# IV1Q07015T4G – 750V 15mΩ SiC MOSFET

Features

- 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
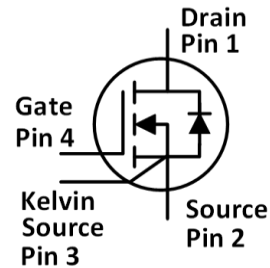- Kelvin gate input easing driver circuit design

Applications

- UPS
- Motor drivers
- EV/HEV drivers
- High voltage DC/DC converters
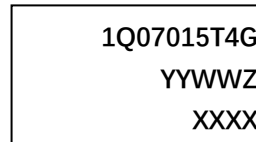- Switch mode power supplies

Outline:
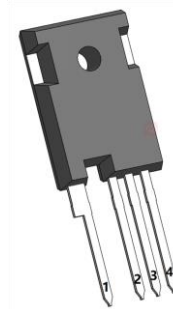
TO247-4

Marking Diagram:

1Q07015T4G
YYWWZ
XXXX

1Q07015T4G = 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	750	V	V_{GS}=0V, I_D=100µA	
V_{GSmax} (DC)	Maximum DC voltage	-5 to 22	V	Static (DC)	
V_{GSmax} (Spike)	Maximum spike voltage	-10 to 25	V	<1% duty cycle, and pulse width<200ns	
V_{GSon}	Recommended turn-on voltage	20±0.5	V		
V_{GSoff}	Recommended turn-off voltage	-3.5 to -2	V		
I_D	Drain current (continuous)	156	A	V_{GS}=20V, T_C=25°C	Fig. 21
		112	A	V_{GS}=20V, T_C=100°C	
I_{DM}	Drain current (pulsed)	390	A	Pulse width limited by SOA	Fig. 24
P_{TOT}	Total power dissipation	553	W	T_C=25°C	Fig. 22
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
$R_{\theta(J-C)}$	Thermal Resistance from Junction to Case	0.271	°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$_{DS}$=750V, 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	5	V	V$_{GS}$=V$_{DS}$, I$_D$=14mA	Fig. 8, 9
			1.9			V$_{GS}$=V$_{DS}$, I$_D$=14mA @ T$_J$=175°C	
R$_{ON}$	Static drain-source on-resistance		15	21	mΩ	V$_{GS}$=20V, I$_D$=60A @T$_J$=25°C	Fig. 4, 5, 6, 7
			20		mΩ	V$_{GS}$=20V, I$_D$=60A @T$_J$=175°C	
C$_{iss}$	Input capacitance		5073		pF	V$_{DS}$=700V, V$_{GS}$=0V, f=100kHz, V$_{AC}$=25mV	Fig. 16
C$_{oss}$	Output capacitance		381		pF		
C$_{rss}$	Reverse transfer capacitance		29		pF		
E$_{oss}$	C$_{oss}$ stored energy		102		µJ		Fig. 17
Q$_g$	Total gate charge		201.7		nC	V$_{DS}$=400V, I$_D$=60A, V$_{GS}$=-5 to 20V	Fig. 18
Q$_{gs}$	Gate-source charge		61.8		nC		
Q$_{gd}$	Gate-drain charge		39.6		nC		
R$_g$	Gate input resistance		1.7		Ω	f=1MHz	
E$_{ON}$	Turn-on switching energy		480.9		µJ	V$_{DS}$=400V, I$_D$=60A, V$_{GS}$=-3.5V to 20V, R$_{G(ext)}$=2.4Ω, L=250µH	Fig. 19, 20
E$_{OFF}$	Turn-off switching energy		173		µJ		
t$_{d(on)}$	Turn-on delay time		17.4		ns		
t$_r$	Rise time		25.4				
t$_{d(off)}$	Turn-off delay time		42.2				
t$_f$	Fall time		15.5				

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		3.3		V	I$_{SD}$=30A, V$_{GS}$=0V	Fig. 10, 11, 12
			2.9		V	I$_{SD}$=30A, V$_{GS}$=0V, T$_J$=175°C	
t$_{rr}$	Reverse recovery time		28.7		ns	V$_{GS}$=-3.5V/+20V, I$_{SD}$=60A, V$_R$=400V, R$_{G(ext)}$=12Ω, di/dt=3000A/µs, L=250µH	
Q$_{rr}$	Reverse recovery charge		424.4		nC		
I$_{RRM}$	Peak reverse recovery current		27.6		A		

