IV2Q12030T4Z – 1200V 30mΩ Gen2 Automotive SiC MOSFET

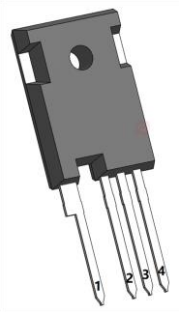
Features

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

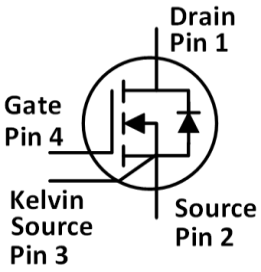
Applications

- Motor drivers
- Solar inverters
- Automotive DC/DC converters
- Automotive compressor inverters
- Switch mode power supplies

Outline:



TO247-4



Marking Diagram:

2Q12030T4Z
YYWWZ
XXXX

2Q12030T4Z= 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} (DC)	Maximum DC voltage	-5 to 20	V	Static (DC)	
V_{GSmax} (Spike)	Maximum spike voltage	-10 to 23	V	Duty cycle<1%, and pulse width<200ns	
V_{GSon}	Recommended turn-on voltage	18±0.5	V		
V_{GSoff}	Recommended turn-off voltage	-3.5 to -2	V		
I_D	Drain current (continuous)	79	A	V_{GS}=18V, T_C=25°C	Fig. 23
		58	A	V_{GS}=18V, T_C=100°C	
I_{DM}	Drain current (pulsed)	198	A	Pulse width limited by SOA	Fig. 26
P_{TOT}	Total power dissipation	395	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	0.38	°C/W	Fig. 23

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		5	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	2.8	4.5	V	V_{GS}=V_{DS}, I_D=12mA	Fig. 8, 9
			2.0			V_{GS}=V_{DS}, I_D=12mA @ T_J=175°C	
R_{ON}	Static drain-source on-resistance		30	39	mΩ	V_{GS}=18V, I_D=30A @T_J=25°C	Fig. 4, 5, 6, 7
			55		mΩ	V_{GS}=18V, I_D=30A @T_J=175°C	
			36	47	mΩ	V_{GS}=15V, I_D=30A @T_J=25°C	
			58		mΩ	V_{GS}=15V, I_D=30A @T_J=175°C	
C_{iss}	Input capacitance		3000		pF	V_{DS}=800V, V_{GS}=0V, f=1MHz, V_{AC}=25mV	Fig. 16
C_{oss}	Output capacitance		140		pF		
C_{rss}	Reverse transfer capacitance		7.7		pF		
E_{oss}	C_{oss} stored energy		57		μJ		Fig. 17
Q_g	Total gate charge		135		nC	V_{DS}=800V, I_D=40A, V_{GS}=-3 to 18V	Fig. 18
Q_{gs}	Gate-source charge		36.8		nC		
Q_{gd}	Gate-drain charge		45.3		nC		
R_g	Gate input resistance		2.3		Ω	f=1MHz	
E_{ON}	Turn-on switching energy		681.4		μJ	V_{DS}=800V, I_D=40A, V_{GS}=-3.5 to 18V, $R_{G(ext)}$=3.3Ω, L=200μH T_J=25°C	Fig. 19, 20
E_{OFF}	Turn-off switching energy		156.0		μJ		
$t_{d(on)}$	Turn-on delay time		12.8		ns		
t_r	Rise time		24.4				
$t_{d(off)}$	Turn-off delay time		28.8				
t_f	Fall time		14.0				

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		4.2		V	I_{SD}=30A, V_{GS}=0V	Fig. 10, 11, 12
			4.0		V	I_{SD}=30A, V_{GS}=0V, T_J=175°C	
t_{rr}	Reverse recovery time		45.5		ns	V_{GS}=-3.5V/+18V, I_{SD}=40A, V_R=800V, $R_{G(ext)}$=10Ω L=200μH di/dt=3000A/μs	
Q_{rr}	Reverse recovery charge		282.6		nC		
I_{RRM}	Peak reverse recovery current		21.6		A		

Typical Performance (curves)

