HC1M45065J

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

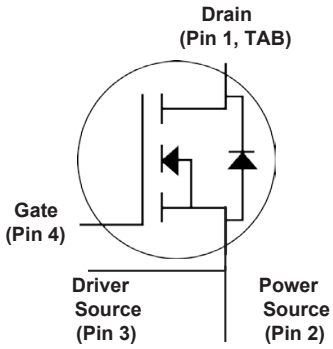
Benefits

- 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

TO247-4L
Package



Ordering Part Number	Package	Marking
HC1M45065J	TO-247-4L	HC1M45065J

Maximum Ratings (T_C = 25 ˚C unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	650	V
Continuous drain current V_{GS}=20V T_C = 25°C V_{GS}=20V 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_{GSOP}	-5/+20	V
Gate-Source voltage（dynamic,Absolute maximum values）	V_{GSmax}	-10/+25	V
Power dissipation (T_C = 25°C)	P_{tot}	85	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}	1.77	°C/W
Thermal resistance, junction – ambient. Max	R_{thJA}	62	

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	100	μA	V_{DS}=650V,V_{GS}=0V
		-	10	-		T_C=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	49		V_{GS}=20V, I_D=17.6A, T_j=25°C
		-	50	-		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℃)

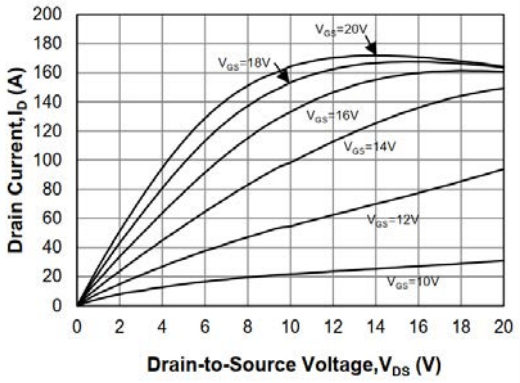


Fig 2. Output Characteristic (T_J=25℃)

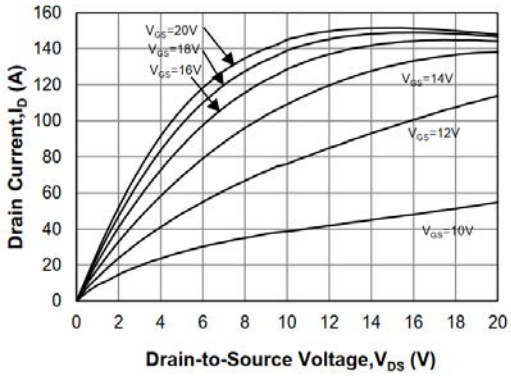


Fig 3. Output Characteristic (T_J=175℃)

