

SiC MOSFET

Features

- ◆ High Speed Switching with Low Capacitances
- ◆ High Blocking Voltage with Low $R_{DS(on)}$
- ◆ Easy to parallel
- ◆ Simple to drive
- ◆ RoHS Compliant

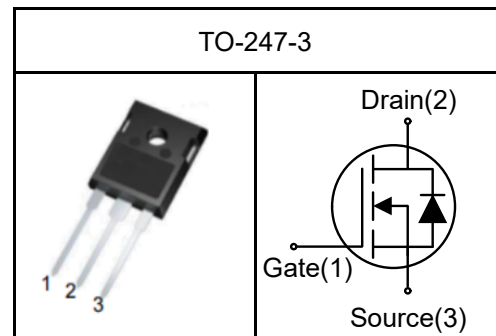
V_{DS}	=	1200 V
$I_D(T_c=25^\circ\text{C})$	=	74A
$R_{DS(on)}$	=	37 mΩ

Benefits

- ◆ Increased Power Density
- ◆ Faster Operating Frequency
- ◆ Reduction of Heat Sink Requirements
- ◆ Higher Efficiency
- ◆ Reduced EMI

Applications

- ◆ Power Factor Correction Modules
- ◆ Switch Mode Power Supplies
- ◆ DC-AC Inverters
- ◆ High Voltage DC/DC Converters



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

Symbol	Parameter	Test conditions	Value	Unit
V_{DS}	Drain-Source Voltage		1200	V
I_D	Continuous Drain Current	$T_c=25^\circ\text{C}$ $T_c=100^\circ\text{C}$	74 52	A
I_{DM}	Peak Drain Current	Pulse width t_p limited by T_{jmax}	150	A
V_{GSmax}	Gate-Source Voltage		-8/+22	V
V_{GSop}	Recommend Gate-Source Voltage		-4/+18	V
P_{tot}	Power Dissipation	$T_c=25^\circ\text{C}$ $T_c=100^\circ\text{C}$	312 156	W
T_j	Operating Junction Temperature		-40~175	$^\circ\text{C}$
T_{stg}	Storage Temperature		-40~175	$^\circ\text{C}$

SiC MOSFET

Electrical Characteristics

Static Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$I_D=100\mu A$, $V_{GS}=0V$	1200			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=1200V$, $V_{GS}=0V$		1		μA
I_{GSS}	Gate-Source Leakage Current	$V_{DS}=0V$, $V_{GS}=18V$			250	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=10mA$ $T_j=25^\circ C$ $T_j=175^\circ C$	2	2.6 2.0	4	V
$R_{DS(on)}$	Drain-Source On-State Resistance	$V_{GS}=18V$, $I_D=40A$ $T_j=25^\circ C$ $T_j=175^\circ C$		37 47		m Ω

Thermal Characteristics

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
$R_{th(j-c)}$	Thermal Resistance from Junction to Case		0.48		$^\circ C/W$

Dynamic Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	$V_{DS}=1000V$, $f=100KHz$, $V_{GS}=0V$		2975		pF
C_{oss}	Output Capacitance			119		pF
C_{rss}	Reverse Transfer Capacitance			12		pF
$R_{G(int)}$	Internal Gate Resistance	$f=1MHz$		2.1		Ω
Q_g	Total Gate Charge	$V_{DS}=800V$, $I_D=40A$, $V_{GS}=-4/18V$		117		nC
Q_{gs}	Gate to Source Charge			38		nC
Q_{gd}	Gate to Drain Charge			27		nC

SiC MOSFET

Switching Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-On Delay Time	$V_{DD}=800V$, $I_D=40A$, $V_{GS}=-4V/18V$, $R_G=2.5\Omega$		22		ns
t_r	Rise Time			30		ns
$t_{d(off)}$	Turn-Off Delay Time			33		ns
t_f	Fall Time			11		ns
E_{on}	Turn-On Energy			701		μJ
E_{off}	Turn-Off Energy			80		μJ