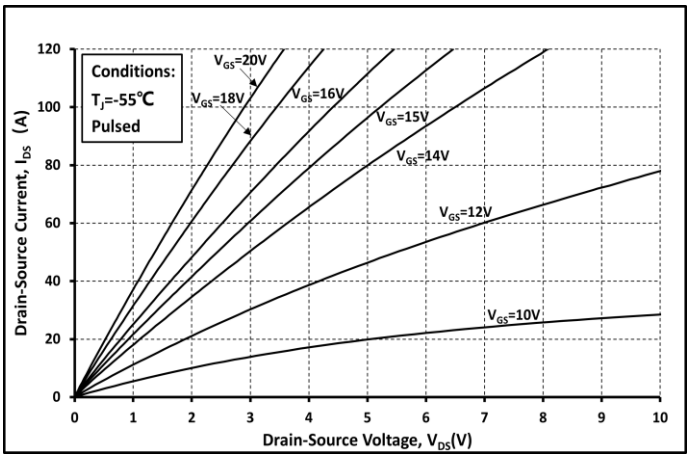


Fig. 1 Output Curve @ T_J=-55℃

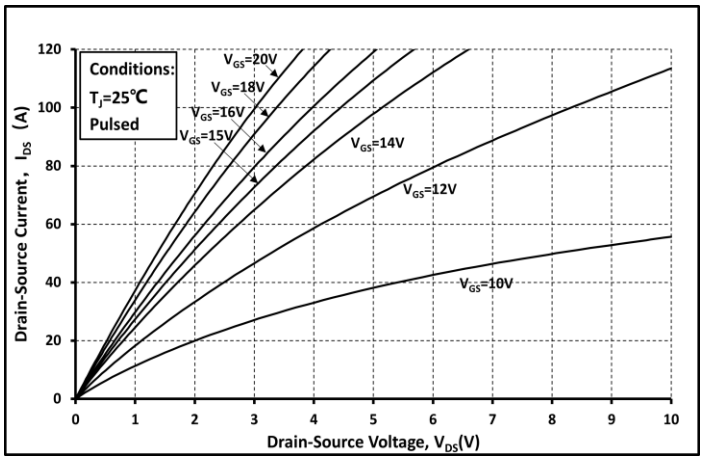


Fig. 2 Output Curve @ T_J=25℃

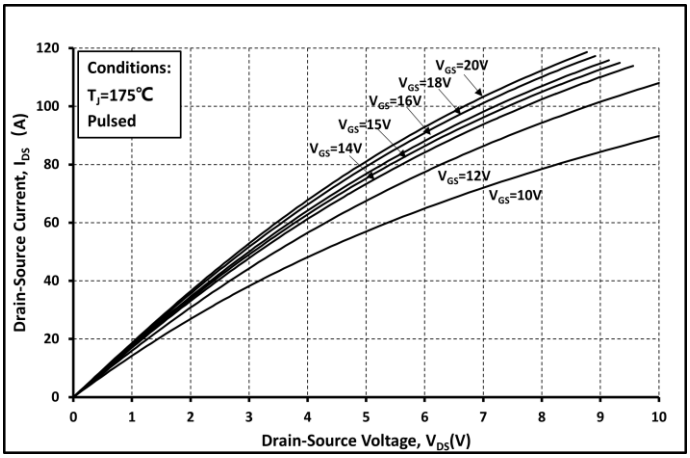


Fig. 3 Output Curve @ T_J=175℃

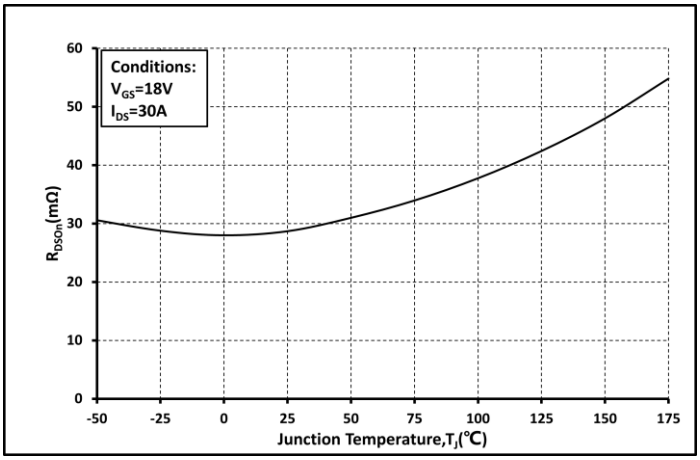


Fig. 4 Ron vs. Temperature

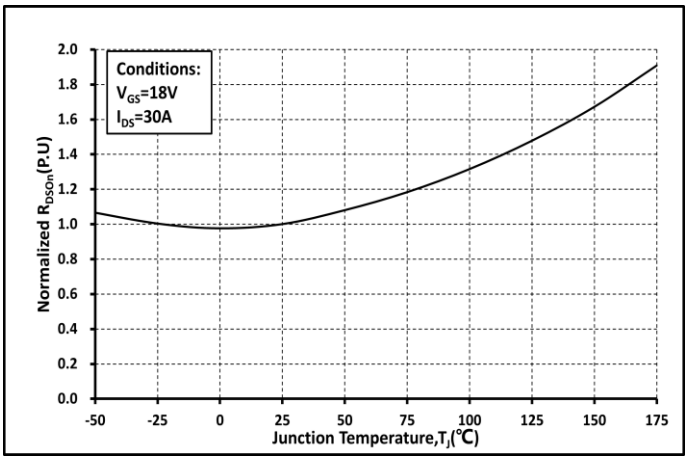


Fig. 5 Normalized Ron vs. Temperature

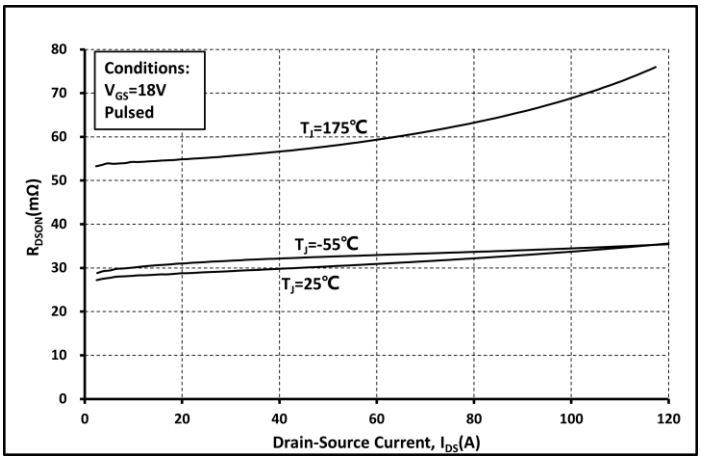


Fig. 6 Ron vs. I_{DS} @ Various Temperature

