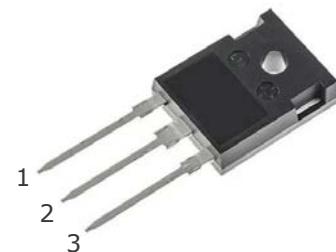




Features

- 3rd generation SiC MOSFET technology
- Optimized package with separate driver source pin
- High blocking voltage with low on-resistance
- High-speed switching with low capacitances
- Fast intrinsic diode with low reverse recovery (Q_{rr})
- Halogen free, RoHS compliant



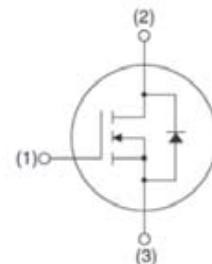
TO-247
Package

Benefits

- Reduce switching losses and minimize gate ringing
- Higher system efficiency
- Reduce cooling requirements
- Increase power density
- Increase system switching frequency

Applications

- Renewable energy
- EV battery chargers
- High voltage DC/DC converters
- Switch Mode Power Supplies



Ordering Part Number	Package	Qty(PCS)
FCH040N65S3-F155	TO-247	30



Maximum Ratings (T_c = 25 °C unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-source voltage	V _{DS}	650	V
Continuous drain current T _c = 25°C T _c = 100°C	I _D	49 35	A
Pulsed drain current (T _c = 25°C, t _p limited by T _{jmax})	I _D pulse	123	A
Avalanche energy, single pulse (L=10mH)	E _{AS}	1000	mJ
Gate-Source voltage	V _{GS}	-5/+20	V
Gate-Source voltage (dynamic, Absolute maximum values)	V _{GSmax}	-10/+25	V
Power dissipation (T _c = 25°C)	P _{tot}	242	W
Operating junction and storage temperature	T _j , T _{stg}	-55...+175	°C

Thermal Resistance

Parameter	Symbol	Value	Unit
Thermal resistance, junction – case. Max	R _{thJC}	0.62	°C/W
Thermal resistance, junction – ambient. Max	R _{thJA}	40	



Electrical Characteristic (at $T_j = 25^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Static Characteristic						
Drain-source breakdown voltage	BV_{DSS}	650	-	-	V	$\text{V}_{\text{GS}}=0\text{V}, \text{I}_D=250\text{uA}$
Gate threshold voltage	$\text{V}_{\text{GS(th)}}$	2	-	4	V	$\text{V}_{\text{DS}}=\text{V}_{\text{GS}}, \text{I}_D=7\text{mA}$
Zero gate voltage drain current	I_{DSS}	-	1	100	μA	$\text{V}_{\text{DS}}=650\text{V}, \text{V}_{\text{GS}}=0\text{V}$ $T_j=25^\circ\text{C}$ $T_j=175^\circ\text{C}$
Gate-source leakage current	I_{GS}	-		250	nA	$\text{V}_{\text{GS}}=20\text{V}, \text{V}_{\text{DS}}=0\text{V}$
Drain-source on-state resistance	$\text{R}_{\text{DS(on)}}$	-	45	-	m	$\text{V}_{\text{GS}}=18\text{V}, \text{I}_D=17.6\text{A},$
		-	33	49		$\text{V}_{\text{GS}}=20\text{V}, \text{I}_D=17.6\text{A},$ $T_j=25^\circ\text{C}$ $T_j=175^\circ\text{C}$
		-	50	-		
Transconductance	g_{fs}	-	5.6	-	S	$\text{V}_{\text{DS}}=20\text{V}, \text{I}_D=17.6\text{A}$
Dynamic Characteristic						
Input Capacitance	C_{iss}	-	1823	-	pF	$\text{V}_{\text{DS}} = 650\text{V}$ $\text{V}_{\text{GS}} = 0\text{V}$ $\text{T}_j = 25^\circ\text{C}$ $\text{V}_{\text{AC}} = 25\text{mV}$ $f = 1\text{MHz}$
Output Capacitance	C_{oss}	-	190	-		
Reverse Transfer Capacitance	C_{rss}	-	19	-		
Gate Total Charge	Q_G	-	96	-	nC	$\text{V}_{\text{DS}} = 400\text{V}$ $\text{V}_{\text{GS}} = -5/20\text{V}$ $\text{I}_D = 17.6\text{A}$
Gate-Source charge	Q_{gs}	-	25	-		
Gate-Drain charge	Q_{gd}	-	26	-		
Turn-On Switching Energy	E_{ON}	-	188	-	μJ	$\text{V}_{\text{DD}} = 400\text{V}$ $\text{V}_{\text{GS}} = -5/+20\text{V}$ $\text{I}_D = 17.6\text{A}$ $\text{R}_G = 10$ $\text{L} = 100\text{uH}$
Turn-Off Switching Energy-	E_{OFF}	-	19			
Turn-on delay time	$\text{t}_{\text{d(on)}}$	-	20	-		
Rise time	t_r	-	26	-	ns	
Turn-off delay time	$\text{t}_{\text{d(off)}}$	-	48	-		
Fall time	t_f	-	15	-		
Gate resistance	R_G	-	1.7	-	$\text{V}_{\text{AC}} = 25\text{mV}, f=1\text{MHz}$	



Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	V _{SD}		3.2		V	V _{GS} =0V, I _{SD} =8.8A, T _J =25°C
			2.6			V _{GS} =0V, I _{SD} =8.8A, T _J =175°C
Body Diode Reverse Recovery Time	t _{rr}	-	40	-	ns	V _R = 400V, I _D = 17.6A di/dt = 1000A/μS
Body Diode Reverse Recovery Charge	Q _{rr}	-	156	-	nC	



Typical Performance Characteristics

Fig 1. Output Characteristic ($T_J=-55^\circ\text{C}$)

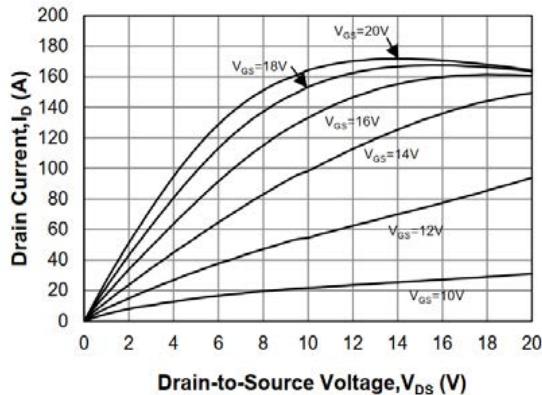


Fig 2. Output Characteristic ($T_J=25^\circ\text{C}$)

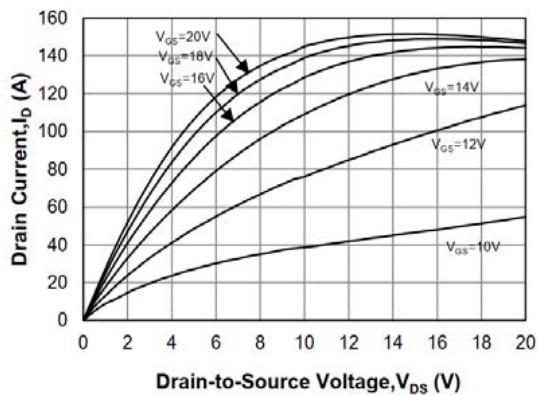


Fig 3. Output Characteristic ($T_J=175^\circ\text{C}$)