Typical Performance (curves)
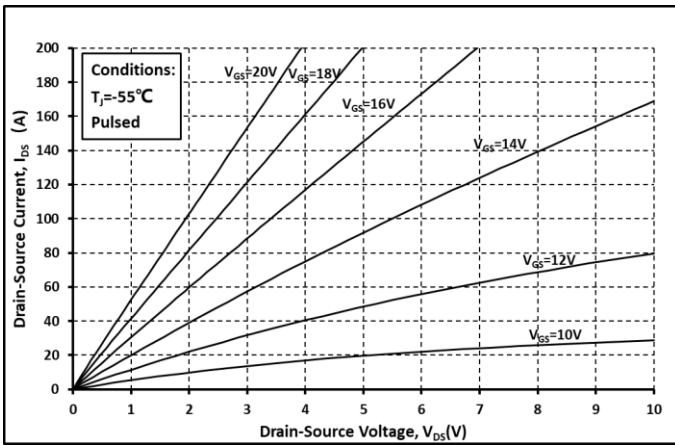
Fig. 1 Output Curve @ T_J=-55℃
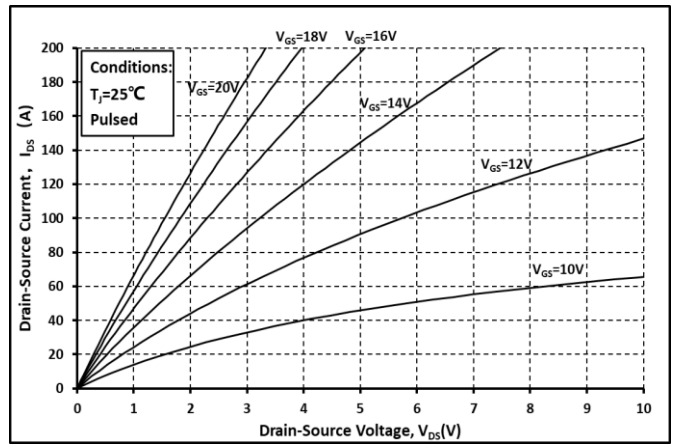
Fig. 2 Output Curve @ T_J=25℃

