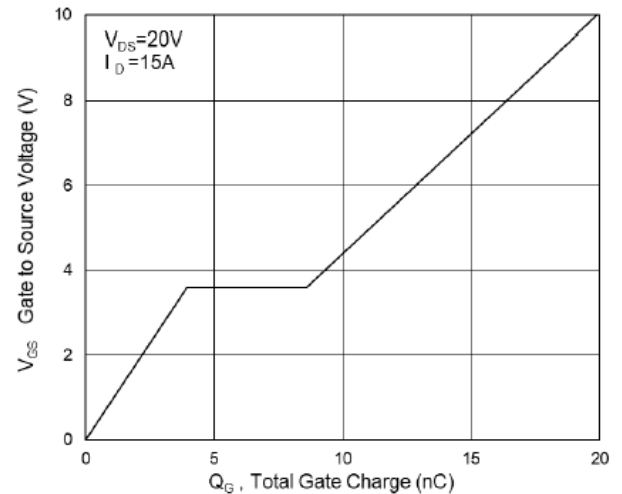


Fig.4 Gate-Charge Characteristics

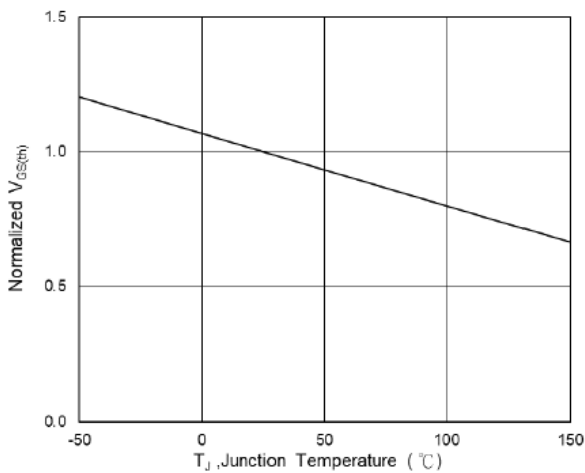


Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$

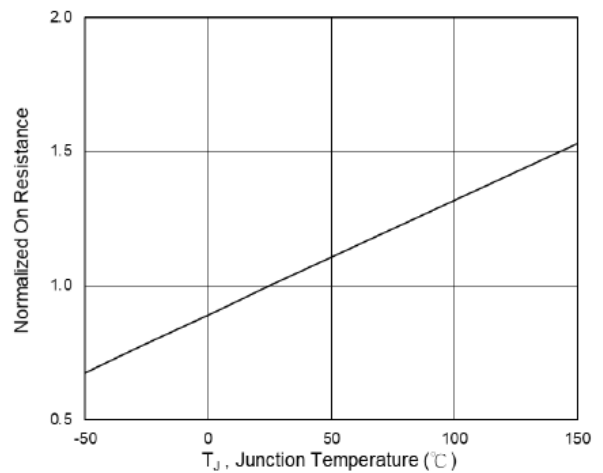
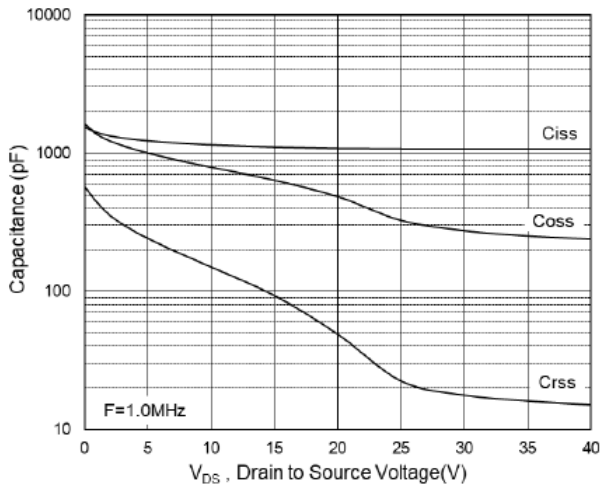
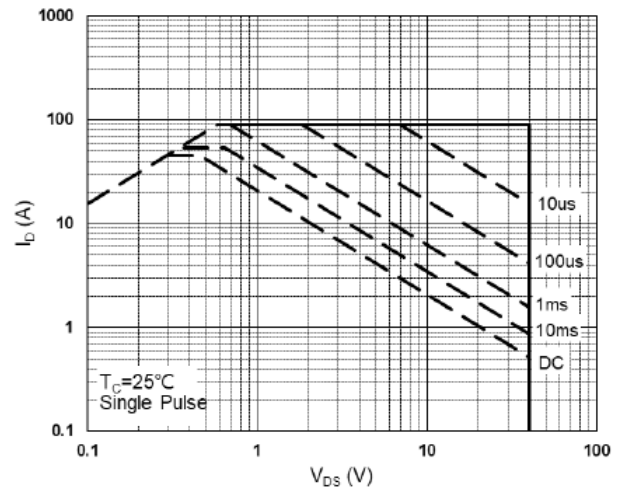


