



Silicon Carbide Power RugSiC

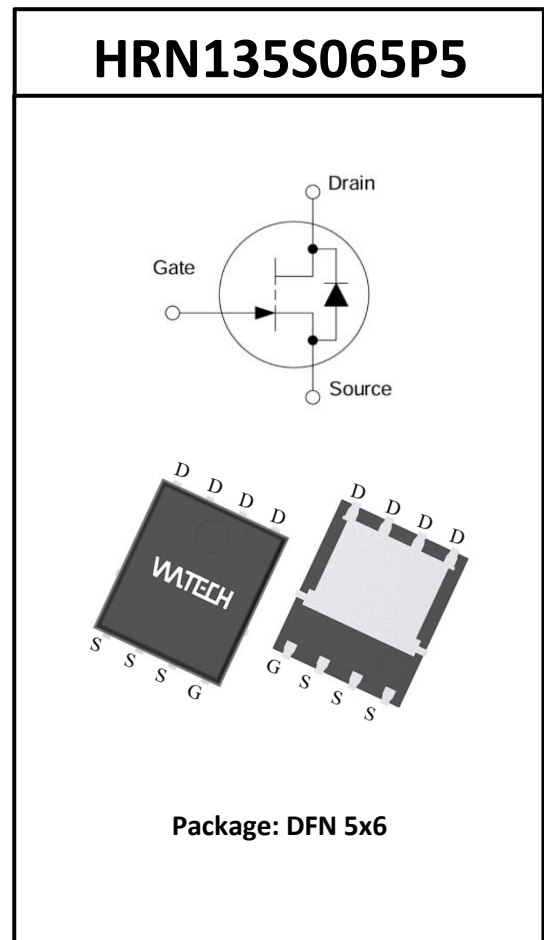
N-Channel Enhancement Mode

1. Product Features

- Ultra-low switching losses
- Ultra-low static losses
- Maximum junction temperature 175°C
- RoHS compliant

2. Product Applications

- Adapter



3. Typical Performance Parameters

V_{DS}	I_{DCC}	$R_{DS(on),typ}$	$R_{DS(on),max}$	T_{vjmax}	Marking	Package
650V	17A	135mΩ	175mΩ	175°C	HRN135S065	DFN 5x6

4. Maximum Ratings

Symbol	Parameters	Value	Unit	Test Conditions
V_{DSS}	Drain - Source Voltage	650	V	$V_{GS} = -3V, I_D = 1mA$
V_{GS}	Gate - Source Voltage	-5/+3	V	Absolute maximum values
V_{GSop}	Gate - Source Voltage	-3/+2.8	V	Recommended operational values
I_{DDC}	Continuous Drain Current	17	A	$V_{GS} = 2.8V, T_C = 25^\circ C$
		13		$V_{GS} = 2.8V, T_C = 100^\circ C$
I_{DM}	Pulsed Drain Current	30	A	Pulse width t_p limited by T_{jmax}
P_{tot}	Power Dissipation	71	W	$T_C = 25^\circ C, T_{jmax} = 175^\circ C$
T_j	Operating Junction	-55 to 175	$^\circ C$	-
T_{stg}	Storage Temperature	-55 to 175	$^\circ C$	-
t_{SC}	Short-circuit withstand time	5	μs	$V_{DS}=400V, T_C = 150^\circ C, V_{GS}=2.8V$
E_{AS}	Avalanche energy	14	mJ	$L = 1mH, V_{DD} = 100V, I_{AS} = 5A$

5. Thermal Characteristics

Symbol	Parameters	Max.	Unit
$R_{th(j-c)}$	Thermal Resistance from Junction to Case	2.2	$^\circ C/W$
$R_{th(j-a)}$	Thermal Resistance From Junction to Ambient	66	

