



## Features

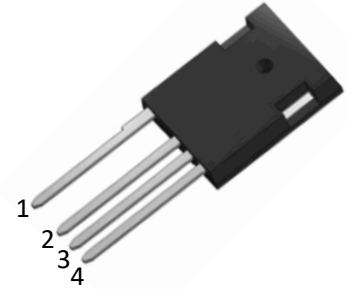
- 3rd generation SiC MOSFET technology
- Optimized package with separate driver source pin
- High blocking voltage with low on-resistance
- High-speed switching with low capacitances
- Fast intrinsic diode with low reverse recovery ( $Q_{rr}$ )
- Halogen free, RoHS compliant

## Benefits

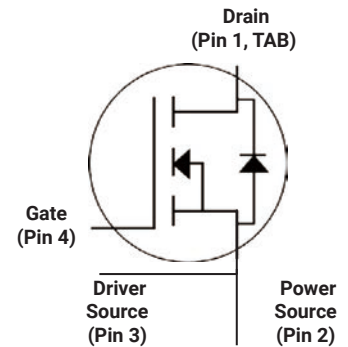
- Reduce switching losses and minimize gate ringing
- Higher system efficiency
- Reduce cooling requirements
- Increase power density
- Increase system switching frequency

## Applications

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



TO-247-4L  
Package



Ordering Part Number	Package	Marking
HC3M0030065K	TO-247-4L	HC3M0030065K



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

Parameter	Symbol	Value	Unit
Drain-source voltage	$V_{DS}$	650	V
Continuous drain current $T_c = 25^\circ\text{C}$ $T_c = 100^\circ\text{C}$	$I_D$	97 69	A
Pulsed drain current ( $T_c = 25^\circ\text{C}$ , $t_p$ limited by $T_{jmax}$ )	$I_D$ pulse	241	A
Avalanche energy, single pulse ( $L=10\text{mH}$ )	$E_{AS}$	1620	mJ
Gate-Source voltage	$V_{GS}$	-5/+20	V
Gate-Source voltage (dynamic, Absolute maximum values)	$V_{GSmax}$	-10/+25	V
Power dissipation ( $T_c = 25^\circ\text{C}$ )	$P_{tot}$	429	W
Operating junction and storage temperature	$T_j, T_{stg}$	-55...+175	$^\circ\text{C}$



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

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
<b>Static Characteristic</b>						
Drain-source breakdown voltage	$BV_{DSS}$	650	-	-	V	$V_{GS}=0V, I_D=250\mu A$
Gate threshold voltage	$V_{GS(th)}$	2	-	4	V	$V_{DS}=V_{GS}, I_D=15mA$
Zero gate voltage drain current	$I_{DSS}$	-	1	100	$\mu A$	$V_{DS}=650V, V_{GS}=0V$ $T_j=25^\circ C$ $T_j=175^\circ C$
Gate-source leakage current	$I_{GSS}$	-	-	250	nA	$V_{GS}=20V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	30	-	m	$V_{GS}=18V, I_D=33.5A,$
		-	25	45		$V_{GS}=20V, I_D=33.5A,$ $T_j=25^\circ C$
		-	34	-		$T_j=175^\circ C$
Transconductance	$g_{fs}$	-	5.6	-	S	$V_{DS}=20V, I_D=17.6A$
<b>Dynamic Characteristic</b>						
Input Capacitance	$C_{iss}$	-	3280	-	pF	$V_{DS} = 650V$ $V_{GS} = 0V$ $T_J = 25^\circ C$ $V_{AC} = 25mV$ $f = 1MHz$
Output Capacitance	$C_{oss}$	-	359	-		
Reverse Transfer Capacitance	$C_{rss}$	-	33	-		
Gate Total Charge	$Q_G$	-	172	-	nC	$V_{DS} = 400V$ $V_{GS} = -5/+20V$ $I_D = 33.5A$
Gate-Source charge	$Q_{gs}$	-	41	-		
Gate-Drain charge	$Q_{gd}$	-	38	-		
Turn-On Switching Energy	$E_{ON}$	-	478	-	$\mu J$	$V_{DD} = 400V$ $V_{GS} = -5/+20V$ $I_D = 33.5A$ $R_G = 10$ $L = 100\mu H$
Turn-Off Switching Energy-	$E_{OFF}$	-	115	-	ns	
Turn-on delay time	$t_{d(on)}$	-	32	-		
Rise time	$t_r$	-	44	-		
Turn-off delay time	$t_{d(off)}$	-	84	-		
Fall time	$t_f$	-	22	-		
Gate resistance	$R_G$	-	1.1	-	$V_{AC} = 25mV, f=1MHz$	



### Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	$V_{SD}$		3.2		V	$V_{GS}=0V, I_{SD}=8.8A,$ $T_J=25^{\circ}C$
			2.6			$V_{GS}=0V, I_{SD}=8.8A,$ $T_J=175^{\circ}C$
Continuous Diode Forward Current	$I_S$		83		A	$V_{GS}=4V, T_C=25^{\circ}C$
Body Diode Reverse Recovery Time	$t_{rr}$	-	40	-	ns	$V_R = 400V,$ $I_D = 17.6A$ $di/dt = 1000A/\mu S$
Body Diode Reverse Recovery Charge	$Q_{rr}$	-	156	-	nC	



## Typical Performance Characteristics

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

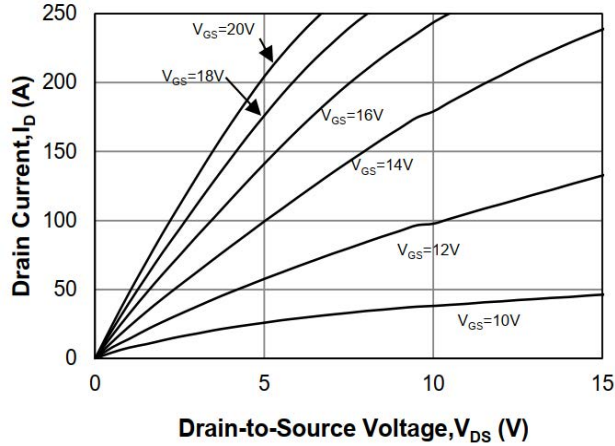


Fig 2. Output Characteristic ( $T_J = 25^\circ\text{C}$ )

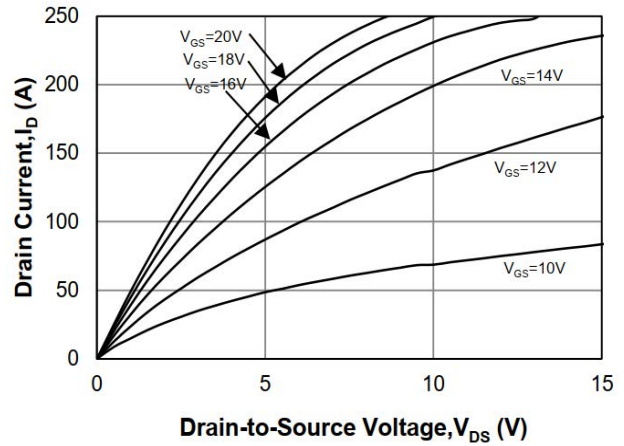


Fig 3. Output Characteristic ( $T_J = 175^\circ\text{C}$ )

