

C4MS012120QT

Switching Optimized 1200V 12mΩ Silicon Carbide Power MOSFET

Features

- Industry compatible drive voltage 15V...18V/-4V...0V
- Soft body diode with low Vds overshoot and ringing
- Low Rds(on) at high operating temperatures
- Improved device capacitance ratio (Ciss/Crss)
- High transient voltage robustness with improved lifetime
- Halogen free, RoHS compliant

Benefits

- Higher efficiency with lower switching losses and EMI
- Faster switching operation enabling high power density
- Enables system level price performance optimization
- Reduction in system level cooling requirements

Typical Applications

- Data Center Power Supplies
- EV Chargers
- Solar/ESS
- Motor Control
- Industrial Power Supplies
- High Voltage DC/DC Converters

Key Parameters

Parameter	Symbol	Min.	Typ.	Max	Unit	Conditions	Note
Drain - Source Voltage	V_{DS}			1200	V		
Transient Drain - Source Voltage				1300		<100hrs of lifetime	Note 1
Maximum Gate - Source Voltage (Transient)	$V_{GS(max)}$	-10		+23		Transient	Note 2
Operational Turn-On Gate - Source Voltage	$V_{GS(op)}$		+15...+18			Refer to AN PRD-04814	
Operational Turn-Off Gate - Source Voltage			-4...0				
DC Continuous Drain Current	I_D		217		A	$V_{GS} = 18V, T_C = 25^\circ C, T_J \leq 175^\circ C$	Note 3
			153			$V_{GS} = 18V, T_C = 100^\circ C, T_J \leq 175^\circ C$	
Pulsed Drain Current	I_{DM}			613		t_{Pmax} limited by T_{Jmax} $V_{GS} = 18V, T_C = 25^\circ C$	
Power Dissipation	P_D		1068		W	$T_C = 25^\circ C, T_J = 175^\circ C$	
Operating Junction and Storage Temperature	T_J	-40		+175	°C		Note 4
Solder Temperature	T_L			260		According to JEDEC J-STD-020	

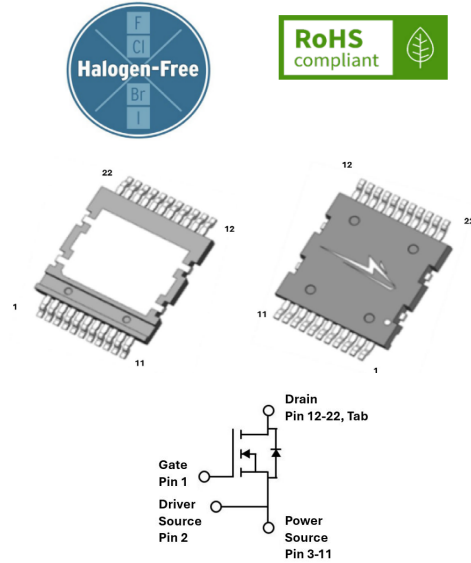
Note (1): 100 hours of total accumulated lifetime of the product.

Note (2): When applying IPC-9592B derating it is permissible to use Maximum Vgs of +25V

Note (3): Current limit calculated by $I_{D(max)} = \sqrt{(P_D / R_{DS(typ)}) / (T_{J(max)} / I_{D(max)})}$