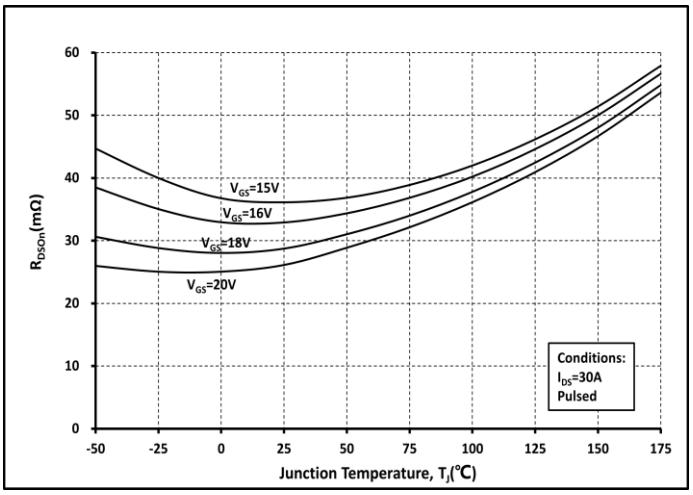


Fig. 7 Ron vs. Temperature @ Various V_{GS}

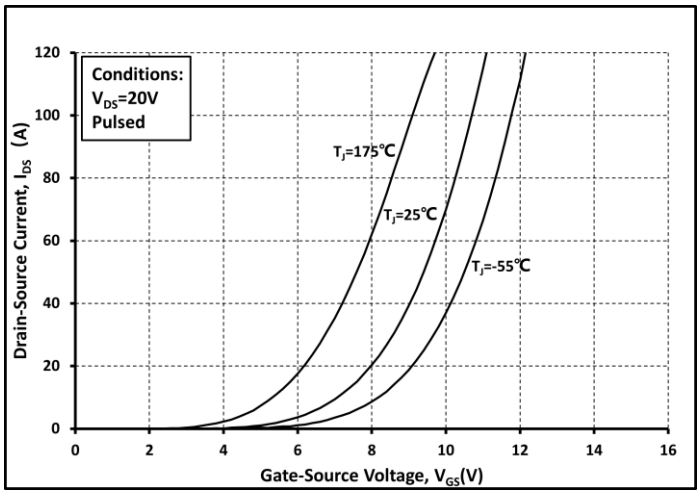


Fig. 8 Transfer Curves @ Various Temperature

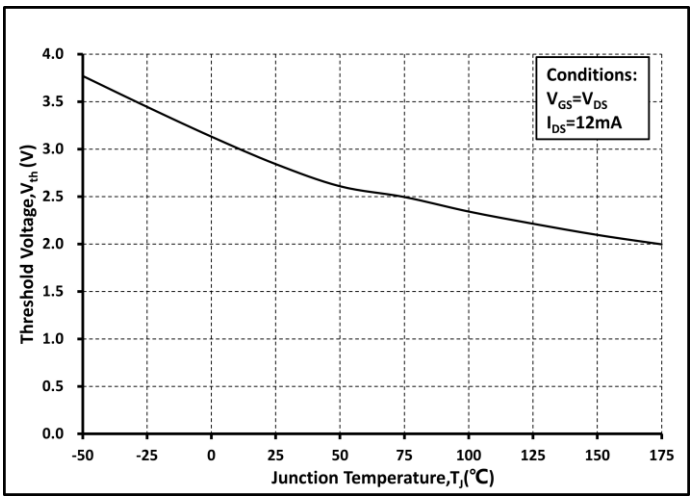


Fig. 9 Threshold Voltage vs. Temperature

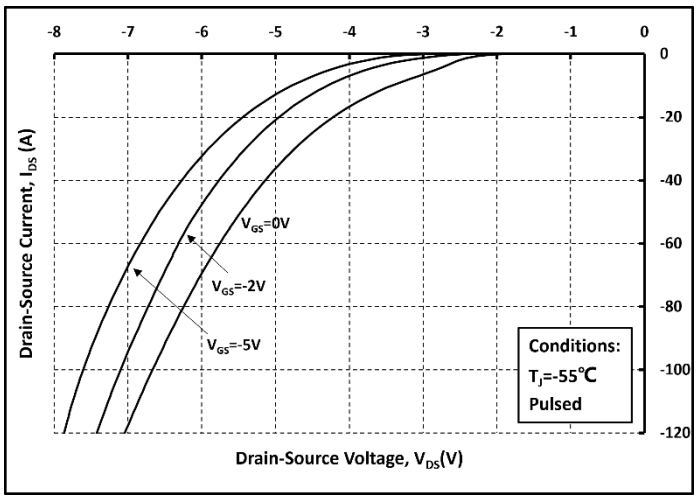


Fig. 10 Body Diode curves @ T_J=-55℃

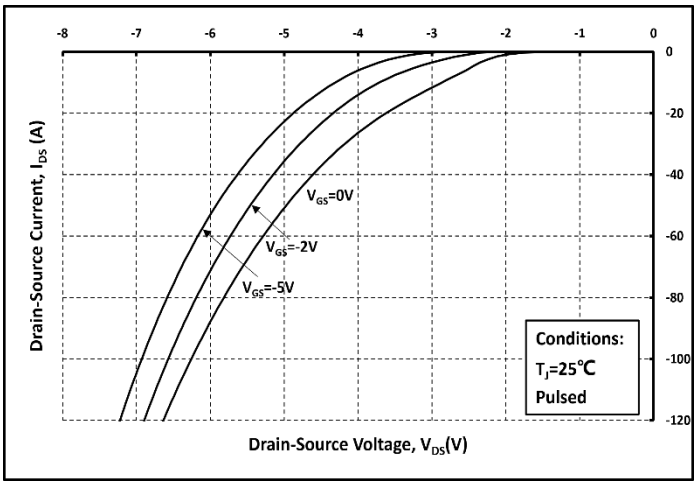


Fig. 11 Body Diode curves @ T_J=25℃