6. Electrical Characteristics

TC = 25°C unless otherwise specified

Static characteristics

Symbol	Parameters	Min.	Typ.	Max.	Unit	Test Conditions
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	650	-	-	V	$V_{GS} = -3V, I_D = 1mA$
		650	-	-	V	$V_{GS} = -3V, I_D = 1mA, T_j = 175^\circ C$
$V_{GS(th)}$	Gate Threshold Voltage	0.65	1.05	1.35	V	$V_{DS} = 0.1V, I_D = 5mA$
		-	0.54	-		$V_{DS} = 0.1V, I_D = 5mA, T_j = 175^\circ C$
I_{DSS}	Zero Gate Voltage Drain Current	-	0.08	400	μA	$V_{DS} = 650V, V_{GS} = -3V$
		-	1.0	-		$V_{DS} = 650V, V_{GS} = -3V, T_j = 175^\circ C$
I_{GSS}	Gate-Source Leakage Current	-	27	100	mA	$I_D = 5A, V_{GS} = 2.8V$
		-	348	-		$I_D = 5A, V_{GS} = 2.8V, T_j = 175^\circ C$
$R_{DS(on)}$	Drain-Source On-State Resistance	-	135	175	m Ω	$V_{GS} = 2.8V, I_D = 5A$
		-	184	-		$V_{GS} = 2.8V, I_D = 5A, T_j = 175^\circ C$

Dynamic characteristics

Symbol	Parameters	Min.	Typ.	Max.	Unit	Test Conditions
C_{iss}	Input Capacitance	-	268	-	pF	$V_{GS} = 0V,$ $V_{DS} = 400V,$ $f = 100kHz$
C_{oss}	Output Capacitance	-	31	-		
C_{rss}	Reverse Transfer Capacitance	-	0.08	-		
E_{on}	Turn-On Switching Energy	-	307.2	-	μJ	$V_{DS} = 400V,$ $V_{GS} = -3V/2.7V,$ $I_D = 15A,$ $R_{gon} = 15\Omega, R_{goff} = 68\Omega$
E_{off}	Turn Off Switching Energy	-	315.1	-		
$t_{d(on)}$	Turn-On Delay Time	-	3	-	ns	
t_r	Rise Time	-	32	-		
$t_{d(off)}$	Turn-Off Delay Time	-	9.2	-		
t_f	Fall Time	-	25.7	-		

Reverse Diode Characteristics

Symbol	Parameters	Min.	Typ.	Max.	Unit	Test Conditions
V_{SD}	Diode Forward Voltage	-	1.72	-	V	$V_{GS} = 0V, I_{SD} = 5A$
		-	1.72	-		$V_{GS} = 0V, I_{SD} = 5A, T_j = 175^{\circ}C$
		-	3.02	-		$V_{GS} = -3V, I_{SD} = 5A$
		-	2.98	-		$V_{GS} = -3V, I_{SD} = 5A, T_j = 175^{\circ}C$
t_{RR}	Reverse Recovery Time		104		ns	$V_{DS} = 400V, I_D = 15A,$ $di_D/dt = 5400 A/\mu s$
Q_{RR}	Reverse Recovery Charge		609		nC	
I_{RRM}	Peak Reverse Recovery Current		15.8		A	

7. Electrical Characteristic Diagrams

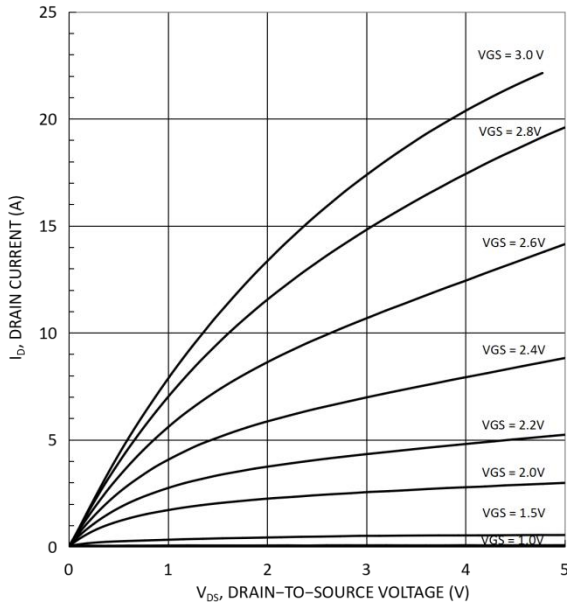


Figure 1. Output Characteristics ($T_j=25^{\circ}\text{C}$)