Reverse Diode Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
V_{SD}	Diode Forward Voltage	$V_{GS}=-4V$, $I_{SD}=20A$ $T_j=25^\circ C$ $T_j=175^\circ C$		5.0 4.4		V
I_S	Continuous Diode Forward Current	$V_{GS}=-4V$ $T_c=25^\circ C$ $T_c=100^\circ C$		45 20		A
t_{rr}	Reverse Recovery Time	$V_{GS}=-4V$, $I_{SD}=40A$, $V_R=800V$, $di/dt=3900A/\mu s$		20		ns
Q_{rr}	Reverse Recovery Charge			540		nC
I_{rrm}	Peak Reverse Recovery Current			52		A

SiC MOSFET

Typical Performance

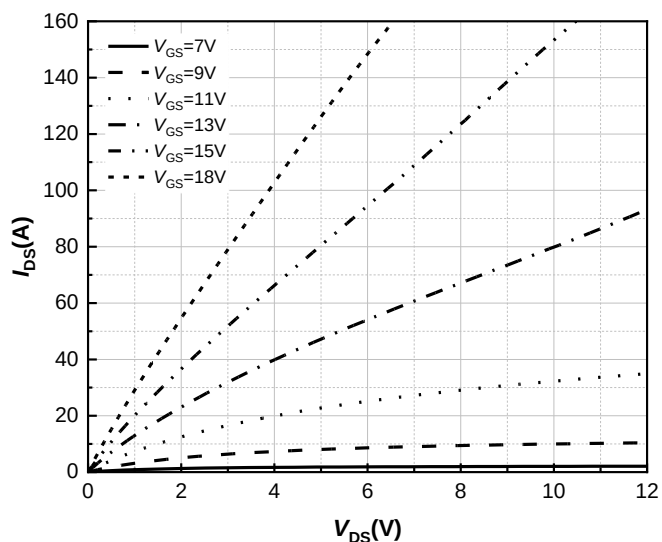


Figure 1. Output Characteristics
 $T_j = -40^\circ\text{C}$

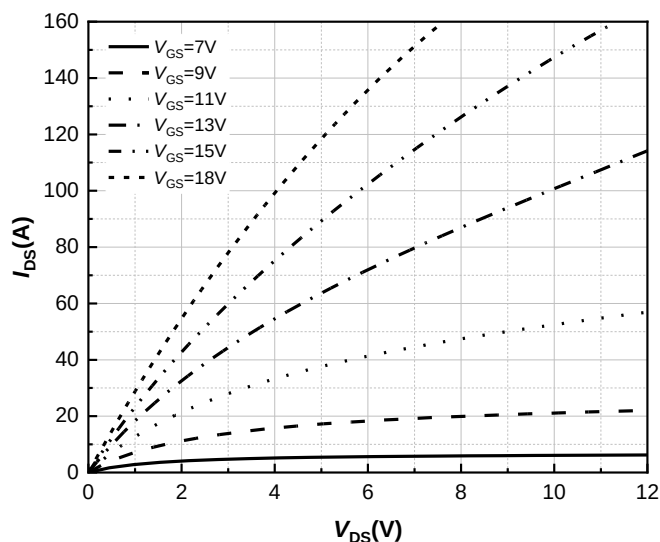


