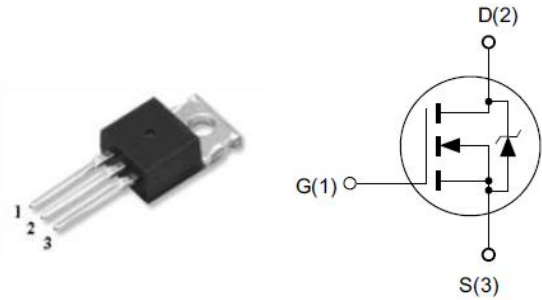


Features

- ◆ 200V, 109A, $R_{DS(on)}$ (Typ.) = $8.6m\Omega @ V_{GS} = 10V$
- ◆ Excellent $R_{DS(on)}$ and Low Gate Charge
- ◆ Halogen free; RoHS compliant
- ◆ 100% E_{AS} Guaranteed



Application

- ◆ Motor Driving in Power Tool, E-vehicle, Robotics
- ◆ Current Switching in DC/DC & AC/DC (SR) Sub-systems
- ◆ Power Management in Telecom, Industrial Automation, CE

Absolute Maximum Ratings $T_c = 25^\circ C$ unless otherwise noted

Symbol	Parameter	Rating	Unit
V_{DS}	Drain-Source Voltage ^a	200	V
V_{GS}	Gate-Source Voltage	± 20	
I_D	Drain Current-Continuous	$T_C = 25^\circ C$	A
		$T_C = 100^\circ C$	
I_{DM}	Drain Current-Pulsed ^b	436	
P_D	Maximum Power Dissipation, $T_C = 25^\circ C$	312	W
E_{AS}	Single Pulsed Avalanche Energy ^c	1225	mJ
T_J, T_{STG}	Operating and Store Temperature Range	150, -55 to 150	$^\circ C$

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.4	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	63	

Electrical Characteristics $T_J = 25^\circ C$ unless otherwise noted

■ Off Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	200	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 200V, V_{GS} = 0V$	-	-	1.0	μA
I_{GSS}	Forward Gate Body Leakage Current	$V_{DS} = 0V, V_{GS} = \pm 20V$	-	-	± 100	nA

■ On Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	2.5	3.3	4.5	V
$R_{DS(on)}$	Static Drain-Source On-Resistance ^d	$V_{GS} = 10V, I_D = 20A$	-	8.6	10	mΩ

■ Dynamic Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
R_G	Gate Resistance	$V_{DS} = V_{GS} = 0V, f = 1.0MHz$	-	7.0	-	Ω
C_{iss}	Input Capacitance	$V_{DS} = 100V, V_{GS} = 0V, f = 1.0MHz$	-	8788	-	pF
C_{oss}	Output Capacitance		-	455	-	
C_{rss}	Reverse Transfer Capacitance		-	17	-	

■ On Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-On Delay Time	$V_{DS} = 100V, V_{GS} = 10V, R_L = 5.0\Omega, R_G = 6.0\Omega$	-	30	-	ns
t_r	Turn-On Rise Time		-	58	-	
$t_{d(off)}$	Turn-Off Delay Time		-	98	-	
t_f	Turn-Off Fall Time		-	43	-	
Q_g	Total Gate Charge	$V_{DS} = 100V, V_{GS} = 0 \text{ to } 10V, I_D = 20A$	-	122	-	nC
Q_{gs}	Gate-Source Charge		-	43	-	
Q_{gd}	Gate-Drain Charge		-	23	-	

■ Drain-Source Diode Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
I_S	Drain-Source Diode Forward Continuous Current	$V_G = V_D = 0V, \text{Force Current}$	-	-	109	A
I_{SM}	Maximum Pulsed Current		-	-	436	
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0V, I_S = 20A$	-	0.8	1.2	V
T_{rr}	Body Diode Reverse Recovery Time	$I_F = 20A, di_F/dt = 100A/\mu s$	-	186	-	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F = 20A, di_F/dt = 100A/\mu s$	-	743	-	nC

Notes:

- $T_J = +25^\circ C \text{ to } +150^\circ C$.
- Repetitive rating: pulse width limited by maximum junction temperature.
- $L = 0.5mH, V_{DD} = 30V, I_{AS} = 70A, R_G = 25\Omega$ Starting $T_J = 25^\circ C$.
- Pulse width $\leq 300\mu s$; duty cycle $\leq 2\%$.