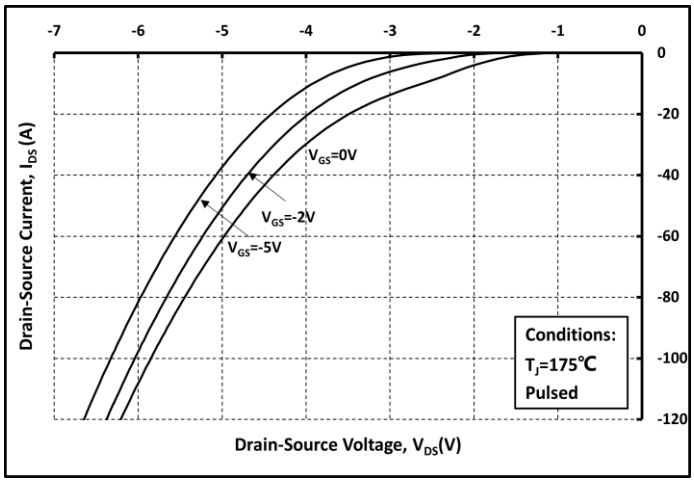


Fig. 12 Body Diode curves @ T_J=175℃

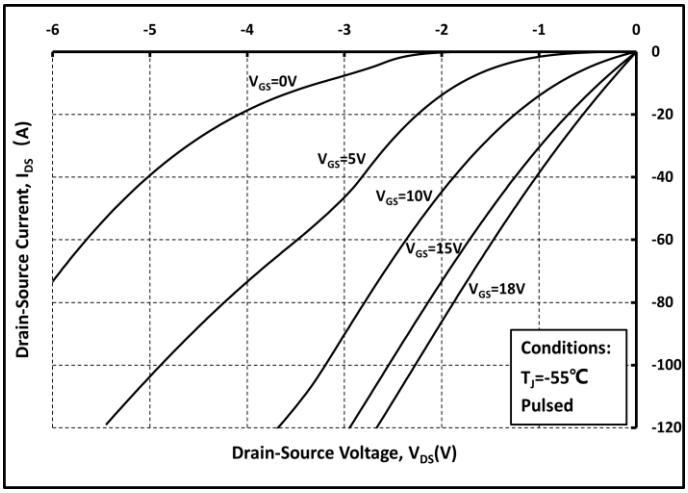


Fig. 13 3rd Quadrant curves @ T_J=-55°C

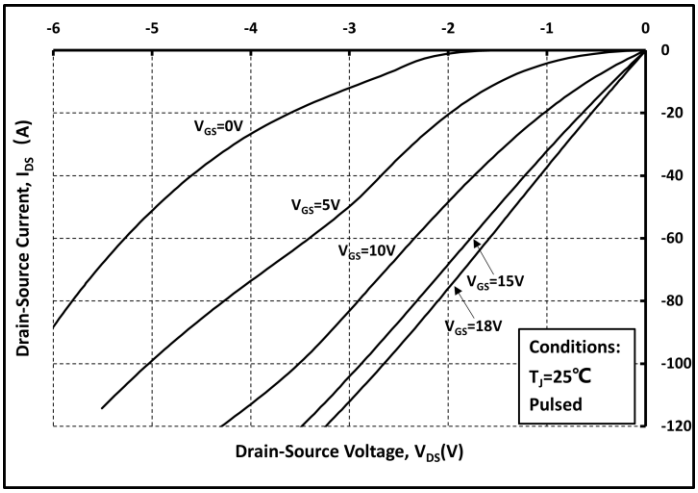


Fig. 14 3rd Quadrant curves @ T_J=25°C

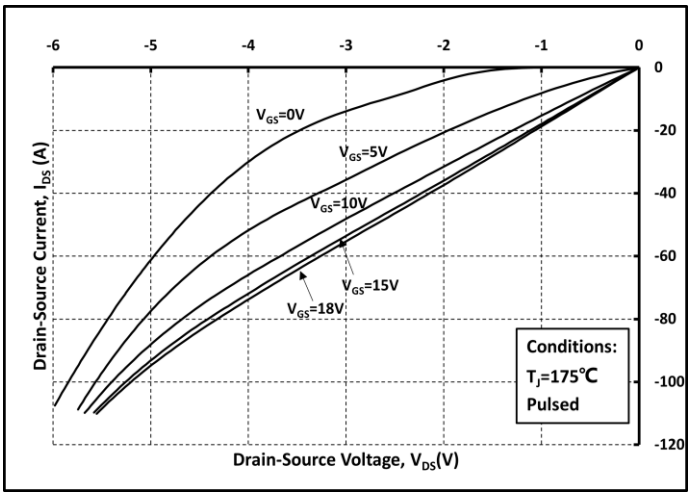


Fig. 15 3rd Quadrant curves @ T_J=175°C

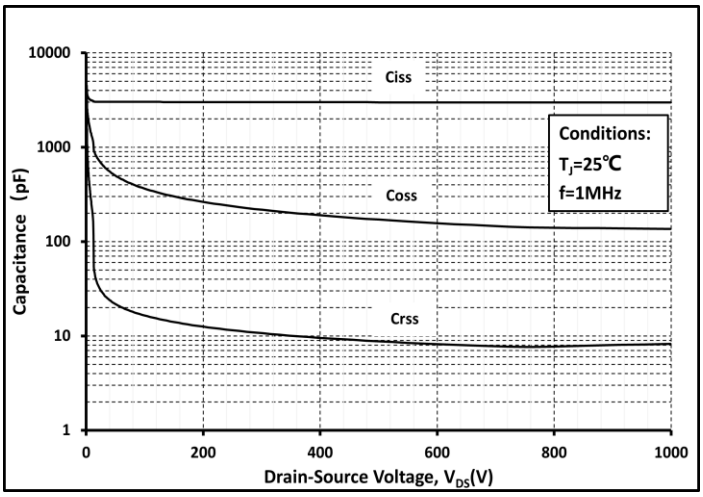


Fig. 16 Capacitance vs. V_{DS}

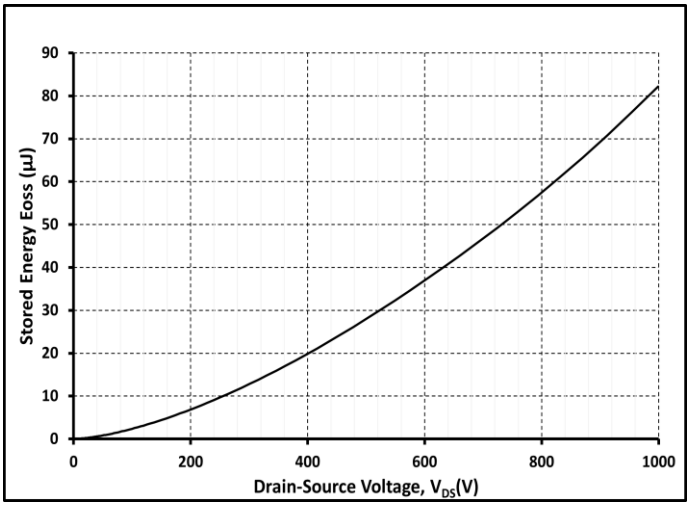