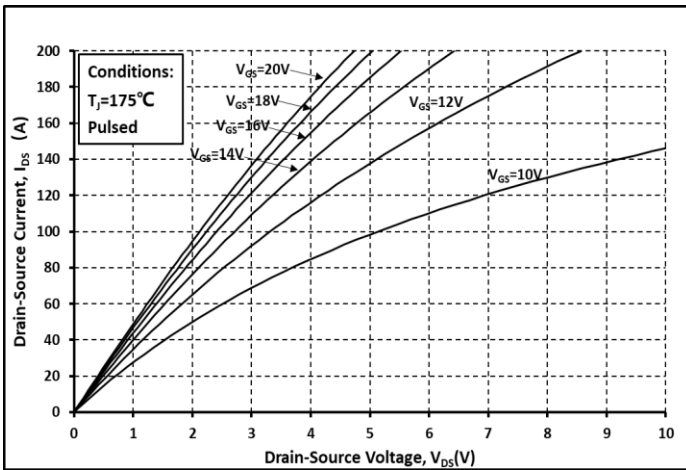

Fig. 3 Output Curve @ T_J=175℃
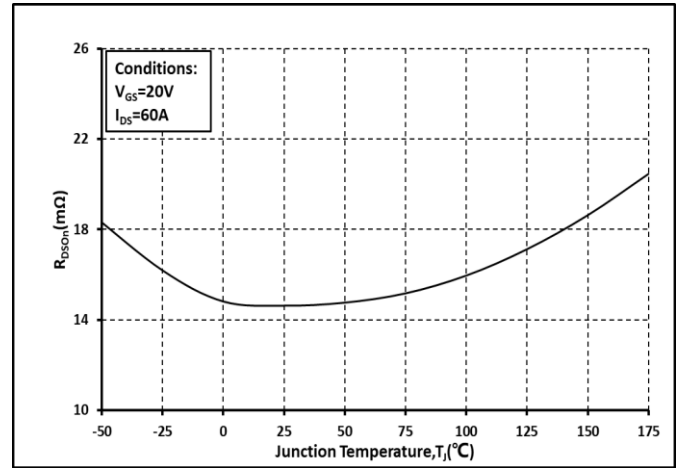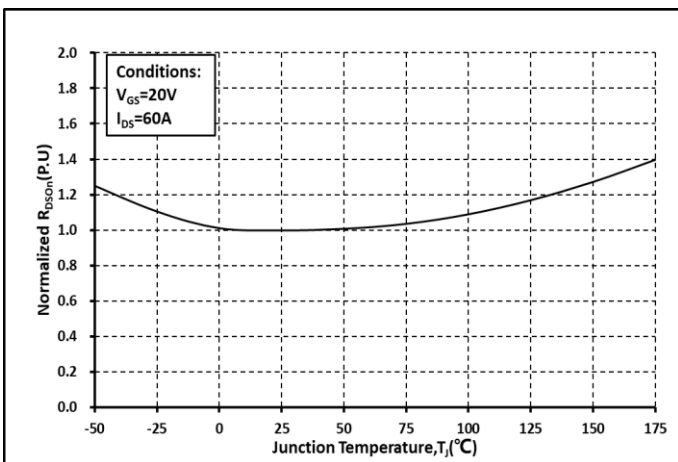

Fig. 4 Ron vs. Temperature
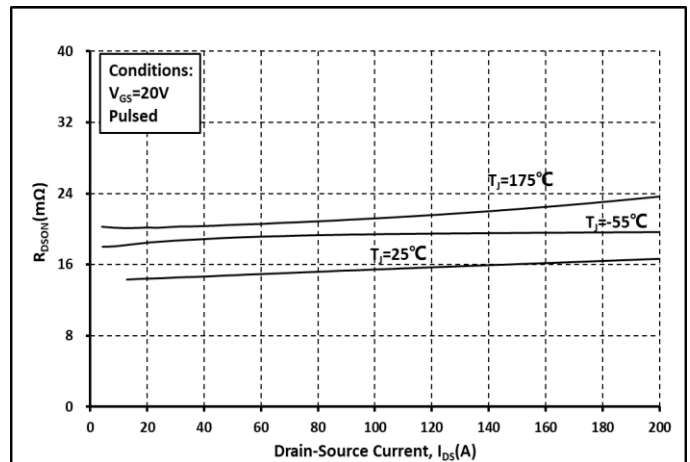

Fig. 5 Normalized Ron vs. Temperature

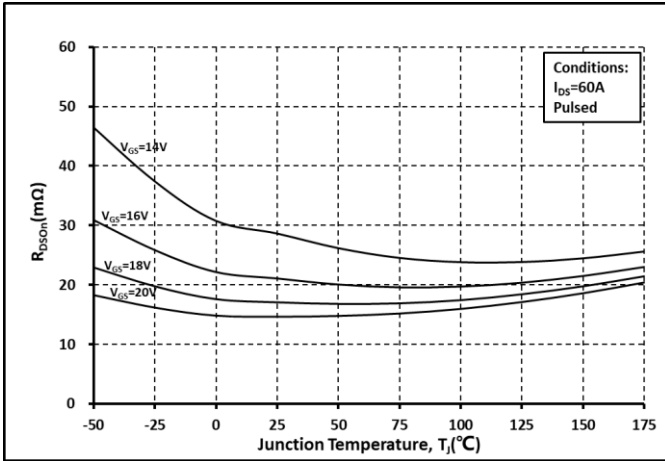

Fig. 6 Ron vs. I_{DS} @ Various Temperature
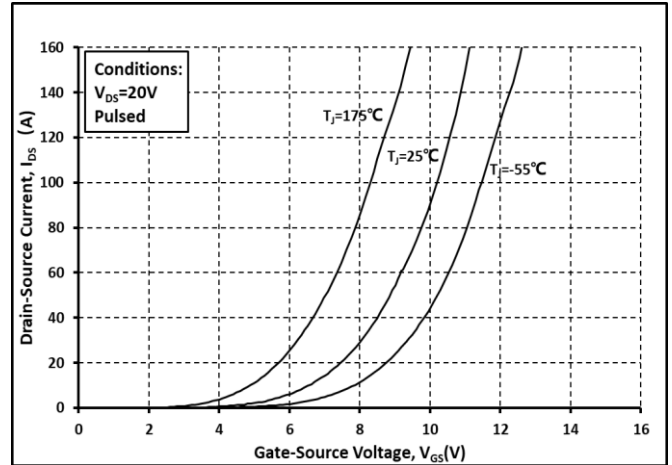
Fig. 7 Ron vs. Temperature @ Various V_{GS}