Note(4): $P_D = (T_J - T_C) / R_{th(JC, typ)}$

Package



Orderable Part number	Package type	Marking
C4MS012120QT-TR	TSC(QT)	C4MS012120QT


Electrical Characteristics ($T_c = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	1200			V	$V_{GS} = 0\text{ V}, I_D = 100\ \mu\text{A}$	
$V_{GS(th)}$	Gate Threshold Voltage	2.1	2.6	3.9	V	$V_{DS} = V_{GS}, I_D = 24.1\ \text{mA}$	Fig. 11
			2.3		V	$V_{DS} = V_{GS}, I_D = 24.1\ \text{mA}, T_J = 175^\circ\text{C}$	
I_{DSS}	Zero Gate Voltage Drain Current		1	50	μA	$V_{DS} = 1200\ \text{V}, V_{GS} = 0\ \text{V}$	
I_{GSS}	Gate-Source Leakage Current		10	250	nA	$V_{GS} = 18\ \text{V}, V_{DS} = 0\ \text{V}$	
$R_{DS(on)}$	Drain-Source On-State Resistance		12	16	m Ω	$V_{GS} = 18\ \text{V}, I_D = 87.6\ \text{A}$	Fig. 4, 5, 6
			23			$V_{GS} = 18\ \text{V}, I_D = 87.6\ \text{A}, T_J = 175^\circ\text{C}$	
			15			$V_{GS} = 15\ \text{V}, I_D = 87.6\ \text{A}$	
g_{fs}	Transconductance		52		S	$V_{DS} = 20\ \text{V}, I_D = 87.6\ \text{A}, T_J = 175^\circ\text{C}$	Fig. 7
			52			$V_{DS} = 20\ \text{V}, I_D = 87.6\ \text{A}, T_J = 25^\circ\text{C}$	
$R_{DS(on)Tempco}$	On resistance temperature coefficient		1.88			$V_{GS} = 18\ \text{V}, I_D = 87.6\ \text{A}$	Note 4
C_{iss}	Input Capacitance		6018		pF	$V_{GS} = 0\ \text{V}, V_{DS} = 1000\ \text{V}$ $f = 100\ \text{kHz}$ $V_{AC} = 25\ \text{mV}$	Fig. 17, 18
C_{oss}	Output Capacitance		201				
C_{rss}	Reverse Transfer Capacitance		9.2				
C_{iss}/C_{rss}	Capacitance Ratio		630				Note 5
E_{oss}	C_{oss} Stored Energy		140				μJ
$R_{G(int)}$	Internal Gate Resistance		4.1		Ω	$f = 1\ \text{MHz}$	
Q_{gs}	Gate to Source Charge		79		nC	$V_{DS} = 800\ \text{V}, V_{GS} = -4\ \text{V}/18\ \text{V}$ $I_D = 87.6\ \text{A}$ Per IEC60747-8-4 pg 21	Fig. 12
Q_{gd}	Gate to Drain Charge		68				
Q_g	Total Gate Charge		280				

Note (4): $R_{DS(on)Tempco}$ refers to $R_{DS(on)}$ at $25\ \text{C}$ / $R_{DS(on)}$ at $175\ \text{C}$

Note (5): Capacitance ratio is a FOM for Partial turn-on immunity PRD-06933, this is a family wide value*

Reverse Diode Characteristics ($T_c = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage	5.1		V	$V_{GS} = -4\ \text{V}, I_{SD} = 43.8\ \text{A}, T_J = 25^\circ\text{C}$	Fig. 8, 9, 10
		4.5		V	$V_{GS} = -4\ \text{V}, I_{SD} = 43.8\ \text{A}, T_J = 175^\circ\text{C}$	
I_S	Continuous Diode Forward Current	150		A	$V_{GS} = -4\ \text{V}, T_c = 25^\circ\text{C}$	
I_{SM}	Diode Pulse Current		613	A	$V_{GS} = -4\ \text{V}$, pulse width t_p limited by T_{jmax}	

Thermal Characteristics

Symbol	Parameter	Typ.	Unit	Test Conditions	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	0.14	$^\circ\text{C}/\text{W}$		



