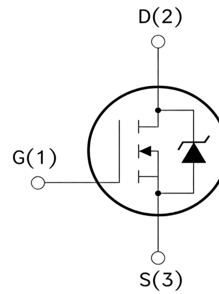
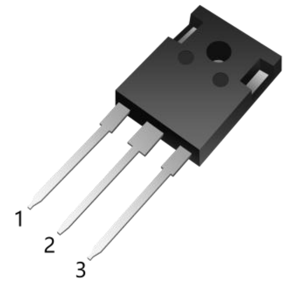
Silicon Carbide Power MOSFET

Parameter	Value	Unit
V_{DS}	650	V
I_D	38	A
$R_{DS(ON)}$	65	mΩ
Q_G	41	nC





TO-247-3L

Features

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitances
- Avalanche Ruggedness
- Easy to Parallel and Simple to Drive

Applications

- EV Charging
- High Voltage DC/DC Converters
- Switched-Mode Power Supply(SMPS)
- Power Factor Correction(PFC)

Absolute Maximum Ratings (at T_J=25℃ unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-source Voltage	V_{DS}	650	V
Gate-source Voltage (Absolute maximum values)	V_{GS}	-10/+22	V
Gate-source Voltage (Recommended operational values)		-5/+18	
Drain Current (continuous;Tc=25°C)	I_D	38	A
Drain Current (continuous;Tc=100°C)		27	
Drain Current (pulsed)	I_{DM}	110	A
Power Dissipation (Tc=25°C, T_J=150°C)	P_D	176	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +175	°C
Thermal Resistance from Junction to Case	$R_{\theta JC}$	0.85	°C/W
Thermal Resistance From Junction to Ambient	$R_{\theta JA}$	40	
Mounting Torque	M	1/8.8	Nm

Electrical Characteristics

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Static characteristics (at T_C=25°C unless otherwise specified)						
Drain-Source Breakdown Voltage	B_{VDS}	V_{GS}=0V; I_D=100uA	650	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=650V; V_{GS}=0V	-	1	100	μA

Gate-Body Leakage Current	I_{GSS+}	V_{GS}=22V; V_{DS}=0V	-	-	200	nA
	I_{GSS-}	V_{GS}=-10V; V_{DS}=0V	-	-	200	
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS}=V_{DS}; I_{DS}=5mA; T_J=25°C	2.2	3.2	4.2	V
		V_{GS}=V_{DS}; I_{DS}=5mA; T_J=175°C	-	2.3	-	
Static Drain-Source on Resistance	$R_{DS(on)}$	V_{GS}=18V; I_D=20A; T_J=25°C	-	65	75	mΩ
		V_{GS}=18V; I_D=20A; T_J=175°C	-	100	-	
Dynamic characteristics (at T_C=25°C unless otherwise specified)						
Input Capacitance	C_{iss}	V_{DS}=400V; f=1MHz; V_{GS}=0V	-	977	-	pF
Output Capacitance	C_{oss}		-	68	-	
Reverse Transfer Capacitance	C_{rss}		-	3.4	-	
Total Gate Charge	Q_G	V_{DD}=400V; V_{GS}=-5/+18V; I_D=20A	-	41	-	nC
Gate-Source Charge	Q_{GS}		-	13	-	
Gate-Drain Charge	Q_{GD}		-	6	-	
Turn-on Energy	E_{on}	V_{DD}=400V; V_{GS}=-5/+18V; I_D=20A; $R_{g(ext)}$=10Ω	-	34	-	uJ
Turn-off Energy	E_{off}		-	44	-	
Internal Gate Resistor	R_{Gint}	f=1MHz; I_D=0A	-	5.6	-	Ω
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=400V; V_{GS}=-5/+18V; I_D=20A; $R_{g(ext)}$=10Ω	-	6.4	-	ns
Rise Time	t_r		-	12	-	
Turn-off Delay Time	$t_{d(off)}$		-	20	-	
Fall Time	t_f		-	6.4	-	

Reverse SiC Diode Characteristics(at T_J=25℃ unless otherwise specified)

Parameter	Symbol	Conditions	Values			Units
			Min.	Typ.	Max.	
Diode Forward Voltage	V_{FSD}	V_{GS}=-5V; I_F=10A; T_J=25°C	-	3.6	-	V
		V_{GS}=-5V; I_F=10A; T_J=175°C	-	3.3	-	
Continuous Diode Forward Current	I_S	T_C=25°C	-	-	41	A
		T_C=100°C	-	-	23	
Reverse Recovery Time	t_{RR}	V_R=400V; V_{GS}=-5V; I_F=20A; di/dt = 1200A/μs,	-	11	-	ns
Reverse Recovery Charge	Q_{RR}		-	67	-	nC
Peak Reverse Recovery Current	I_{RRM}		-	10	-	A