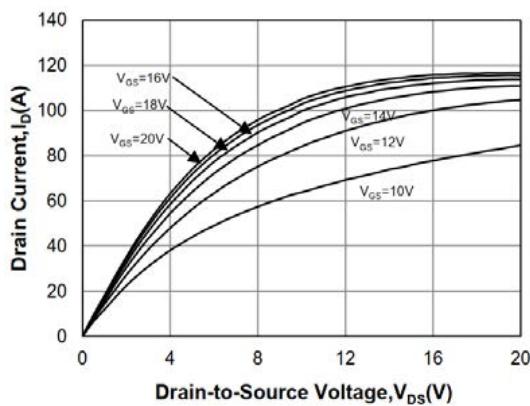


Fig 4: $R_{DS(on)}$ Vs I_D Characteristic

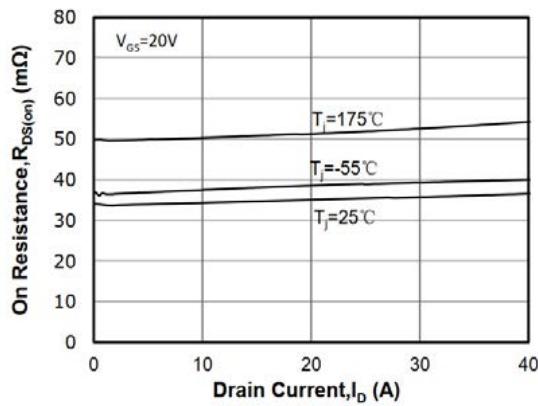


Fig 5: $R_{DS(on)}$ vs. Temperature

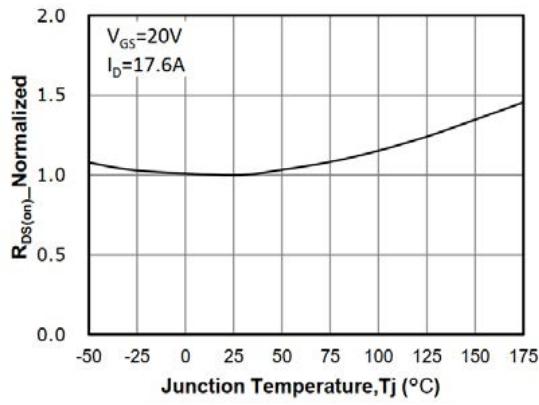


Fig 6: Transfer Characteristic

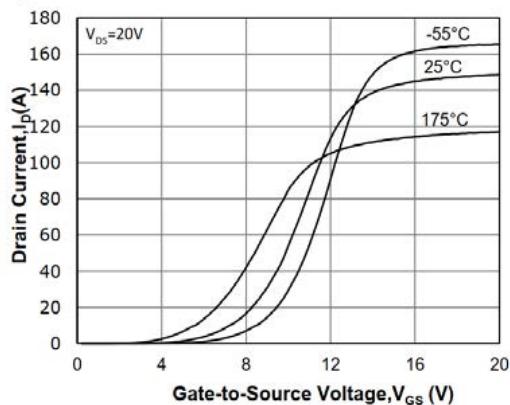




Fig 7: Body-diode Characteristic

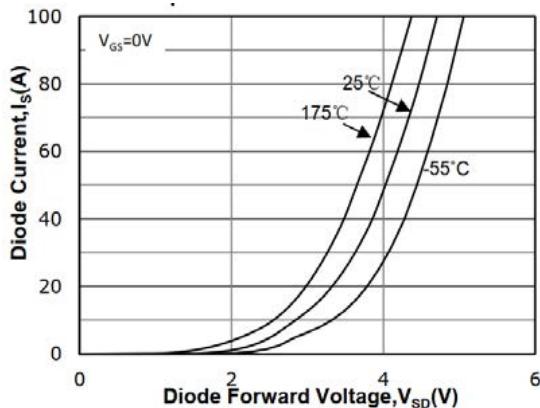


Fig 8: V_{TH} Vs T_J Temperature Characteristic

