



## Features

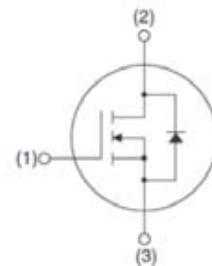
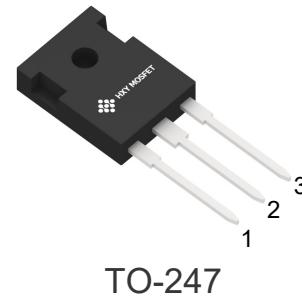
- 3rd generation SiC MOSFET technology
- Optimized package with separate driver source pin
- High blocking voltage with low on-resistance
- High-speed switching with low capacitances
- Fast intrinsic diode with low reverse recovery ( $Q_{rr}$ )
- Halogen free, RoHS compliant

## 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



Ordering Part Number	Package	Qty(PCS)
HSCT3060AL	TO-247	30



## 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 $T_c = 25^\circ\text{C}$ $T_c = 100^\circ\text{C}$	$I_D$	49 35	A
Pulsed drain current ( $T_c = 25^\circ\text{C}$ , $t_p$ limited by $T_{j\max}$ )	$I_{D\text{ pulse}}$	123	A
Avalanche energy, single pulse ( $L=10\text{mH}$ )	$E_{AS}$	1000	mJ
Gate-Source voltage	$V_{GS}$	-5/+20	V
Gate-Source voltage (dynamic, Absolute maximum values)	$V_{GS\max}$	-10/+25	V
Power dissipation ( $T_c = 25^\circ\text{C}$ )	$P_{\text{tot}}$	242	W
Operating junction and storage temperature	$T_j$ , $T_{\text{stg}}$	-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.		
<b>Static Characteristic</b>						
Drain-source breakdown voltage	$\text{BV}_{\text{DSS}}$	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	$\text{I}_{\text{DSS}}$	-	1	100	$\mu\text{A}$	$\text{V}_{\text{DS}}=650\text{V}, \text{V}_{\text{GS}}=0\text{V}$ $T_j=25^\circ\text{C}$ $T_j=175^\circ\text{C}$
Gate-source leakage current	$\text{I}_{\text{GS}}$	-		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	$\text{g}_{\text{fs}}$	-	5.6	-	S	$\text{V}_{\text{DS}}=20\text{V}, \text{I}_D=17.6\text{A}$
<b>Dynamic Characteristic</b>						
Input Capacitance	$\text{C}_{\text{iss}}$	-	1823	-	pF	$\text{V}_{\text{DS}} = 650\text{V}$ $\text{V}_{\text{GS}} = 0\text{V}$ $T_j = 25^\circ\text{C}$ $\text{V}_{\text{AC}} = 25\text{mV}$ $f = 1\text{MHz}$
Output Capacitance	$\text{C}_{\text{oss}}$	-	190	-		
Reverse Transfer Capacitance	$\text{C}_{\text{rss}}$	-	19	-		
Gate Total Charge	$\text{Q}_{\text{G}}$	-	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	$\text{Q}_{\text{gs}}$	-	25	-		
Gate-Drain charge	$\text{Q}_{\text{gd}}$	-	26	-		
Turn-On Switching Energy	$\text{E}_{\text{ON}}$	-	188	-	$\mu\text{J}$	$\text{V}_{\text{DD}} = 400\text{V}$ $\text{V}_{\text{GS}} = -5/+20\text{V}$ $\text{I}_D = 17.6\text{A}$ $\text{R}_{\text{G}} = 10$ $\text{L} = 100\text{uH}$
Turn-Off Switching Energy-	$\text{E}_{\text{OFF}}$	-	19			
Turn-on delay time	$\text{t}_{\text{d(on)}}$	-	20	-		
Rise time	$\text{t}_{\text{r}}$	-	26	-	ns	
Turn-off delay time	$\text{t}_{\text{d(off)}}$	-	48	-		
Fall time	$\text{t}_{\text{f}}$	-	15	-		
Gate resistance	$\text{R}_{\text{G}}$	-	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 <sub>SD</sub>		3.2		V	V <sub>GS</sub> =0V, I <sub>SD</sub> =8.8A, T <sub>J</sub> =25°C
			2.6			V <sub>GS</sub> =0V, I <sub>SD</sub> =8.8A, T <sub>J</sub> =175°C
Body Diode Reverse Recovery Time	t <sub>rr</sub>	-	40	-	ns	V <sub>R</sub> = 400V, I <sub>D</sub> = 17.6A di/dt = 1000A/μS
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	-	156	-	nC	



