



HCP65R050F-S2

650V N-Channel Super Junction Power MOSFET

● Features:

■ 60A, 650V, $R_{DS(on)}(Typ) = 45m\Omega @ V_{GS}=10V$

■ Low Gate Charge

■ Low C_{rss}

■ 100% Avalanche Tested

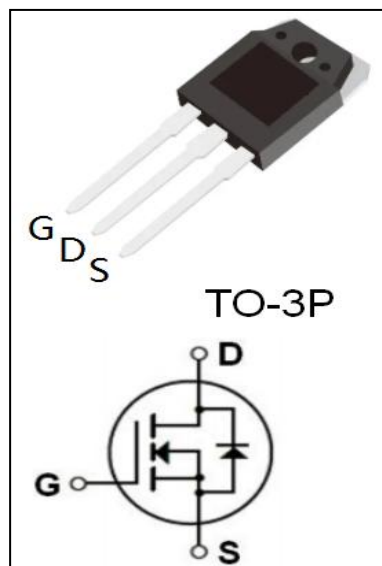
■ Fast Switching

■ Improved dv/dt Capability

● Application:

■ High Frequency Switching Mode Power Supply

■ Active Power Factor Correction



Absolute Maximum Ratings ($T_c=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-Source Voltage	650	V
I_D	Drain Current - Continuous($T_c=25^\circ\text{C}$) - Continuous($T_c=100^\circ\text{C}$)	60.0*	A
		37.9*	A
I_{DM}	Drain Current -Pulsed (Note1)	200*	A
V_{GSS}	Gate-Source Voltage	± 20	V
E_{AS}	Single Pulsed Avalanche Energy (Limit Reference Value) (Note2)	1901	mJ
I_{AR}	Avalanche Current (Note1)	12	A
dv/dt	Peak Diode Recovery dv/dt (Note3)	8.5	V/ns
P_D	Power Dissipation($T_c = 25^\circ\text{C}$) -Derate above 25°C	423	W
		3.38	W/ $^\circ\text{C}$
T_j	Operating Junction Temperature	150	$^\circ\text{C}$
T_{stg}	Storage Temperature Range	-55 to +150	$^\circ\text{C}$

* Drain Current Limited by Maximum Junction Temperature.

Thermal Characteristics

Symbol	Parameter	Max	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.296	$^\circ\text{C} / \text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62	$^\circ\text{C} / \text{W}$

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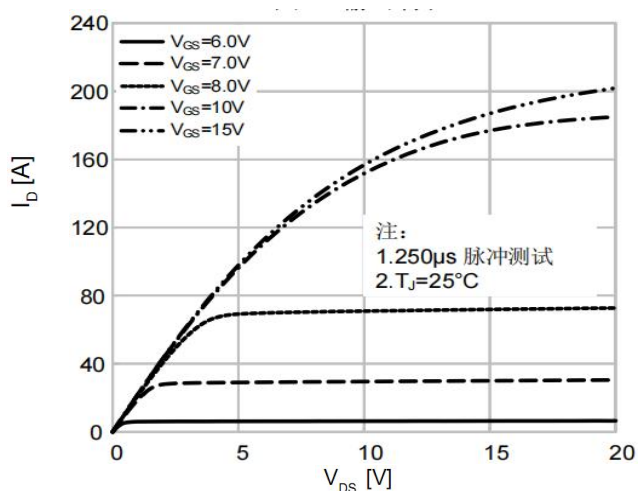
Electrical Characteristics(Tc=25°C unless otherwise noted)