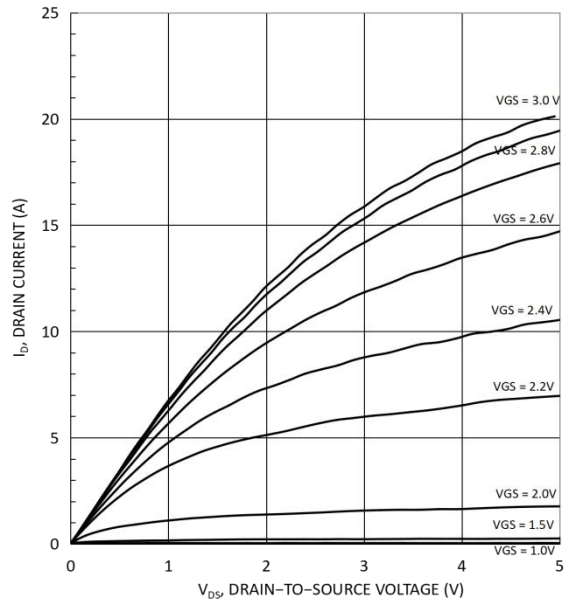


Figure 2. Output Characteristics ($T_j = 125^{\circ}\text{C}$)

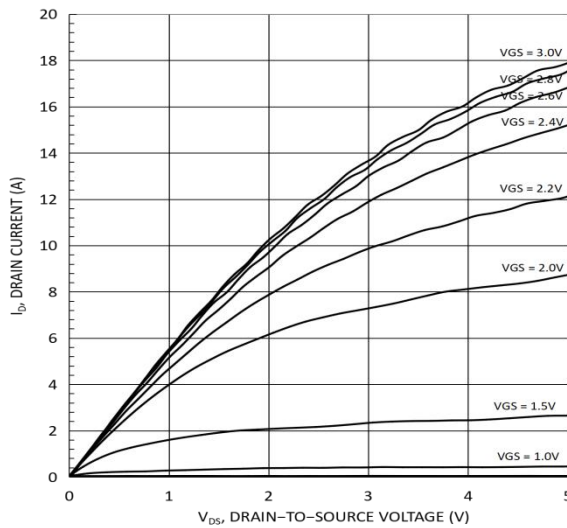


Figure 3. Output Characteristics ($T_j = 175^{\circ}\text{C}$)