Figure 2. Output Characteristics
 $T_j = 25^\circ\text{C}$

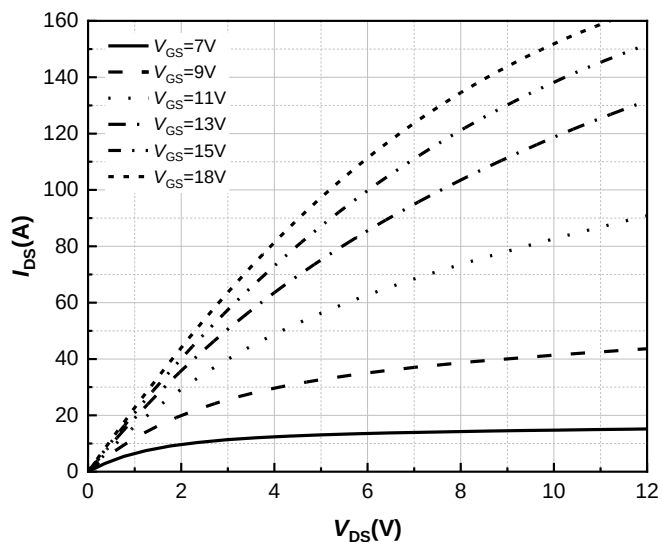


Figure 3. Output Characteristics
 $T_j = 175^\circ\text{C}$

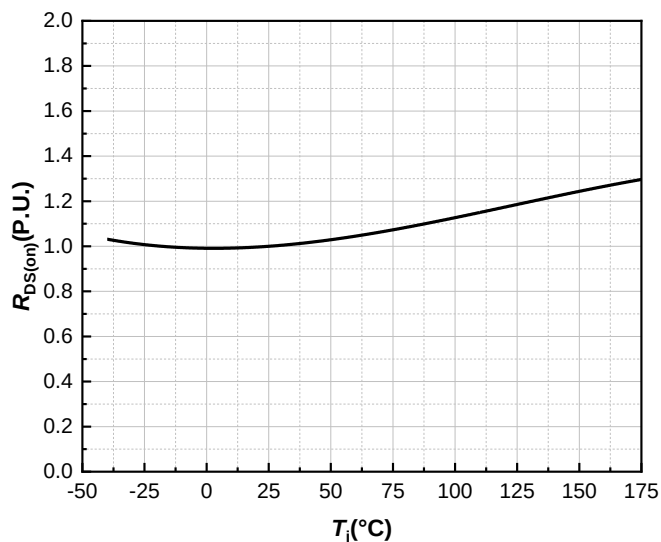


Figure 4. Normalized On-Resistance vs. Temperature

Typical Performance

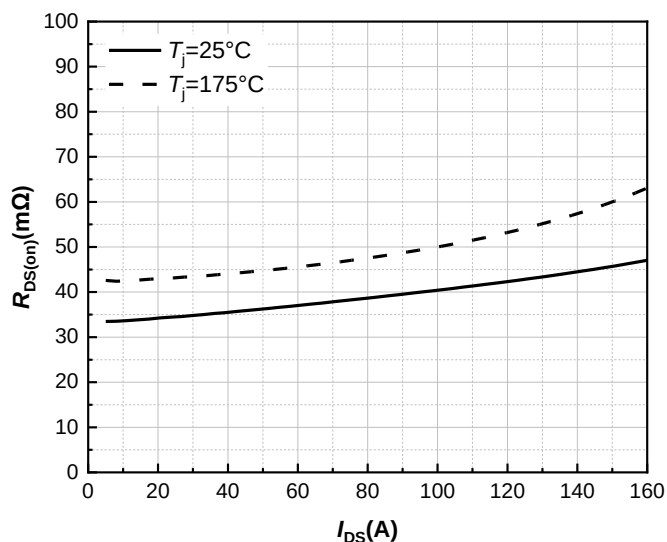


Figure 5. On-Resistance vs. Drain Current For Various Temperatures

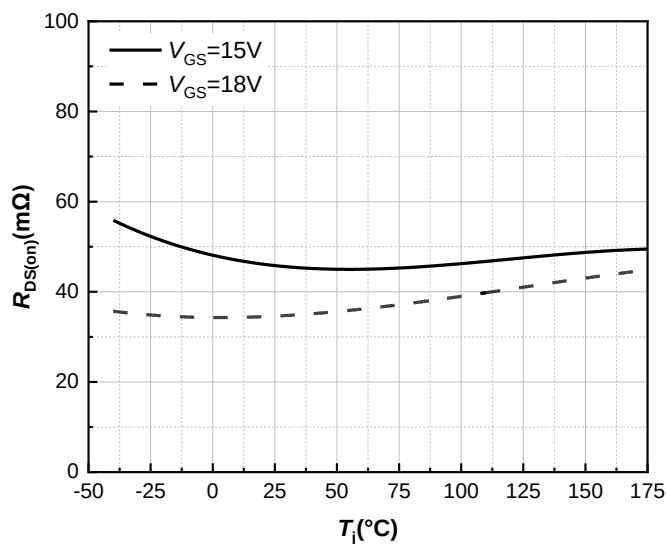


Figure 6. On-Resistance vs. Temperature For Various Gate Voltage

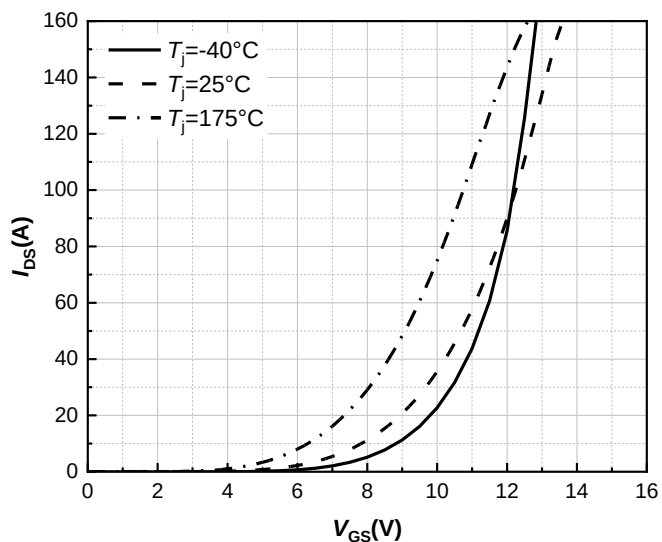


Figure 7. Transfer Characteristic for Various Junction Temperatures
 $V_{DS}=20V$