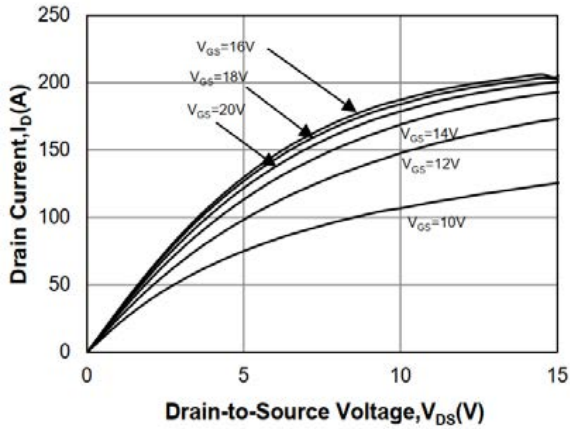


Fig 4: Rds(on) Vs Ids Characteristic

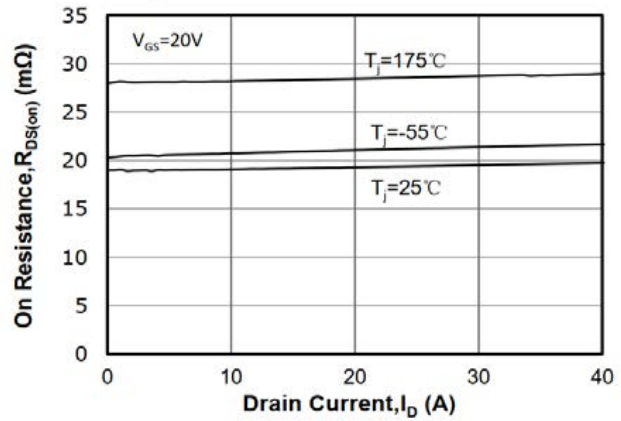


Fig 5: Rds(on) vs. Temperature

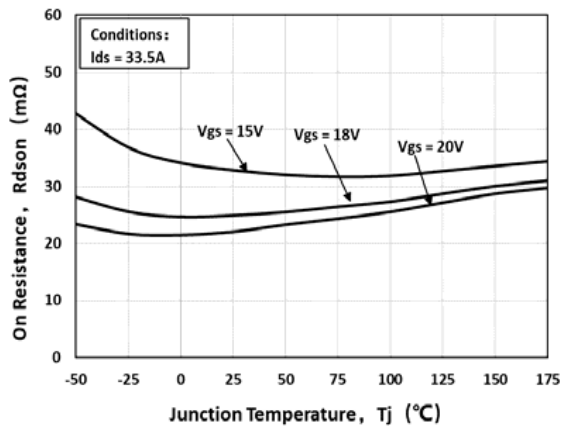


Fig 6: Transfer Characteristic

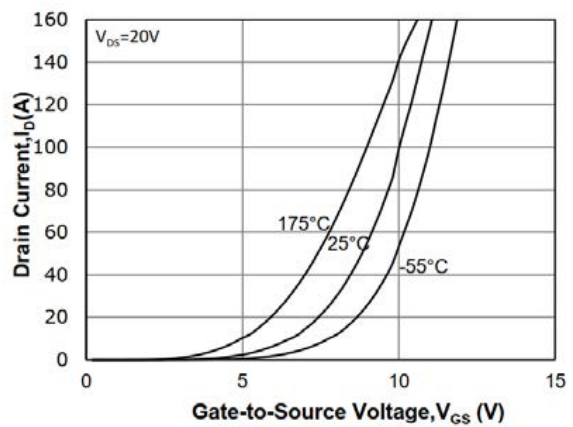




Fig 7: Body-diode Characteristic

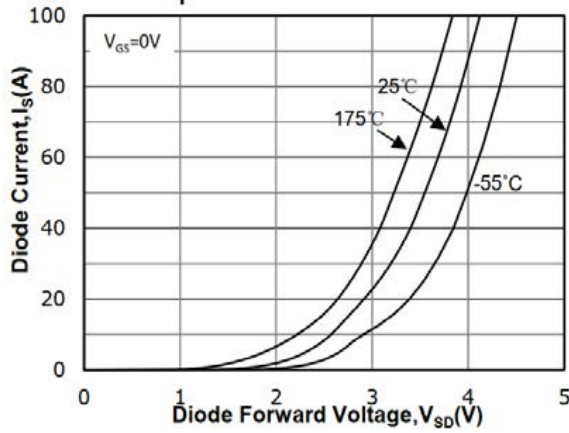


Fig 8:  $V_{TH}$  Vs  $T_J$  Temperature Characteristic

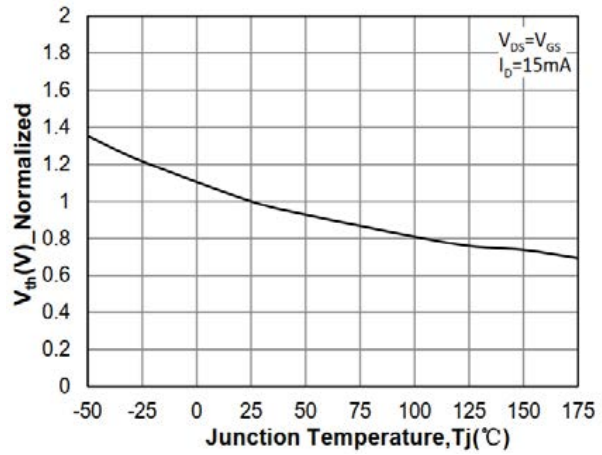