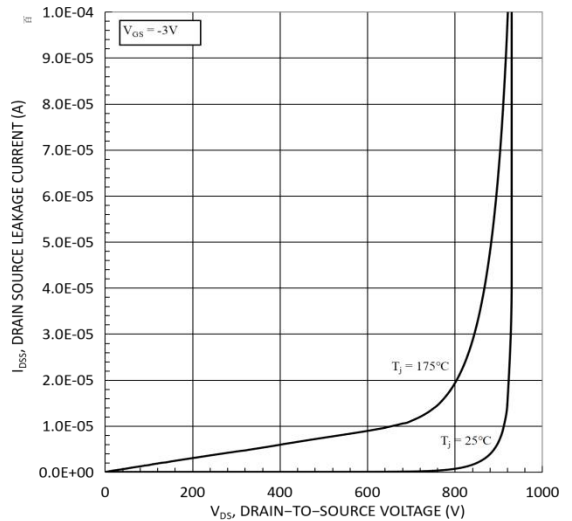


Figure 4. Drain-to-Source Leakage Current vs. Drain-to-Source Voltage

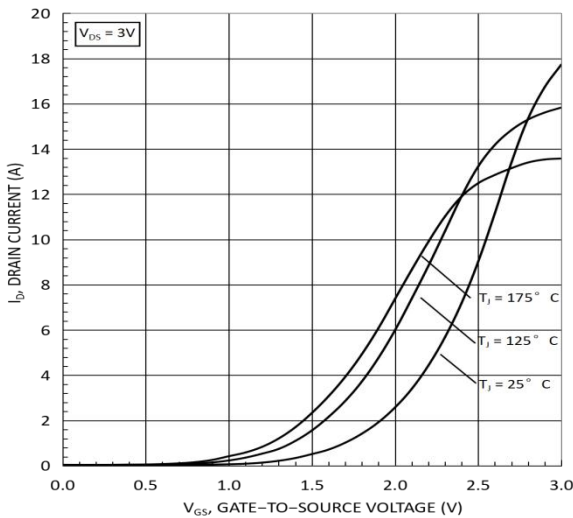


Figure 5. Transfer Characteristic for Various Junction Temperatures

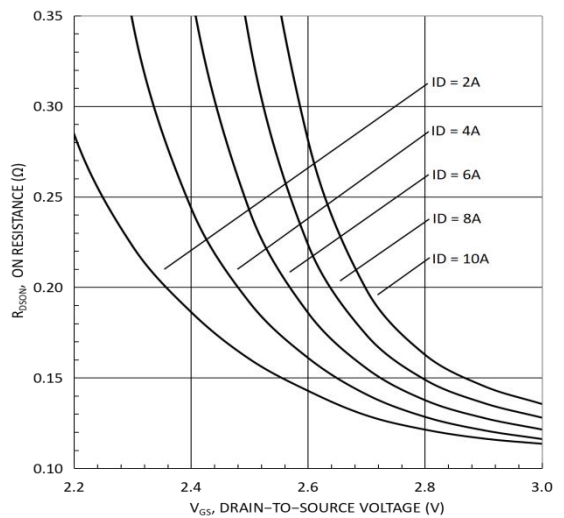


Figure 6. On-Resistance vs. Drain-to-Source Voltage ($T_j = 25^{\circ}\text{C}$)

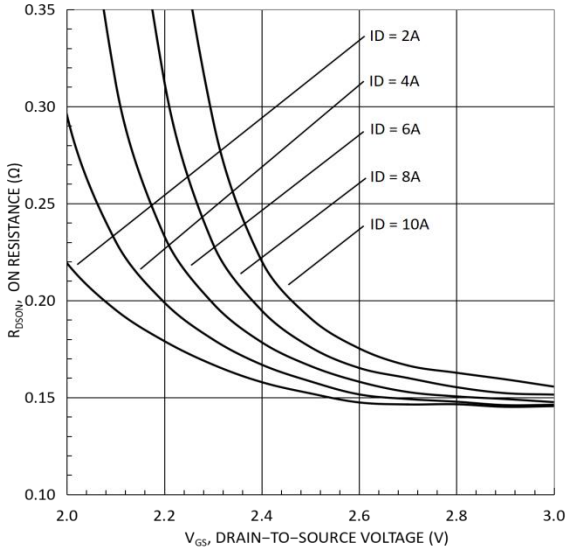


Figure 7. On-Resistance vs. Drain-to-Source Voltage ($T_j = 125^\circ\text{C}$)

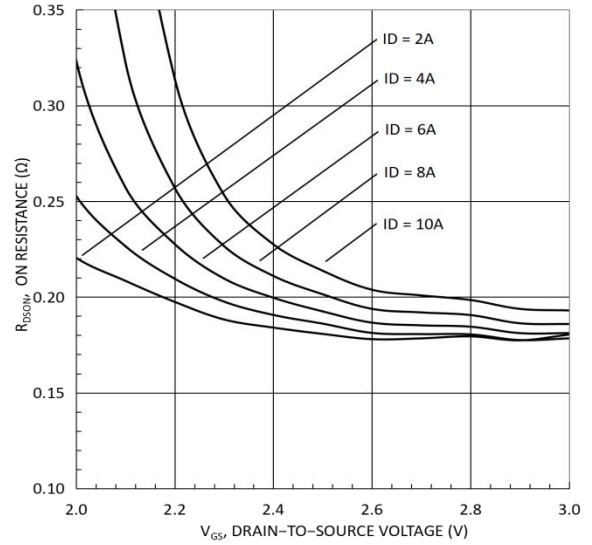


Figure 8. On-Resistance vs. Drain-to-Source Voltage ($T_j = 175^\circ\text{C}$)

