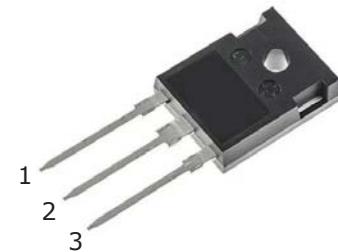




Features

- 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



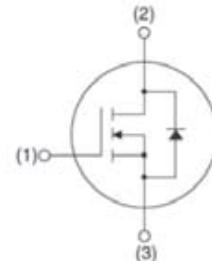
TO-247
Package

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)
HSCT20N120	TO-247	30



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

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	1200	V
Continuous drain current	I_D		
$T_c = 25^\circ\text{C}$		17	A
$T_c = 100^\circ\text{C}$		12	
Pulsed drain current ($T_c = 25^\circ\text{C}$, t_p limited by T_{jmax})	$I_{D\text{ pulse}}$	34	A
Avalanche energy, single pulse ($L=10\text{mH}$)	E_{AS}	1000	mJ
Gate-Source voltage	V_{GS}	-4/+18	V
Gate-Source voltage (dynamic, Absolute maximum values)	V_{GSmax}	-8/+22	V
Power dissipation ($T_c = 25^\circ\text{C}$)	P_{tot}	116	W
Operating junction and storage temperature	T_j, T_{stg}	-55...+175	°C

- Example of acceptable V_{GS} waveform





Thermal Resistance

Parameter	Symbol	Value	Unit
Thermal resistance, junction – case. Max	R_{thJC}	1.29	°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}	1200	-	-	V	$V_{GS}=0\text{V}, I_D=100\text{uA}$
Gate threshold voltage	$V_{GS(\text{th})}$	2	3.1	4	V	$V_{DS}=V_{GS}, I_D=2.3\text{mA}$
Zero gate voltage drain current	I_{DSS}	-	1 5	20	μA	$V_{DS}=1200\text{V}, V_{GS}=0\text{V}$ $T_j=25^\circ\text{C}$ $T_j=175^\circ\text{C}$
Gate-source leakage current	I_{GS}	-		200	nA	$V_{GS}=18\text{V}, V_{DS}=0\text{V}$
Drain-source on-state resistance	$R_{DS(\text{on})}$	-	160 250	208	m	$V_{GS}=18\text{V}, I_D=8\text{A},$ $T_j=25^\circ\text{C}$ $T_j=175^\circ\text{C}$
Transconductance	g_{fs}	-	5	-	S	$V_{DS}=20\text{V}, I_D=40\text{A}$
Dynamic Characteristic						
Input Capacitance	C_{iss}	-	624	-	pF	$V_{DS} = 1000\text{V}$ $V_{GS} = 0\text{V}$ $T_j = 25^\circ\text{C}$ $V_{AC} = 25\text{mV}$ $f = 1\text{MHz}$
Output Capacitance	C_{oss}	-	42	-		
Reverse Transfer Capacitance	C_{rss}	-	6	-		
Gate Total Charge	Q_G	-	37.4	-	nC	$V_{DS} = 800\text{V}$ $V_{GS} = -0/18\text{V}$ $I_D = 8\text{A}$ $I_G = 10\text{mA}$
Gate-Source charge	Q_{gs}	-	5.3	-		
Gate-Drain charge	Q_{gd}	-	20.6	-		
Turn-On Switching Energy	E_{ON}	-	11	-	μJ	$V_{DD} = 800\text{V}$ $V_{GS} = -4/+18\text{V}$ $I_D = 8\text{A}$ $R_G = 5$ $L = 120\text{uH}$
Turn-Off Switching Energy-	E_{OFF}	-	230			
Turn-on delay time	$t_{d(on)}$	-	12.25	-		
Rise time	t_r	-	18.68	-	ns	
Turn-off delay time	$t_{d(off)}$	-	17.37	-		
Fall time	t_f	-	11.82	-		
Gate resistance	R_G	-	3.3	-		$V_{AC} = 25\text{mV}, f=1\text{MHz}$



Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	V _{SD}		3.6		V	V _{GS} =0V, I _{SD} =40A, T _J =25°C
			3.2			V _{GS} =0V, I _{SD} =40A, T _J =175°C
Body Diode Reverse Recovery Time	t _{rr}	-	13.5	-	ns	V _R = 400V, I _D = 8A di/dt = 1000A/μS T _J =25°C
Body Diode Reverse Recovery Charge	Q _{rr}	-	36.8	-	nC	



