IV2Q12160D7Z – 1200V 160mΩ Gen2 Automotive SiC MOSFET

Features

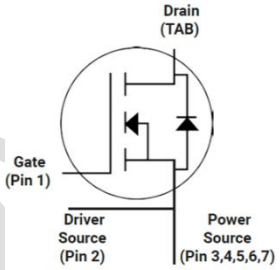
- 2nd Generation SiC MOSFET Technology with +15V~+18V gate drive
- High blocking voltage with low on-resistance
- High speed switching with low capacitance
- 175℃ operating junction temperature capability
- Ultra fast and robust intrinsic body diode
- Kelvin gate input easing driver circuit design
- AEC-Q101 qualified

Applications

- EV chargers and OCs
- Solar boosters
- Automotive compressor inverters
- AC/DC power supplies

Outline:

TO263-7



Marking Diagram:

YYWWZ
XXXX
2Q12160D7Z

2Q12160D7Z = Specific Device Code
YY = Year
WW = Work Week
Z = Assembly Location
XXXX = Lot Traceability

Absolute Maximum Ratings (T_C=25°C unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DS}	Drain-Source voltage	1200	V	V_{GS}=0V, I_D=100μA	
V_{GSmax} (Transient)	Maximum transient voltage	-10 to 23	V	Duty cycle<1%, and pulse width<200ns	
V_{GSon}	Recommended turn-on voltage	15 to 18	V		
V_{GSoff}	Recommended turn-off voltage	-5 to -2	V	Typical -3.5V	
I_D	Drain current (continuous)	20	A	V_{GS}=18V, T_C=25°C	Fig. 23
		15	A	V_{GS}=18V, T_C=100°C	
I_{DM}	Drain current (pulsed)	50	A	Pulse width limited by SOA and dynamic $R_{θ(J-C)}$	Fig. 25, 26
I_{SM}	Body diode current (pulsed)	50	A	Pulse width limited by SOA and dynamic $R_{θ(J-C)}$	Fig. 25, 26
P_{TOT}	Total power dissipation	136	W	T_C=25°C	Fig. 24
T_{stg}	Storage temperature range	-55 to 175	°C		
T_J	Operating junction temperature	-55 to 175	°C		
T_L	Solder Temperature	260	°C	wave soldering only allowed at leads, 1.6mm from case for 10 s	

Thermal Data

Symbol	Parameter	Value	Unit	Note
$R_{θ(J-C)}$	Thermal Resistance from Junction to Case	1.1	°C/W	Fig. 25

Electrical Characteristics (T_C=25°C unless otherwise specified)

Symbol	Parameter	Value			Unit	Test Conditions	Note
		Min.	Typ.	Max.			
I_{DSS}	Zero gate voltage drain current		1	100	μA	V_{DS}=1200V, V_{GS}=0V	
I_{GSS}	Gate leakage current			±100	nA	V_{DS}=0V, V_{GS}=-5~20V	
V_{TH}	Gate threshold voltage	1.8	3.0	4.5	V	V_{GS}=V_{DS}, I_D=2mA	Fig. 8, 9
			2.2			V_{GS}=V_{DS}, I_D=2mA @ T_J=175°C	
R_{ON}	Static drain-source on-resistance		160	208	mΩ	V_{GS}=18V, I_D=5A @T_J=25°C	Fig. 4, 5, 6, 7
			260		mΩ	V_{GS}=18V, I_D=5A @T_J=175°C	
			210		mΩ	V_{GS}=15V, I_D=5A @T_J=25°C	
			280		mΩ	V_{GS}=15V, I_D=5A @T_J=175°C	
C_{iss}	Input capacitance		580		pF	V_{DS}=800V, V_{GS}=0V, f=1MHz, V_{AC}=25mV	Fig. 16
C_{oss}	Output capacitance		35		pF		
C_{rss}	Reverse transfer capacitance		2.5		pF		
E_{oss}	C_{oss} stored energy		14		μJ		Fig. 17
Q_g	Total gate charge		29		nC	V_{DS}=800V, I_D=10A, V_{GS}=-3 to 18V	Fig. 18
Q_{gs}	Gate-source charge		6.6		nC		
Q_{gd}	Gate-drain charge		14.4		nC		
R_g	Gate input resistance		10		Ω	f=1MHz	
E_{ON}	Turn-on switching energy		148		μJ	V_{DS}=800V, I_D=10A, V_{GS}=-3.5 to 18V, $R_{G(ext)}$=3.3Ω, L=300μH T_J=25°C	Fig. 19, 20
E_{OFF}	Turn-off switching energy		14.6		μJ		
$t_{d(on)}$	Turn-on delay time		2.4		ns		
t_r	Rise time		10.4				
$t_{d(off)}$	Turn-off delay time		7.0				
t_f	Fall time		13.0				
E_{ON}	Turn-on switching energy		262		μJ	V_{DS}=800V, I_D=10A, V_{GS}=-3.5 to 18V, $R_{G(ext)}$=3.3Ω,L=300μH T_J=175°C	Fig. 22
E_{OFF}	Turn-off switching energy		17.1		μJ		