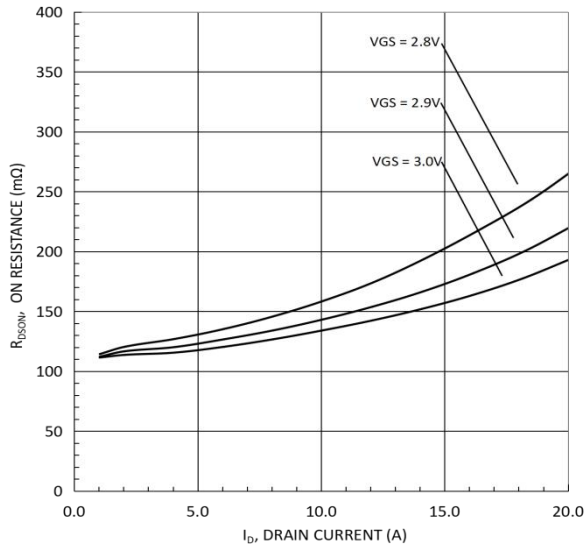


Figure 9. On-Resistance vs. Drain Current ($T_j = 25^\circ\text{C}$)

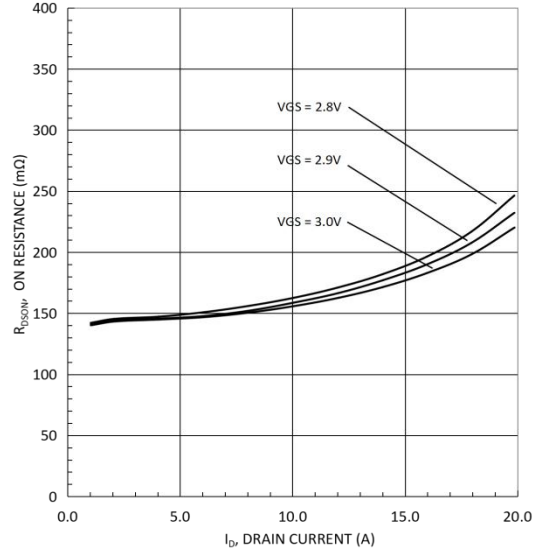


Figure 10. On-Resistance vs. Drain Current ($T_j = 125^\circ\text{C}$)

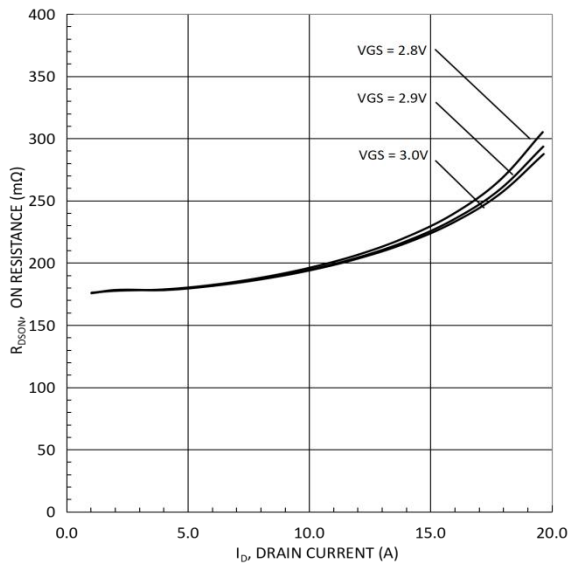


Figure 11. On-Resistance vs. Drain Current ($T_j = 175^\circ\text{C}$)