Characteristic Curve

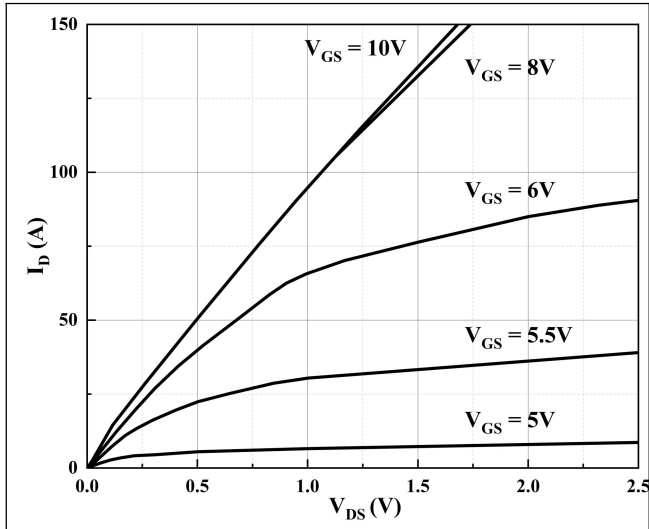


Figure 1. Typical Output Characteristics

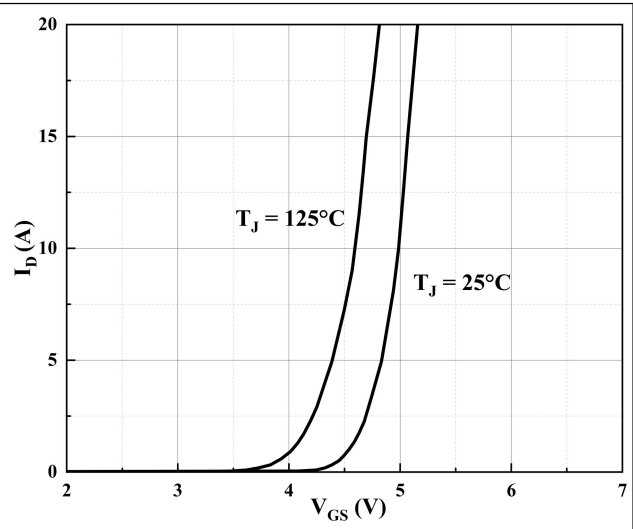


Figure 2. Typical Transfer Characteristics

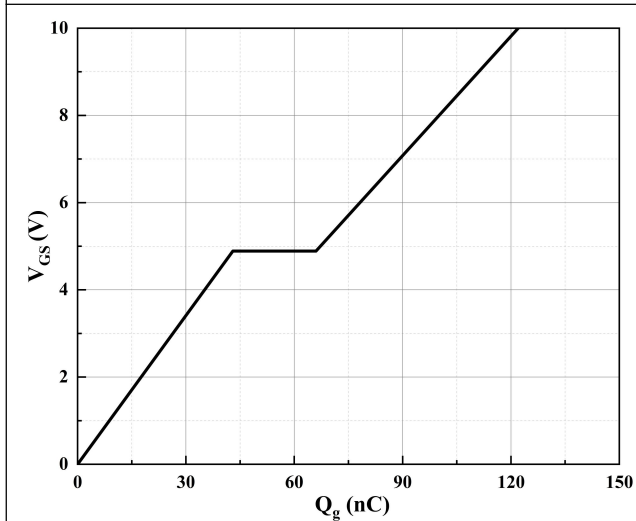


Figure 3. Typical Gate Charge

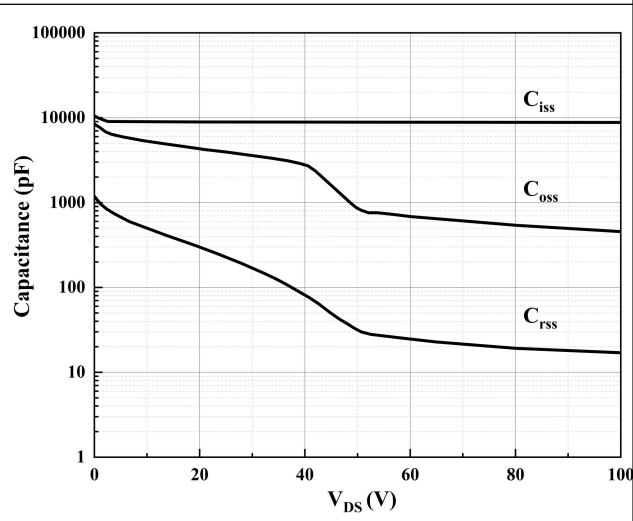