Symbol	Parameter	Test Conditons	Min	Typ	Max	Unit
Off Characteristics						
BV _{DSS}	Drain-source Breakdown Voltage	V _{GS} =0V ,I _D =1mA	650	--	--	V
ΔBV _{DSS} /ΔT _J	Breakdown Voltage Temperature Coefficient	I _D =5mA (Referenced to 25°C)	--	0.59	--	V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =650V,V _{GS} =0V	--	--	10	μA
		V _{DS} =520V,T _c =125°C	--	--	200	μA
I _{GSSF}	Gate-Body Leakage Current,Forward	V _{GS} =+20V, V _{DS} =0V	--	--	200	nA
I _{GSSR}	Gate-Body Leakage Current,Reverse	V _{GS} =-20V, V _{DS} =0V	--	--	-200	nA
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D =250μA	3.0	--	5.0	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} =10 V, I _D =30A	--	45	52	mΩ
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} =200V,V _{GS} =0V, f=1.0MHz	--	6286	--	pF
C _{oss}	Output Capacitance		--	165	--	pF
C _{rss}	Reverse Transfer Capacitance		--	6.1	--	pF
Switching Characteristics						
t _{d(on)}	Turn-On Delay Time	V _{DD} = 400 V, I _D = 45.0A, R _G = 1.8 Ω (Note4,5)	--	35	--	ns
t _r	Turn-On Rise Time		--	37	--	ns
t _{d(off)}	Turn-Off Delay Time		--	99	--	ns
t _f	Turn-Off Fall Time		--	24	--	ns
Q _g	Total Gate Charge	V _{DS} = 520 V, I _D =45.0A, V _{GS} = 10 V (Note4,5)	--	140	--	nC
Q _{gs}	Gate-Source Charge		--	53	--	nC
Q _{gd}	Gate-Drain Charge		--	58	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain-Source Diode Forward Current		--	--	60	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	200	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} =0V,I _S =30.0A	--	--	1.4	V
t _{rr}	Reverse Recovery Time	V _{GS} =0V, I _S =45.0A, d I _F /dt=100A/μs (Note4)	--	155	--	ns
Q _{rr}	Reverse Recovery Charge		--	1.1	--	μC

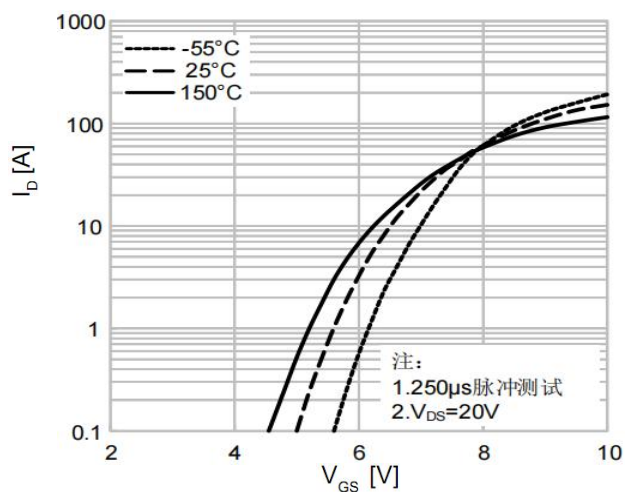
Notes:

- 1、Repetitive Rating:Pulse Width Limited by Maximum Junction Temperature.
- 2、 $L=24mH, I_{AS}=12A, V_{DD}=120V, R_G=25\Omega$, Starting $T_J=25^\circ C$.
- 3、 $I_{SD}\leq 60.0A, di/dt\leq 200A/\mu s, V_{DD}\leq BV_{DSS}$, Starting $T_J=25^\circ C$.
- 4、Pulse Test : Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
- 5、Essentially Independent of Operating Temperature.

