

### Description

The HSH190N03 is the high cell density trenched N-ch MOSFETs, which provide excellent R<sub>DS(on)</sub> and gate charge for most of the synchronous buck converter applications.

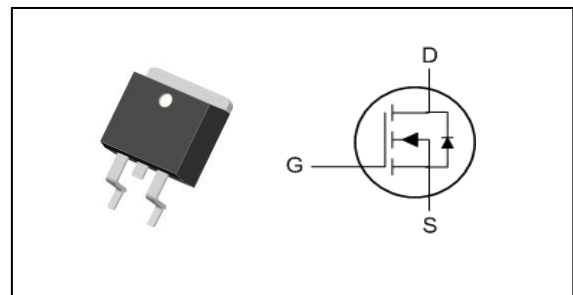
The HSH190N03 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

- 100% EAS Guaranteed
- Green Device Available
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- Advanced high cell density Trench technology

### Product Summary

V <sub>DS</sub>	30	V
R <sub>DS(ON),typ</sub>	1.9	mΩ
I <sub>D</sub>	190	A

### TO263 Pin Configuration



### Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V <sub>DS</sub>	Drain-Source Voltage	30	V
V <sub>GS</sub>	Gate-Source Voltage	±20	V
I <sub>D</sub> @T <sub>C</sub> =25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V <sub>1,6</sub>	190	A
I <sub>D</sub> @T <sub>C</sub> =100°C	Continuous Drain Current, V <sub>GS</sub> @ 10V <sub>1,6</sub>	120	A
I <sub>DM</sub>	Pulsed Drain Current <sub>2</sub>	720	A
EAS	Single Pulse Avalanche Energy <sub>3</sub>	440	mJ
I <sub>AS</sub>	Avalanche Current	42	A
P <sub>D</sub> @T <sub>C</sub> =25°C	Total Power Dissipation <sub>4</sub>	180	W
T <sub>STG</sub>	Storage Temperature Range	-55 to 175	°C
T <sub>J</sub>	Operating Junction Temperature Range	-55 to 175	°C

### Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
R <sub>θJA</sub>	Thermal Resistance Junction-Ambient <sub>1</sub>	---	62	°C/W
R <sub>θJC</sub>	Thermal Resistance Junction-Case <sub>1</sub>	---	0.85	°C/W

**N-Ch 30V Fast Switching MOSFETs**
**Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise noted)**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250uA	30	---	---	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	BV <sub>DSS</sub> Temperature Coefficient	Reference to 25°C, I <sub>D</sub> =1mA	---	0.014	---	V/°C
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sub>2</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =40A	---	1.9	2.4	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =30A	---	3	4.2	
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA	1.0	---	2.5	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient		---	-4	---	mV/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =24V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	1	uA
		V <sub>DS</sub> =24V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C	---	---	5	
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	---	---	±100	nA
Q <sub>g</sub>	Total Gate Charge (4.5V)	V <sub>DS</sub> =15V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =30A	---	94	---	nC
Q <sub>gs</sub>	Gate-Source Charge		---	19	---	
Q <sub>gd</sub>	Gate-Drain Charge		---	22	---	
T <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> =15V, V <sub>GS</sub> =10V, R <sub>G</sub> =3.3Ω, I <sub>D</sub> =30A	---	20	---	ns
T <sub>r</sub>	Rise Time		---	9	---	
T <sub>d(off)</sub>	Turn-Off Delay Time		---	66	---	
T <sub>f</sub>	Fall Time		---	19	---	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1MHz	---	6900	---	pF
C <sub>oss</sub>	Output Capacitance		---	940	---	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	619	---	

**Diode Characteristics**

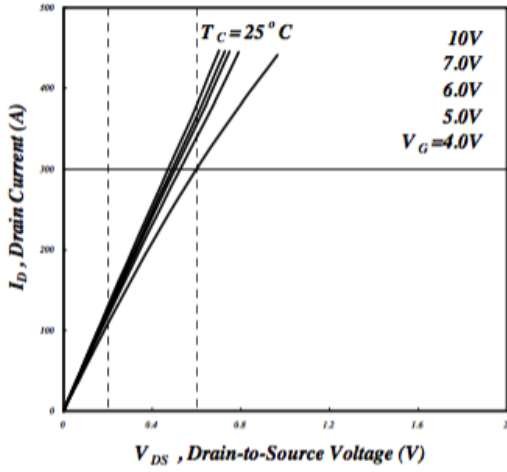
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
T <sub>rr</sub>	Reverse Recovery Time	I <sub>S</sub> =40A, V <sub>GS</sub> =0V, di/dt=100A/us	---	29	---	ns
Q <sub>rr</sub>	Reverse Recovery Charge		---	18	---	nC
V <sub>SD</sub>	Diode Forward Voltage <sub>2</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =40A, T <sub>J</sub> =25°C	---	---	1.2	V