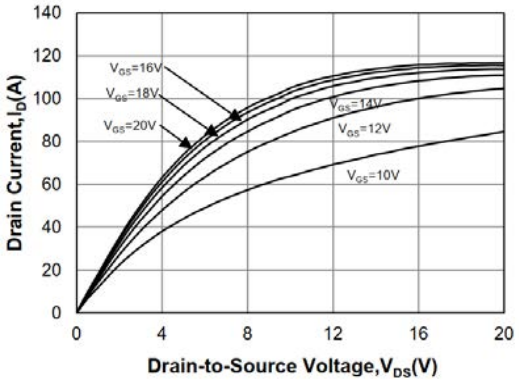


Fig 4: Rdson Vs Ids Characteristic

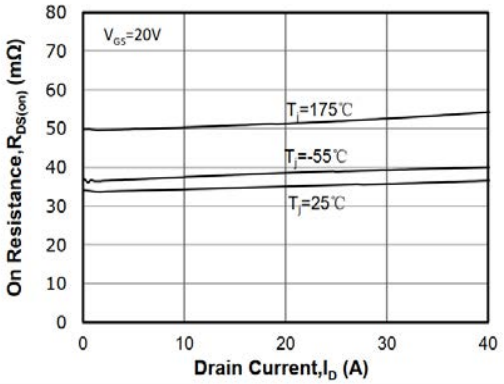


Fig 5: Rds(on) vs. Temperature

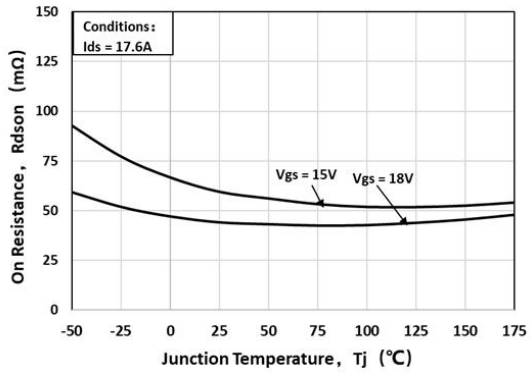


Fig 6: Transfer Characteristic

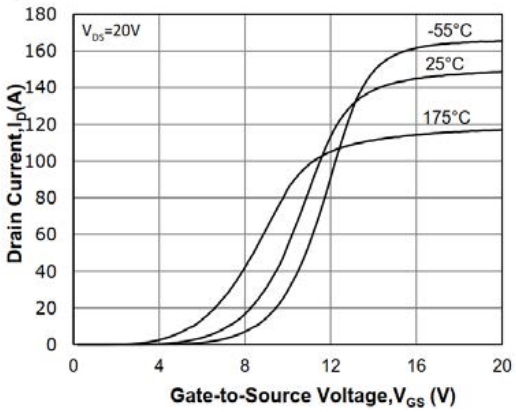


Fig 7: Body-diode Characteristic

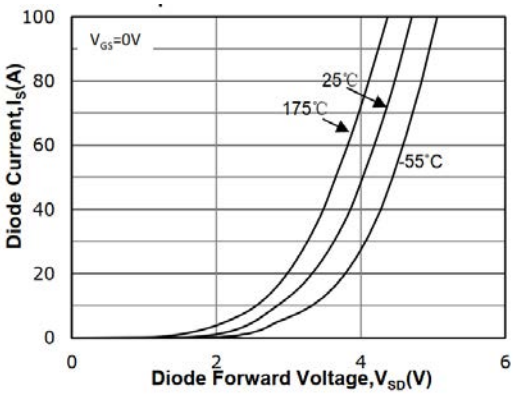


Fig 8: V_{TH} Vs T_J Temperature Characteristic

