

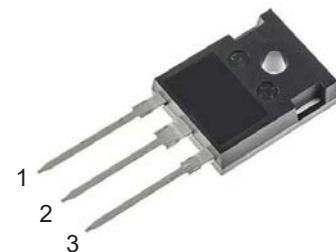


## Features

- 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

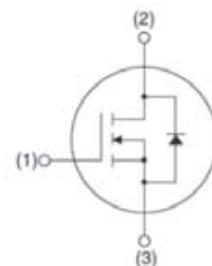


TO-247  
(TO-247-3)  
Package

## Applications

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

Ordering Part Number	Package	Qty(PCS)
HIMW120R220M1H	TO-247(TO-247-3)	30



## Maximum Ratings (T<sub>c</sub> = 25 °C unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-source voltage	V <sub>DS</sub>	1200	V
Continuous drain current	I <sub>D</sub>	17	A
T <sub>c</sub> = 25°C		12	
T <sub>c</sub> = 100°C			
Pulsed drain current (T <sub>c</sub> = 25°C, t <sub>p</sub> limited by T <sub>jmax</sub> )	I <sub>D</sub> pulse	34	A
Avalanche energy, single pulse (L=10mH)	E <sub>AS</sub>	1000	mJ
Gate-Source voltage	V <sub>GS</sub>	-4/+18	V
Gate-Source voltage (dynamic, Absolute maximum values)	V <sub>GSmax</sub>	-8/+22	V
Power dissipation (T <sub>c</sub> = 25°C)	P <sub>tot</sub>	116	W
Operating junction and storage temperature	T <sub>j</sub> , T <sub>stg</sub>	-55...+175	°C

- Example of acceptable V<sub>GS</sub> 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	$\text{BV}_{DSS}$	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	20	$\mu\text{A}$	$V_{DS}=1200\text{V}, V_{GS}=0\text{V}$
		-	5	-		$T_j=25^\circ\text{C}$
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	208	$\text{m}\Omega$	$V_{GS}=18\text{V}, I_D=8\text{A},$
		-	250	-		$T_j=25^\circ\text{C}$
		-				$T_j=175^\circ\text{C}$
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	-	$\mu\text{J}$	$V_{DD} = 800\text{V}$ $V_{GS} = -4/+18\text{V}$ $I_D = 8\text{A}$ $R_G = 5\Omega$ $L = 120\text{uH}$
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	-	$\Omega$	$V_{AC} = 25\text{mV}, f=1\text{MHz}$



### Body Diode Characteristic

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



## Typical Performance Characteristics

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

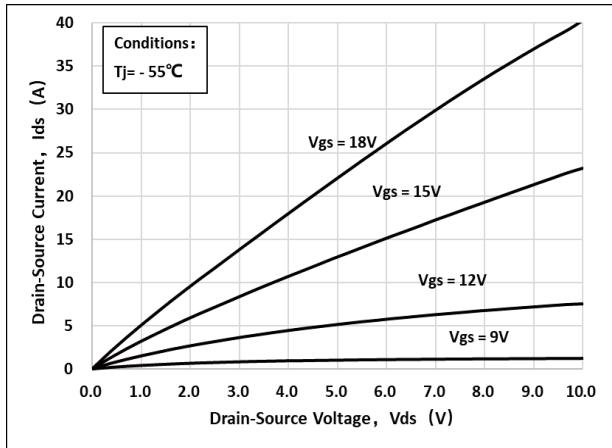


Fig 2. Output Characteristic ( $T_J = 25^\circ\text{C}$ )