Fig. 17 Output Capacitor Stored Energy

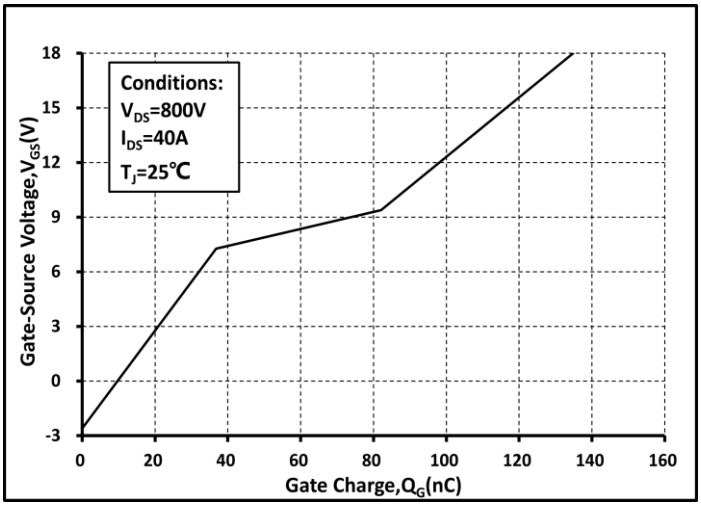


Fig. 18 Gate Charge Characteristics

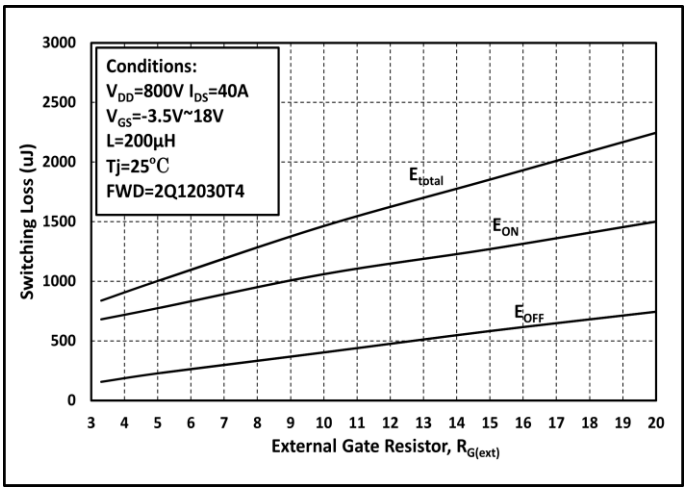


Fig. 19 Switching Energy vs. $R_{G(ext)}$

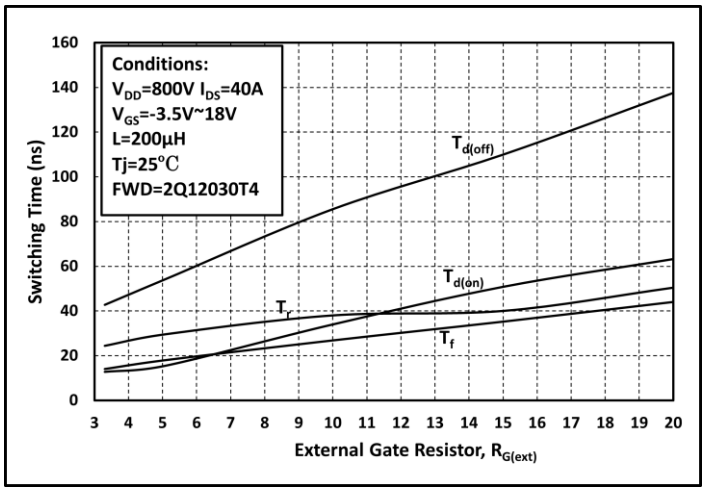


Fig. 20 Switching Times vs. $R_{G(ext)}$

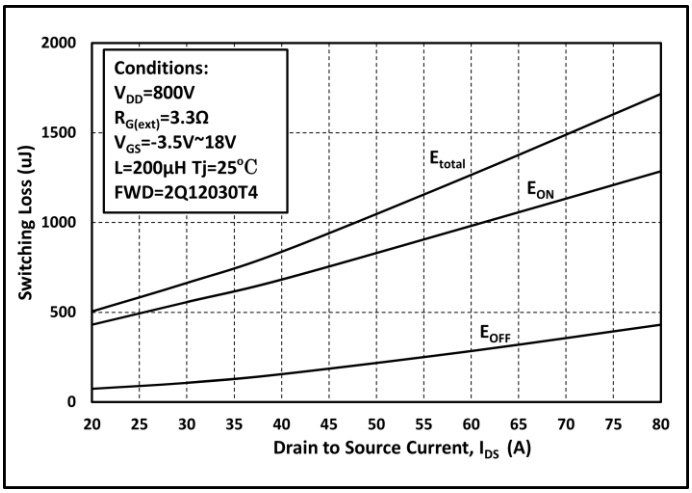


Fig. 21 Switching Energy vs. I_{DS}

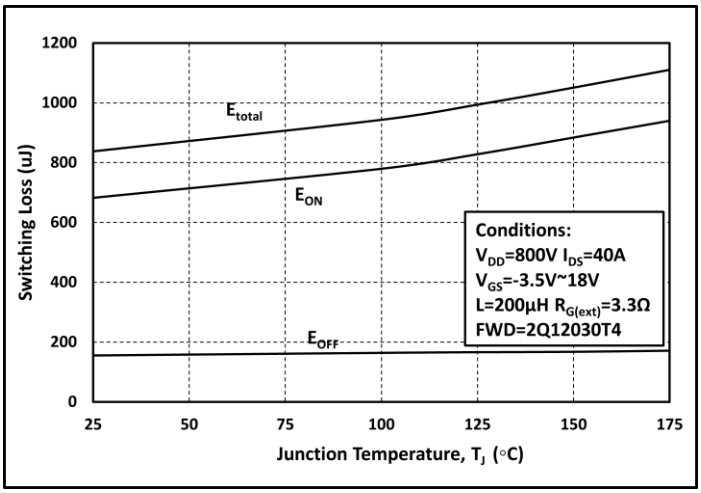


Fig. 22 Switching Energy vs. Temperature