## Typical Performance Characteristics

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

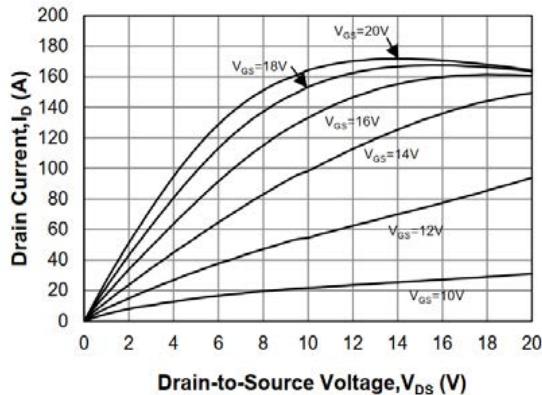


Fig 2. Output Characteristic ( $T_J = 25^\circ\text{C}$ )

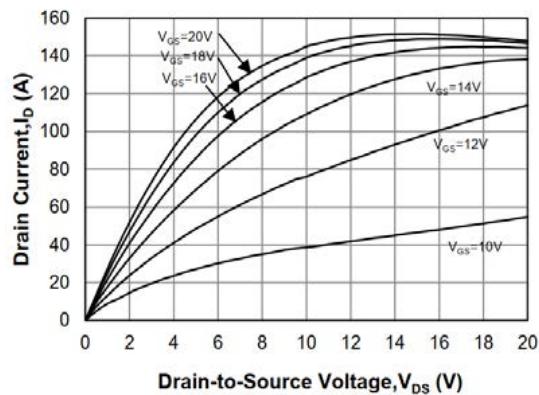


Fig 3. Output Characteristic ( $T_J = 175^\circ\text{C}$ )