Fig. 8 Transfer Curves @ Various Temperature

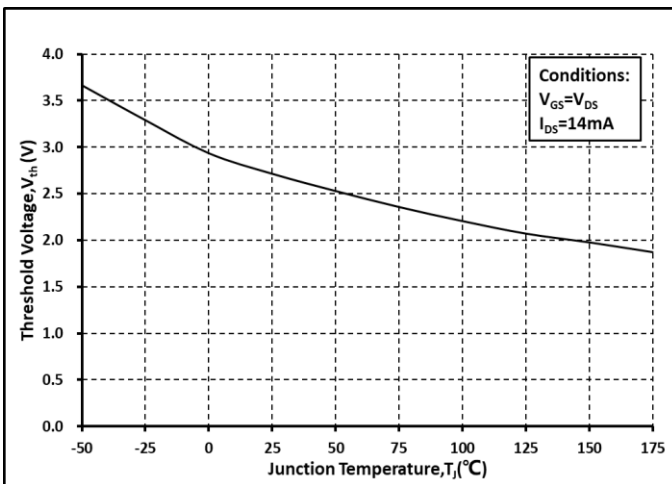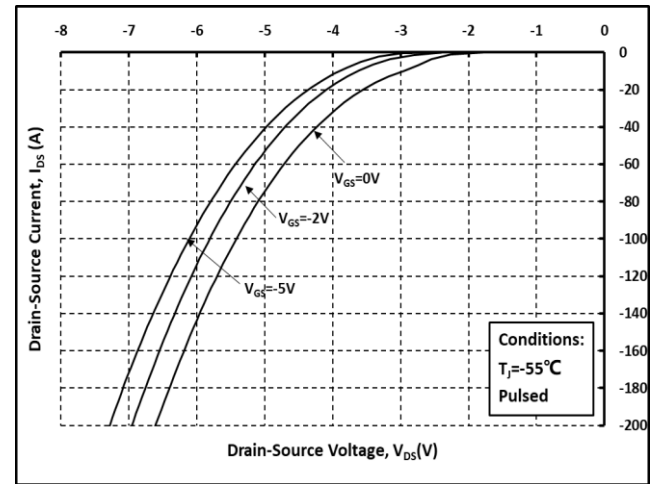Fig. 9 Threshold Voltage vs. Temperature
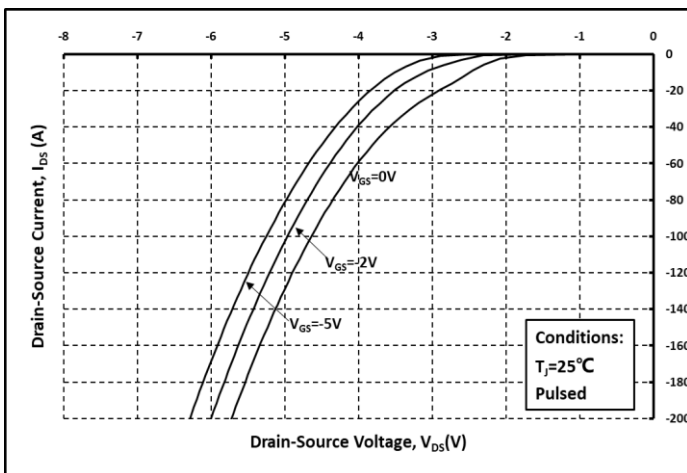
Fig. 10 Body Diode curves @ T_J=-55℃