Typical Performance Characteristics

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

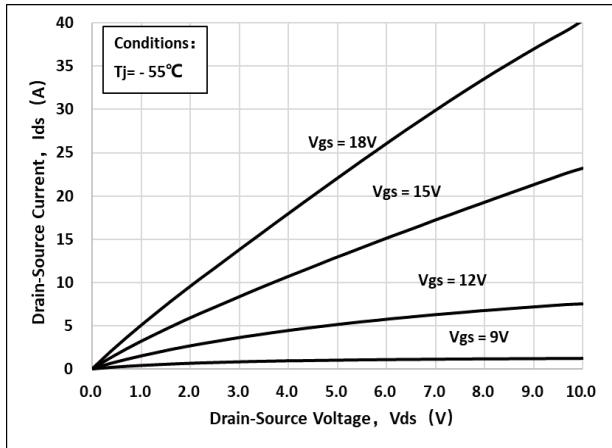


Fig 2. Output Characteristic ($T_J = 25^\circ\text{C}$)

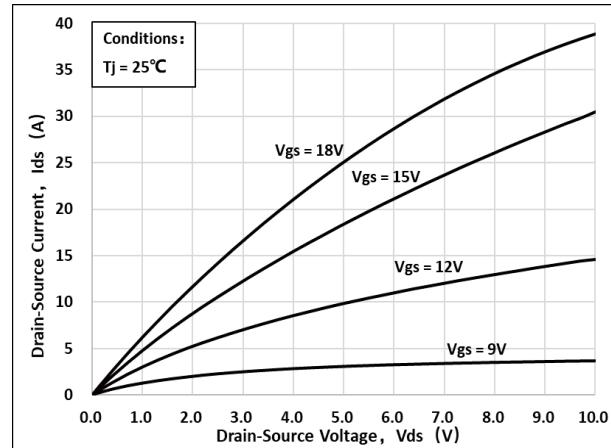


Fig 3. Output Characteristic ($T_J = 175^\circ\text{C}$)