Reverse Diode Characteristics (T_C=25°C unless otherwise specified)

Symbol	Parameter	Value			Unit	Test Conditions	Note
		Min.	Typ.	Max.			
V_{SD}	Diode forward voltage		4.0		V	I_{SD}=5A, V_{GS}=0V	Fig. 10, 11, 12
			3.7		V	I_{SD}=5A, V_{GS}=0V, T_J=175°C	
I_S	Diode forward current (continuous)			23	A	V_{GS}=-2V, T_C=25°C	
				13	A	V_{GS}=-2V, T_C=100°C	
t_{rr}	Reverse recovery time		29		ns	V_{GS}=-3.5V/+18V, I_{SD}=10A, V_R=800V, $R_{G(ext)}$=18Ω L=300μH di/dt=3000A/μs	
Q_{rr}	Reverse recovery charge		97		nC		
I_{RRM}	Peak reverse recovery current		9.6		A		

Typical Performance (curves)

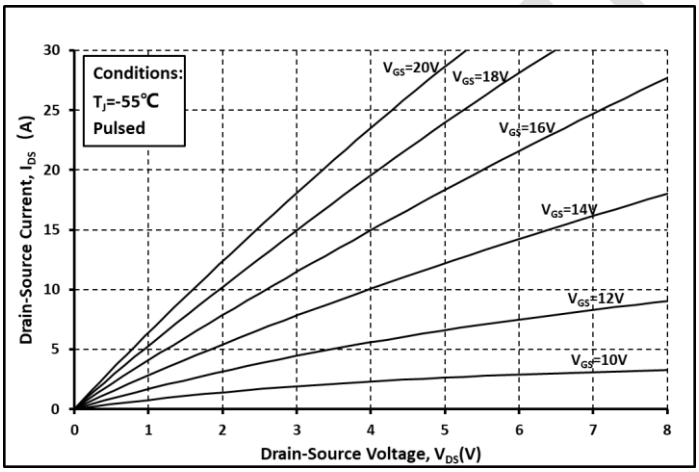


Fig. 1 Output Curve @ T_J=-55℃

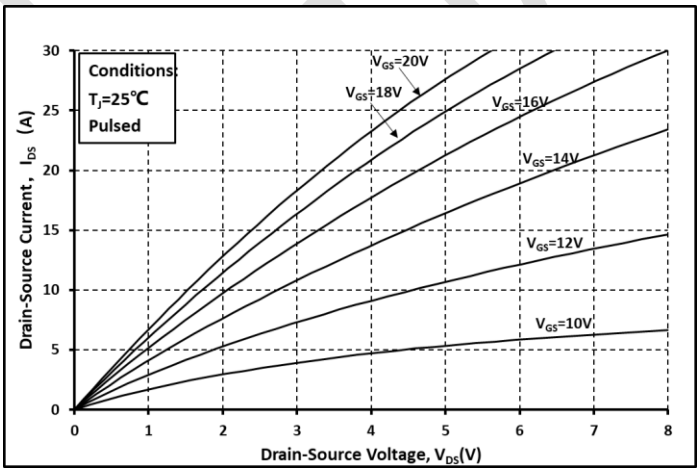


Fig. 2 Output Curve @ T_J=25℃

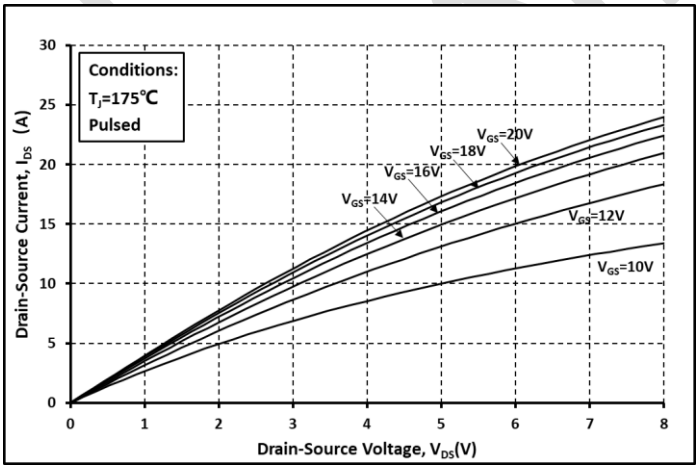


Fig. 3 Output Curve @ T_J=175℃

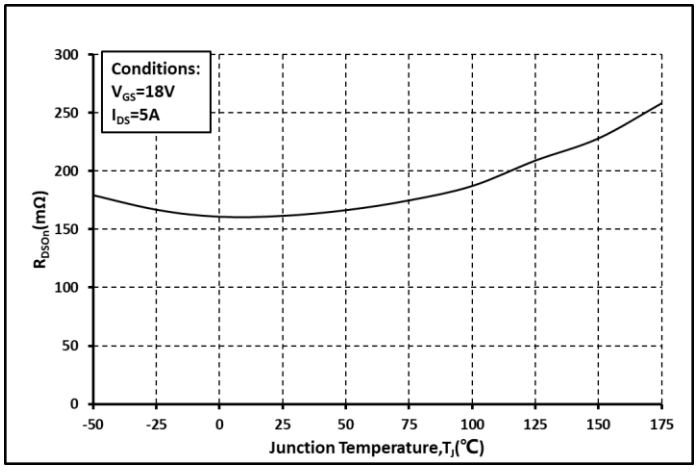


Fig. 4 Ron vs. Temperature

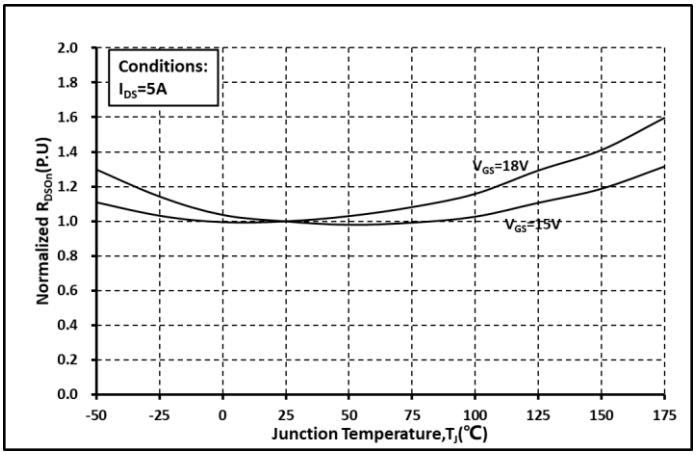


Fig. 5 Normalized Ron vs. Temperature