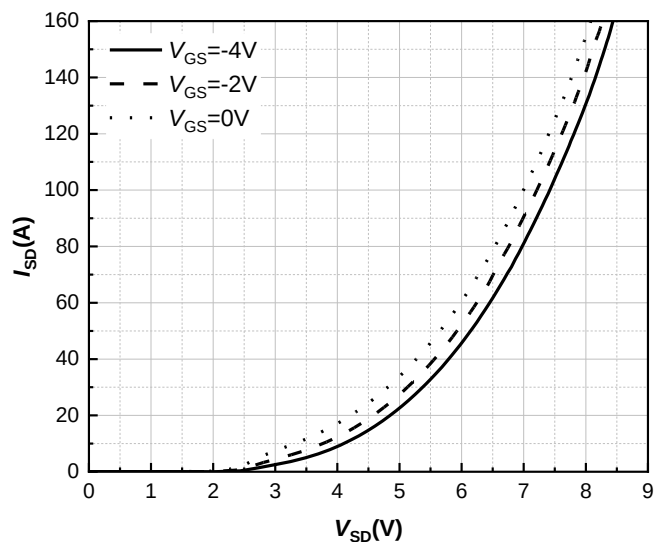


Figure 8. Body Diode Characteristic
 $T_j=-40^{\circ}C$

Typical Performance

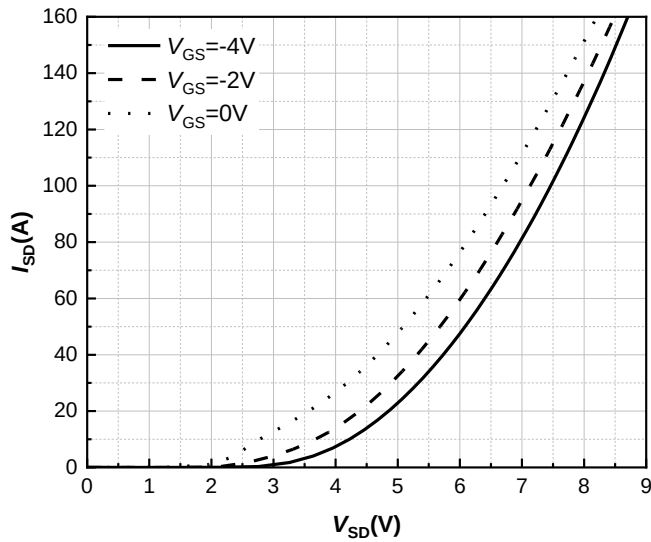


Figure 9. **Body Diode Characteristic**
 $T_j=25^{\circ}\text{C}$

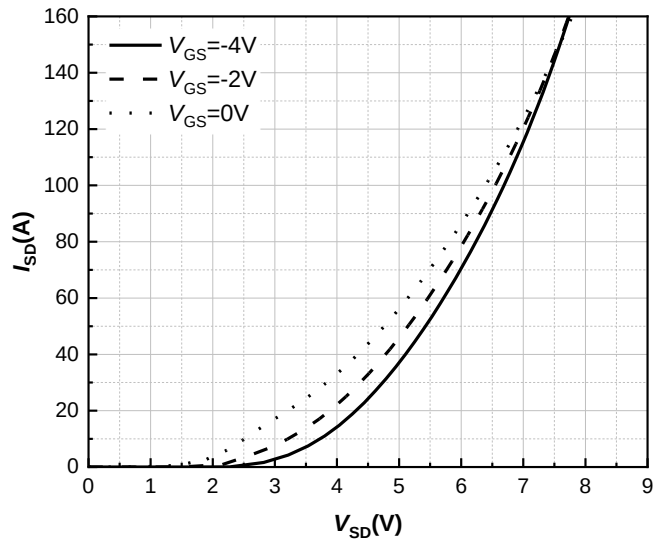


Figure 10. **Body Diode Characteristic**
 $T_j=175^{\circ}\text{C}$