Fig. 11 Body Diode curves @ T_J=25℃
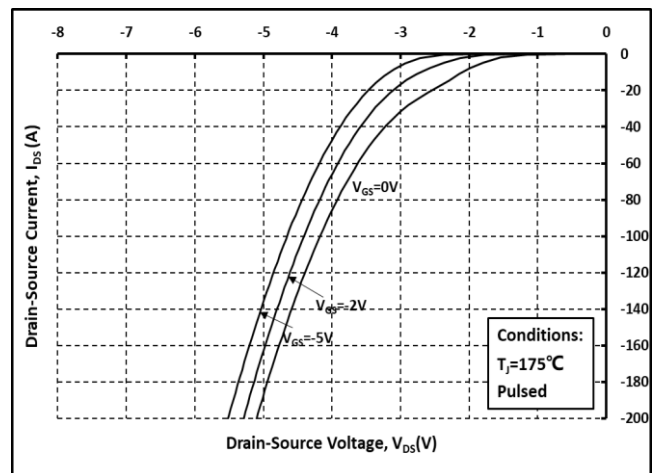
Fig. 12 Body Diode curves @ T_J=175℃
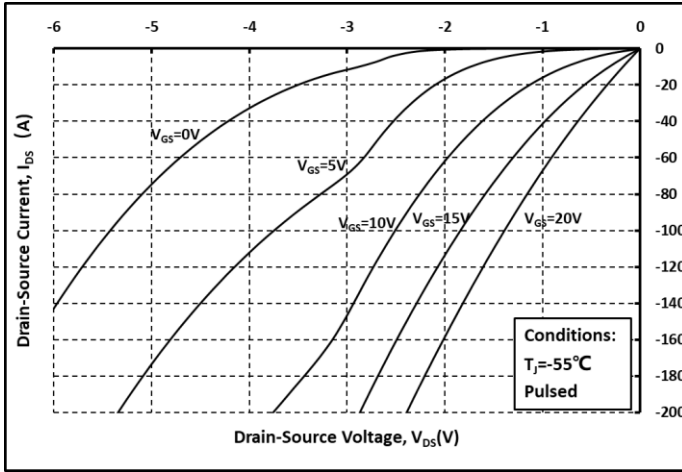
Fig. 13 3rd Quadrant curves @ T_J=-55℃
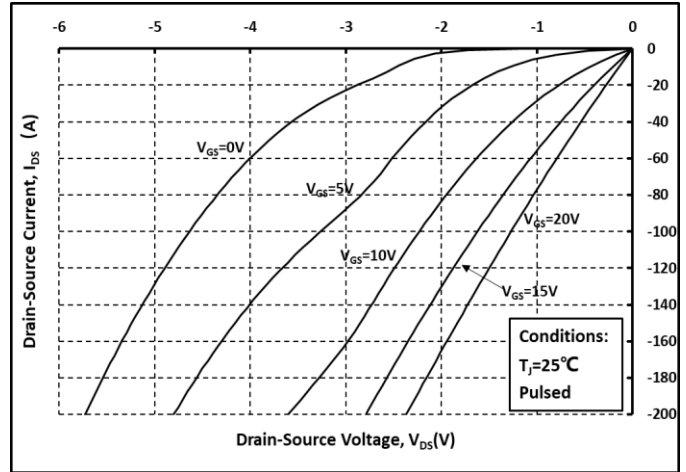
Fig. 14 3rd Quadrant curves @ T_J=25℃
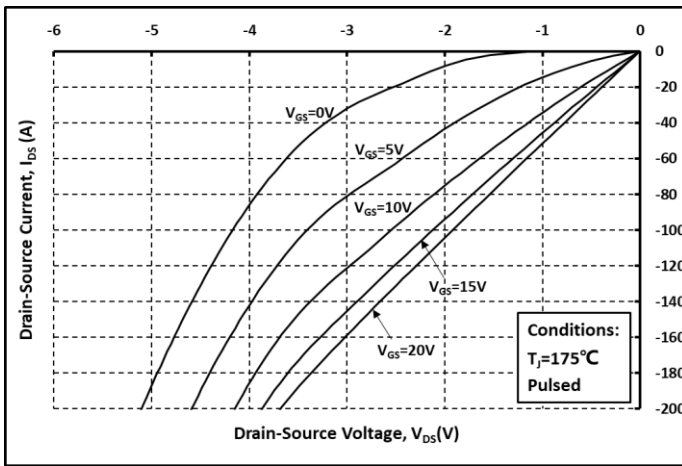
Fig. 15 3rd Quadrant curves @ T_J=175℃
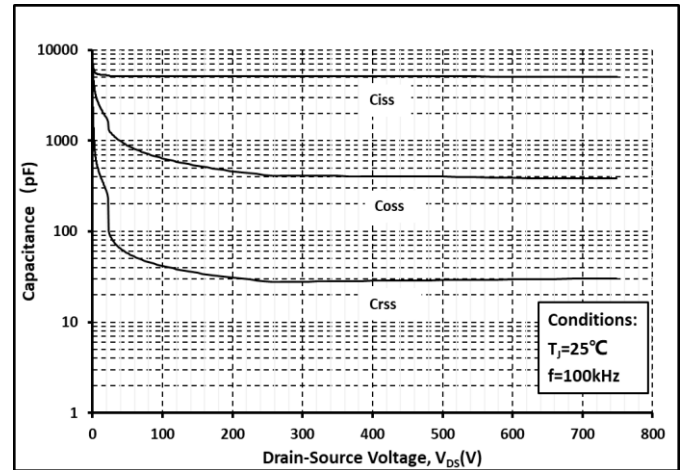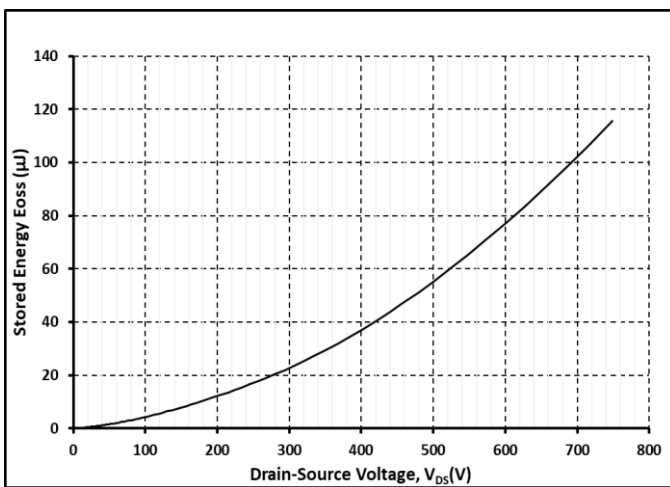