Typical Performance

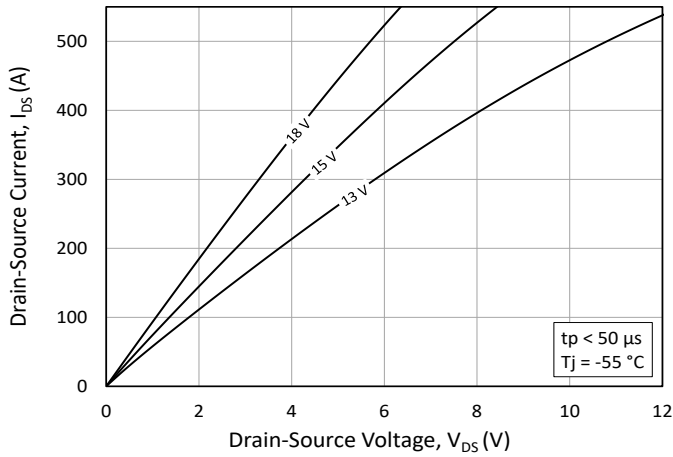


Figure 1. Output Characteristics $T_j = -55^{\circ}\text{C}$

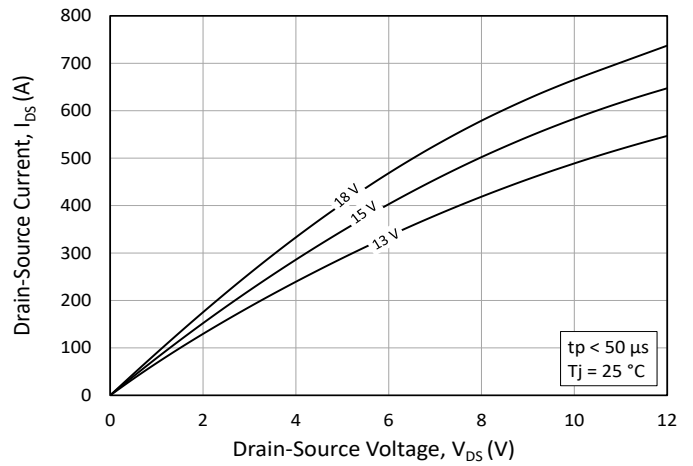


Figure 2. Output Characteristics $T_j = 25^{\circ}\text{C}$

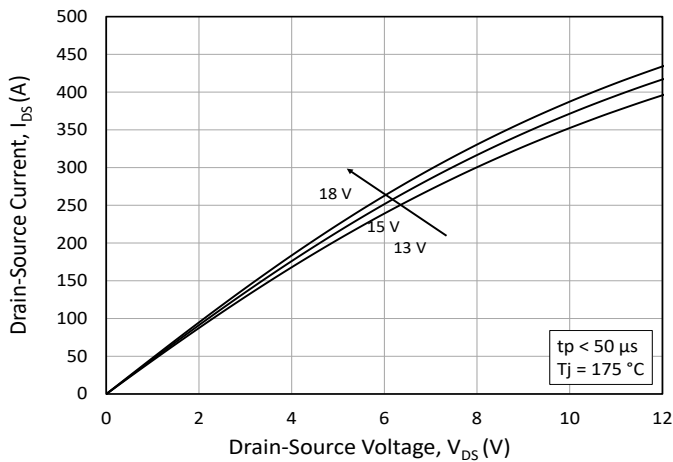


Figure 3. Output Characteristics $T_j = 175^{\circ}\text{C}$