Note :

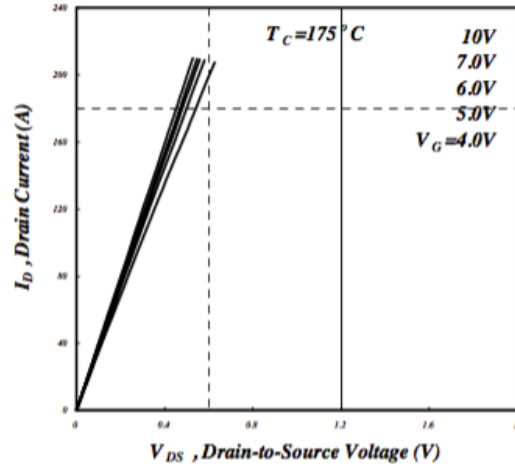
- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- 2.The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%
- 3.The EAS data shows Max. rating . The test condition is V<sub>DD</sub>=15V, V<sub>GS</sub>=10V, L=0.5mH, R<sub>G</sub>=25R, I<sub>AS</sub>=42A
- 4.The power dissipation is limited by 175°C junction temperature
- 5.The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub> , in real applications , should be limited by total power dissipation.
- 6.Package limitation current is 120A.



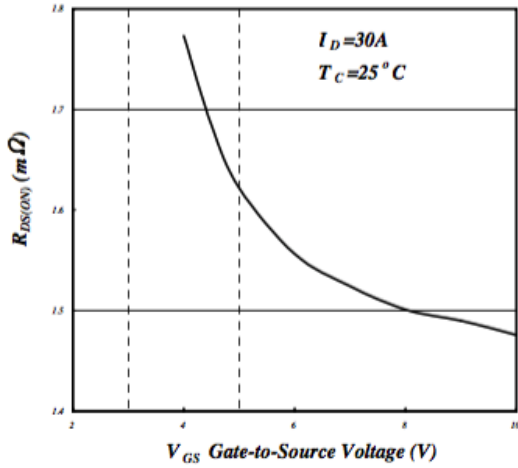
**Typical Characteristics**



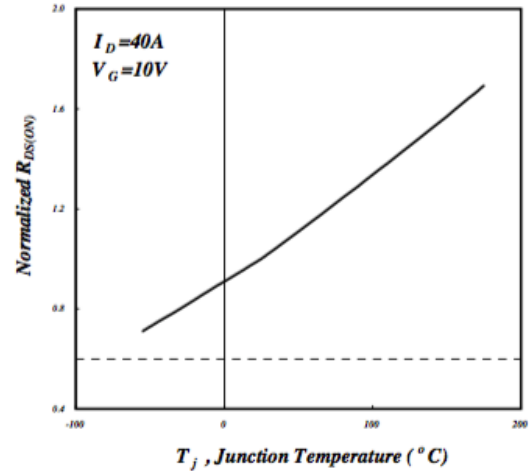
**Fig 1. Typical Output Characteristics**



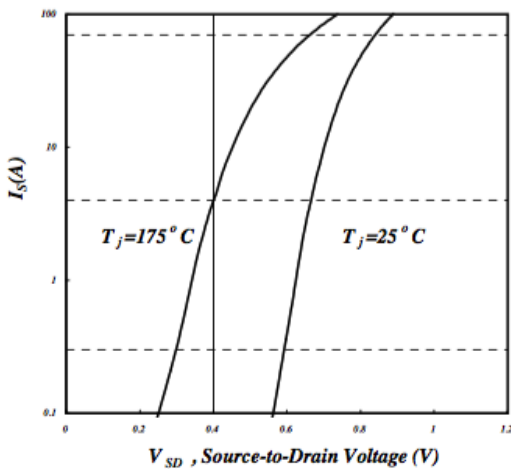
**Fig 2. Typical Output Characteristics**