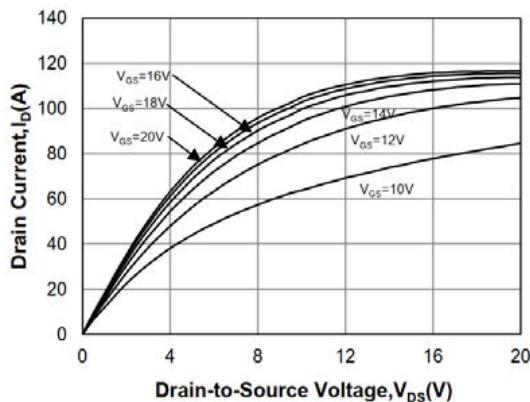


Fig 4:  $R_{DS(on)}$  Vs  $I_D$  Characteristic

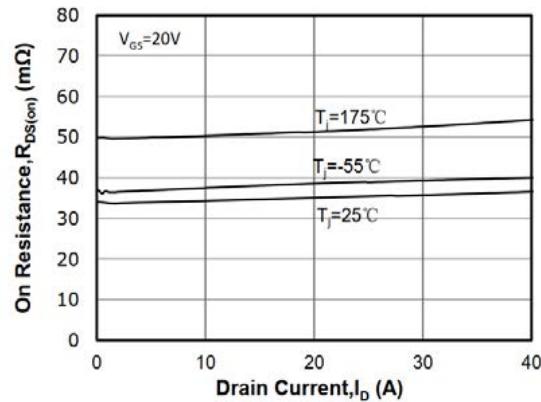


Fig 5:  $R_{DS(on)}$  vs. Temperature

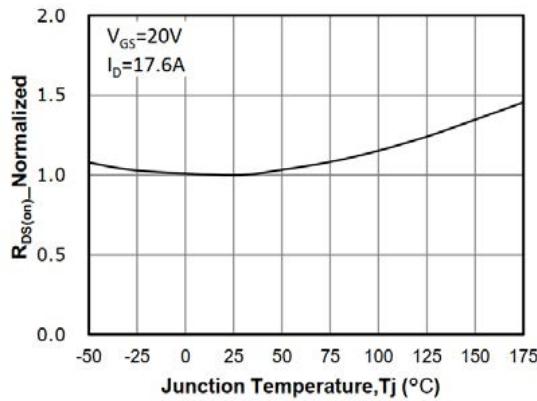


Fig 6: Transfer Characteristic

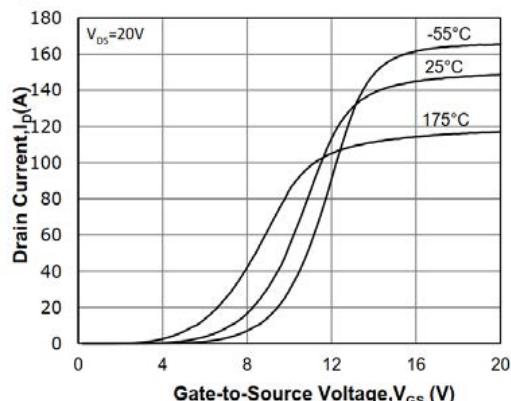




Fig 7: Body-diode Characteristic

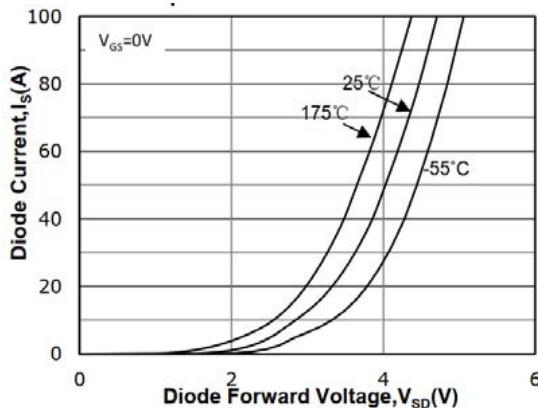


Fig 8:  $V_{TH}$  Vs  $T_J$  Temperature Characteristic

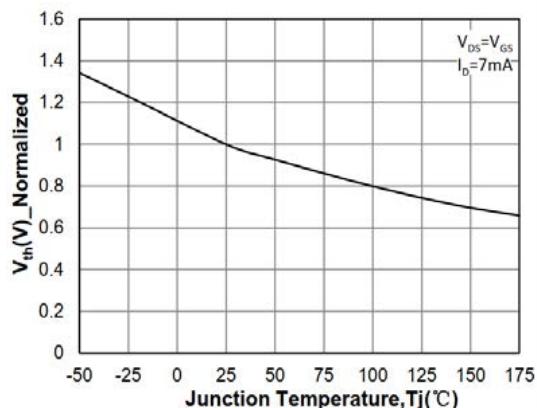


Fig 9: Gate Charge Characteristics

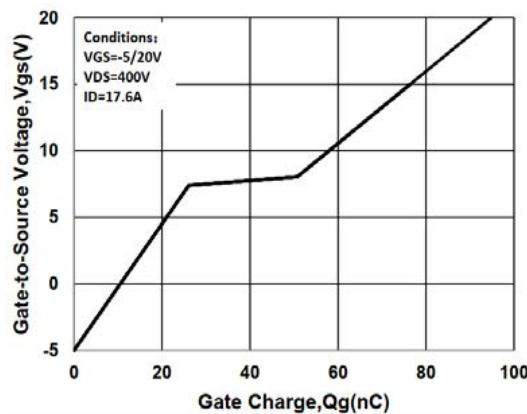


Fig 10: Continuous Drain Current vs. Case Temperature

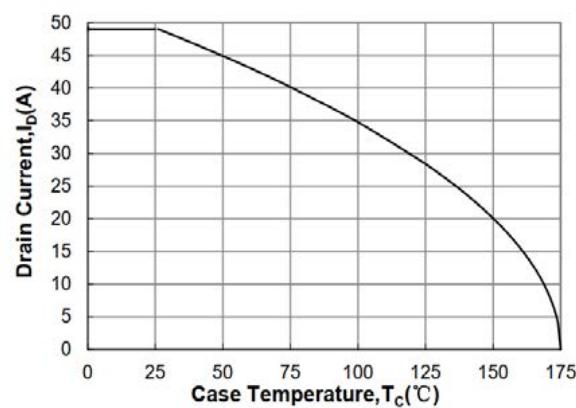


Fig 11: Safe Operating Area

