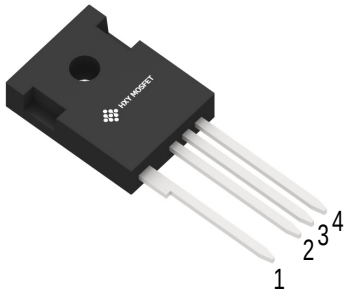
STW70N65DM6-4

SiC Power MOSFET N-Channel Enhancement Mode

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



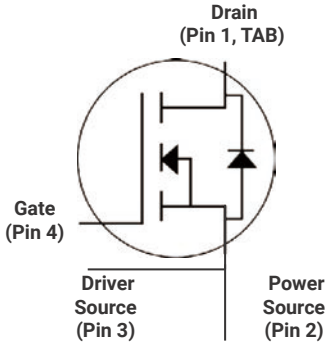
TO-247-4L
(TO-247-4)

Benefits

- Reduce switching losses and minimize gate ringing
- Higher system effciency
- 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)
STW70N65DM6-4	TO-247-4L (TO-247-4)	30

Maximum Ratings (T_C = 25 °C unless otherwise specifed)

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 53	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 Tj = 25 °C, unless otherwise specified)

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

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℃)

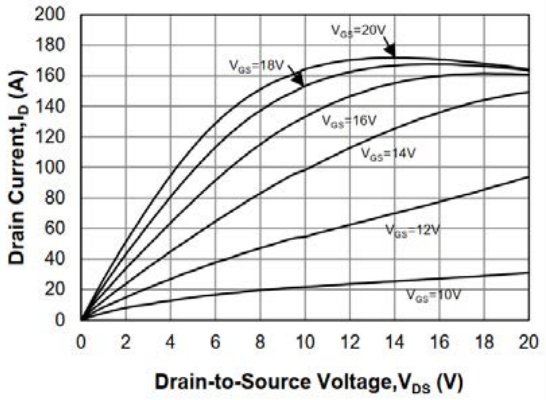


Fig 2. Output Characteristic (T_J=25℃)

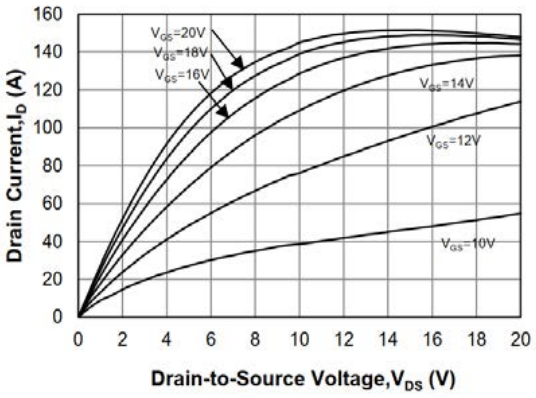


Fig 3. Output Characteristic (T_J=175℃)