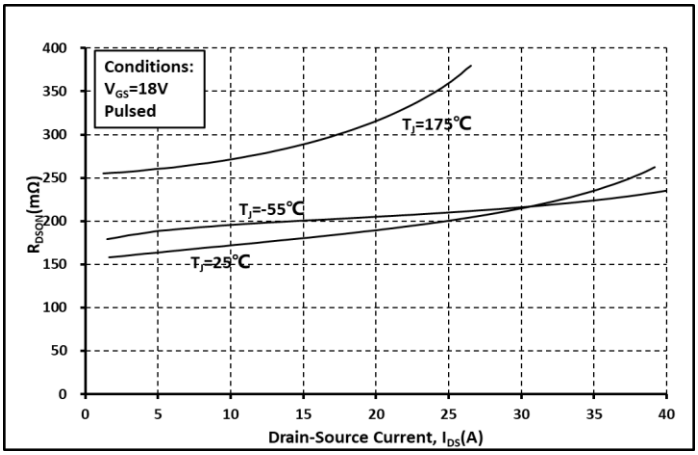


Fig. 6 Ron vs. I_{DS} @ Various Temperature

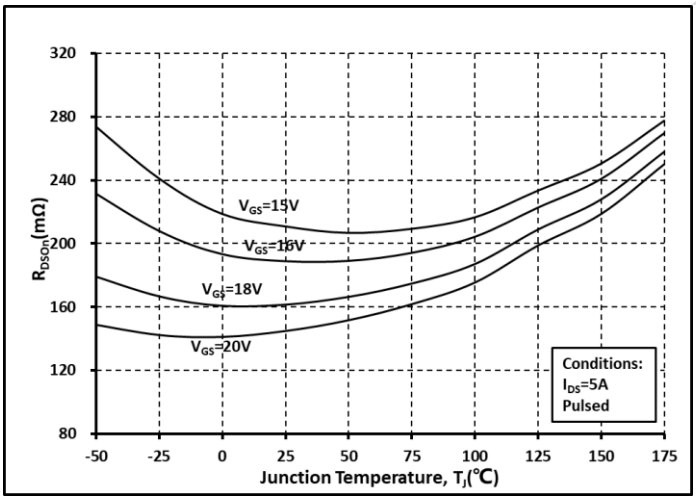


Fig. 7 Ron vs. Temperature @ Various V_{GS}

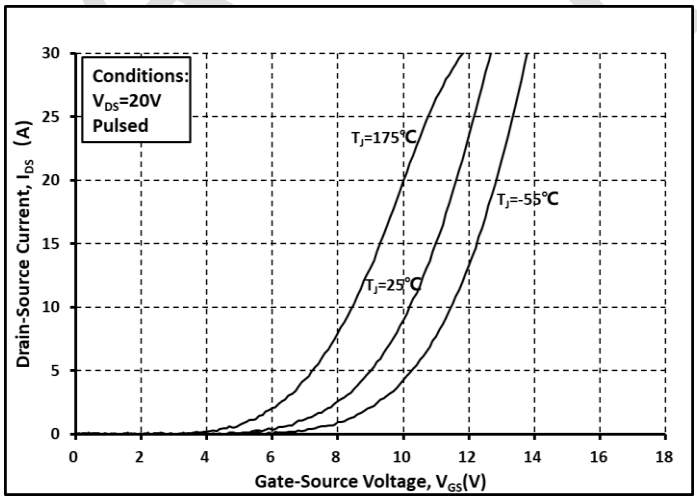


Fig. 8 Transfer Curves @ Various Temperature

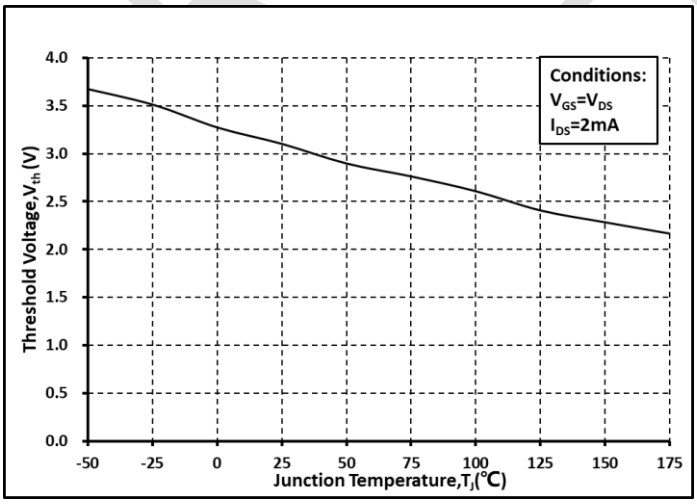


Fig. 9 Threshold Voltage vs. Temperature

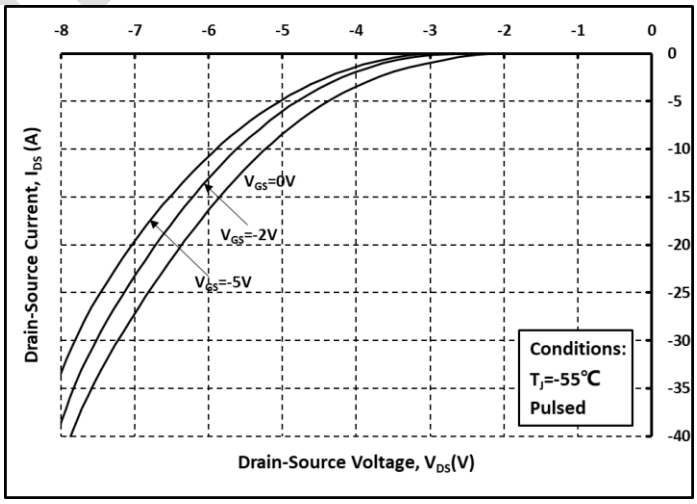


Fig. 10 Body Diode curves @ T_J=-55°C

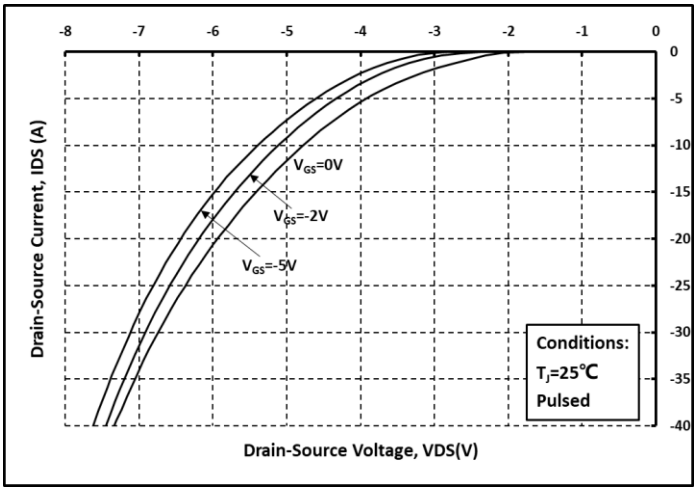


Fig. 11 Body Diode curves @ T_J=25°C