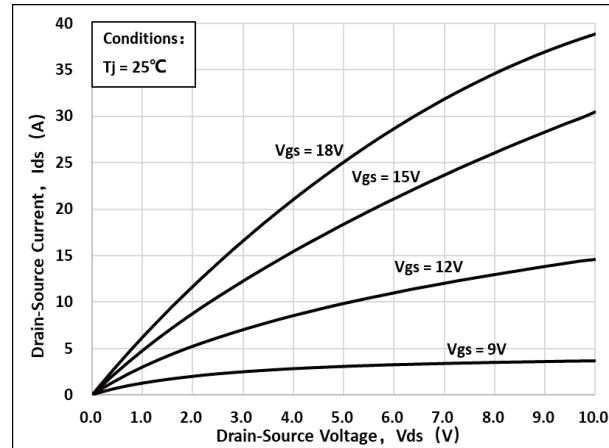


Fig 3. Output Characteristic ( $T_J = 175^\circ\text{C}$ )

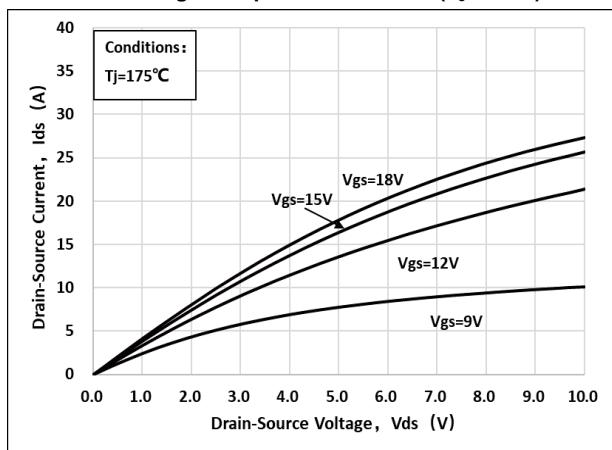


Fig 4:  $R_{ds(on)}$  Vs  $Id_s$  Characteristic

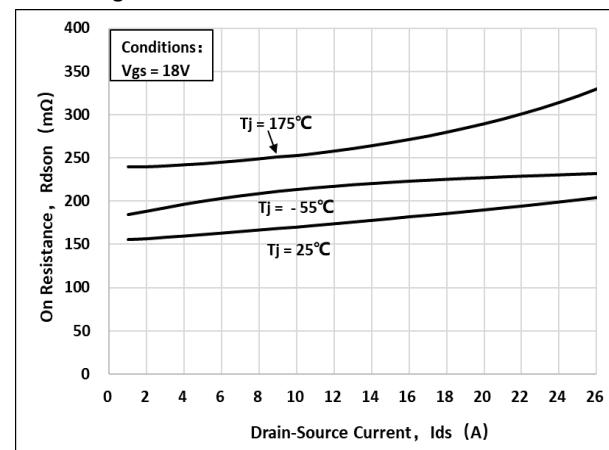


Fig 5:  $R_{ds(on)}$  vs. Temperature

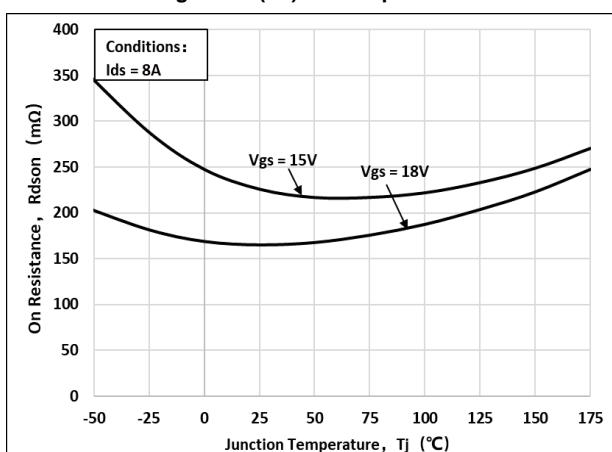


Fig 6: Transfer Characteristic