Fig 9: Gate Charge Characteristics

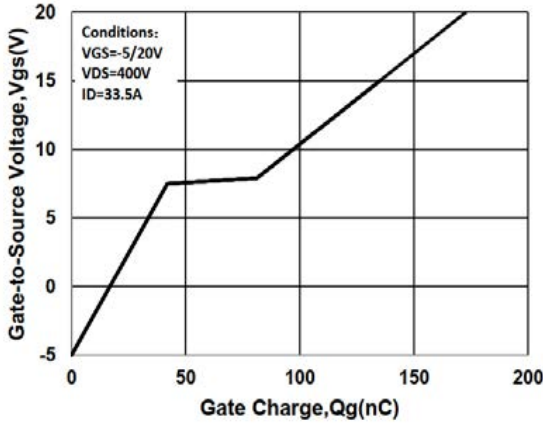


Fig 10: Continuous Drain Current vs. Case Temperature

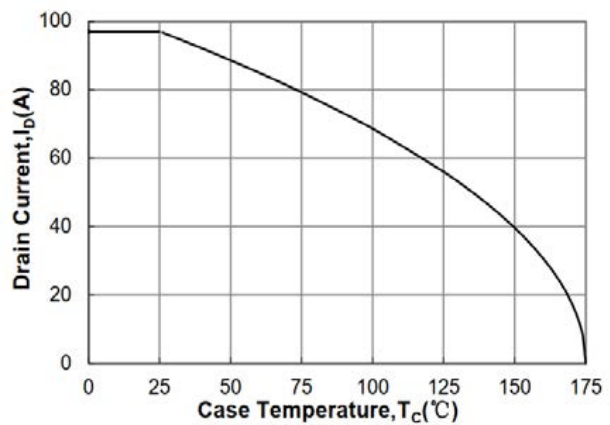


Fig 11: Safe Operating Area

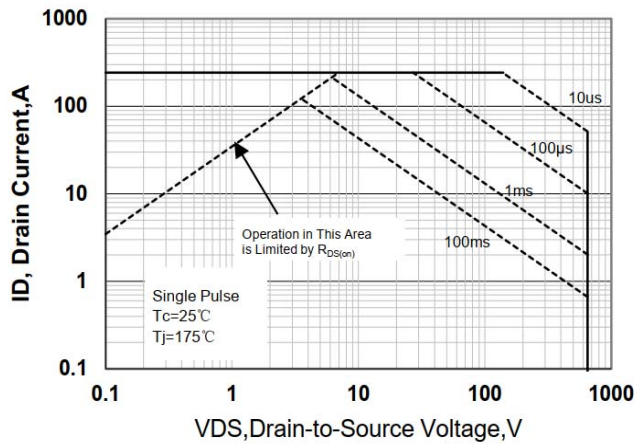


Fig 12: Capacitance Characteristics

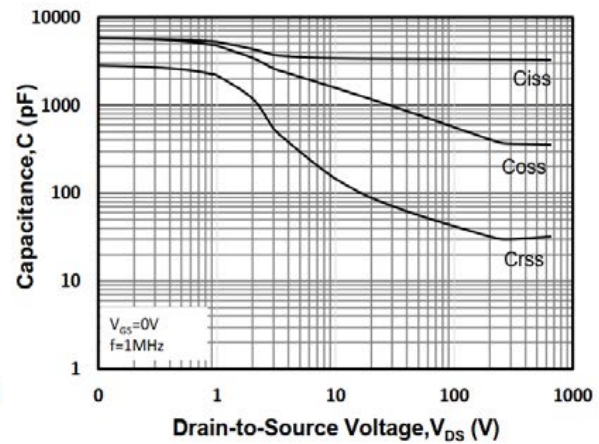
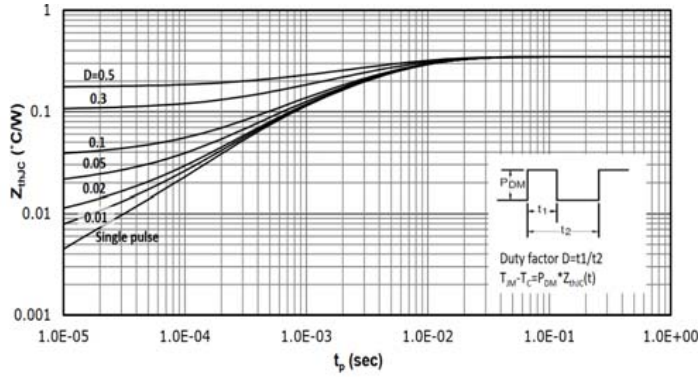




Fig 13: Transient Thermal Impedance



## Test Circuit & Waveform

Figure A. Definition of switching times