Fig. 16 Capacitance vs. V_{DS}
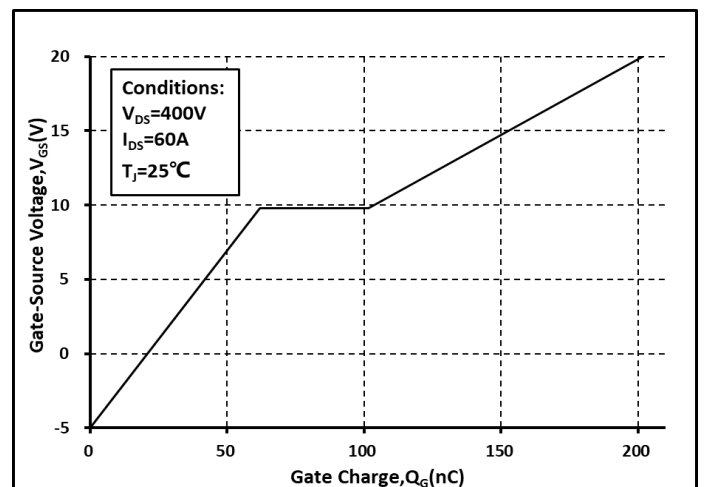

Fig. 17 Output Capacitor Stored Energy
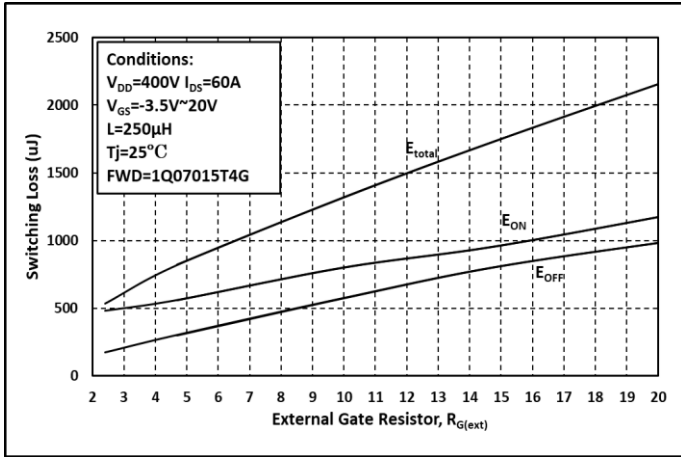

Fig. 18 Gate Charge Characteristics

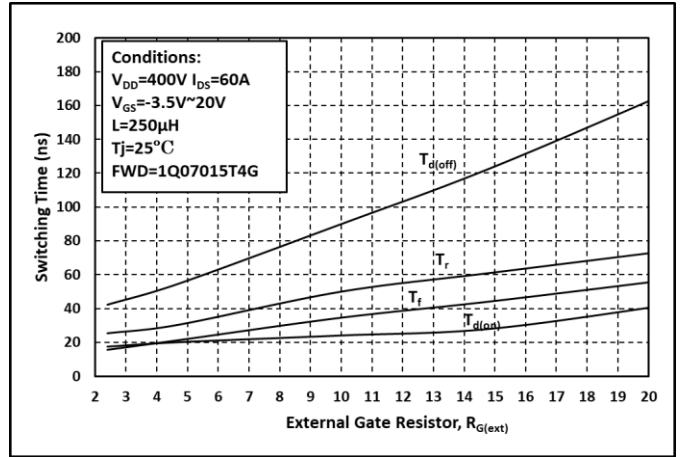Fig. 19 Switching Energy vs. R$_{G(ext)}$