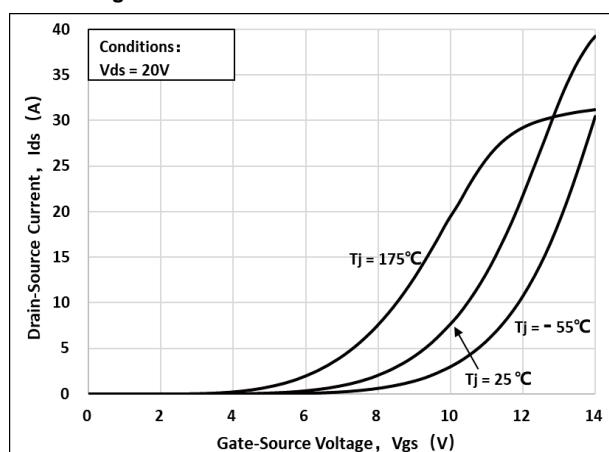




Fig 7: Body-diode Characteristic ( $T_J = -55^\circ\text{C}$ )

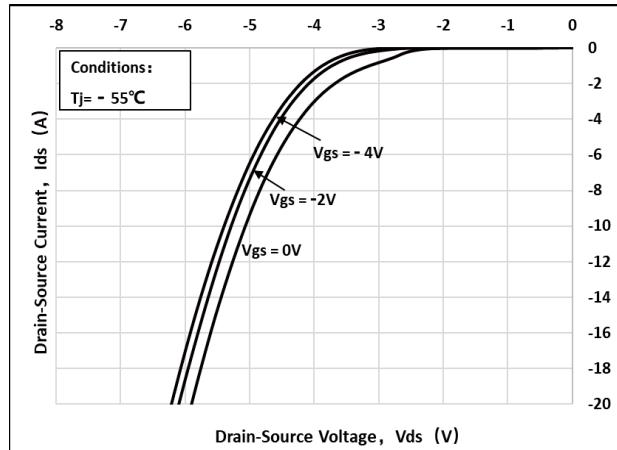


Fig 8: Body-diode Characteristic ( $T_J = 25^\circ\text{C}$ )

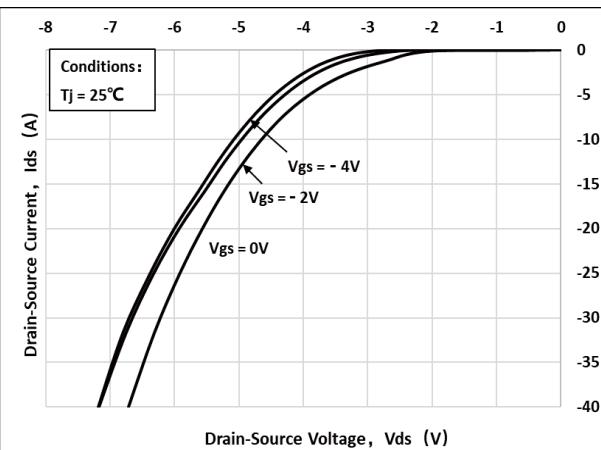


Fig 9: Body-diode Characteristic ( $T_J = 175^\circ\text{C}$ )