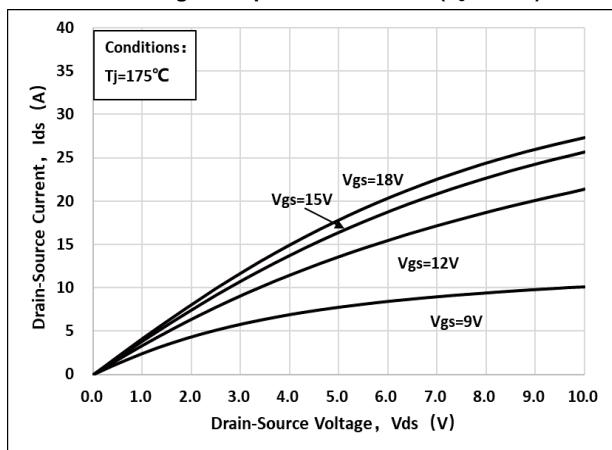


Fig 4: $R_{ds(on)}$ Vs I_{ds} Characteristic

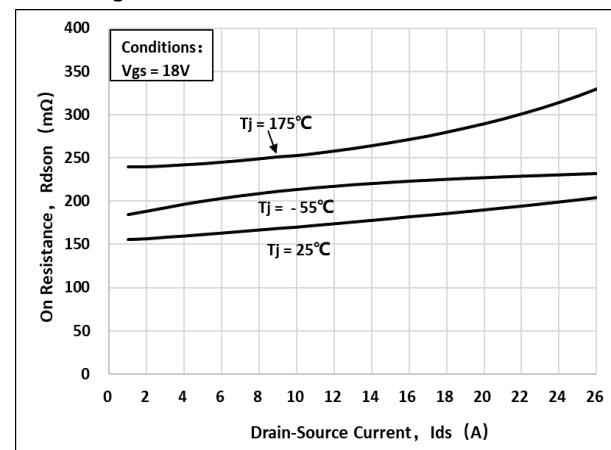


Fig 5: $R_{ds(on)}$ vs. Temperature

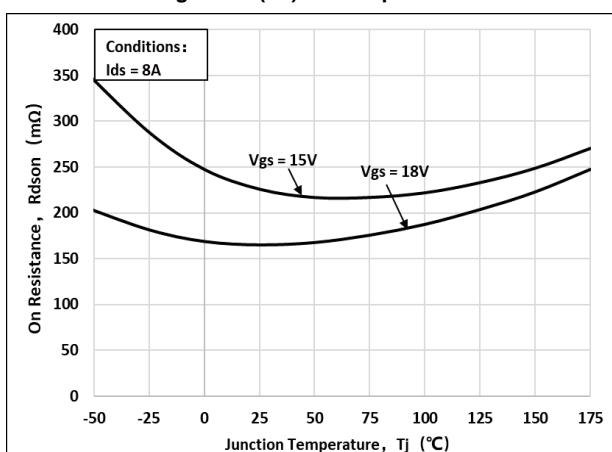


Fig 6: Transfer Characteristic

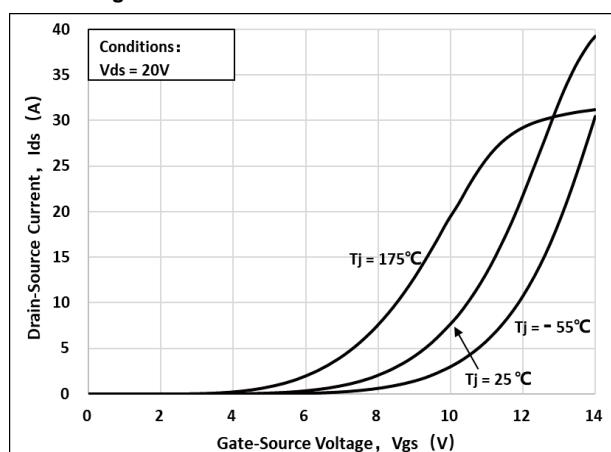




Fig 7: Body-diode Characteristic ($T_J = -55^\circ\text{C}$)

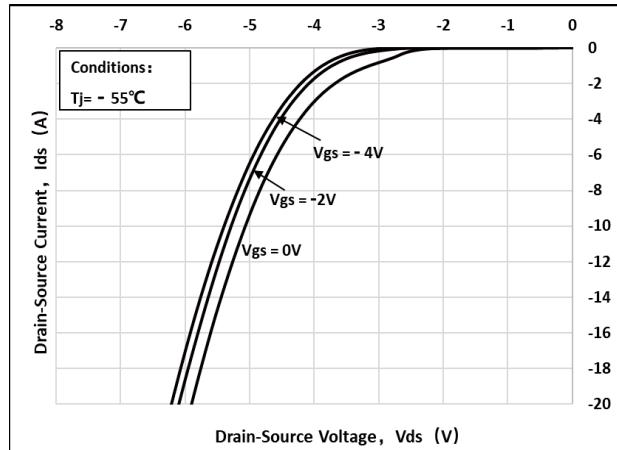


Fig 8: Body-diode Characteristic ($T_J = 25^\circ\text{C}$)

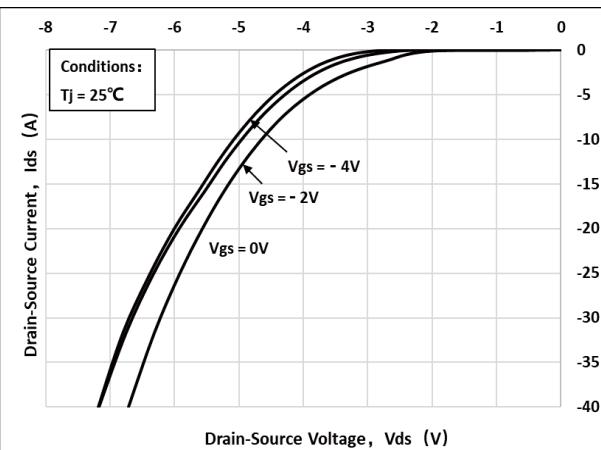


Fig 9: Body-diode Characteristic ($T_J = 175^\circ\text{C}$)