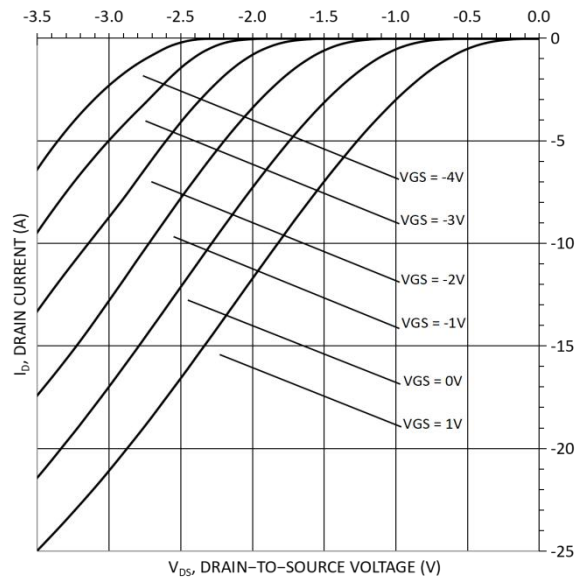


Figure 12. Body Diode Characteristic ($T_j = 25^\circ\text{C}$)

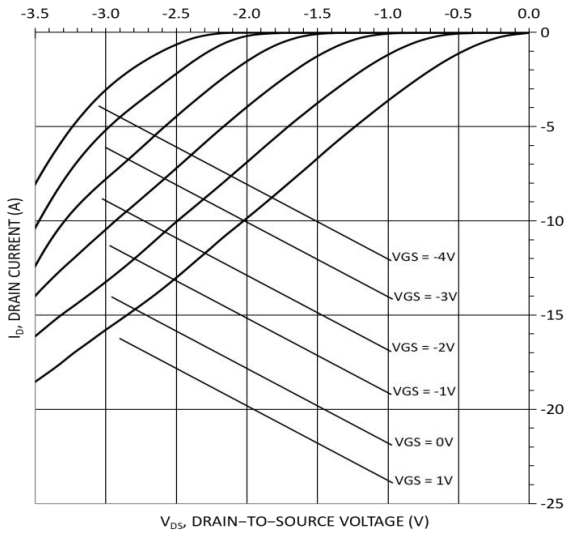


Figure 13. Body Diode Characteristic ($T_j = 125^\circ\text{C}$)

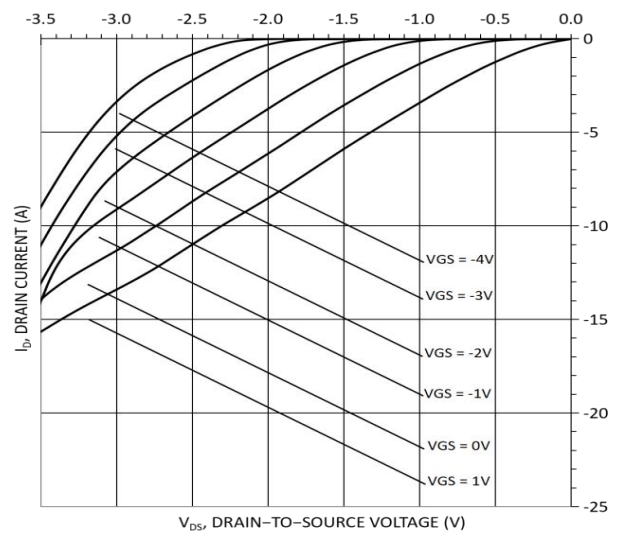


Figure 14. Body Diode Characteristic ($T_j = 175^\circ\text{C}$)