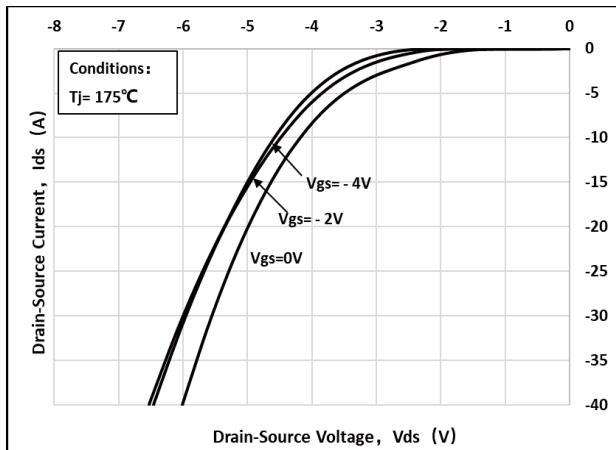


Fig 10:  $V_{th}$  Vs  $T_J$  Temperature Characteristic

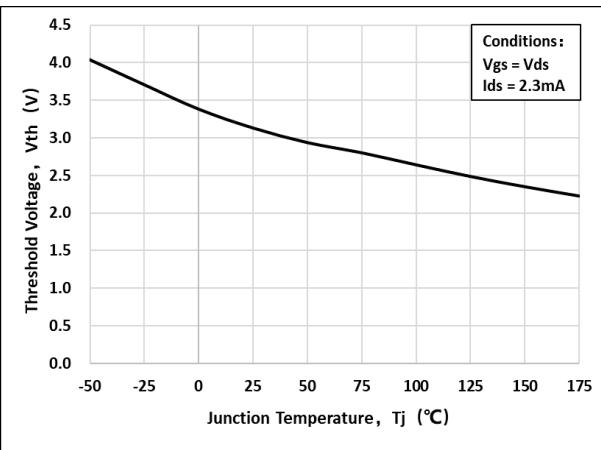


Fig 11: Gate Charge Characteristics

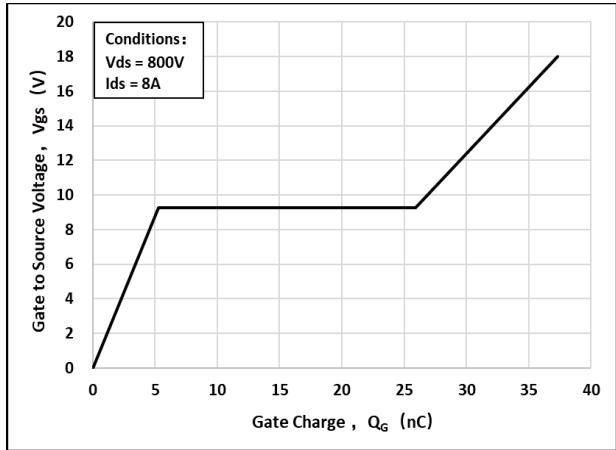


Fig 12: 3rd Quadrant Characteristic ( $T_J = -55^\circ\text{C}$ )

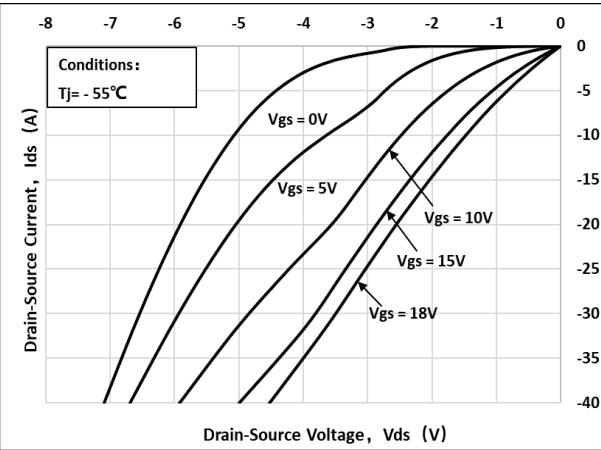




Fig 13: 3rd Quadrant Characteristic( $T_J=25^\circ\text{C}$ )

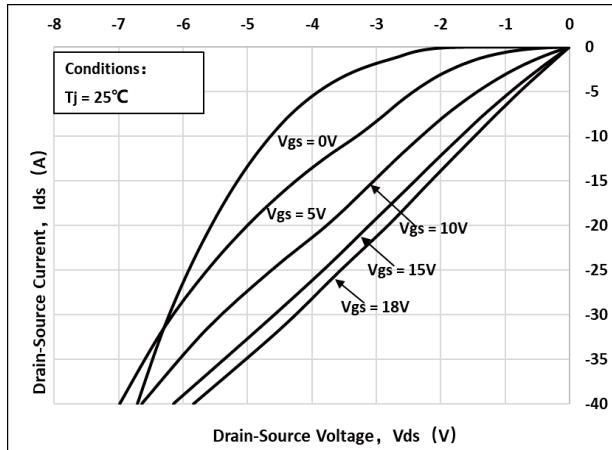


Fig 14: 3rd Quadrant Characteristic( $T_J=175^\circ\text{C}$ )