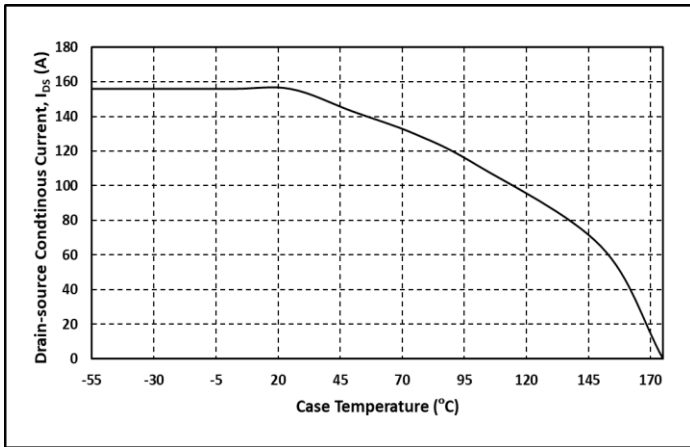Fig. 20 Switching Times vs. R$_{G(ext)}$

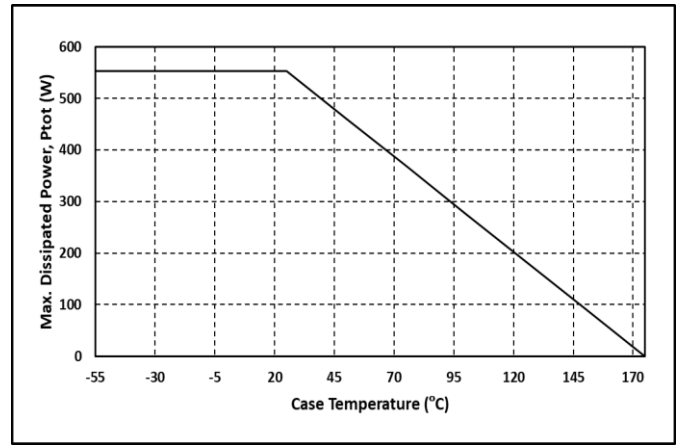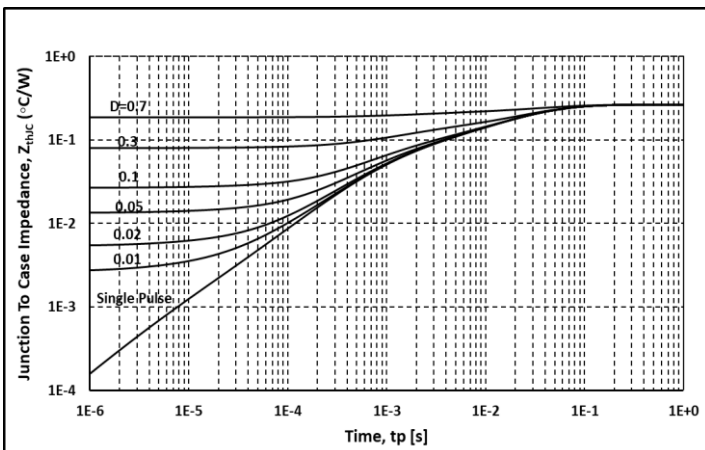Fig. 21 Continuous Drain Current vs. Case Temperature
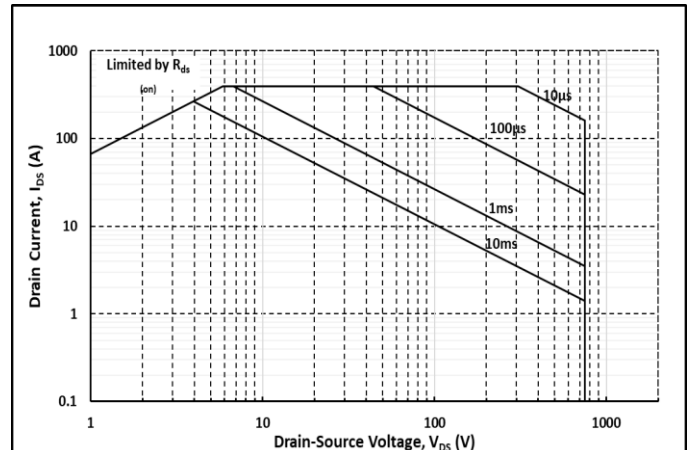