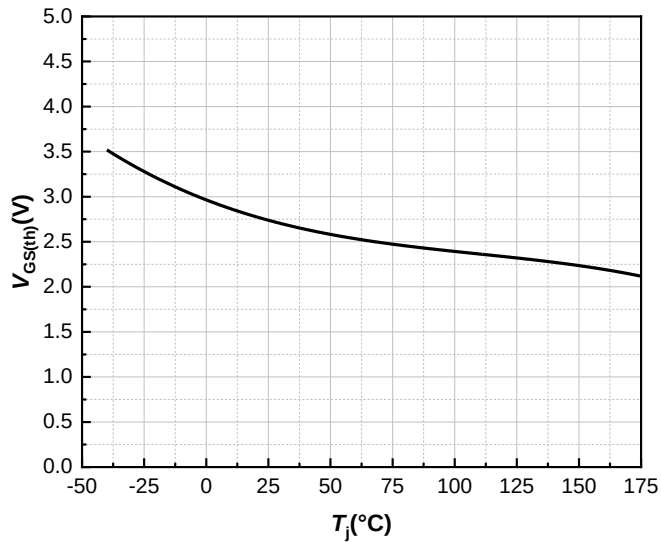


Figure 11. **Threshold Voltage vs. Temperature**

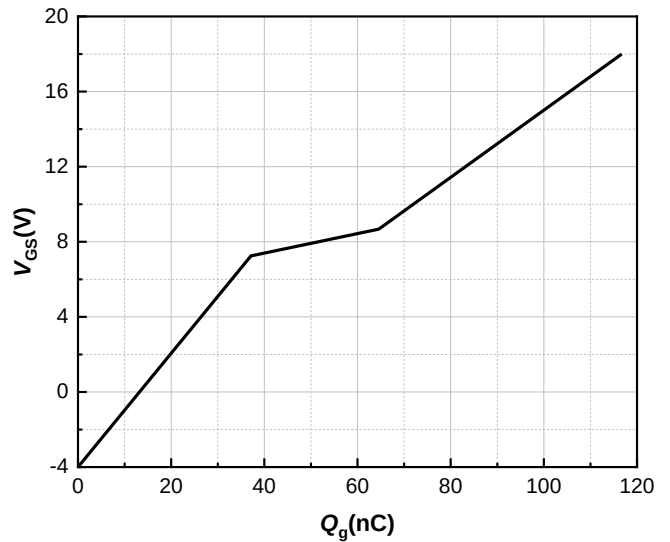


Figure 12. **Gate Charge Characteristics**

Typical Performance

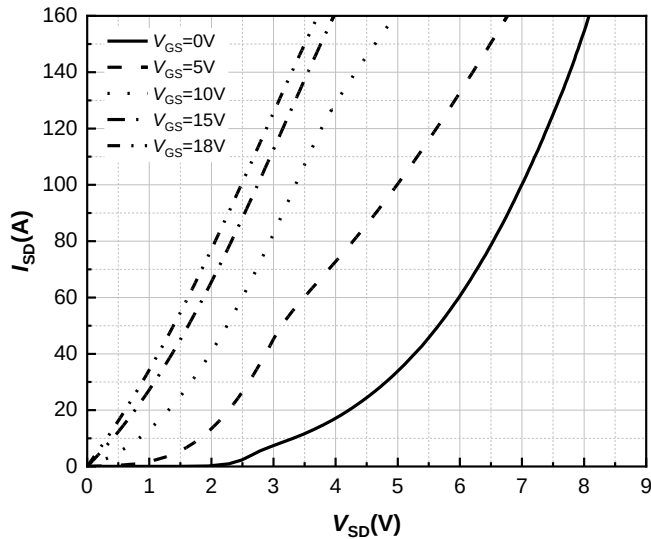


Figure 13. 3rd Quadrant Characteristic
 $T_j = -40^\circ\text{C}$