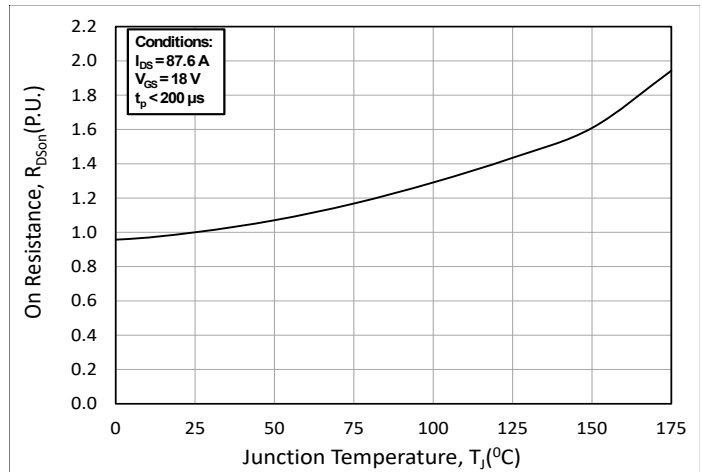


Figure 4. Normalized On-Resistance vs. Temperature

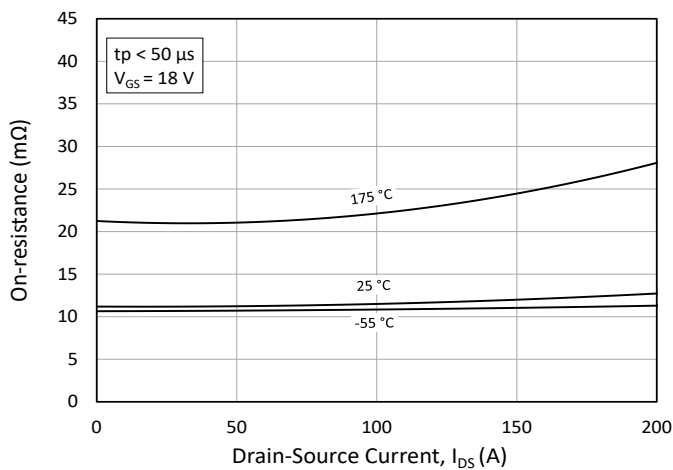


Figure 5. On-Resistance vs. Drain Current For Various Temperatures

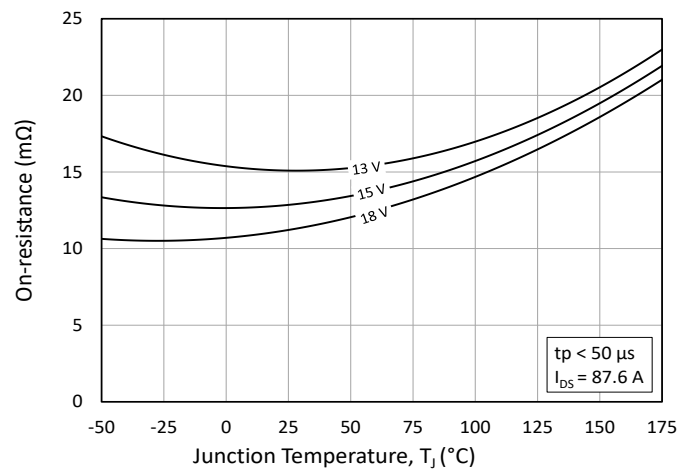


Figure 6. On-Resistance vs. Temperature For Various Gate Voltage



Typical Performance