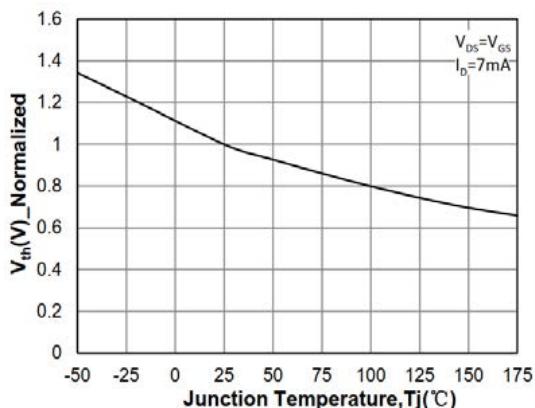


Fig 9: Gate Charge Characteristics

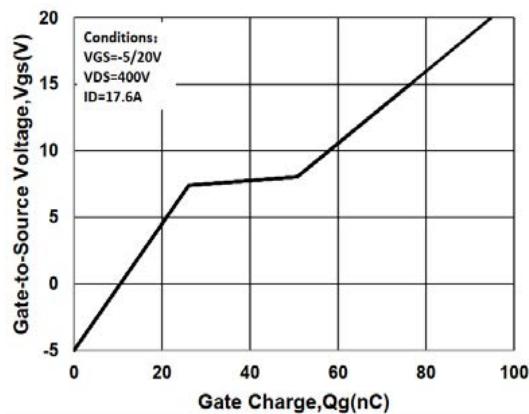


Fig 10: Continuous Drain Current vs. Case Temperature

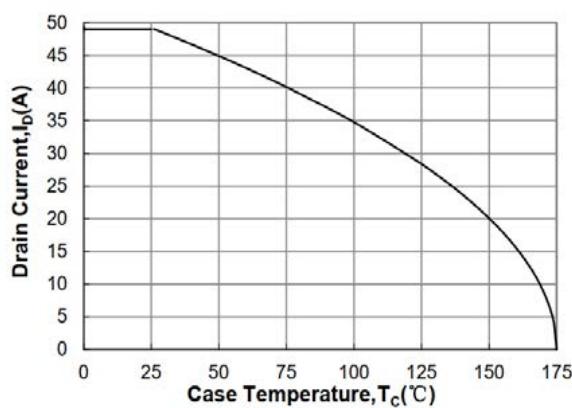


Fig 11: Safe Operating Area

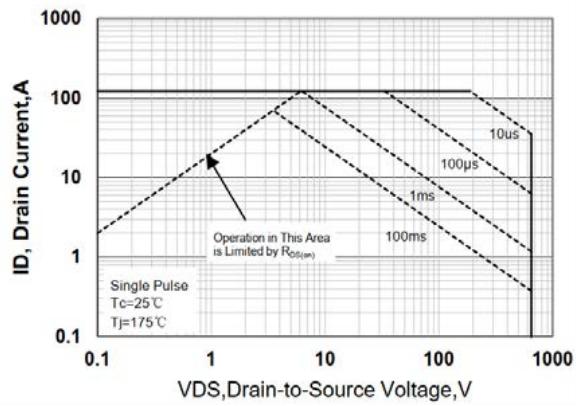


Fig 12: Capacitance Characteristics

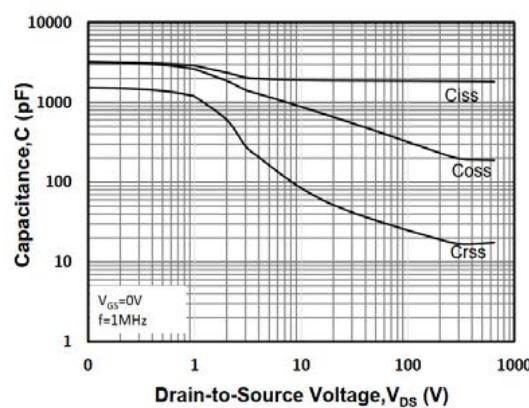
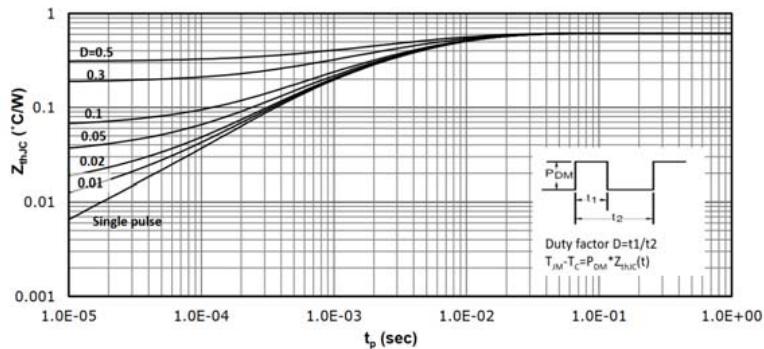