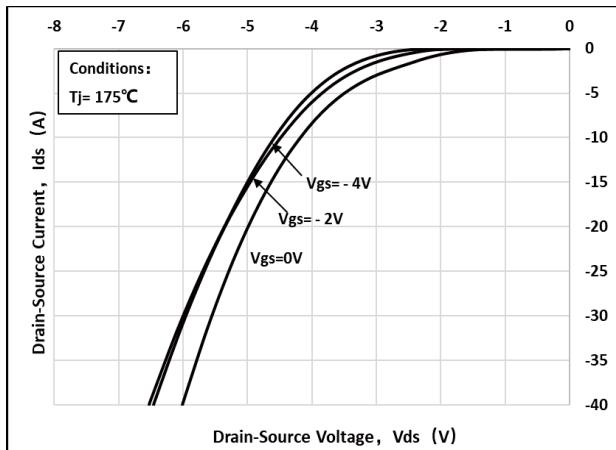


Fig 10: V_{th} Vs T_J Temperature Characteristic

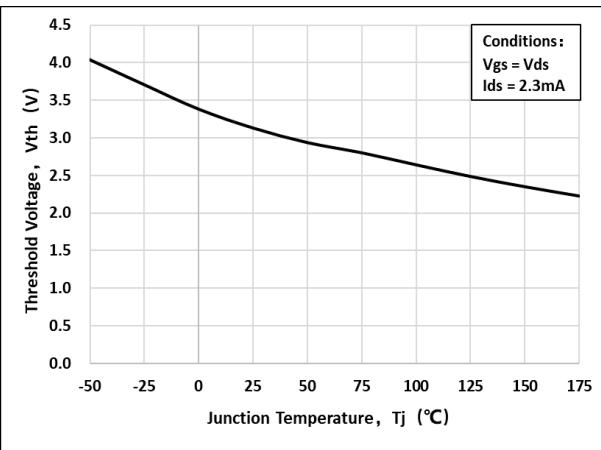


Fig 11: Gate Charge Characteristics

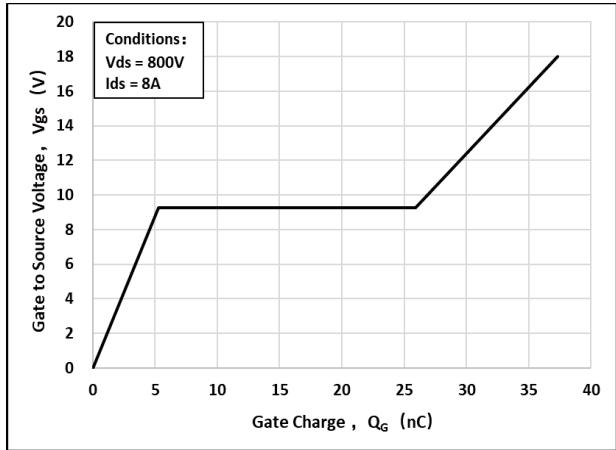


Fig 12: 3rd Quadrant Characteristic ($T_J = -55^\circ\text{C}$)

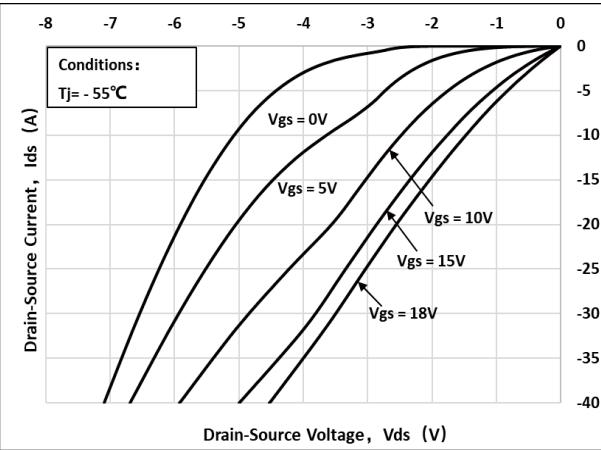




Fig 13: 3rd Quadrant Characteristic($T_J=25^\circ\text{C}$)

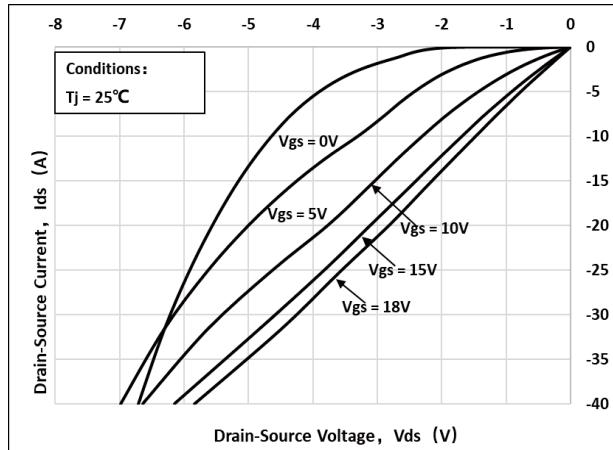


Fig 14: 3rd Quadrant Characteristic($T_J=175^\circ\text{C}$)