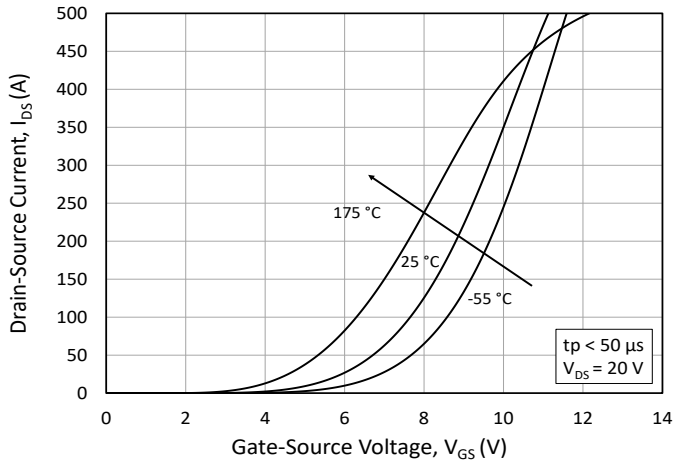


Figure 7. Transfer Characteristic for Various Junction Temperatures

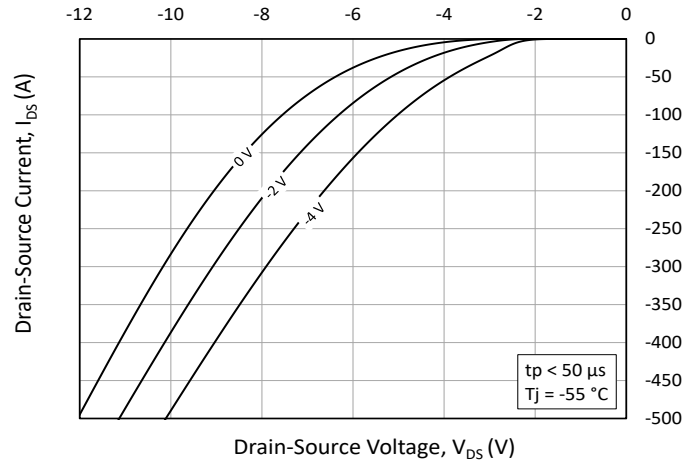


Figure 8. Body Diode Characteristic at -55 °C

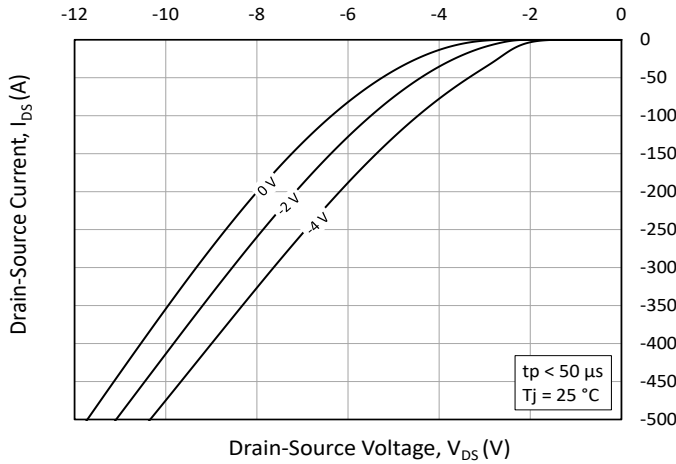


Figure 9. Body Diode Characteristic at 25 °C

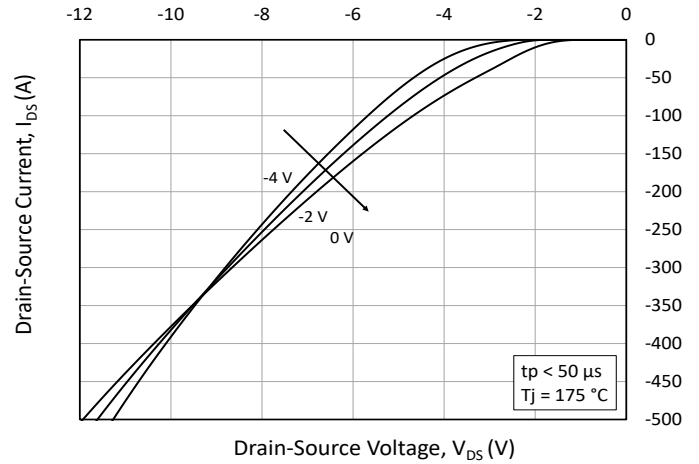