Typical Characteristics

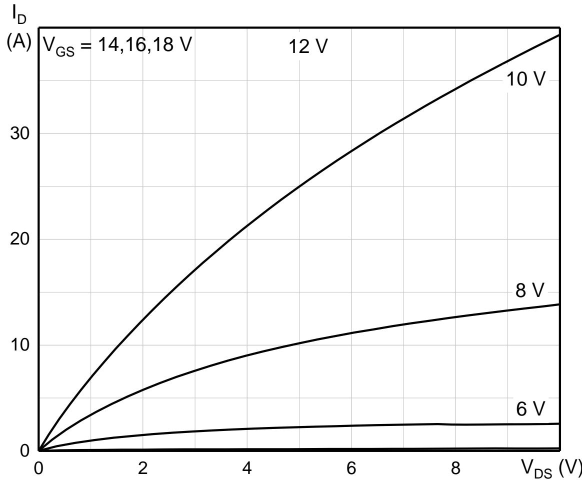


Figure 1. Typical Output Characteristics, T_J = 25°C

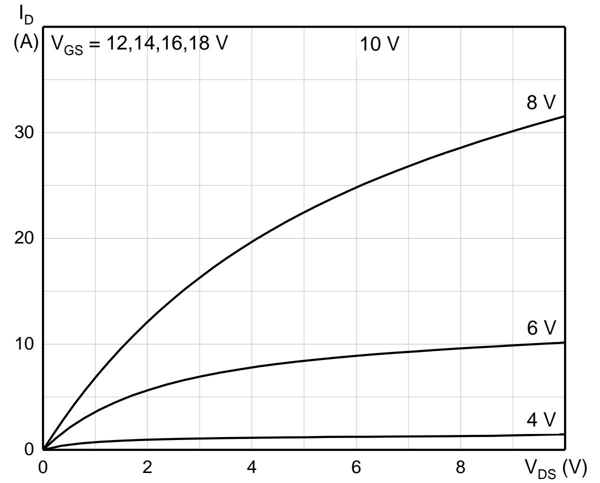


Figure 2. Typical Output Characteristics, T_J = 175°C

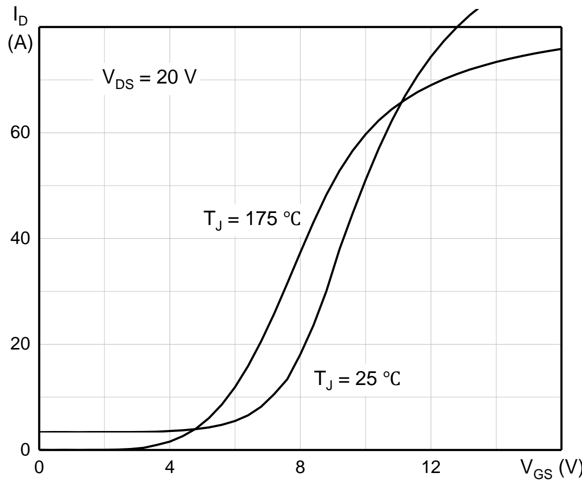


Fig 3. Typical Transfer Characteristics

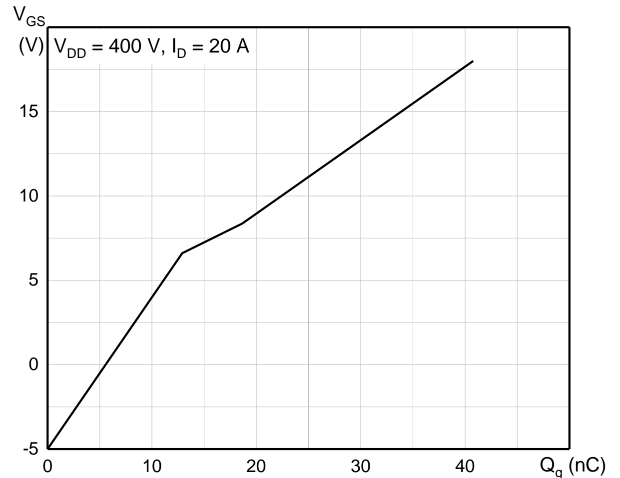