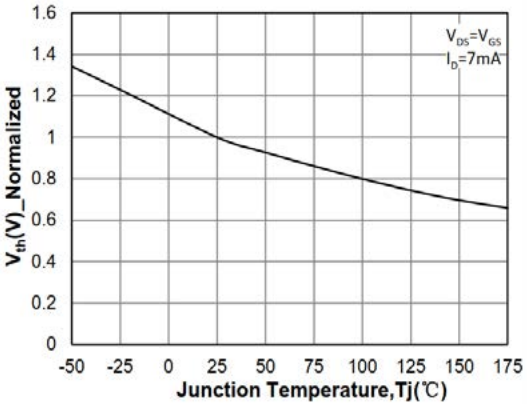


Fig 9: Gate Charge Characteristics

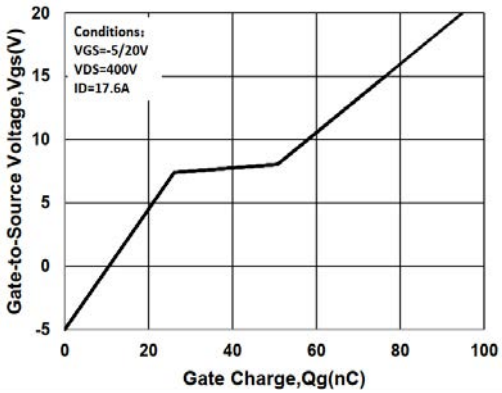


Fig 10:Continuous Drain Current vs.Case Temperature

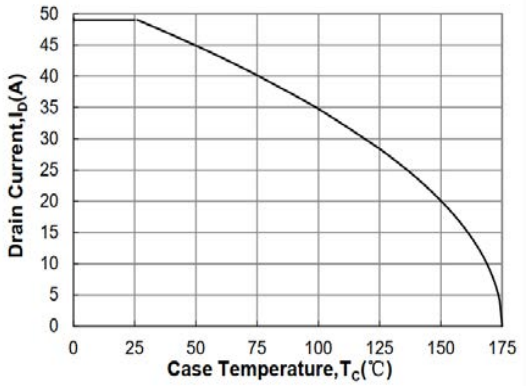


Fig 11: Safe Operating Area

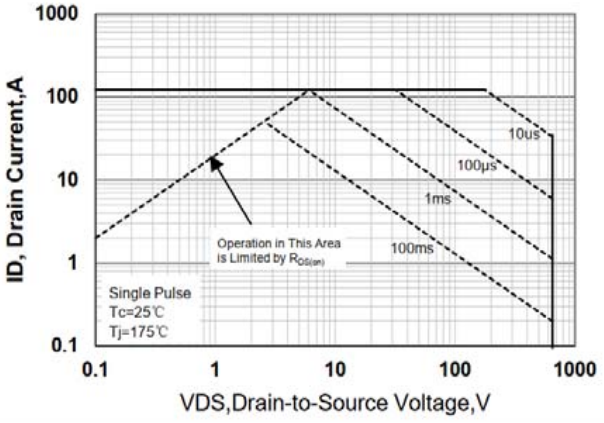


Fig 12: Capacitance Characteri stics

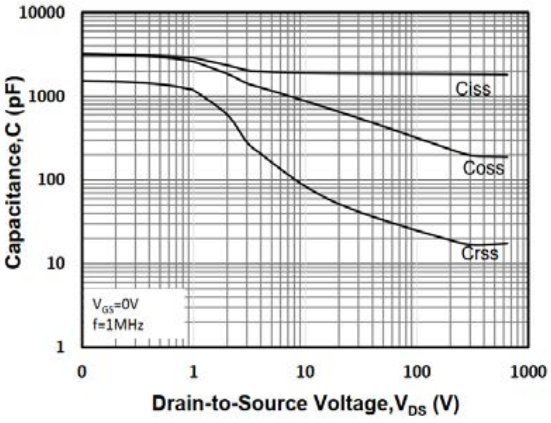
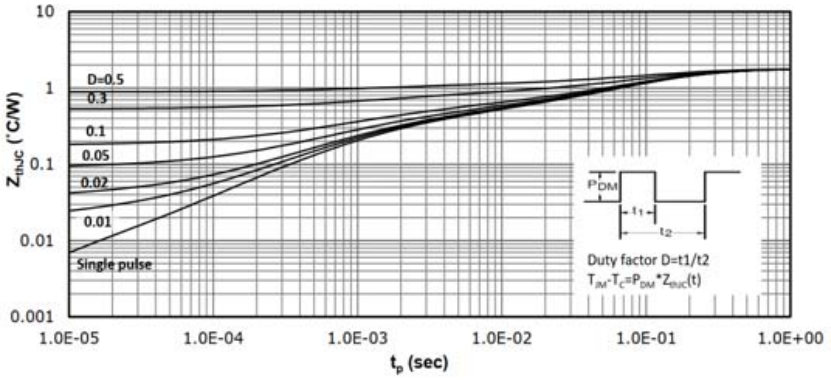