Figure 4. Typical Capacitance

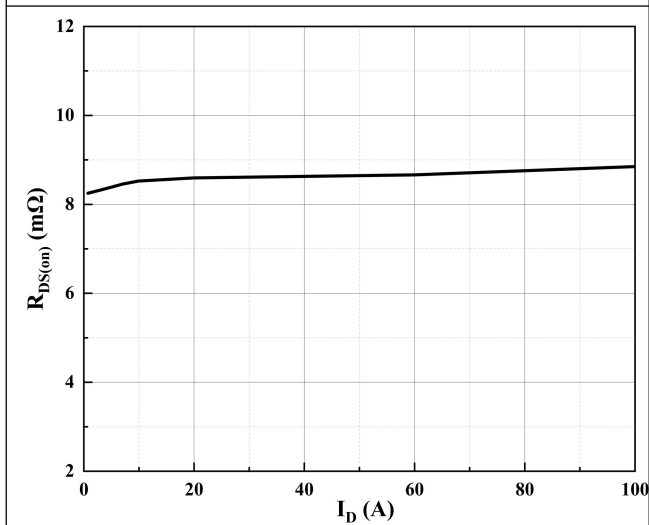


Figure 5. Static Drain-Source On-Resistance vs. Drain Current

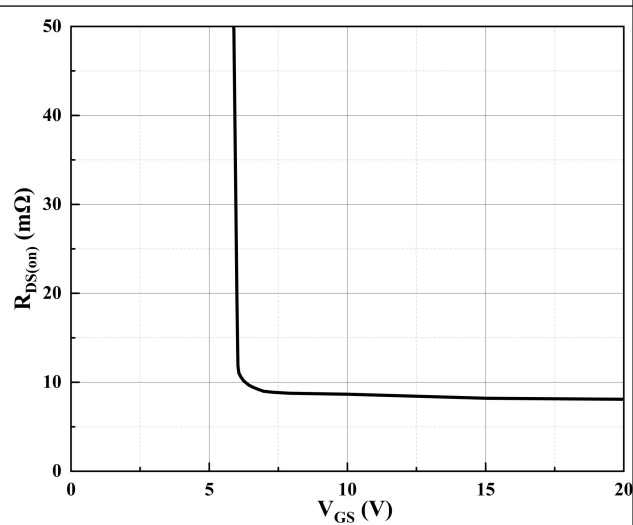


Figure 6. Static Drain-Source On-Resistance vs. Gate-Source Voltage

■ Characteristic Curve

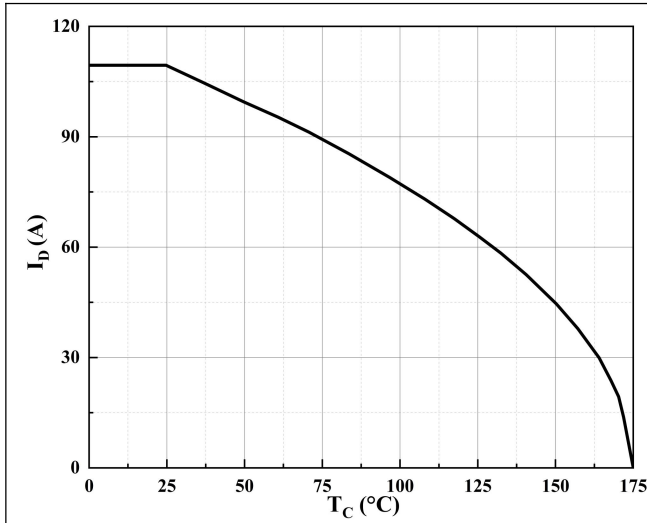