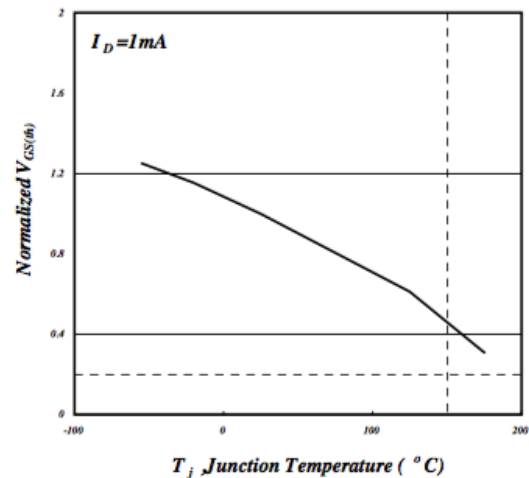
**Fig 3. On-Resistance v.s. Gate Voltage**



**Fig 4. Normalized On-Resistance v.s. Junction Temperature**



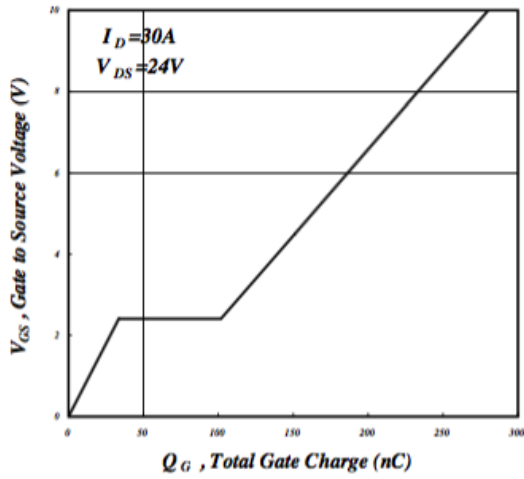
**Fig 5. Forward Characteristic of Reverse Diode**



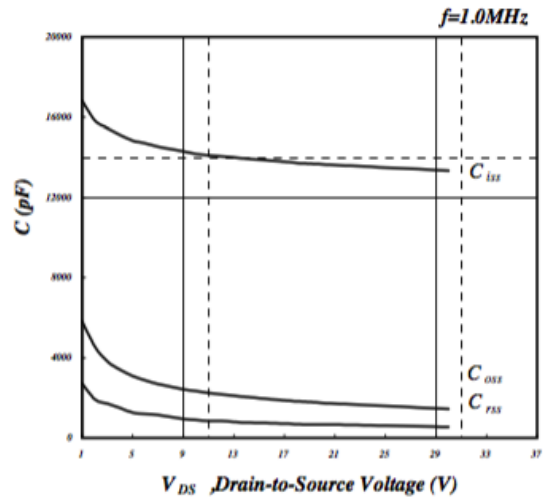
**Fig 6. Gate Threshold Voltage v.s. Junction Temperature**