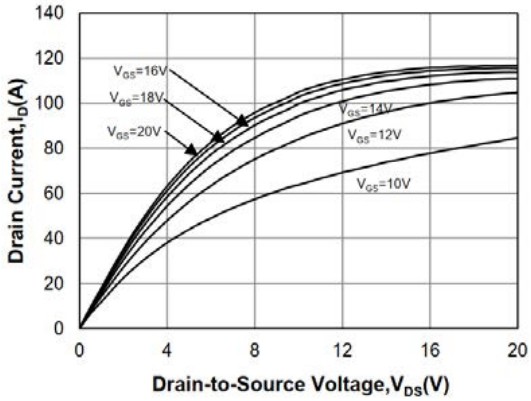


Fig 4: Rdson Vs Ids Characteristic

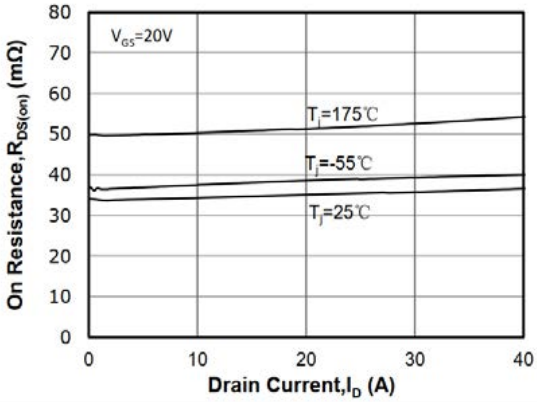


Fig 5: Rds(on) vs. Temperature

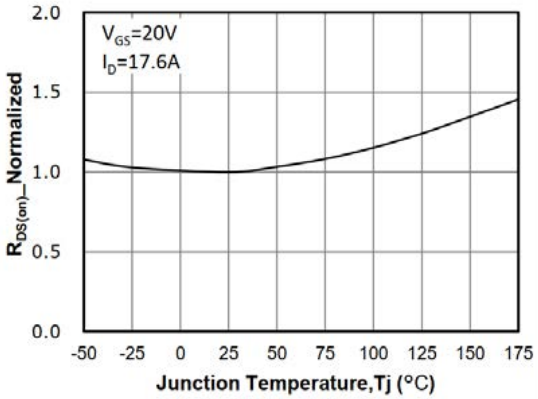


Fig 6: Transfer Characteristic

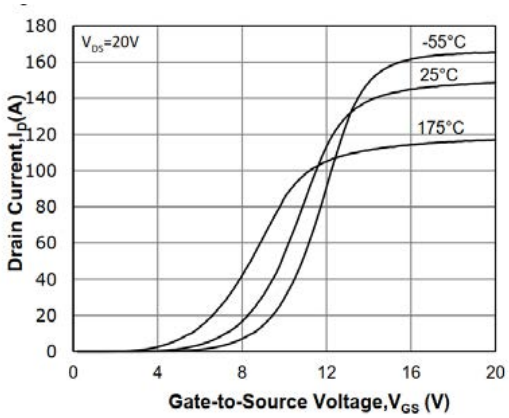


Fig 7: Body-diode Characteristic

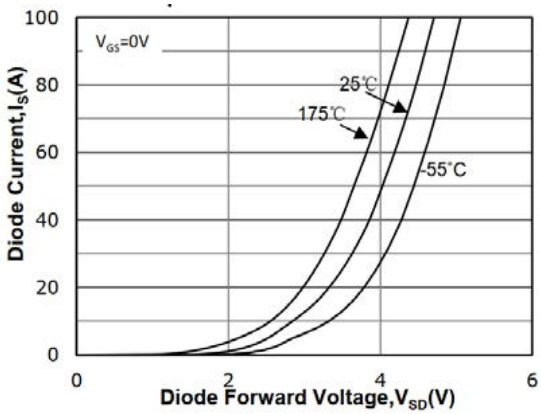


Fig 8: V_{TH} Vs T_J Temperature Characteristic

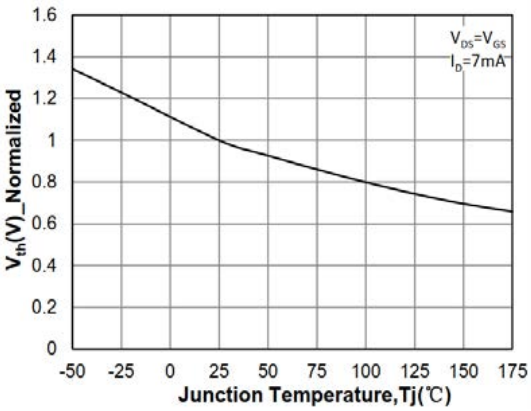


Fig 9: Gate Charge Characteristics

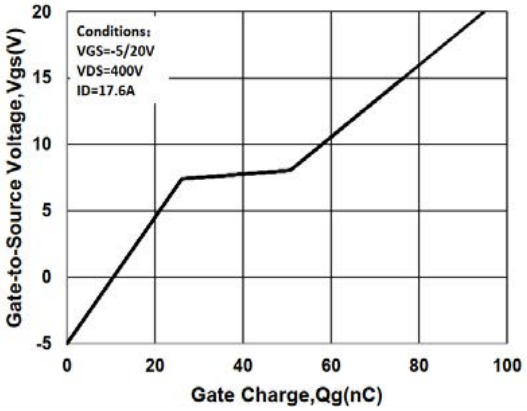


Fig 10:Continuous Drain Current vs.Case Temperature

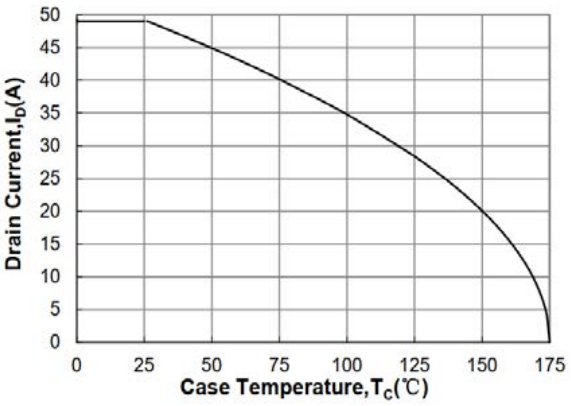


Fig 11: Safe Operating Area

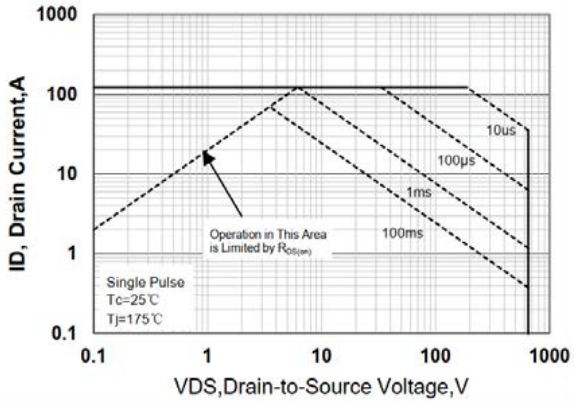


Fig 12: Capacitance Characteristics

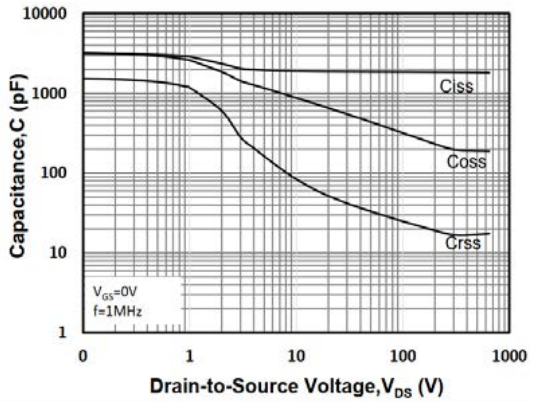