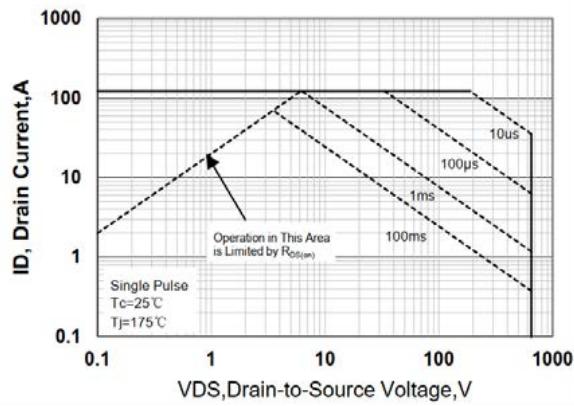


Fig 12: Capacitance Characteristics

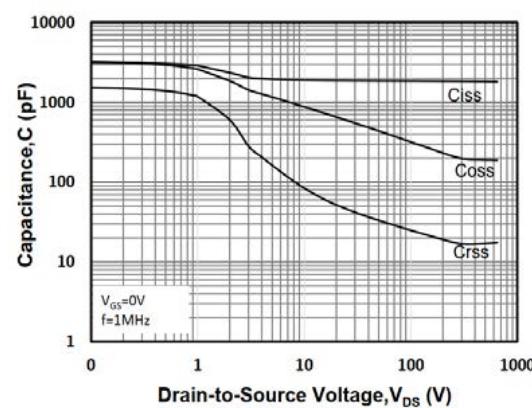
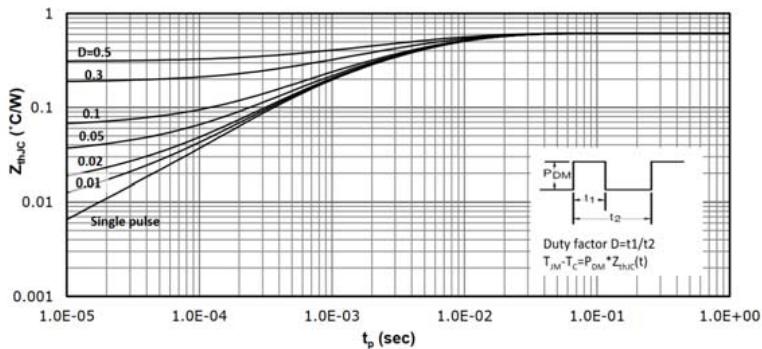




Fig 13: Transient Thermal Impedance



## Test Circuit & Waveform

Figure A. Definition of switching times

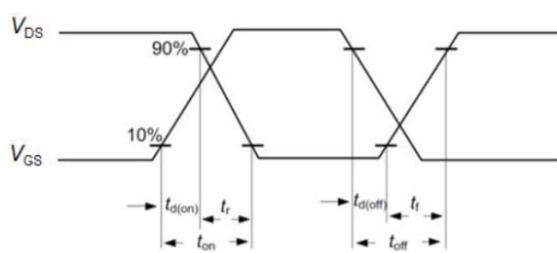


Figure B. Dynamic test circuit

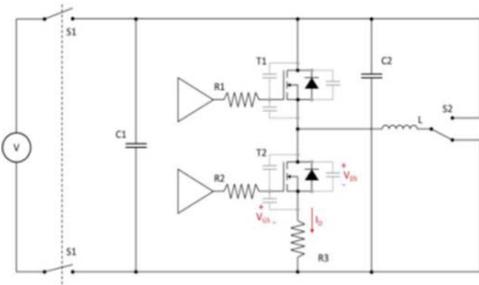
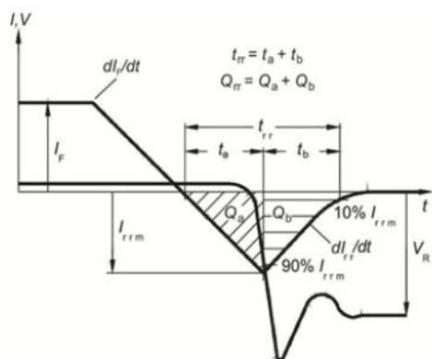


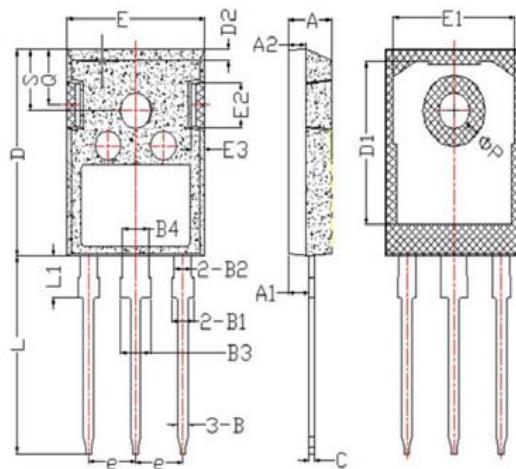
Figure C. Definition of body diodeswitching characteristics





## 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
$\Phi_p$	3.3	3.7
Q	5.2	6
S	5.8	6.6



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