Fig. 22 Max. Power Dissipation Derating vs. Case Temperature
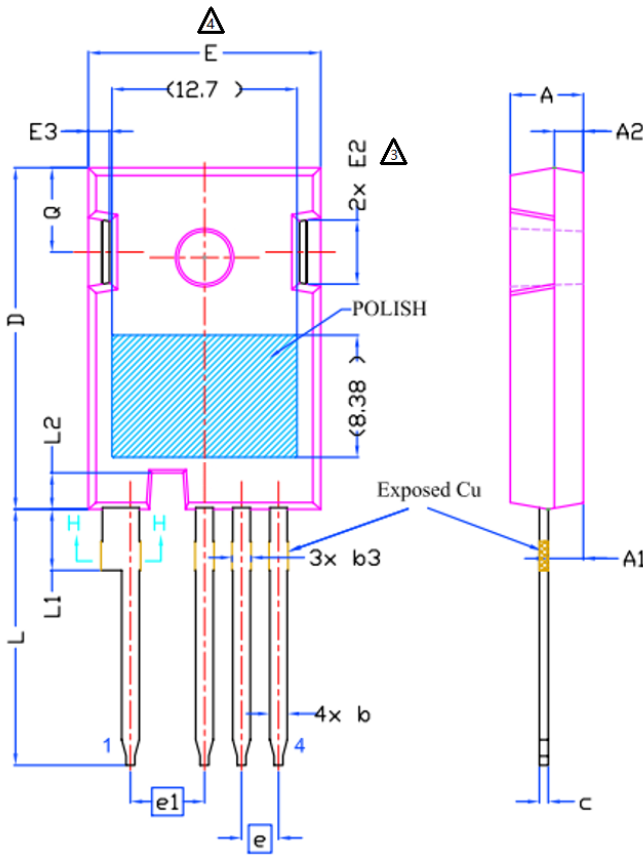

Fig. 23 Thermal impedance

Fig. 24 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
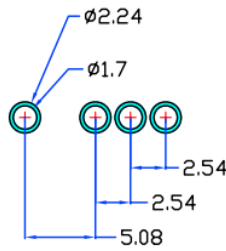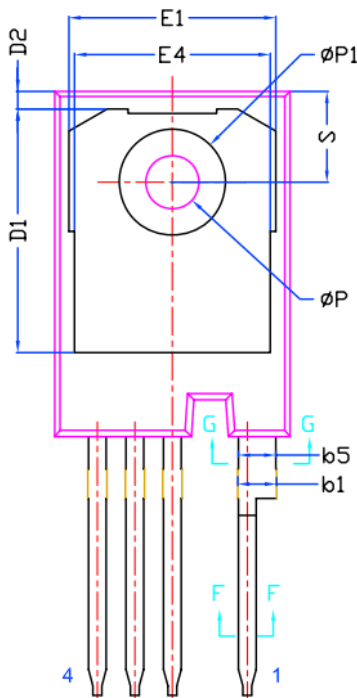
Recommended Solder Pad Layout
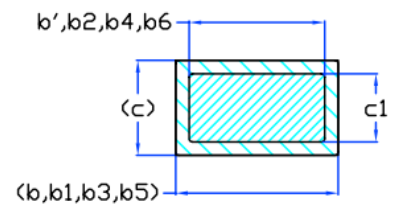
Section F--F, G--G, H--H

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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