Figure 7. Maximum Continuous Drain Current vs. Case Temperature

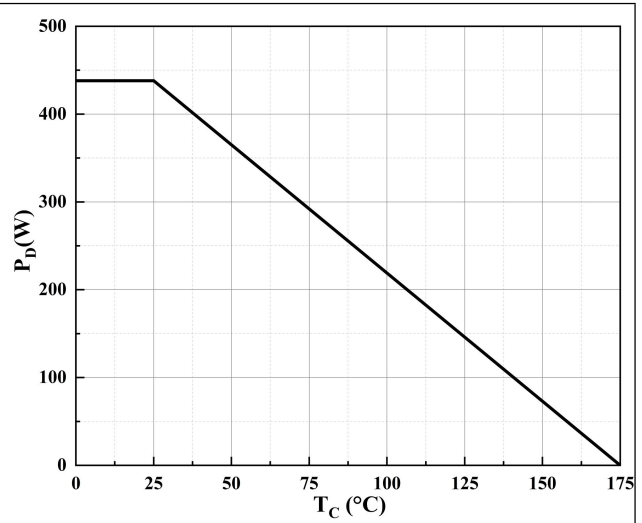


Figure 8. Maximum Power Dissipation vs. Case Temperature

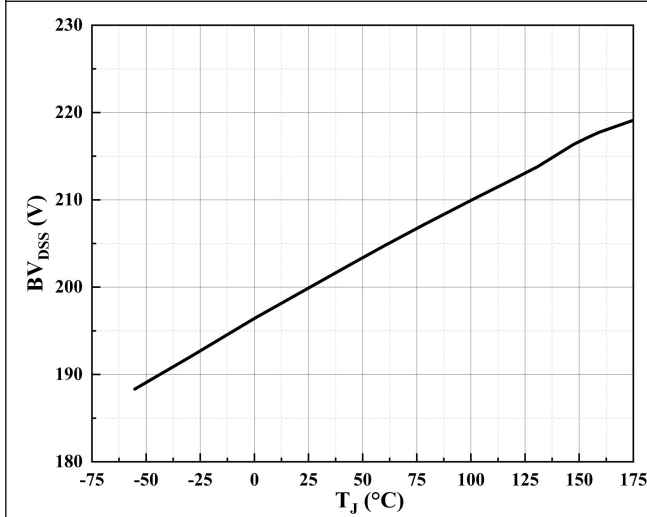


Figure 9. Normalized Drain-Source Breakdown Voltage vs. Junction Temperature