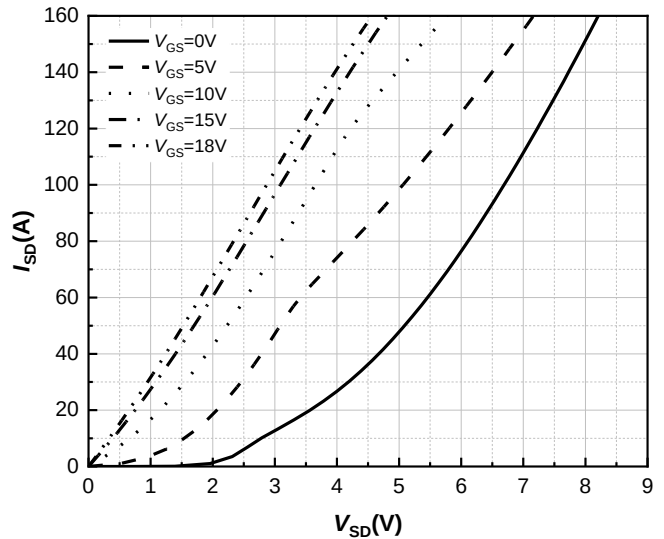


Figure 14. 3rd Quadrant Characteristic
 $T_j = 25^\circ\text{C}$

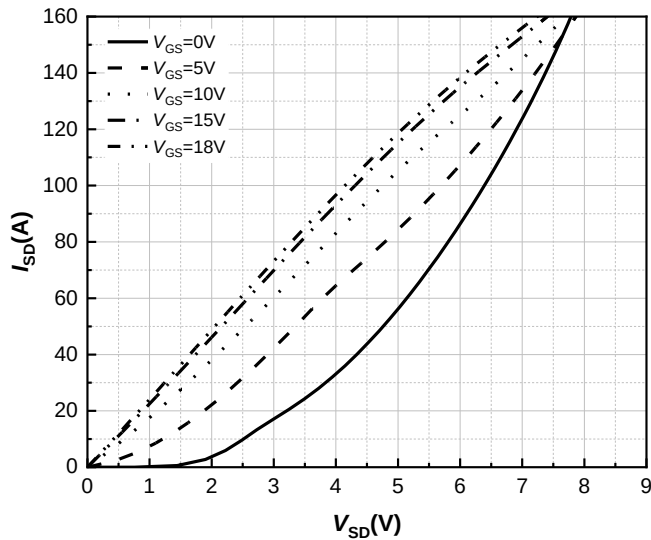


Figure 15. 3rd Quadrant Characteristic
 $T_j = 175^\circ\text{C}$

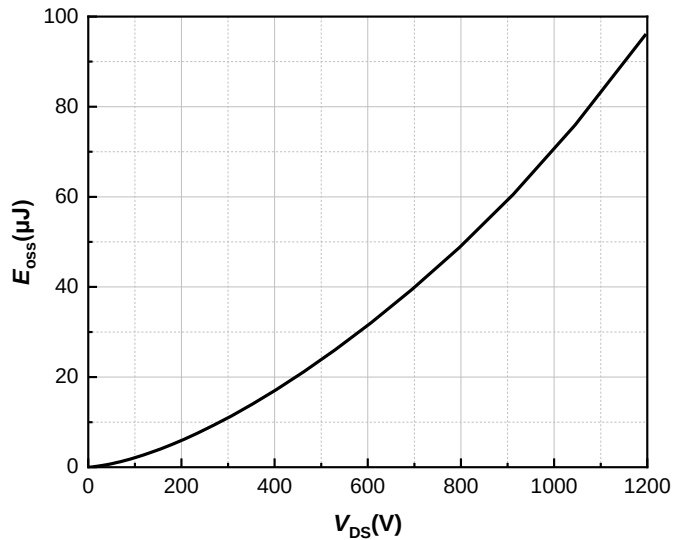


Figure 16. Output Capacitor Stored Energy

Typical Performance

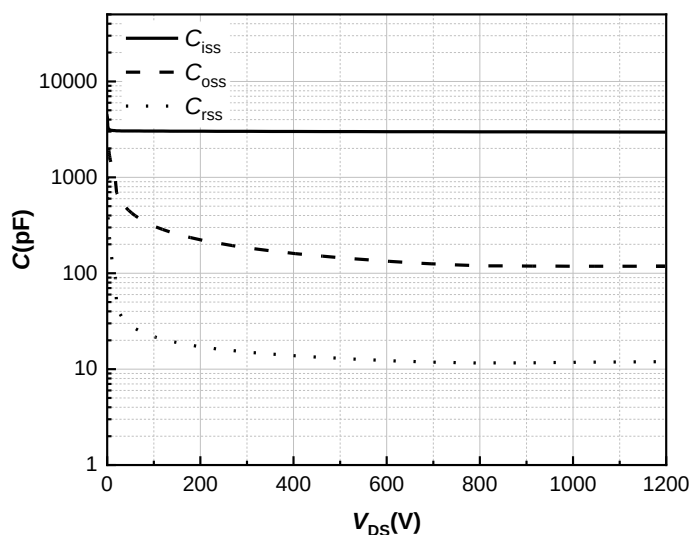