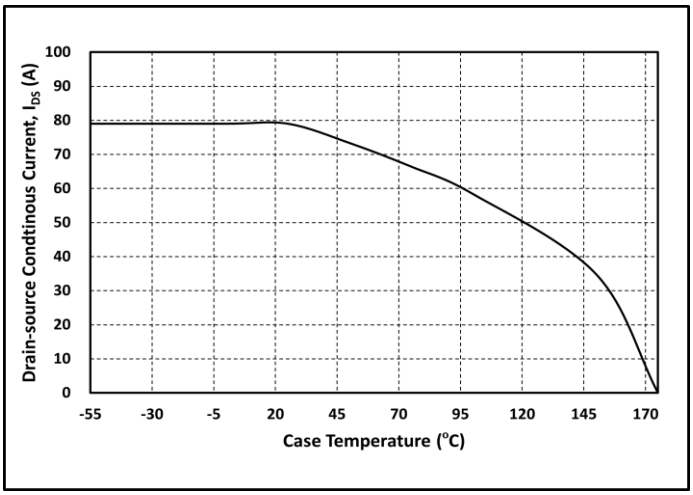


Fig. 23 Continuous Drain Current vs. Case Temperature

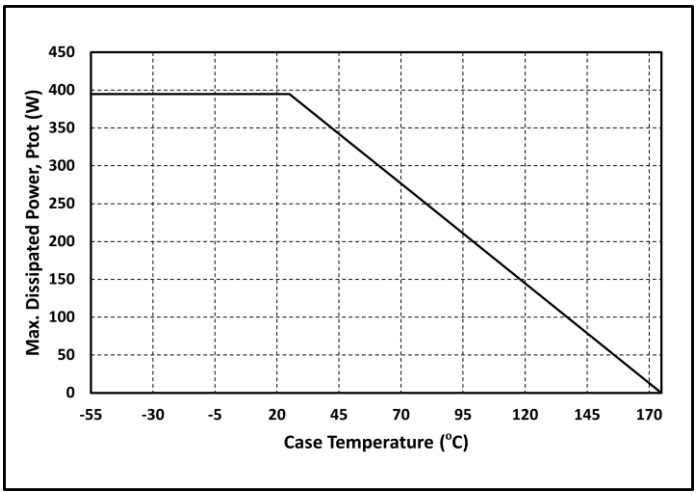


Fig. 24 Max. Power Dissipation Derating vs. Case Temperature

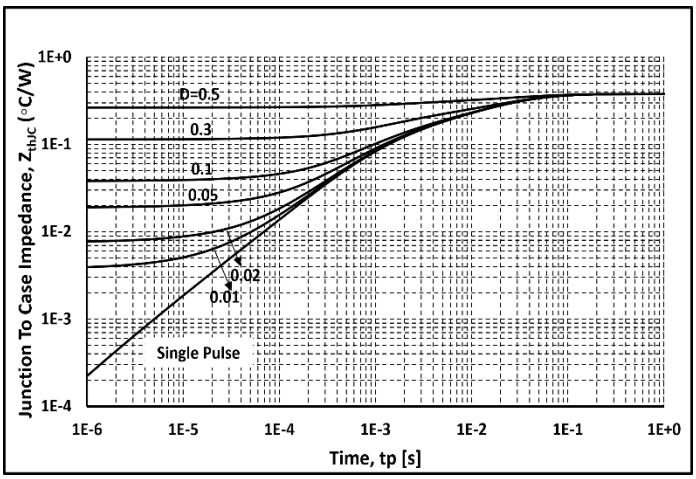


Fig. 25 Thermal impedance

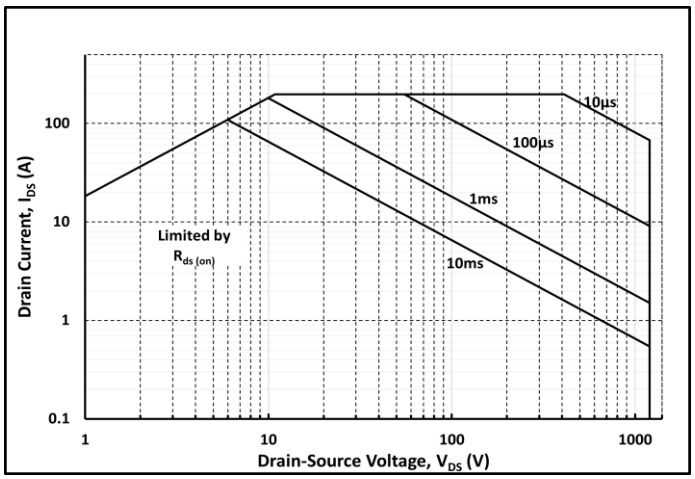
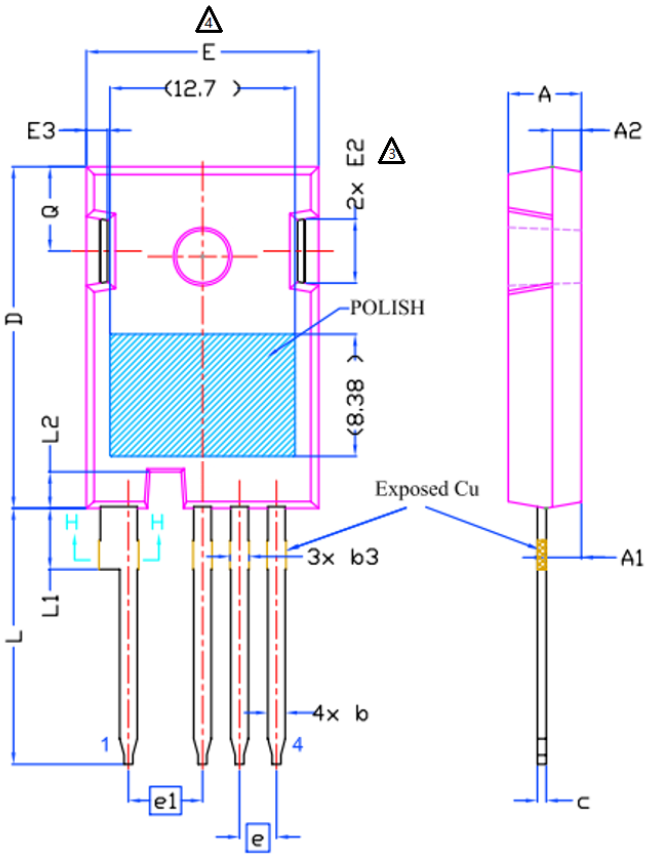
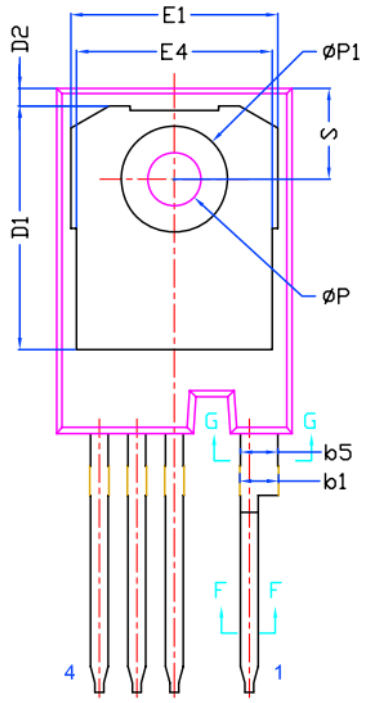


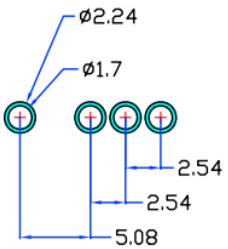