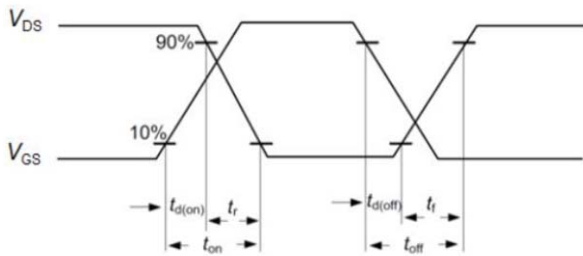


Figure B. Dynamic test circuit

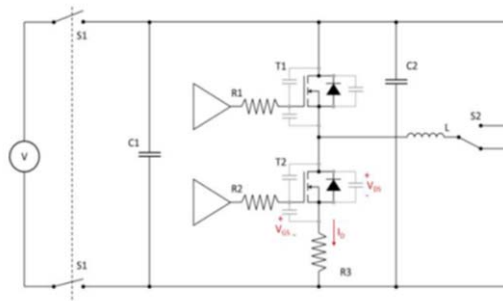
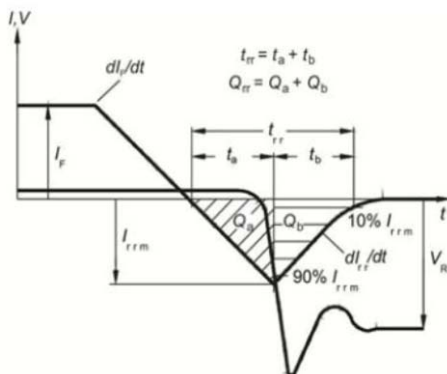


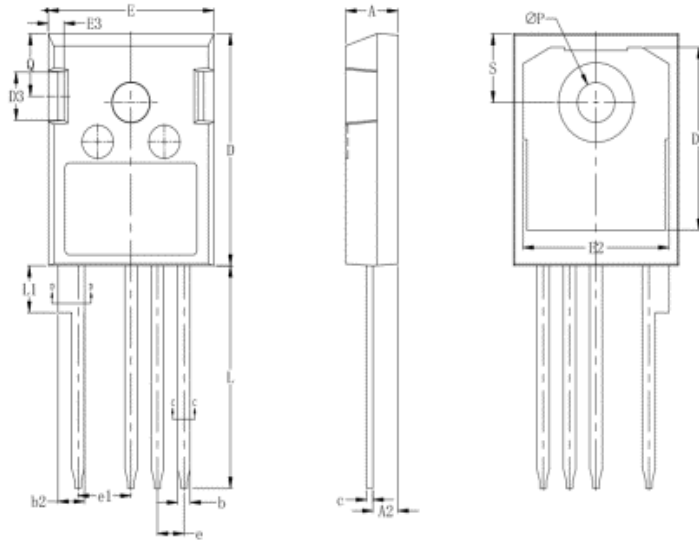
Figure C. Definition of body diodeswitching characteristics





## Package Dimensions

Package TO-247-4L



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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