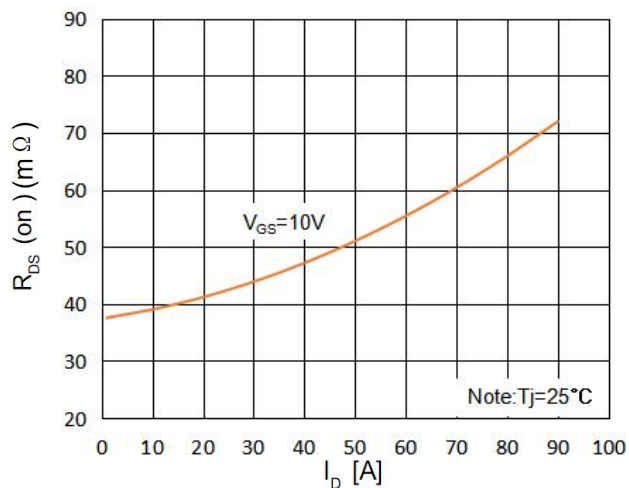
On-Regin Characteristics



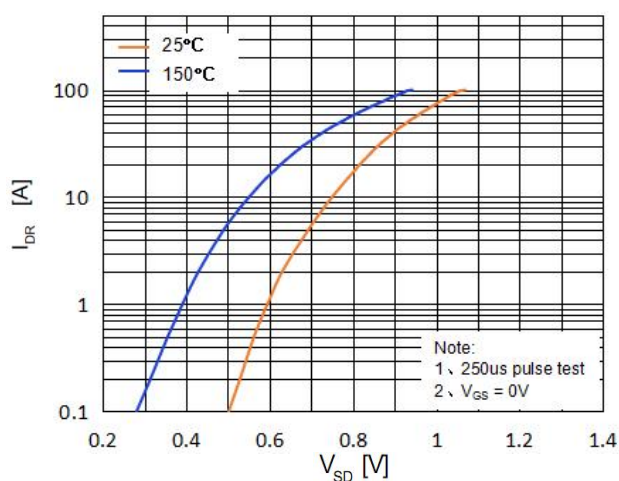
Transfer Characteristics



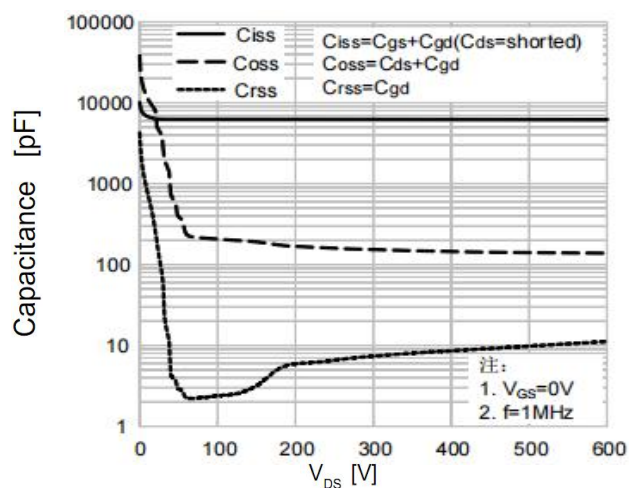
On-Resistance Variation vs. Drain Current and Gate Voltage



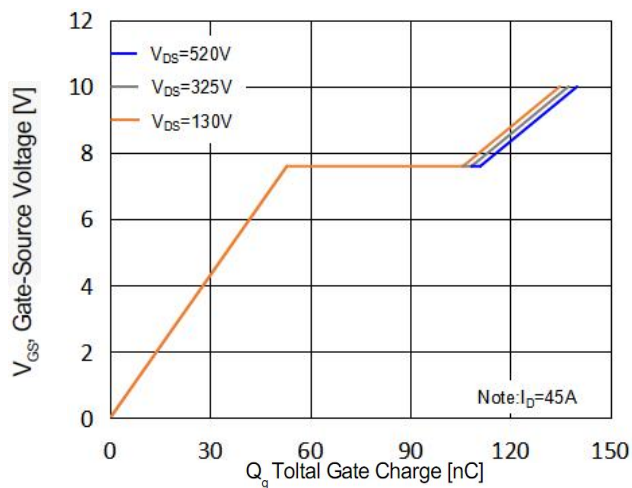
Body Diode Forward Voltage Variation vs. Source Current and Temperature