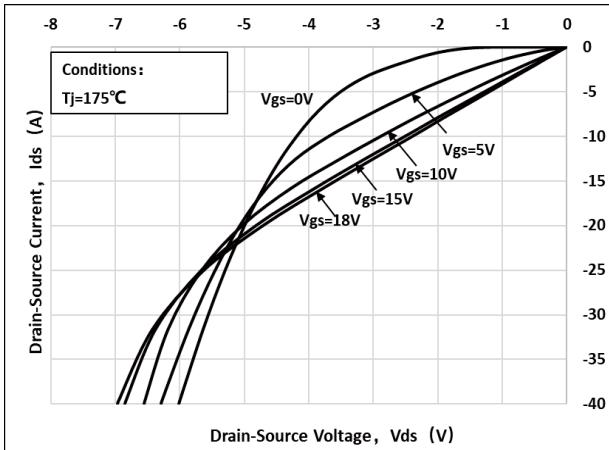


Fig 15: Capacitance Characteristic

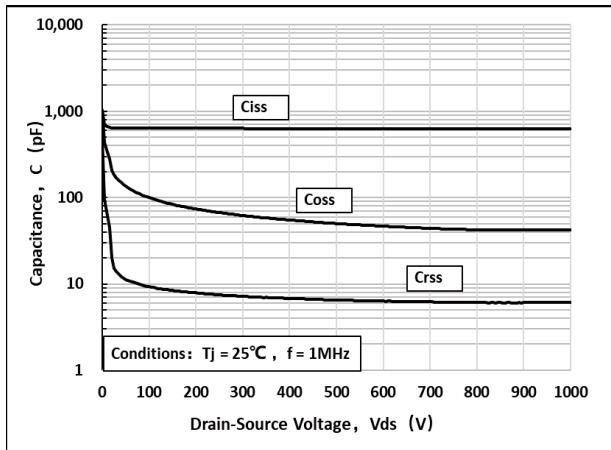


Fig 16: Safe Operating Area

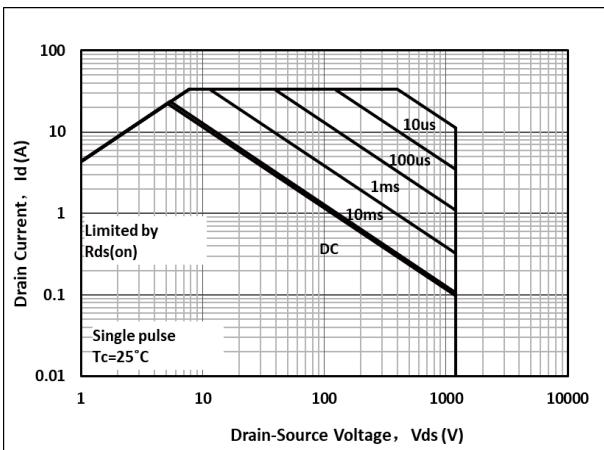
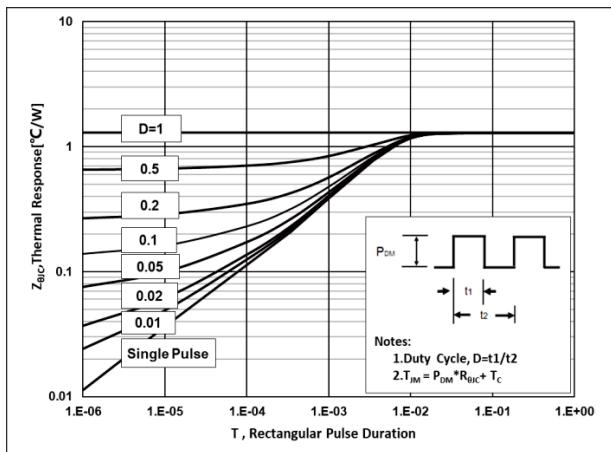