Figure 10. Body Diode Characteristic at 175 °C

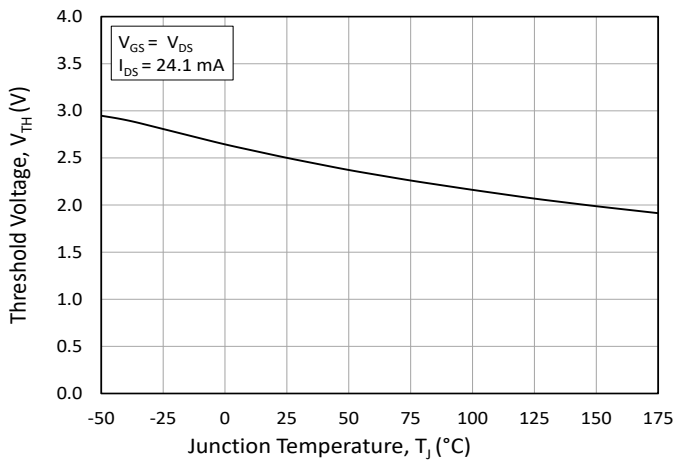


Figure 11. Threshold Voltage vs. Temperature

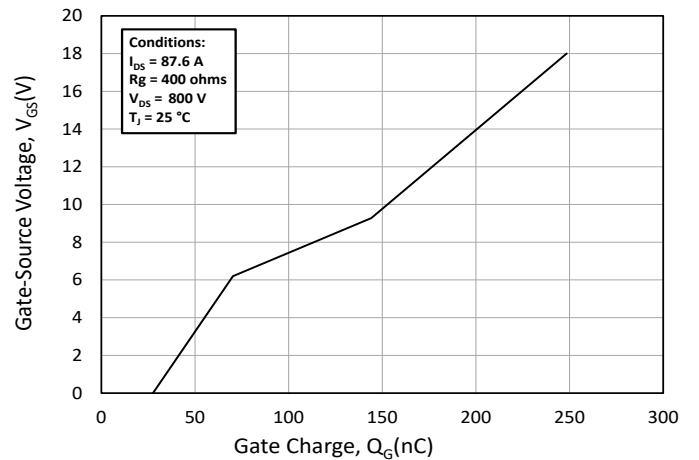


Figure 12. Gate Charge Characteristics



Typical Performance

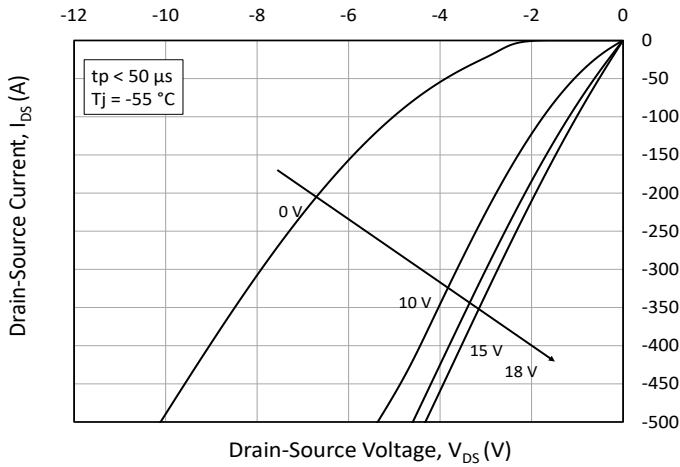


Figure 13. 3rd Quadrant Characteristic at -55°C

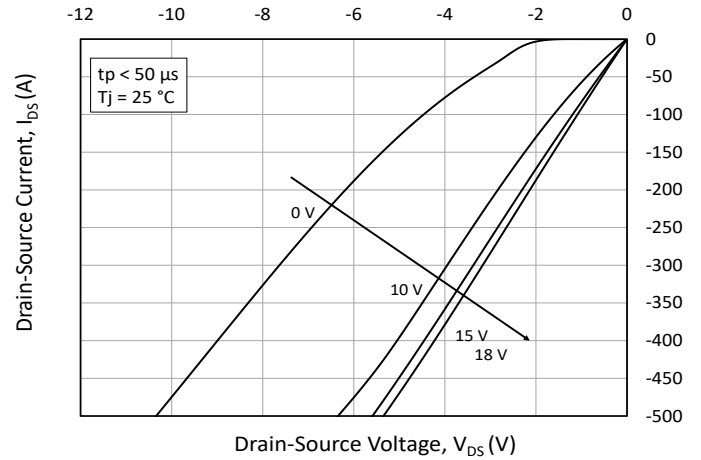