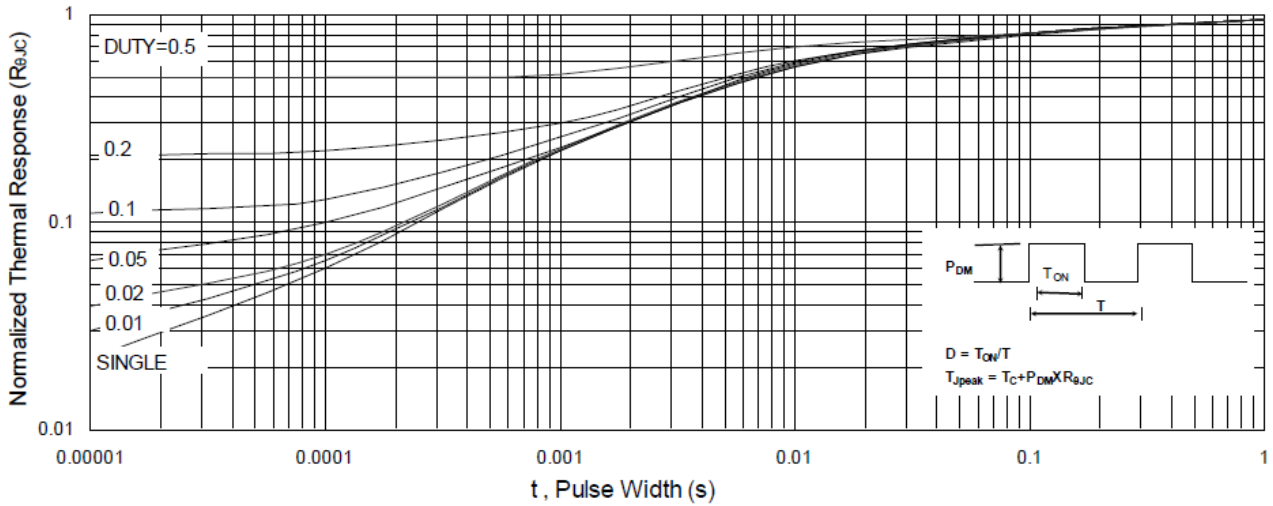
Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$