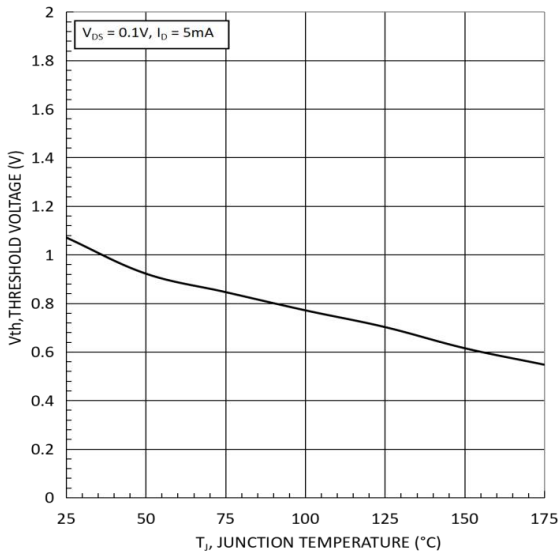


Figure 15. Threshold Voltage vs. Temperature

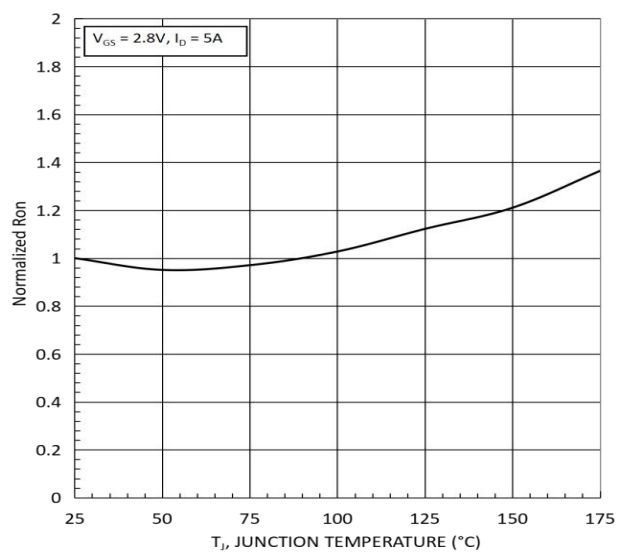


Figure 16. Normalized On-Resistance vs. Temperature

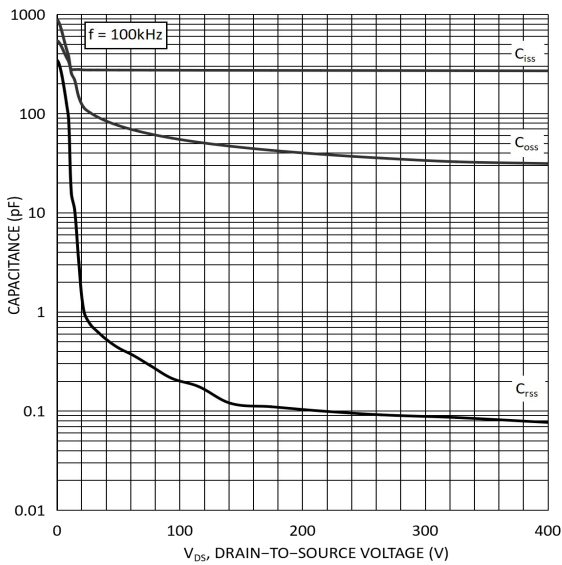


Figure 17. Capacitances vs. Drain-to-Source Voltage