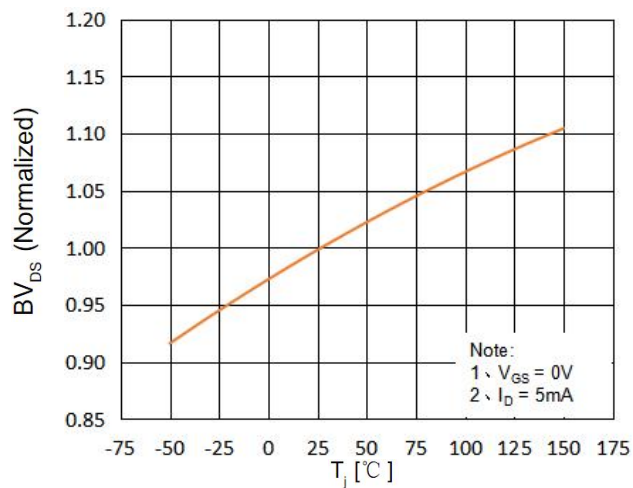
Capacitance Characteristics



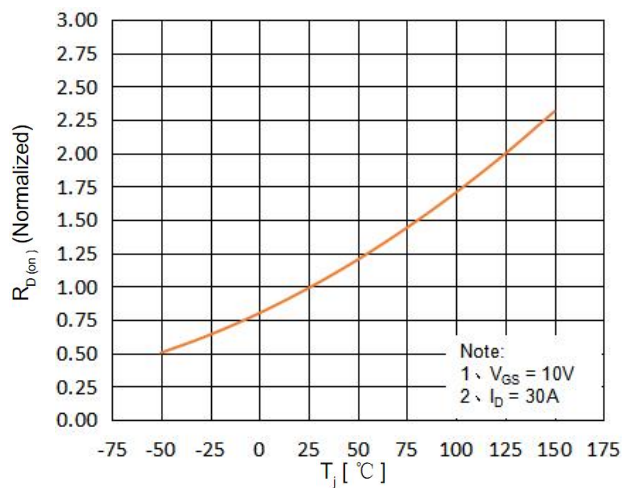
Gate Charge Characteristics



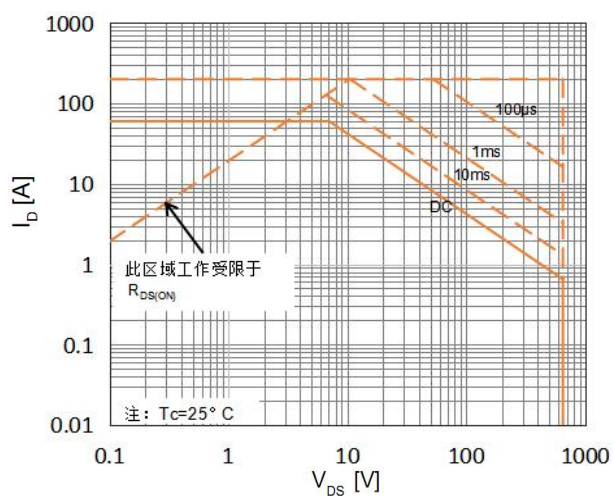
Breakdown Voltage Variation vs. Temperature