Fig 4. Typical Gate Charge Characteristics

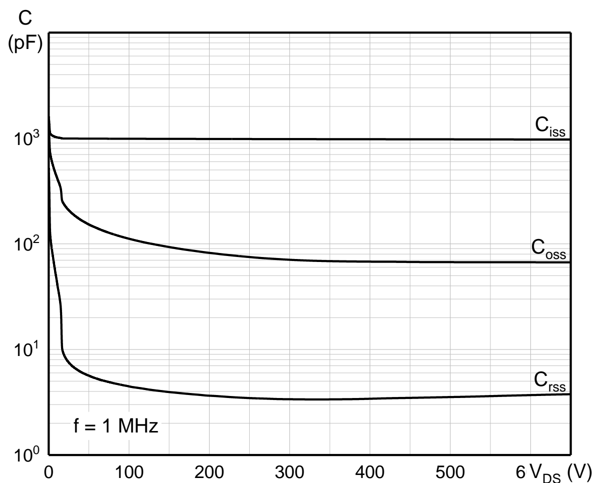


Fig 5. Typical Capacitance Characteristics

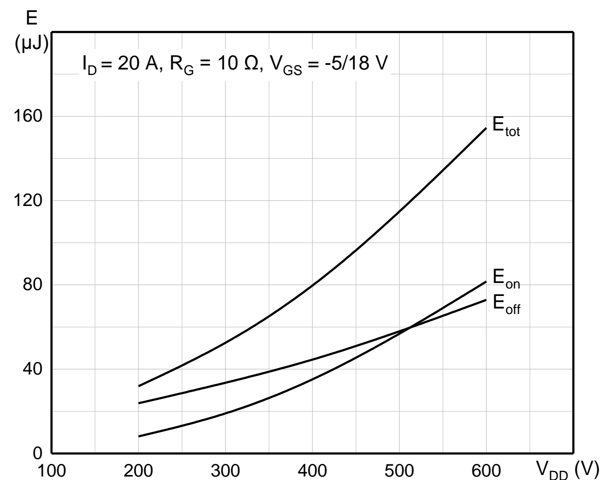


Fig 6. Typical Switching Energy vs. Supply Voltage

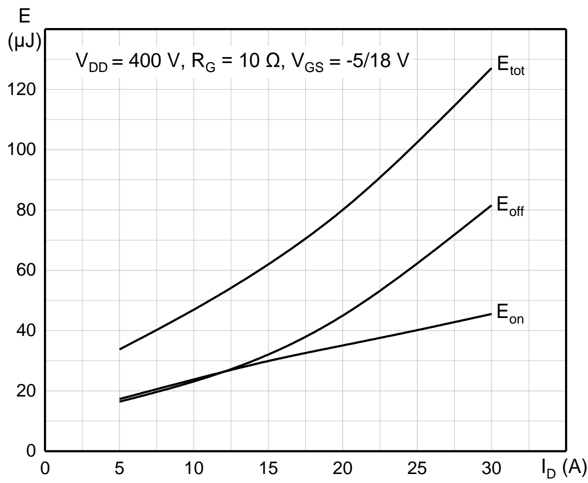


Fig 7. Typical Switching Energy vs. Drain Current

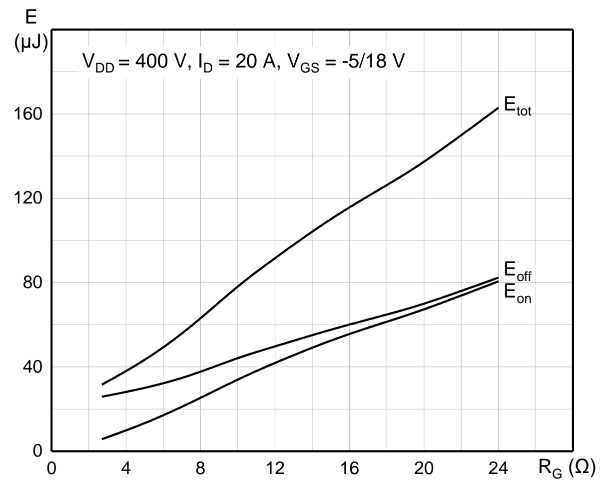