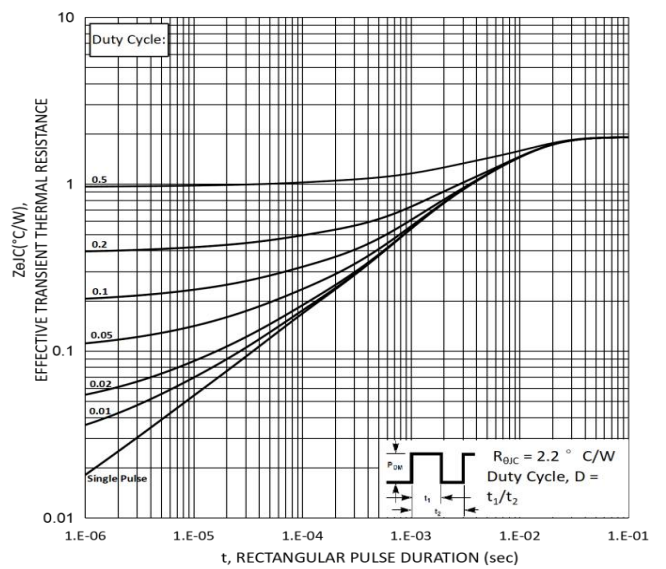
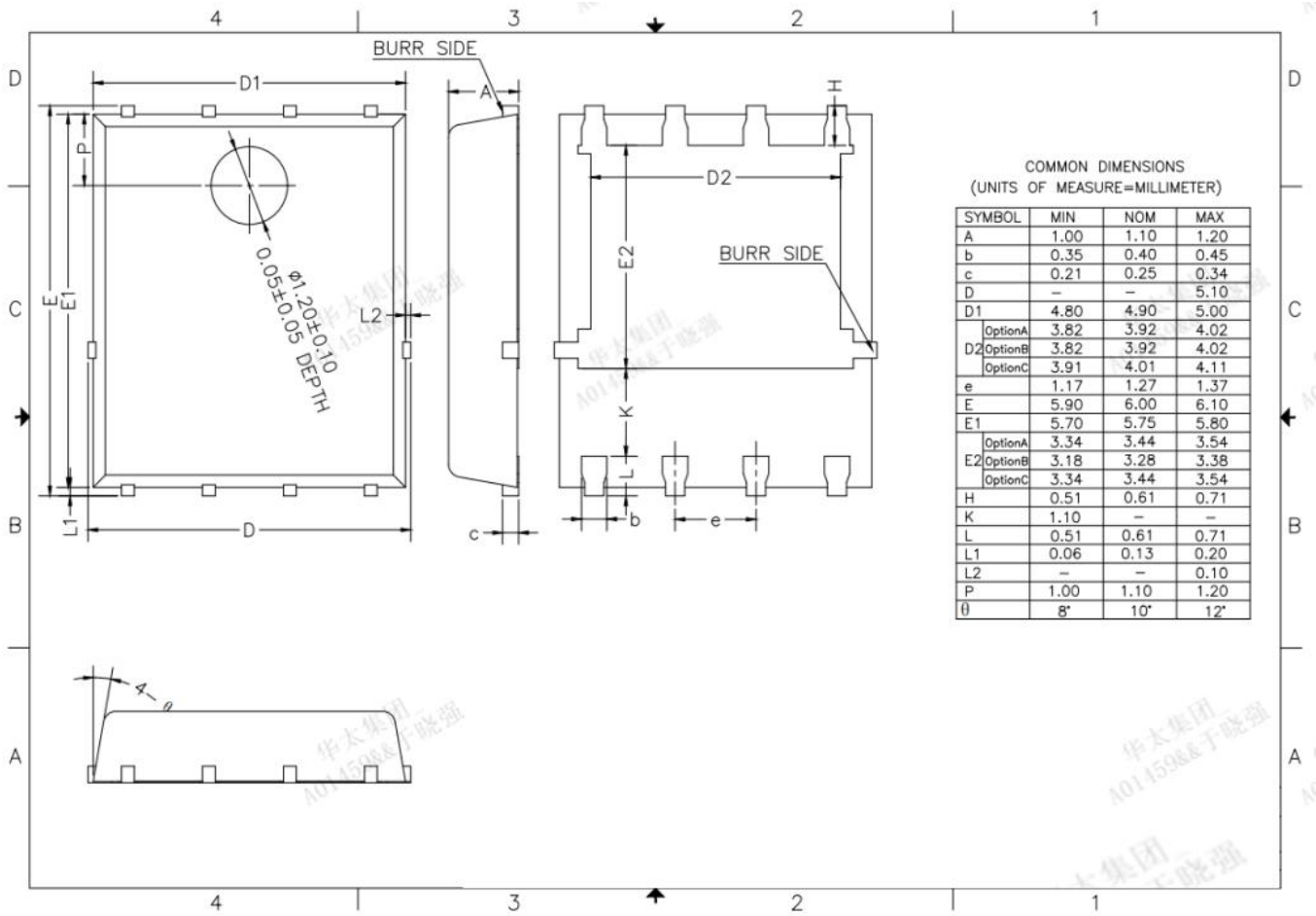


Figure 18. Transient Thermal Impedance

8. Package Dimensions



9. Version Information

Version No.	Date	Version revision record
A1.1	2025/12	Preliminary