Fig 13: Transient Thermal Impedance



Test Circuit & Waveform

Figure A. Definition of switching times

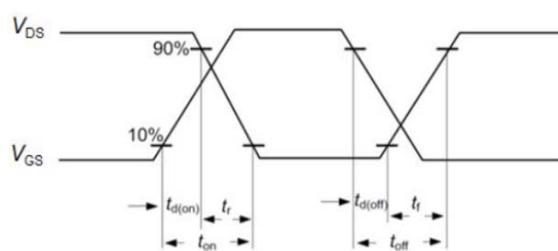


Figure B. Dynamic test circuit

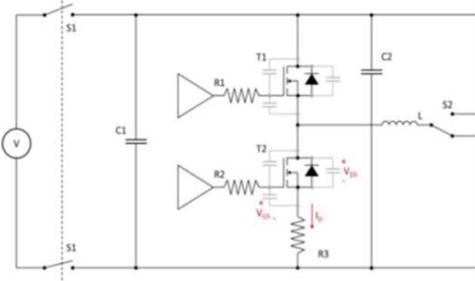
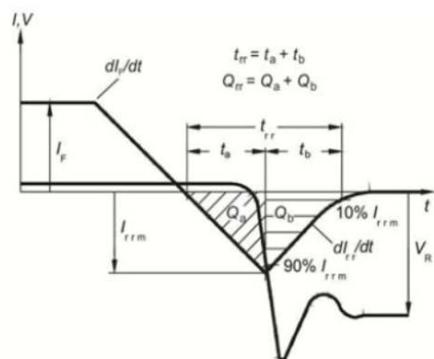


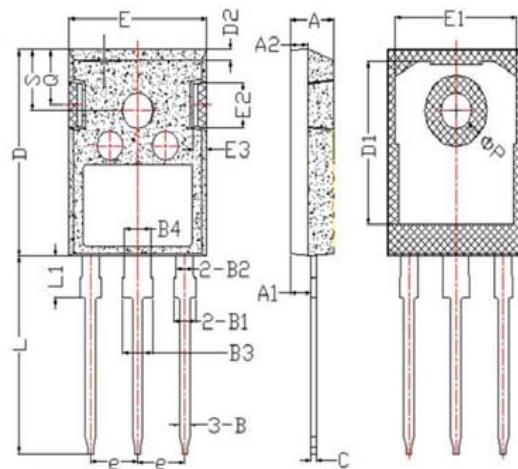
Figure C. Definition of body diodeswitching characteristics





Package Dimensions

Package TO-247



Items	Values(mm)	
	MIN	MAX
A	4.6	5.2
A1	2.2	2.6
B	0.9	1.4
B1	1.75	2.35
B2	1.75	2.15
B3	2.8	3.35
B4	2.8	3.15
C	0.5	0.7
D	20.6	21.3
D1	16	18
E	15.5	16.1
E1	13	14.7
E2	3.8	5.3
E3	0.8	2.6
e	5.2	5.2
L	19	20.5
L1	3.9	4.6
Φ_p	3.3	3.7
Q	5.2	6
S	5.8	6.6



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