Fig 8. Typical Switching Energy vs. Gate Resistance

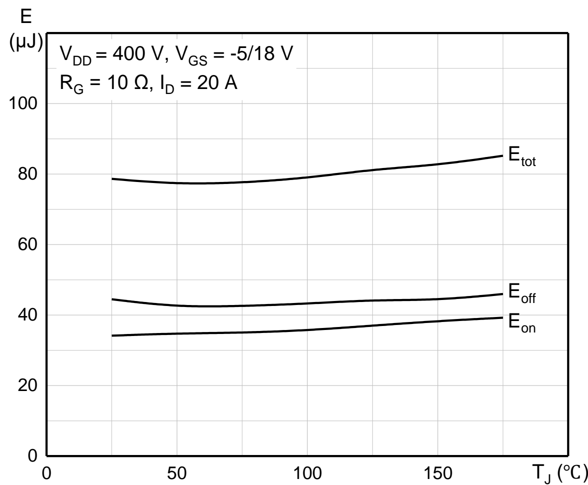


Fig 9. Typical Switching Energy vs. Temperature

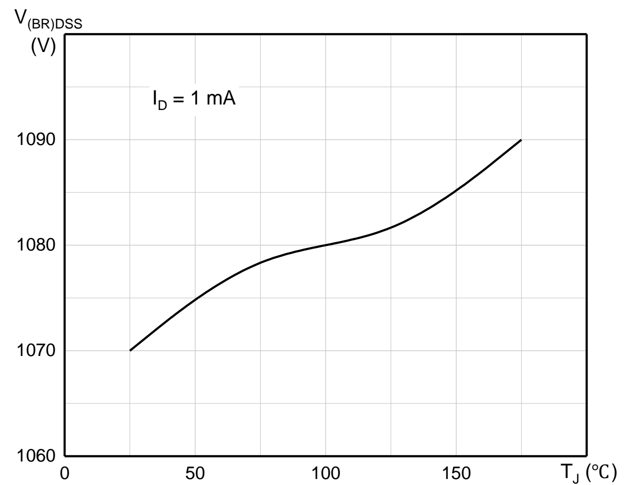


Fig 10. Breakdown Voltage vs. Temperature

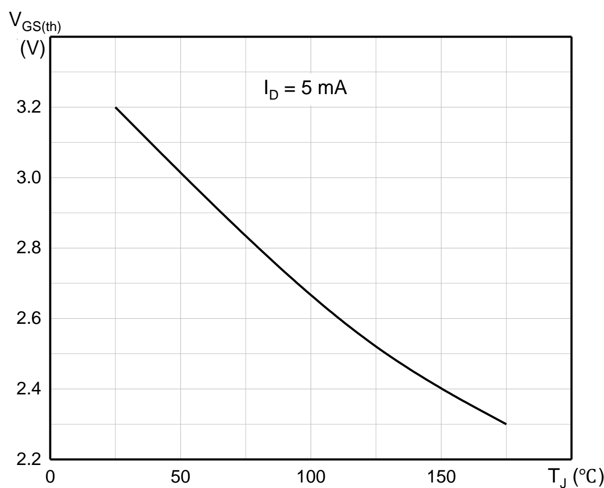


Fig 11. Gate Threshold vs. Temperature

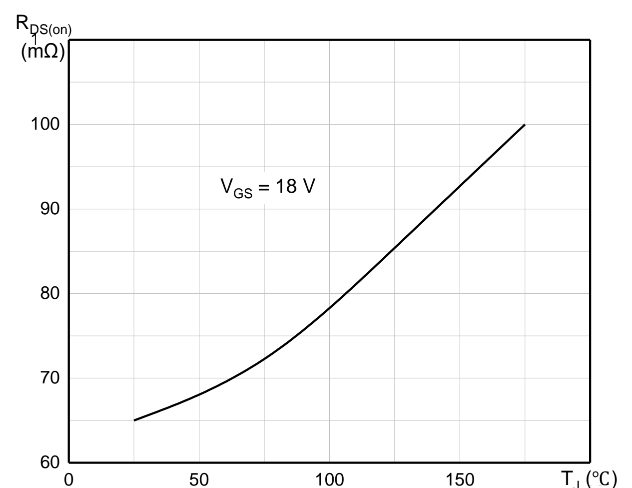