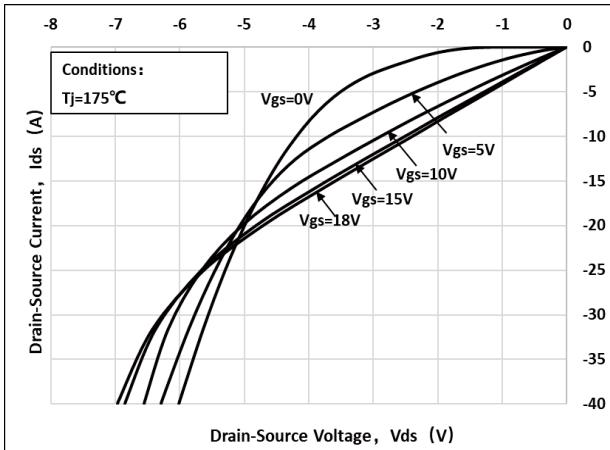


Fig 15: Capacitance Characteristic

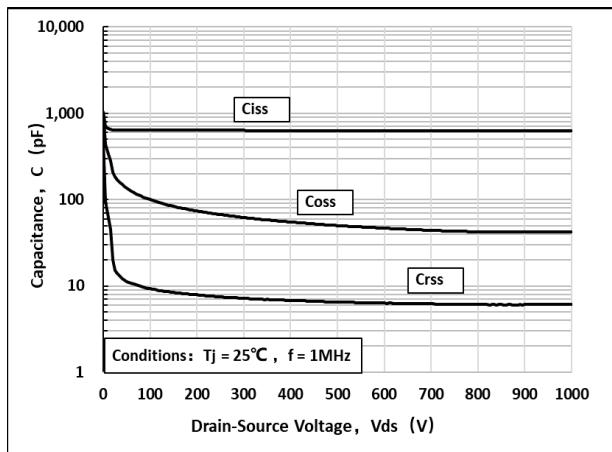


Fig 16: Safe Operating Area

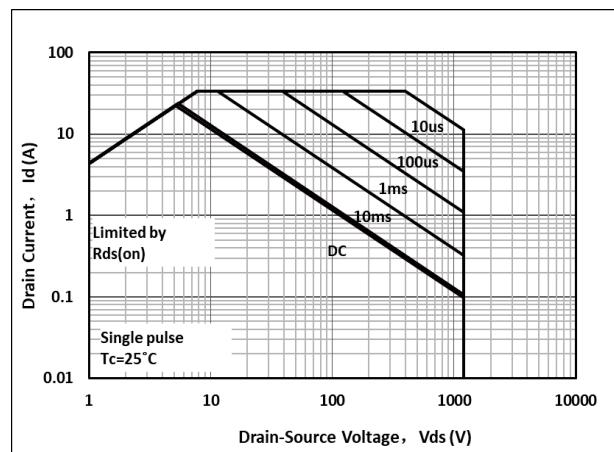
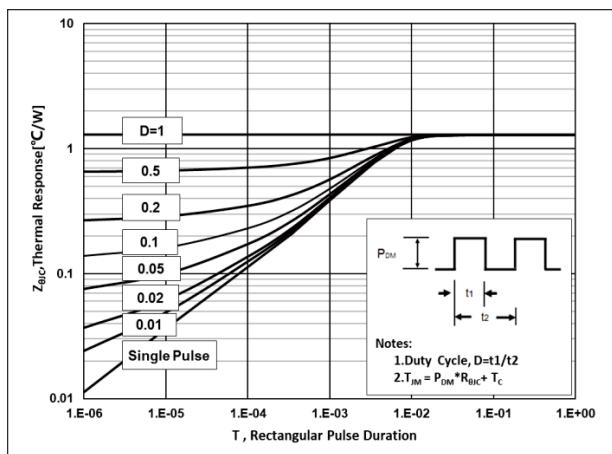