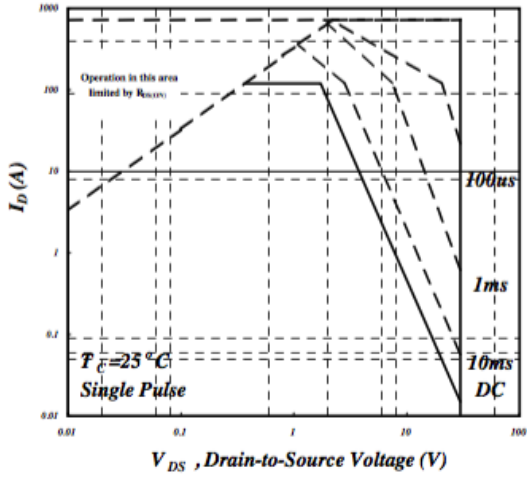
**N-Ch 30V Fast Switching MOSFETs**



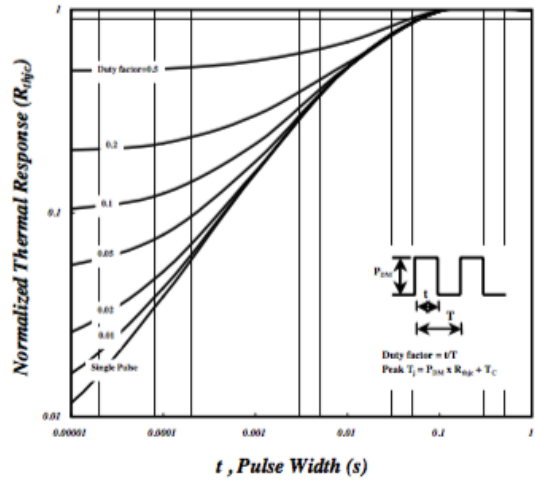
**Fig 7. Gate Charge Characteristics**



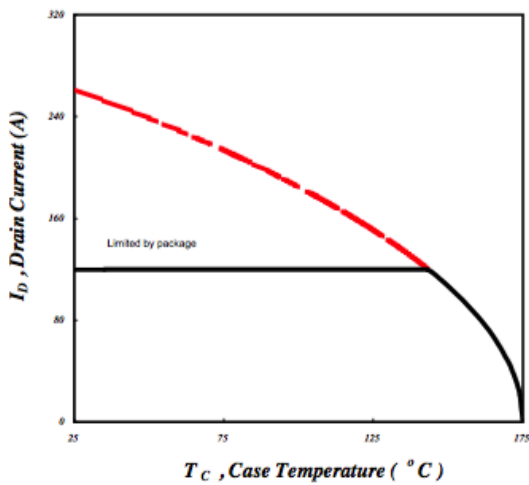
**Fig 8. Typical Capacitance Characteristics**



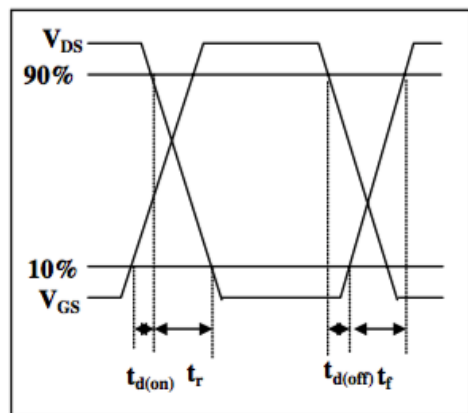
**Fig 9. Maximum Safe Operating Area**



**Fig 10. Effective Transient Thermal Impedance**



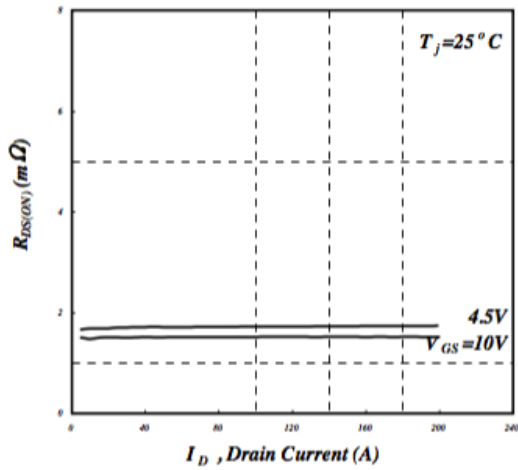
**Fig 11. Drain Current v.s. Case Temperature**