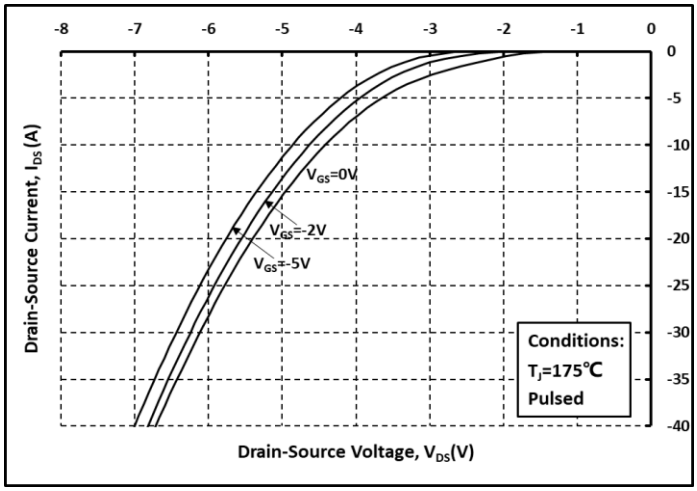


Fig. 12 Body Diode curves @ T_J=175°C

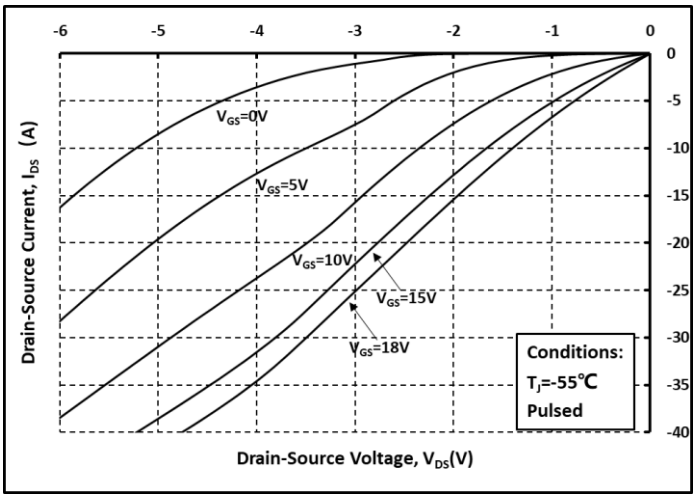


Fig. 13 3rd Quadrant curves @ T_J=-55°C

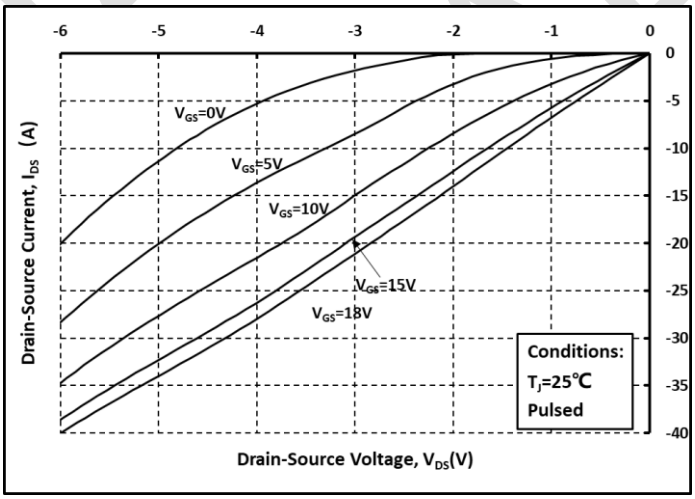


Fig. 14 3rd Quadrant curves @ T_J=25°C

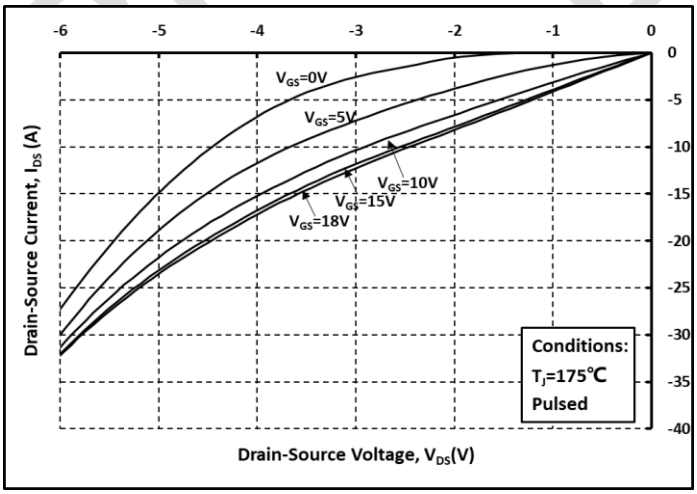


Fig. 15 3rd Quadrant curves @ T_J=175°C

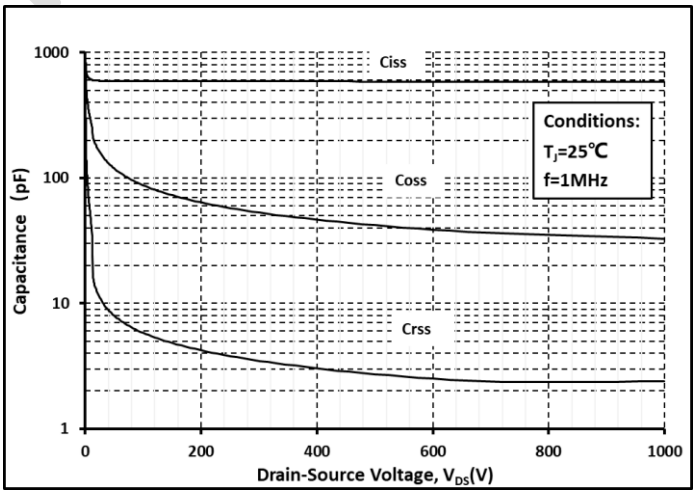


Fig. 16 Capacitance vs. V_{DS}

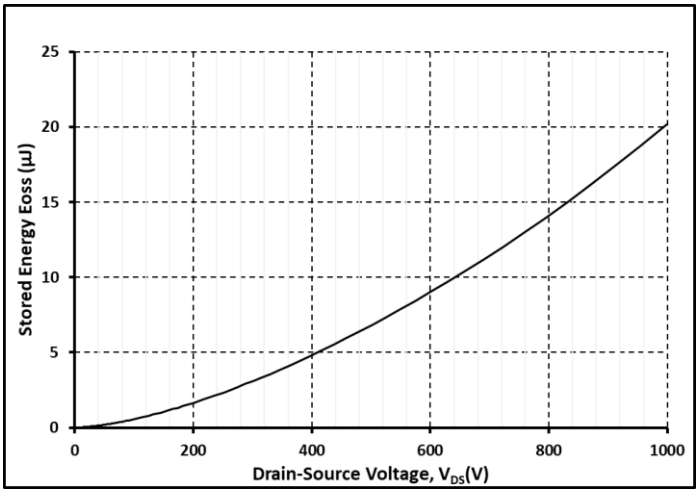


Fig. 17 Output Capacitor Stored Energy