Fig 17: Transient Thermal Impedance



Test Circuit Schematic

Figure A. Definition of switching times

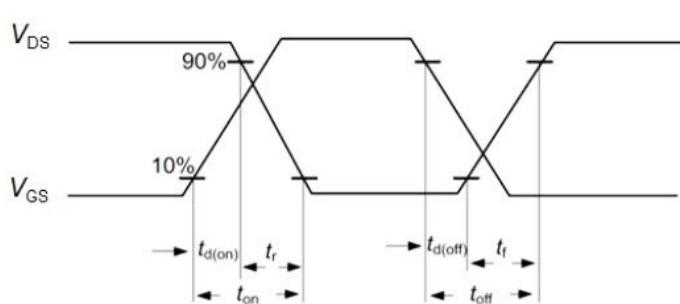


Figure B. Dynamic test circuit

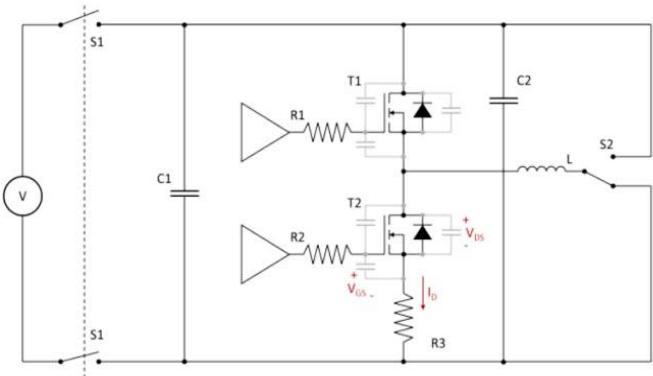


Figure C. Definition of body diodeswitching characteristics

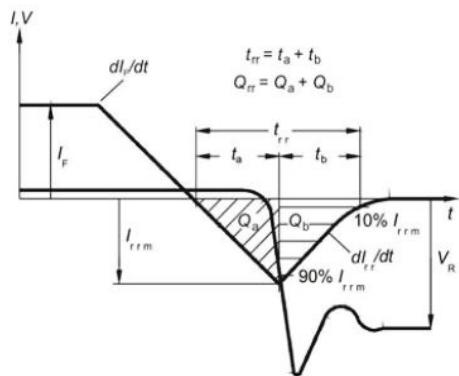


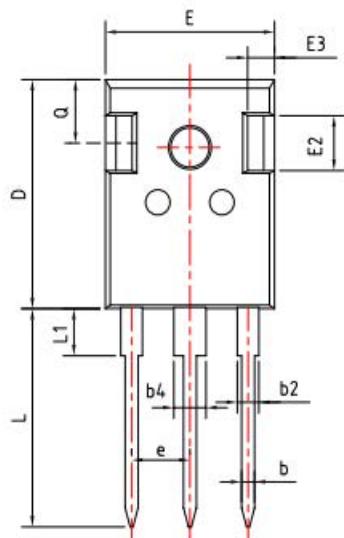
Figure C. Definition of diode switching characteristics



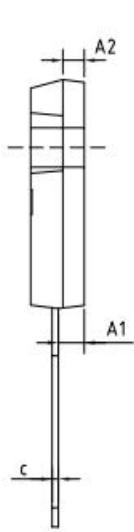
Package Dimensions

Package TO-247

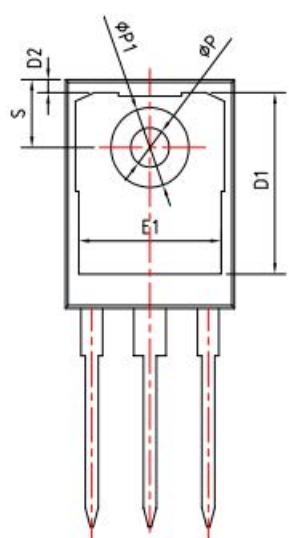
Top View



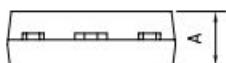
Side View



Bottom View



Front View



Dimension unit:[mm]

SYMBOL	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.61
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b2	1.91	2.01	2.21
b4	2.91	3.01	3.21
c	0.51	0.60	0.75
D	20.70	21.00	21.30
D1	16.25	16.55	16.85
D2	1.00	1.20	1.35
E	15.50	15.80	16.10
E1	13.00	13.30	13.60
E2	4.80	5.00	5.20
E3	2.30	2.50	2.70
e	5.44 BSC		
L	19.62	19.92	20.22
L1	-	-	4.30
φP	3.40	3.60	3.80
φP1	-	-	7.30
Q	5.40	5.80	6.20
S	6.20 BSC		



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