Fig 17: Transient Thermal Impedance





## Test Circuit Schematic

Figure A. Definition of switching times

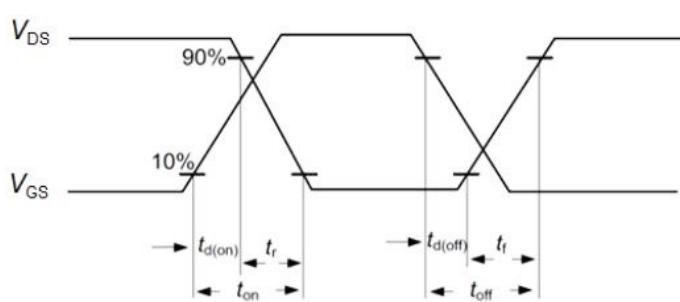


Figure B. Dynamic test circuit

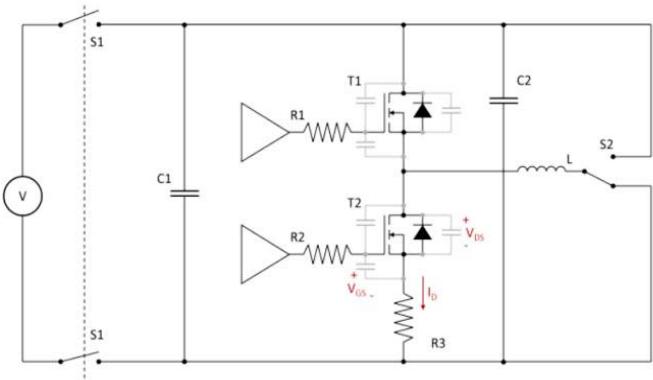


Figure C. Definition of body diodeswitching characteristics

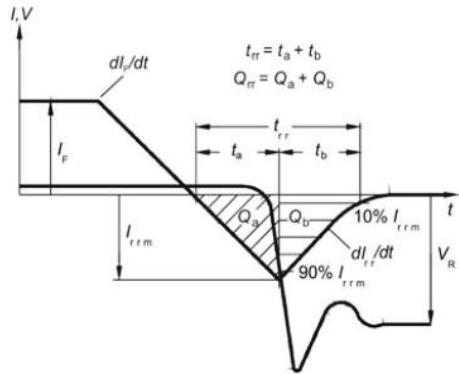


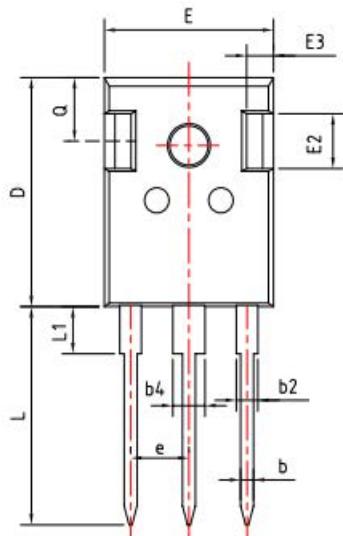
Figure C. Definition of diode switching characteristics



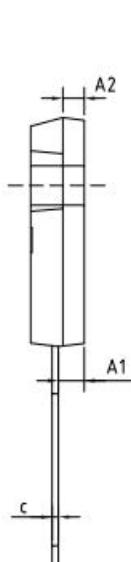
## Package Dimensions

## Package TO-247(TO-247-3)

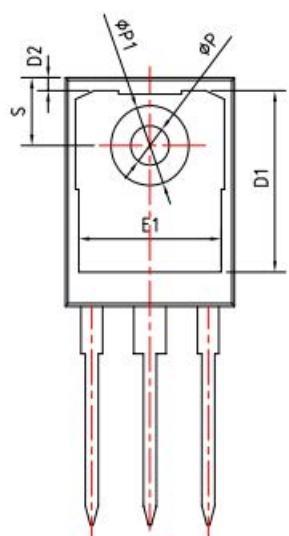
### Top View



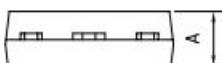
### Side View



### 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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