Figure 17. Capacitances vs. Drain-Source

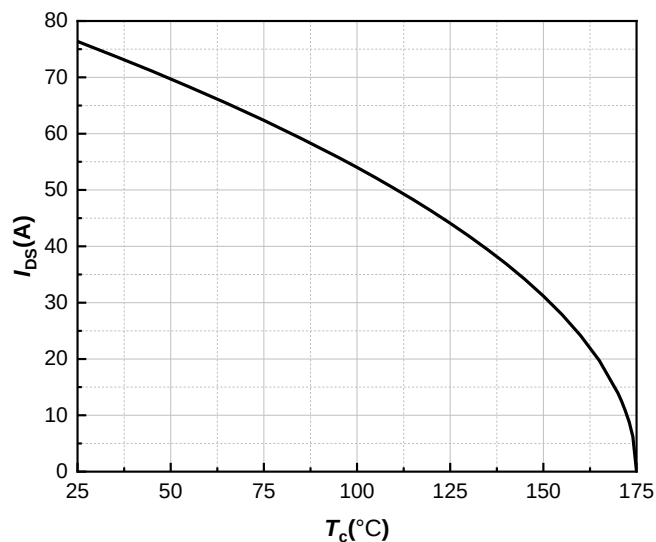


Figure 18. Continuous Drain Current Derating vs. Case Temperature

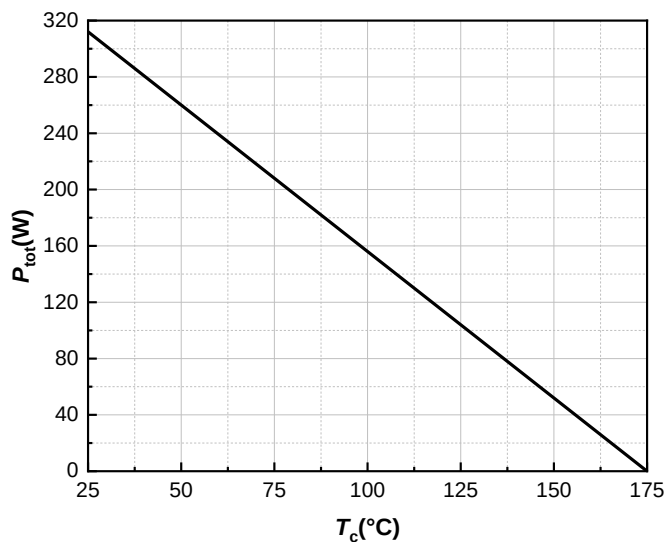


Figure 19. Maximum Power Dissipation Derating vs. Case Temperature

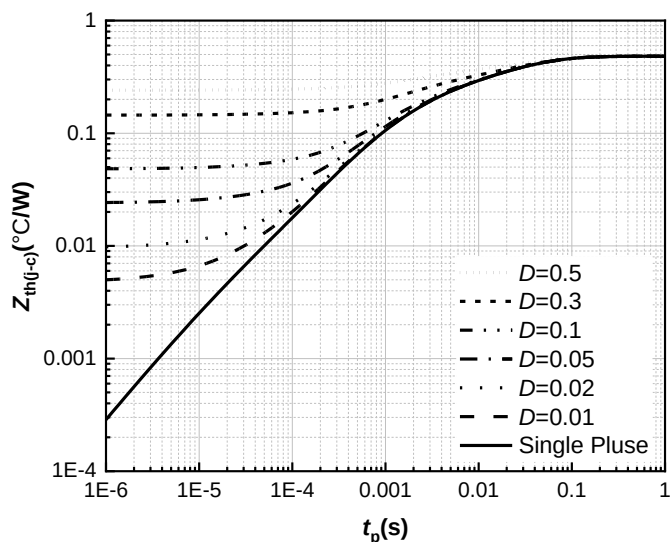