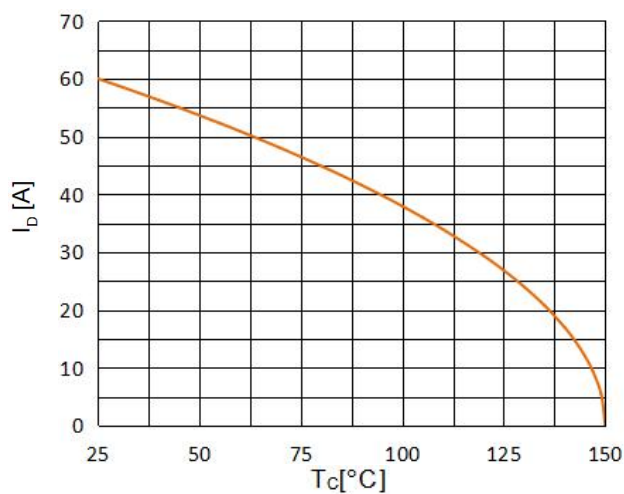
On-Resistance Variation vs. Temperature



Maximum Safe Operating Area



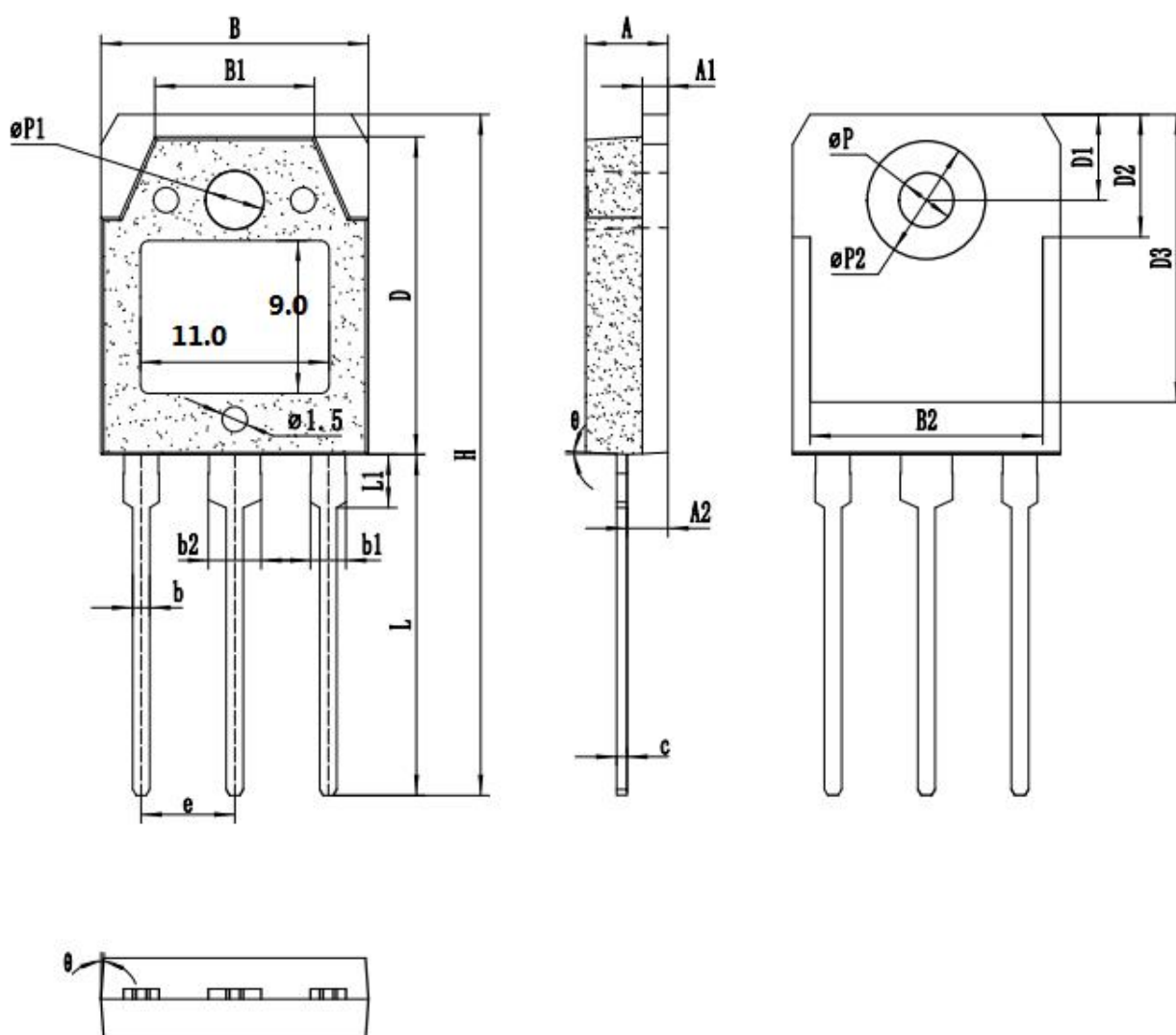
Maximum Drain Current Vs. Case Temperature



TO-3P Package Dimensions

UNIT: mm

SYMBOL	min	nom	max	SYMBOL	min	nom	max
A	4.50	4.80	5.10	D	18.00	18.50	19.00
A1	1.40	1.50	1.60	D1	4.60	5.00	5.40
A2	2.10	2.40	2.70	D2	6.70	7.10	7.50
b	0.80	1.00	1.20	D3	16.20	16.70	17.20
b1	1.90	2.10	2.30	L1	2.70	3.10	3.50
b2	2.90	3.10	3.30	L	19.20	20.20	21.20
e		5.45		H	38.40	39.90	41.40
B	15.20	15.70	16.20	ΦP	2.90	3.15	3.40
B1	9.10	9.40	9.70	ΦP1	3.15	3.40	3.65
B2	13.20	13.60	14.00	ΦP2	6.70	7.00	7.30
c	0.50	0.60	0.70	θ	3°	5°	7°



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注意事项：

- 1、在电路设计时请不要超过器件的最大额定值，否则会影响整机的可靠性。
- 2、MOSFET产品为静电敏感型器件，使用时应注意采取防静电保护措施，如佩戴防静电手环、设备接地等。
- 3、如需安装散热片，请注意控制扭力大小及散热片的平整度。
- 4、该规格书由华科公司制作，并可能不定期更改，恕不另行通知。
- 5、如有疑问，请及时联系我司销售代表。

版本履历表：

序号	版本号	修改时间	修改记录
1	V1.0	2023-3-28	首次发行