Fig 12. On-Resistance vs. Temperature

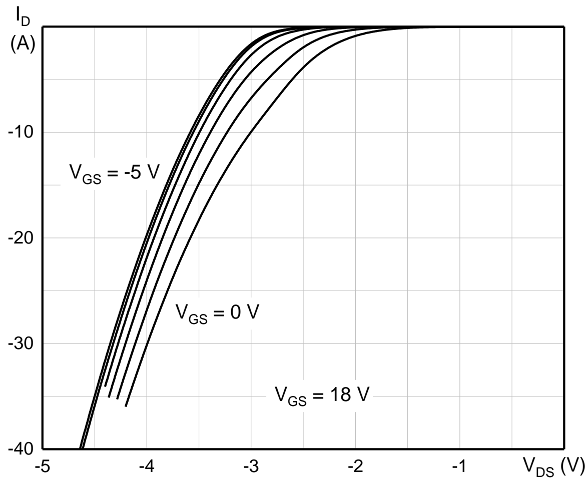


Fig 13. Body Diode Characteristics, T_J = 25°C

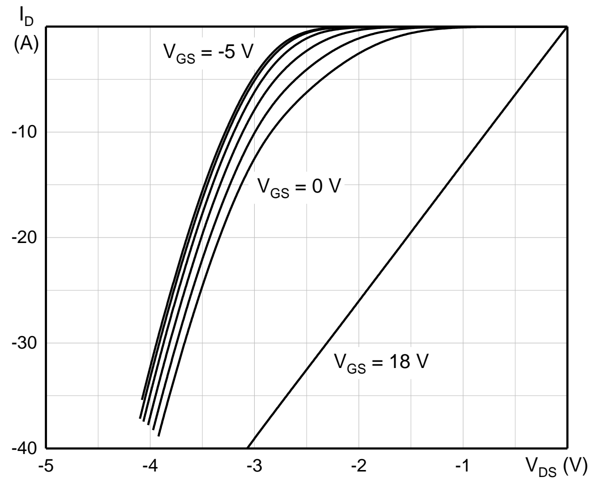
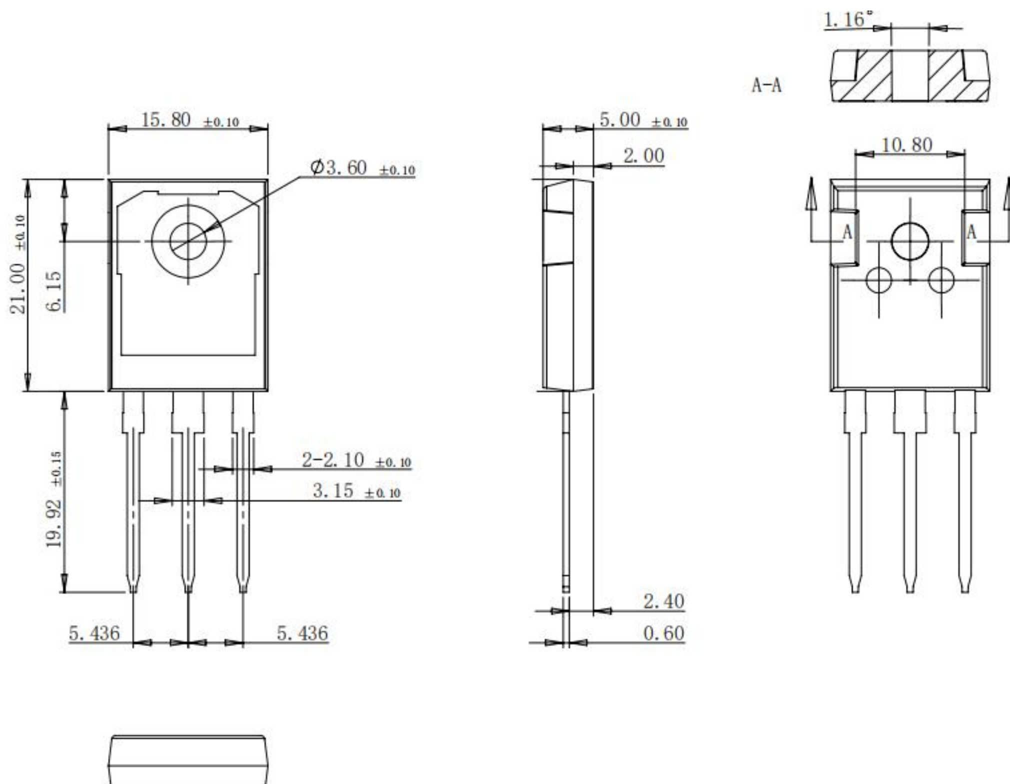


Fig 14. Body Diode Characteristics, T_J = 175°C

Package Outlines(Unit:mm)

TO-247-3L



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