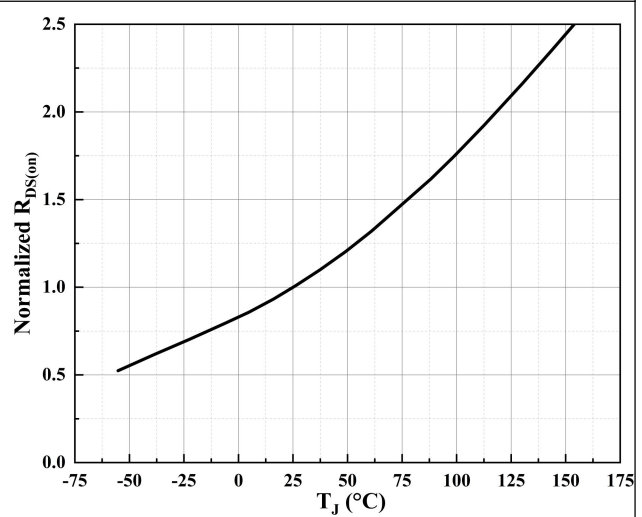


Figure 10. Normalized Static Drain-Source On-Resistance vs. Junction Temperature

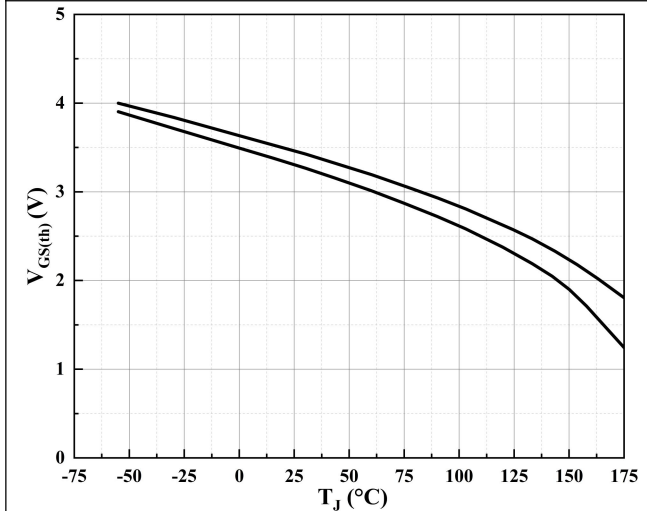


Figure 11. Gate Threshold Voltage vs. Junction Temperature

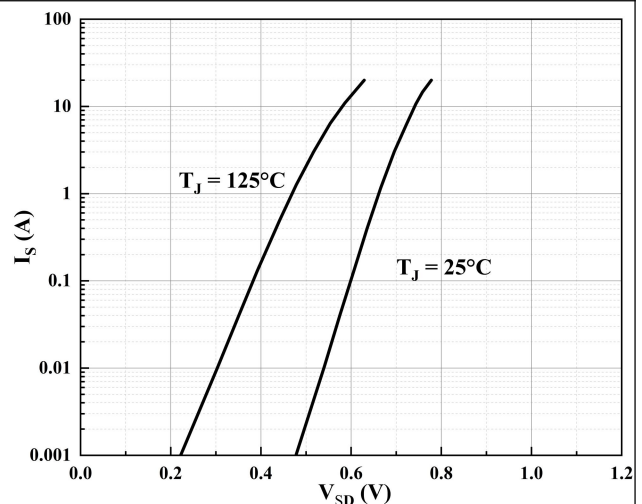
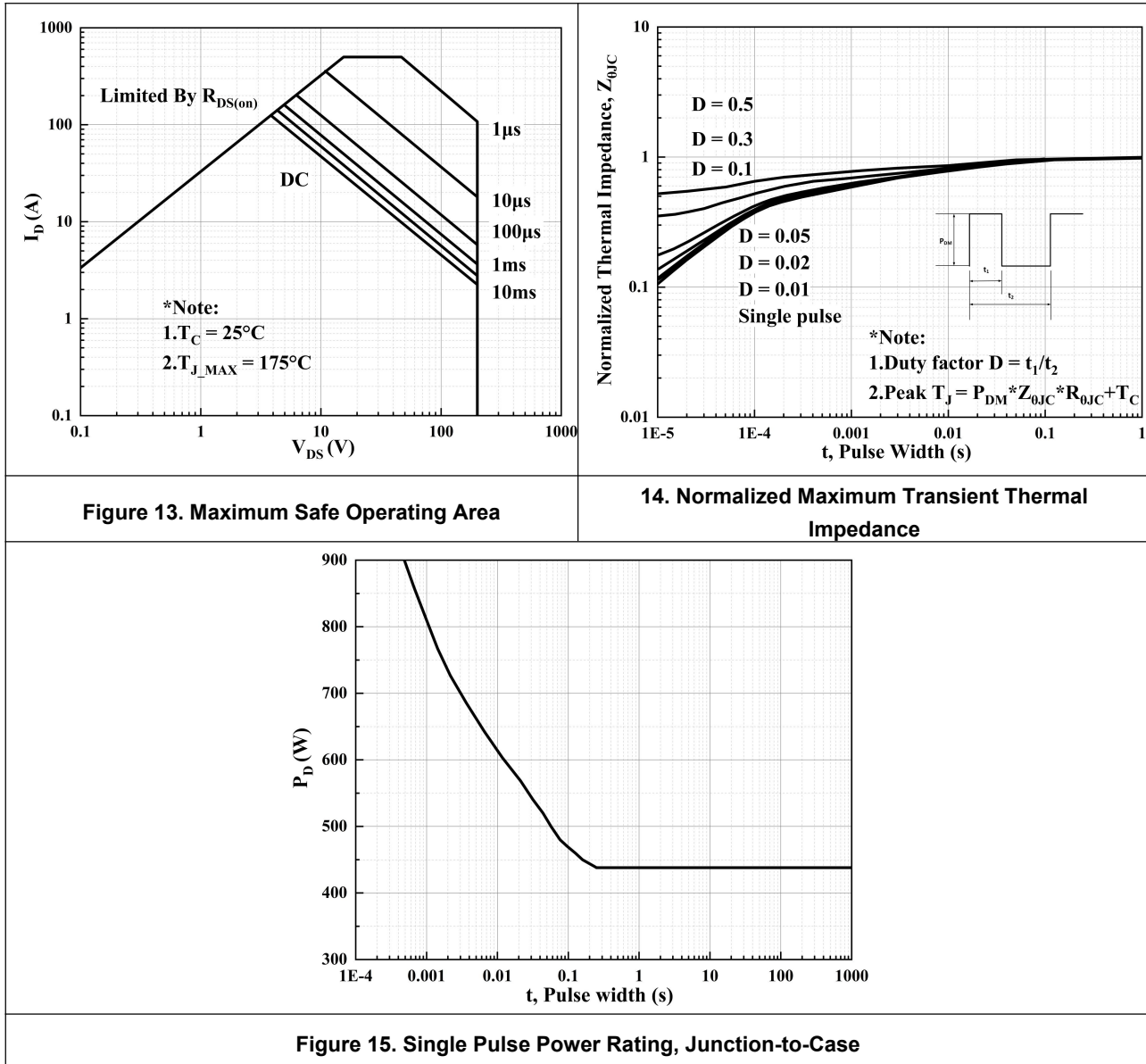