Fig 13: Transient Thermal Impedance



Test Circuit & Waveform

Figure A. Definition of switching times

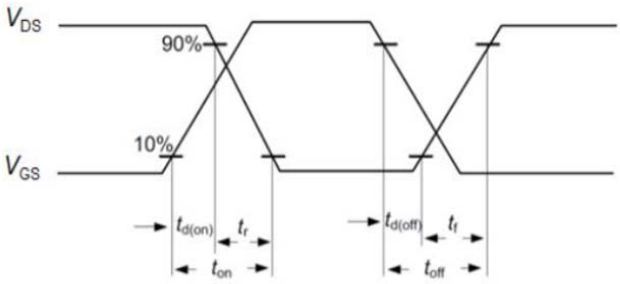


Figure B. Dynamic test circuit

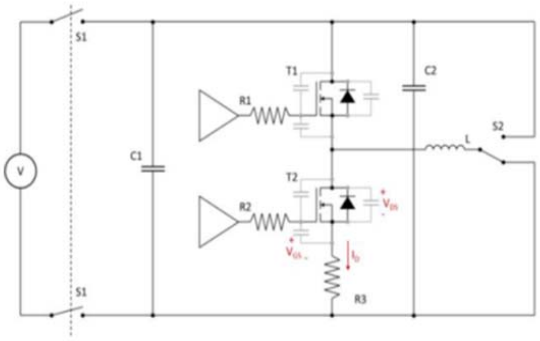
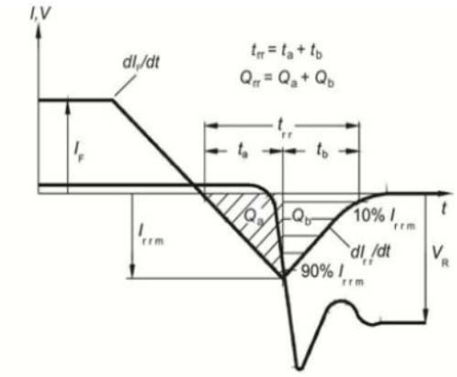


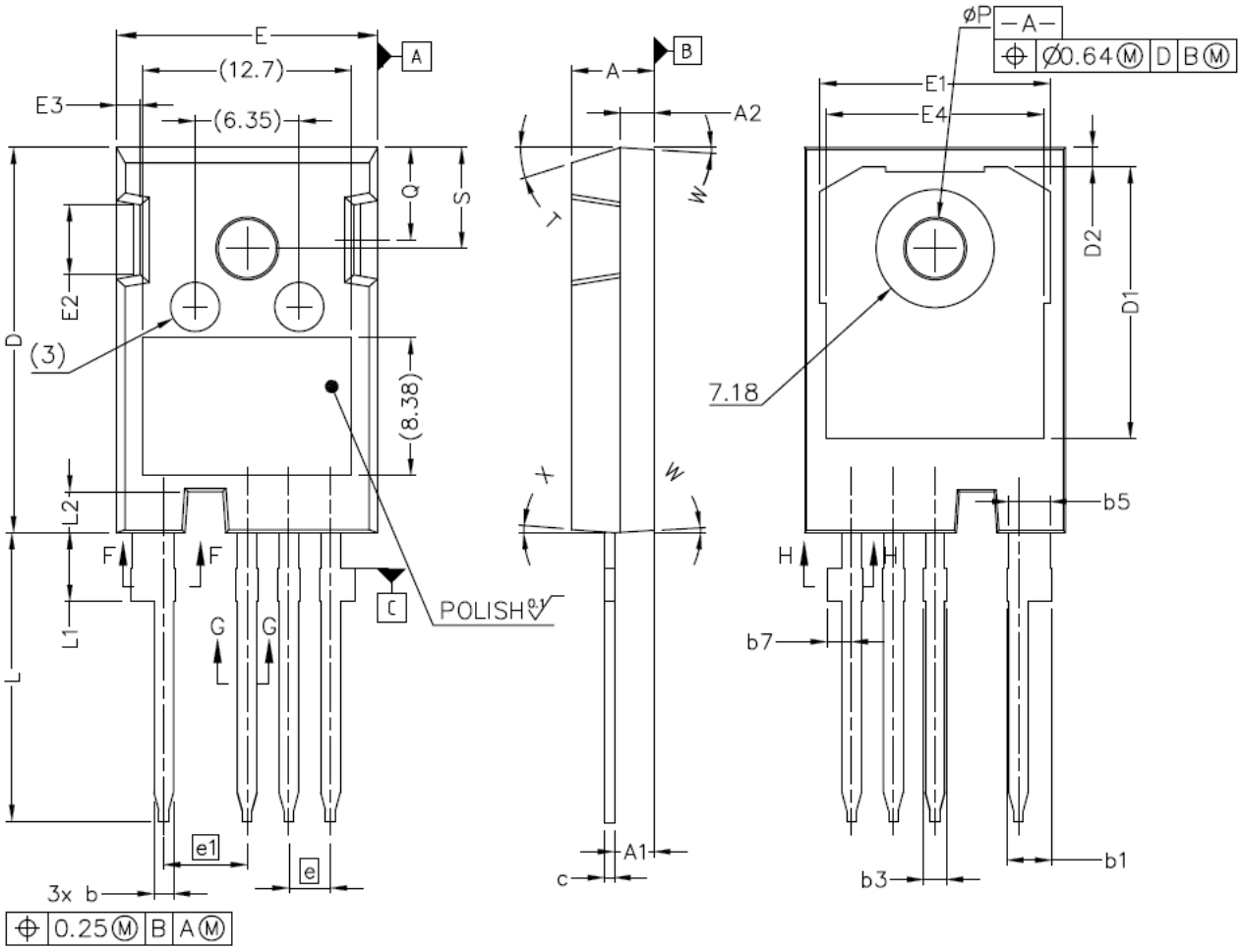
Figure C. Definition of body diodeswitching characteristics