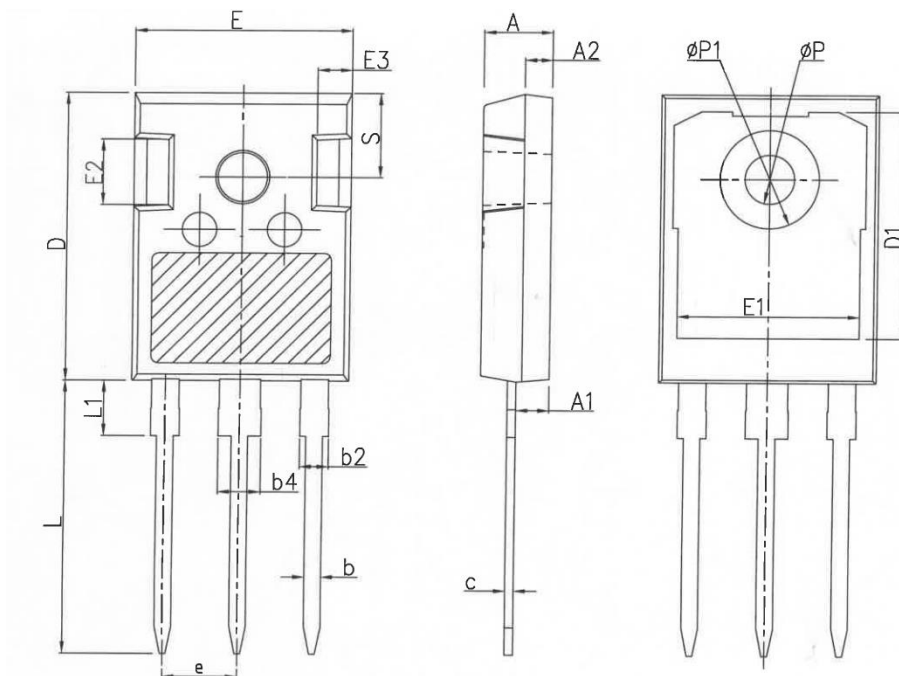


Figure 20. Transient Thermal Impedance

Package Outlines



SYMBOL	Unit: mm		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.59
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	0.61	0.75
D	20.70	21.00	21.30
D1	16.25	16.55	16.85
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
S	6.15 BSC		