Fig. 26 Safe Operating Area

Package Dimensions

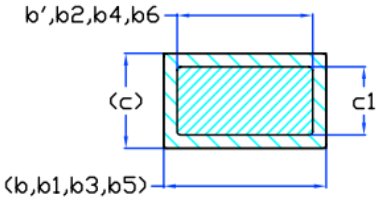


Dimensions In Millimeters		
SYMBOL	MIN.	MAX.
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b	1.07	1.33
b'	1.07	1.28
b1	2.39	2.94
b2	2.39	2.84
b3	1.07	1.60
b4	1.07	1.50
b5	2.39	2.69
b6	2.39	2.64
c	0.55	0.68
c1	0.55	0.65
D	23.30	23.60
D1	16.25	17.65
D2	0.95	1.25
E	15.75	16.13
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
e	2.54 BSC	
e1	5.08 BSC	
L	17.31	17.82
L1	3.97	4.37
L2	2.35	2.65
N	4	
ϕP	3.51	3.65
ϕP1	7.18 REF.	
Q	5.49	6
S	6.04	6.3





Recommended Solder Pad Layout



Section F--F, G--G, H--H

Note:

1. Package Reference: JEDEC TO247, Variation AD
2. All Dimensions are in mm
3. Slot Required, Notch May Be Rounded
4. Dimension D&E Do Not Include Mold Flash
5. 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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