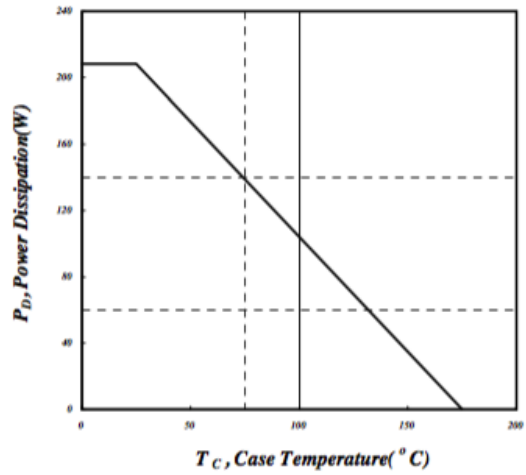
**Fig 12. Switching Time Waveform**



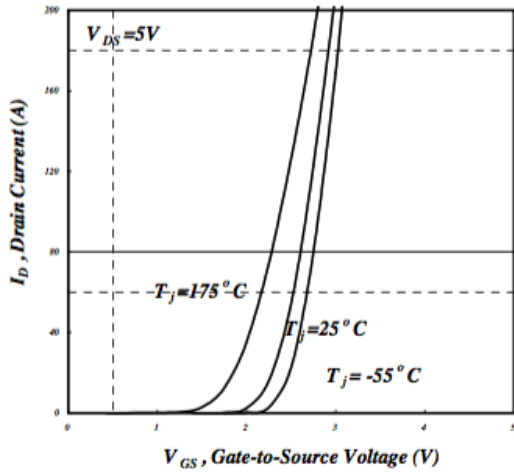
## N-Ch 30V Fast Switching MOSFETs



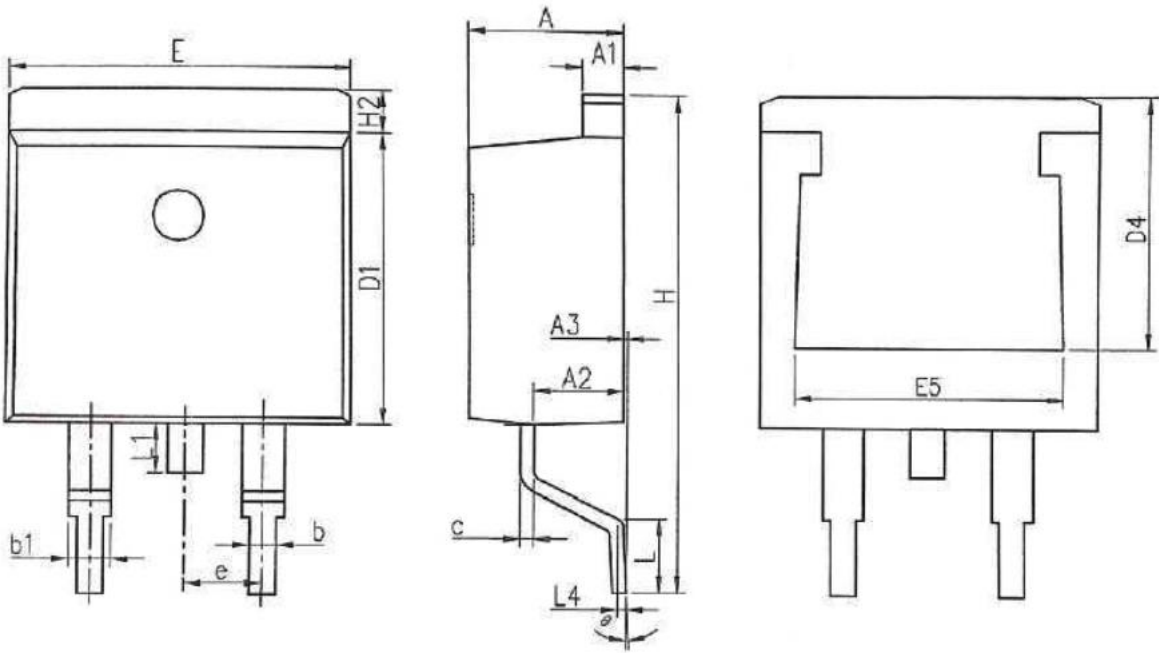
**Fig 13. Typ. Drain-Source on State Resistance**



**Fig 14. Total Power Dissipation**



**Fig 15. Transfer Characteristics**



SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.370	4.770	0.172	0.188
A1	1.220	1.420	0.048	0.056
A2	2.200	2.890	0.087	0.114
A3	0.000	0.250	0.000	0.010
b	0.700	0.960	0.028	0.038
b1	1.170	1.470	0.046	0.058
c	0.300	0.530	0.012	0.021
D1	8.500	9.300	0.335	0.366
D4	6.600	-	0.260	-
E	9.860	10.36	0.388	0.408
E5	7.060	-	0.278	-
e	2.540 BSC		0.100 BSC	
H	14.70	15.70	0.579	0.618
H2	1.070	1.470	0.042	0.058
L	2.000	2.600	0.079	0.102
L1	1.400	1.750	0.055	0.069
L4	0.250 BSC		0.010 BSC	
Θ	0°	9°	0°	9°