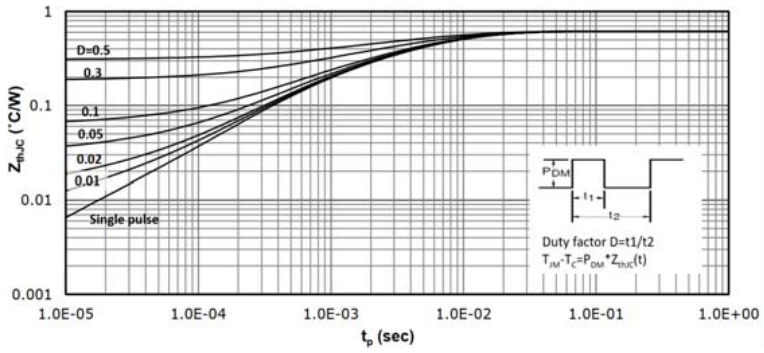


Fig 13: Transient Thermal Impedance



Test Circuit & Waveform

Figure A. Definition of switching times

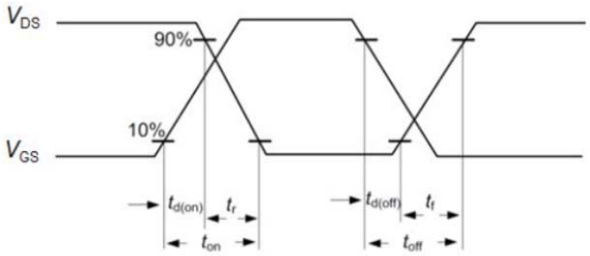


Figure B. Dynamic test circuit

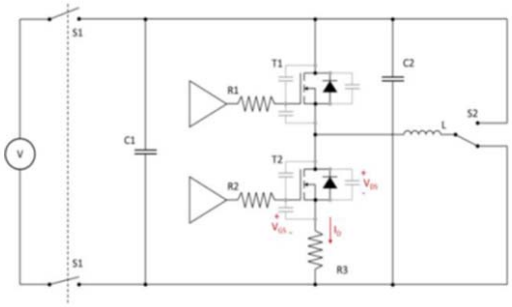
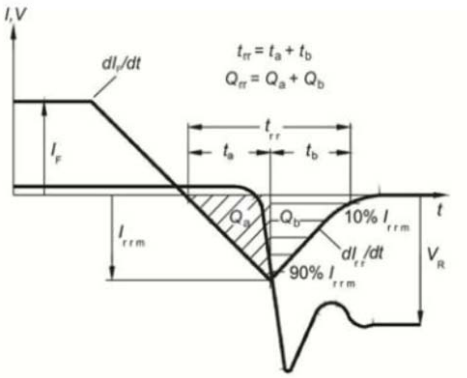
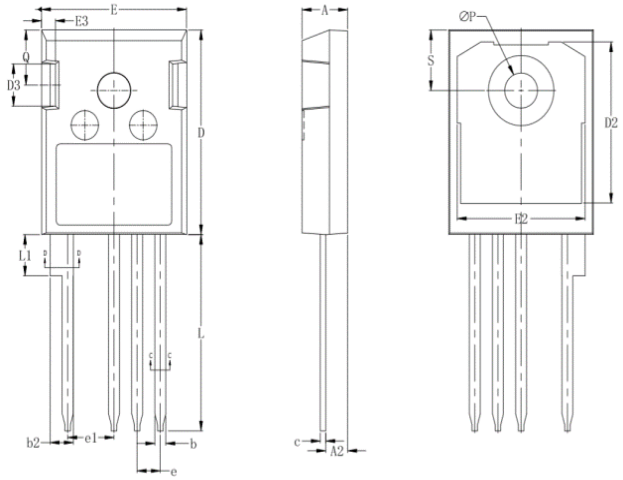


Figure C. Definition of body diodeswitching characteristics



Package Dimensions

Package TO-247-4L(TO-247-4)



Items	Values(mm)	
	MIN	MAX
A	4.8	5.2
A2	2.2	2.6
b	1.05	1.4
b2	2.4	2.75
c	0.5	0.75
D	20	21.5
D2	15.5	17.2
D3	4	5
E	15.5	16.1
E2	13	15
E3	1	2
e	2.54 BSC.	
e1	5.08 BSC.	
L	19	21
L1	4	4.45
ΦP	3.5	3.7
Q	5.4	5.9
S	5.9	6.4

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