Figure 14. 3rd Quadrant Characteristic at 25°C

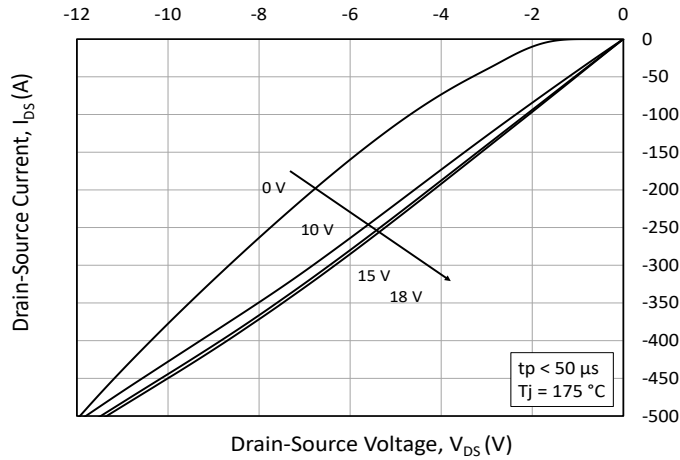


Figure 15. 3rd Quadrant Characteristic at 175°C

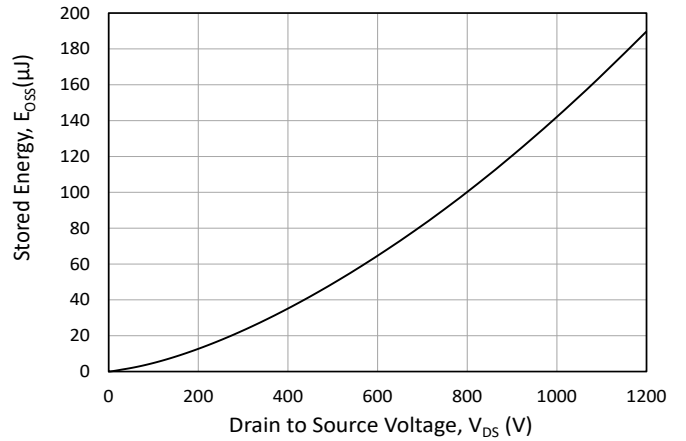


Figure 16. Output Capacitor Stored Energy

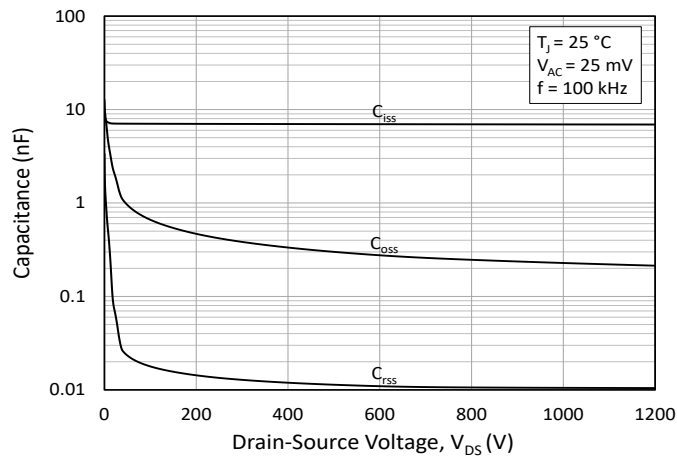


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200 V)