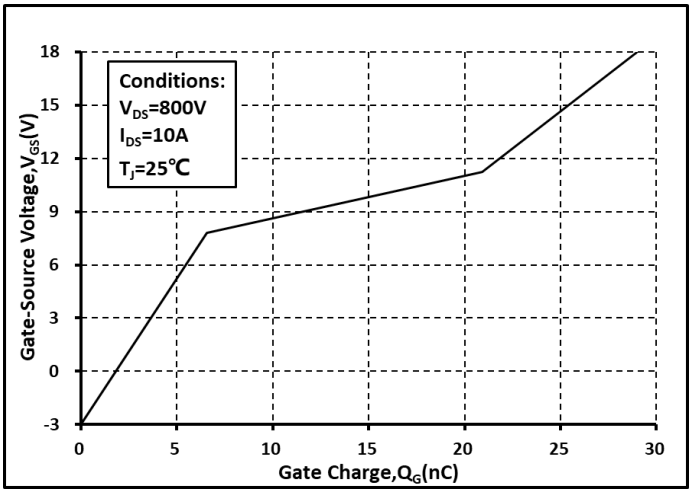


Fig. 18 Gate Charge Characteristics

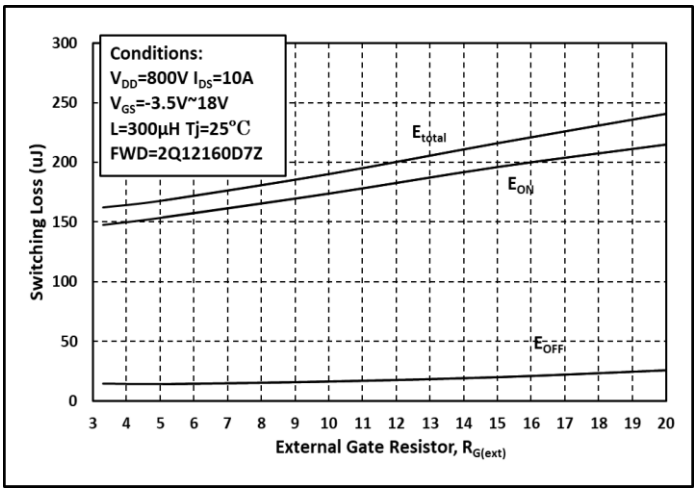


Fig. 19 Switching Energy vs. $R_{G(ext)}$

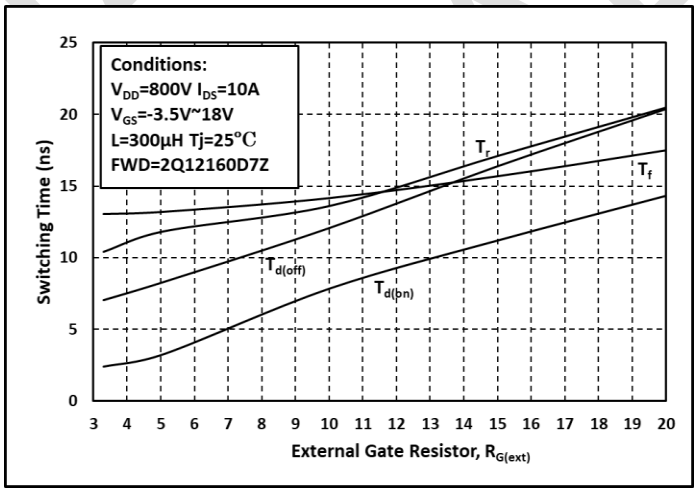


Fig. 20 Switching Times vs. $R_{G(ext)}$

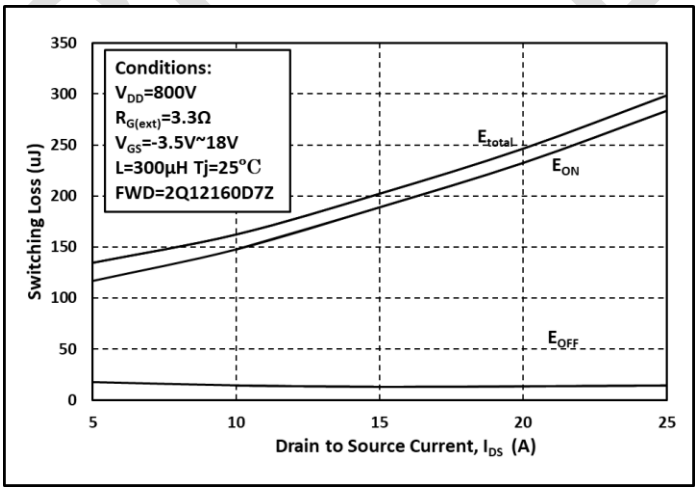


Fig. 21 Switching Energy vs. I_{DS}

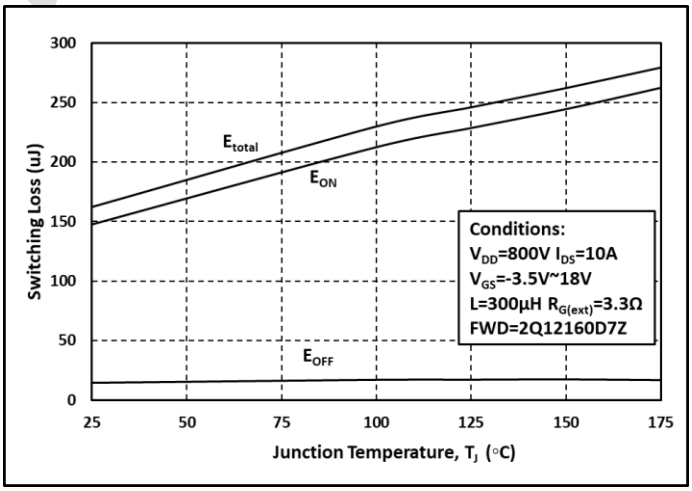


Fig. 22 Switching Energy vs. Temperature

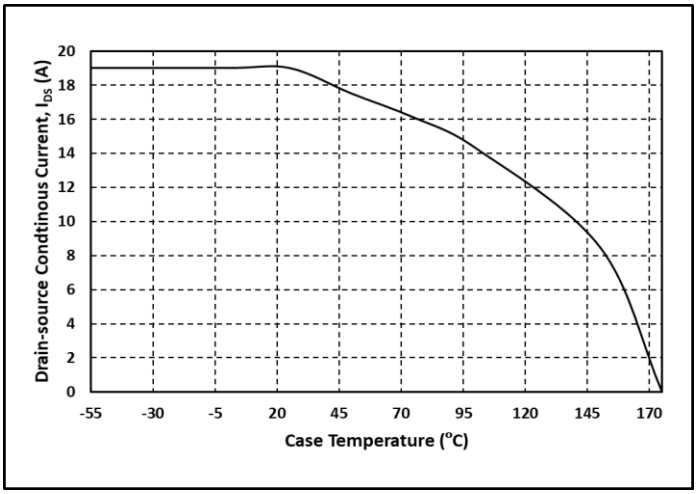


Fig. 23 Continuous Drain Current vs. Case Temperature