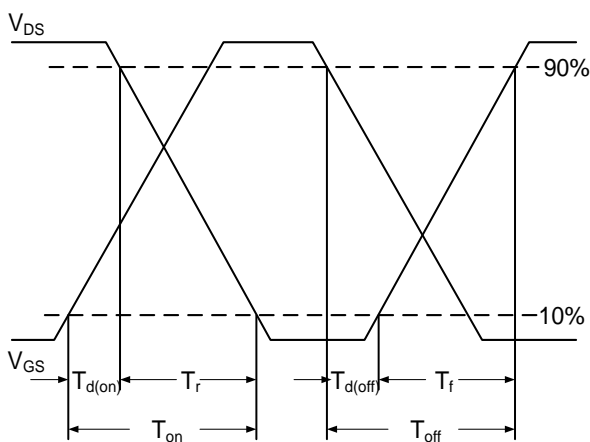
**Fig.7 Capacitance**



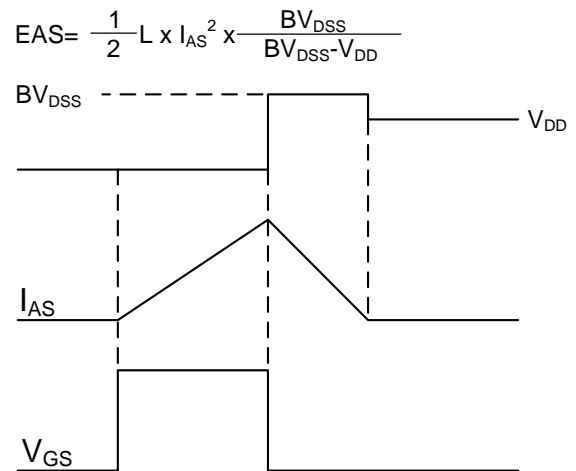
**Fig.8 Safe Operating Area**



**Fig.9 Normalized Maximum Transient Thermal Impedance**



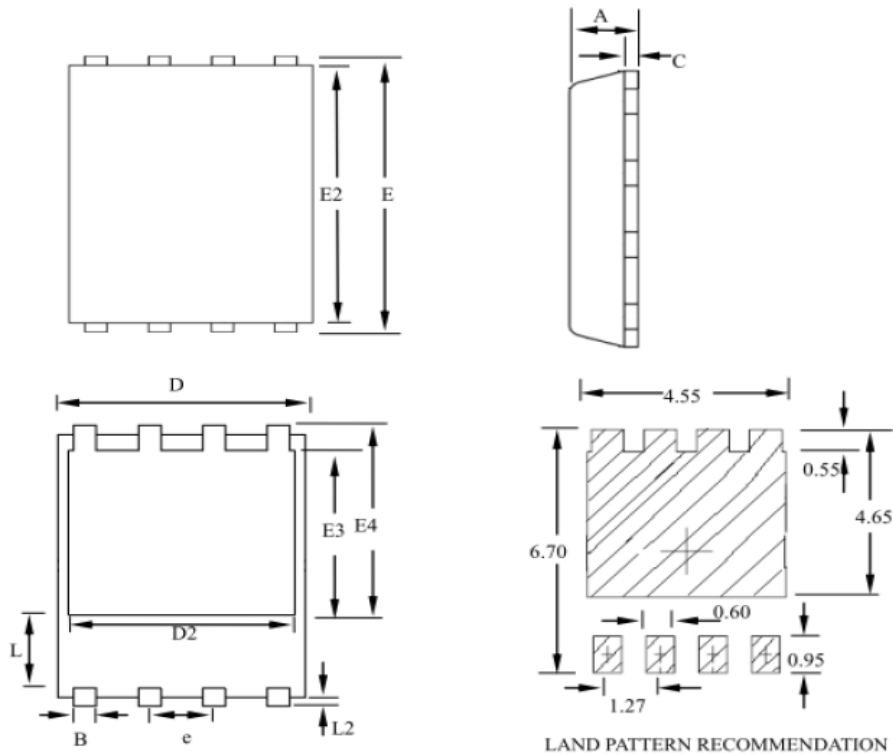
**Fig.10 Switching Time Waveform**



**Fig.11 Unclamped Inductive Waveform**

## Ordering Information

Part Number	Package code	Packaging
HSBA4054	PRPAK5*6	3000/Tape&Reel



SYMBOLS	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.80	--	1.20	0.031	--	0.047
B	0.30	--	0.51	0.012	--	0.020
C	0.15	--	0.35	0.006	--	0.014
D	4.80	--	5.30	0.189	--	0.209
D2	3.61	--	4.35	0.142	--	0.171
E	5.90	--	6.35	0.232	--	0.250
E2	5.42	--	5.90	0.213	--	0.232
E3	3.23	--	3.90	0.127	--	0.154
E4	3.69	--	4.55	0.145	--	0.179
L	0.61	--	1.80	0.024	--	0.071
L2	0.05	--	0.36	0.002	--	0.014
e	--	1.27	--	--	0.050	--