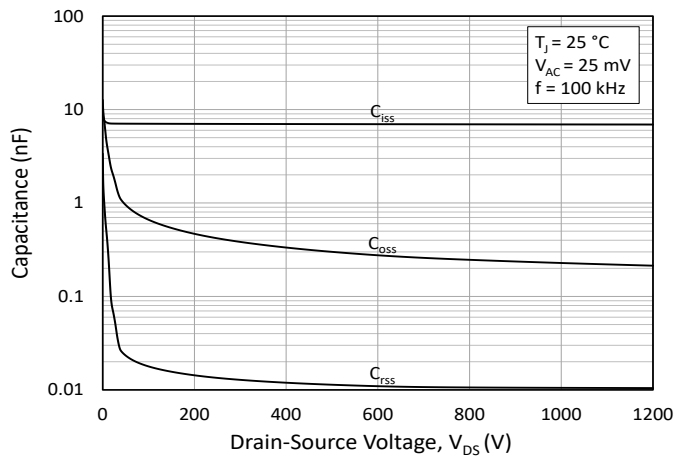
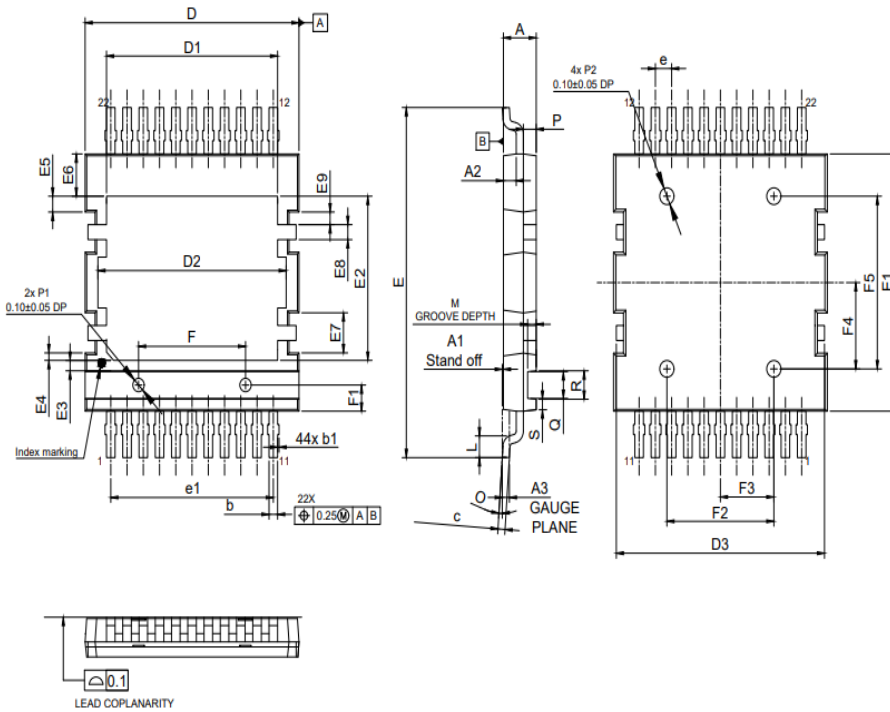


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1200 V)



Package Dimensions



SYMBOL	MIN	MAX	SYMBOL	MIN	MAX
A	2.25	2.35	E9		0.75
A1	0.00	0.15	e		1.14
A2		0.90	e1		11.4
A3		0.50	F	7.40	7.60
b	0.50	0.70	F1	1.47	1.67
b1	-	0.15	F2	7.40	7.60
c	0.46	0.58	F3	3.65	3.85
D	14.90	15.10	F4	5.07	5.27
D1		12.00	F5	10.24	10.44
D2		13.20	L		1.30
D3	14.50	14.70	M		0.60
E	20.81	21.11	N		22
E1	15.30	15.50	O	0°	8°
E2		9.83	P		0.90
E3		0.625	P1	0.70	0.90
E4		0.45	P2	0.90	1.10
E5		0.95	Q		1.60
E6		2.53	R		1.70
E7		2.40	S		0.631
E8		0.90			



Revision history

Document Version	Date of release	Description of changes
P1	October 2025	Initial release



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