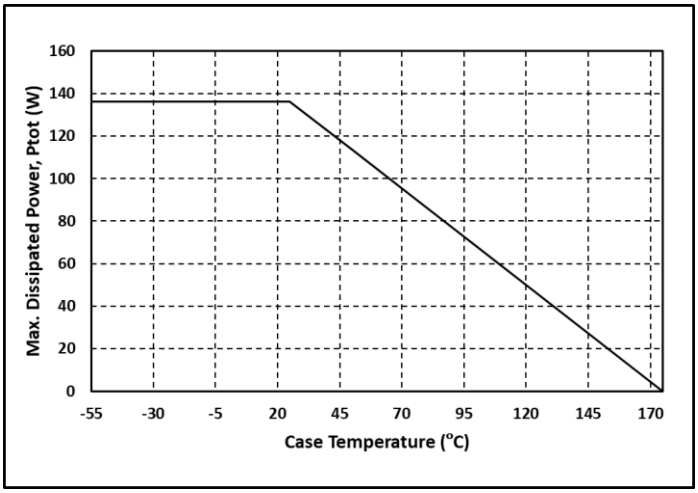


Fig. 24 Max. Power Dissipation Derating vs. Case Temperature

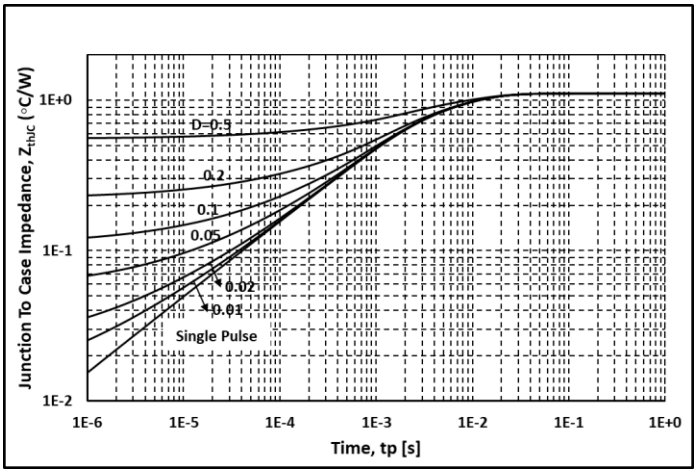


Fig. 25 Thermal impedance

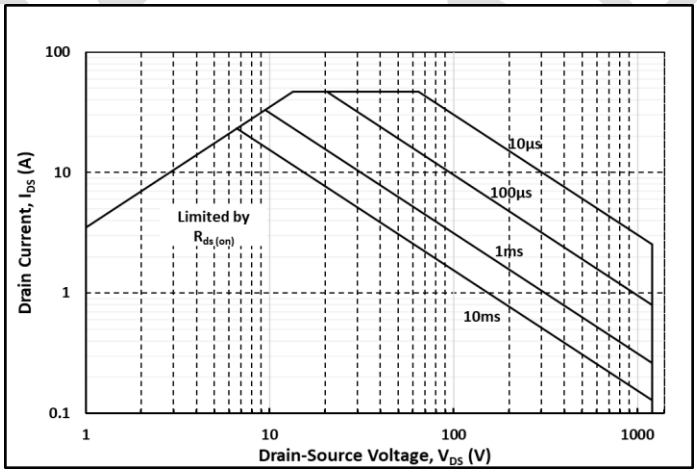
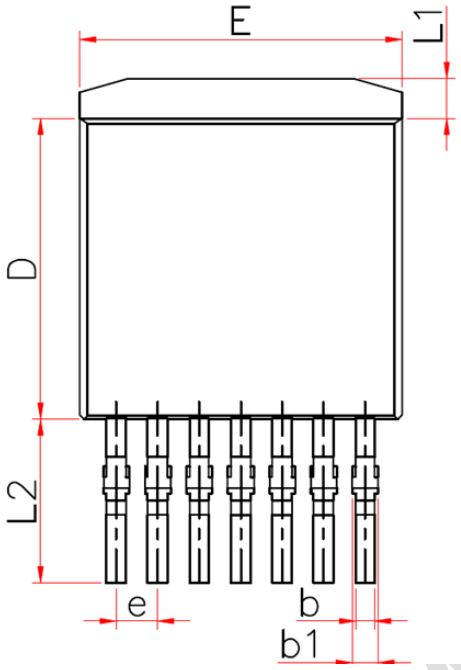
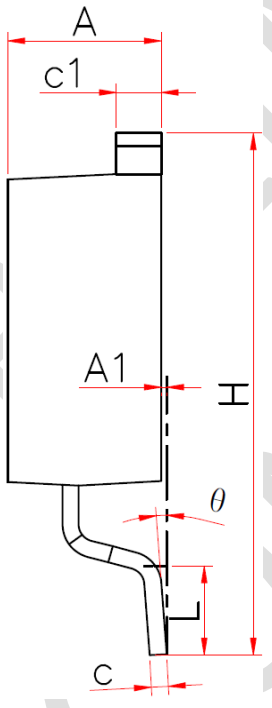


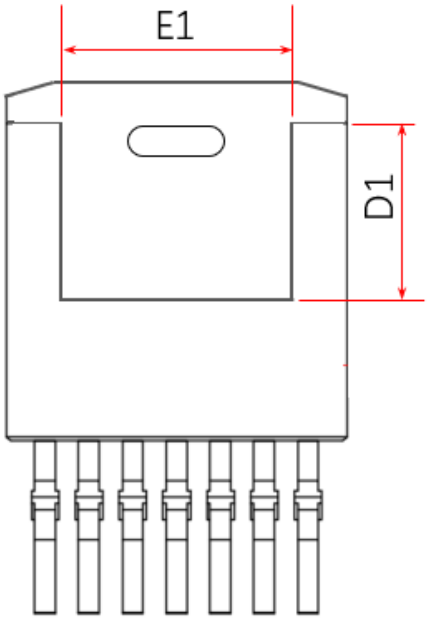
Fig. 26 Safe Operating Area

Package Dimensions



Symbol	Dimensions In Millimeters	
	Min.	Max.
A	4.300	4.560
A1	—	0.250
b	0.500	0.700
b1	0.600	0.900
c	0.450	0.600
c1	1.200	1.400
D	8.930	9.230
D1	4.650	4.950
E	10.080	10.280
E1	6.820	7.620
e	1.27 REF.	
H	15.000	16.000
L	1.900	2.500
L1	0.980	1.420
L2	4.350	5.890
θ	0°	7°





Note:

1. Package Reference: JEDEC TO263, Variation AD
2. All Dimensions are in mm
3. Subject to Change Without Notice

Notes

For further information please contact IVCT's office.

The Information in this document is subject to change without notice.

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