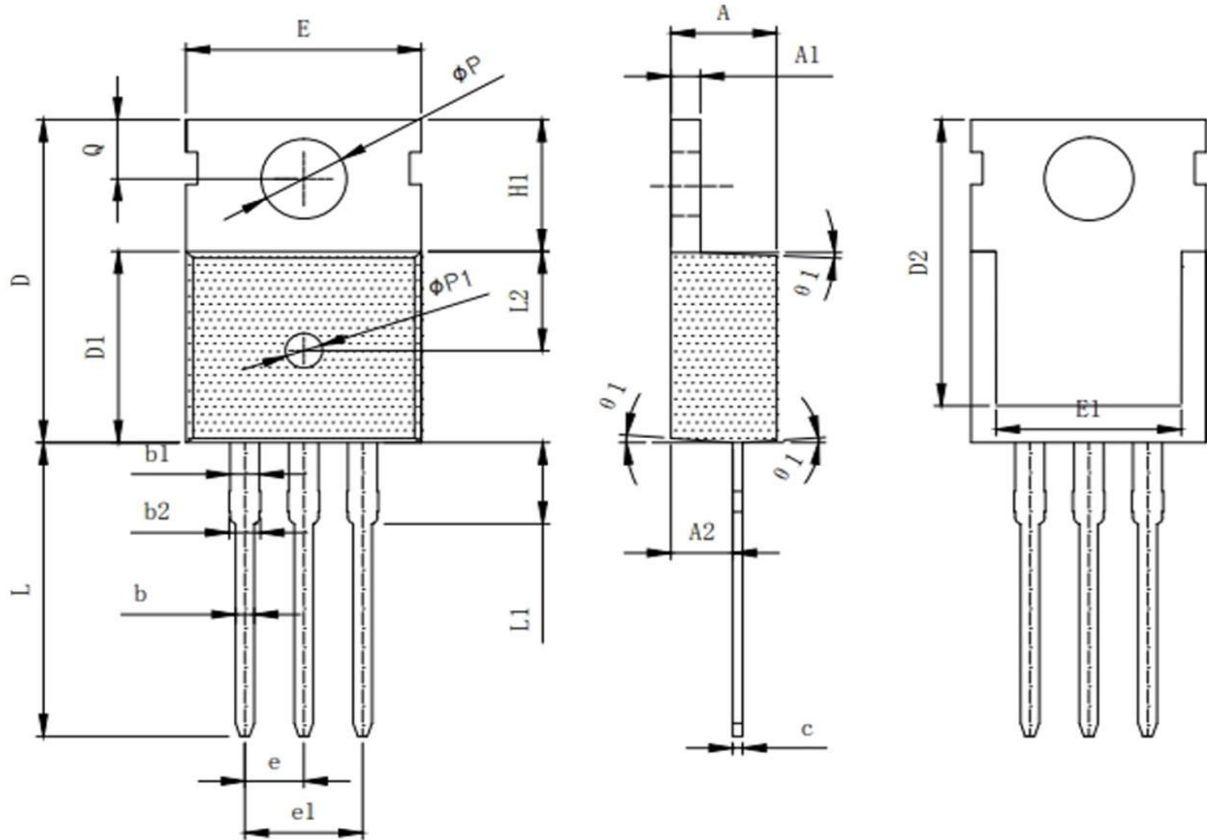
Figure 12. Body Diode Characteristics

■ Characteristic Curve



Package Information

TO-220



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	4.40	4.50	4.60
A1	1.25	1.30	1.35
A2	2.30	2.40	2.50
b	0.70	0.80	0.90
b1	1.21	1.27	1.40
b2	1.25	1.35	1.45
c	0.40	0.50	0.60
D	15.40	15.70	16.00
D1	9.10	9.20	9.30
D2	13.14	13.24	13.70
E	9.70	9.90	10.20
E1	7.60	8.00	8.40
e	2.54 (BSC)		
e1	5.08 (BSC)		
H1	6.30	6.50	6.80
L	12.75	13.08	13.50
L1	—	—	3.10
L2	4.30	4.60	4.90
ϕP	3.50	3.60	3.70
$\phi P1$	1.40	1.50	1.60
Q	2.70	—	2.90
$\theta 1$	1°	3°	5°