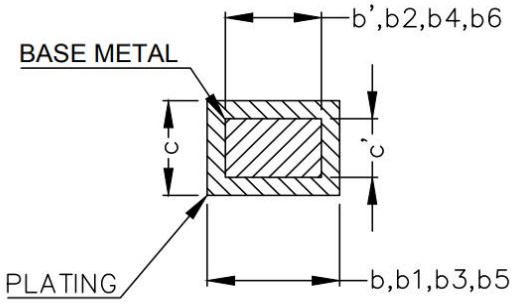


Package

Dimensions Package

TO-247-4L





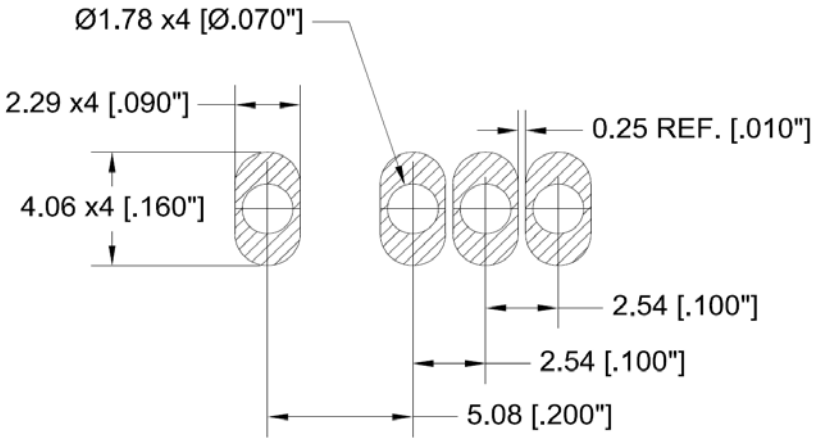
SECTION "F-F", "G-G" AND "H-H"
SCALE: NONE

NOTE ;

1. **ALL METAL SURFACES: TIN PLATED, EXCEPT AREA OF CUT**
2. **DIMENSIONING & TOLERANCEING CONFIRM TO ASME Y14.5M-1994.**
3. **ALL DIMENSIONS ARE IN MILLIMETERS.ANGLES ARE IN DEGREES.**
4. **'N' IS THE NUMBER OF TERMINAL POSITIONS**

SYM	MILLIMETERS	
	MIN	MAX
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b`	1.07	1.28
b	1.07	1.33
b1	2.39	2.94
b2	2.39	2.84
b3	1.07	1.60
b4	1.07	1.50
b5	2.39	2.69
b6	2.39	2.64
b7	1.30	1.70
c`	0.55	0.65
c	0.55	0.68
D	23.30	23.60
D1	16.25	17.65
D2	0.95	1.25
E	15.75	16.13

SYM	MILLIMETERS	
	MIN	MAX
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
e	2.54 BSC	
e1	5.08 BSC	
N*	4	
L	17.31	17.82
L1	3.97	4.37
L2	2.35	2.65
Ø P	3.51	3.65
Q	5.49	6.00
S	6.04	6.30
T	17.5° REF.	
W	3.5° REF.	
X	4° REF.	



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