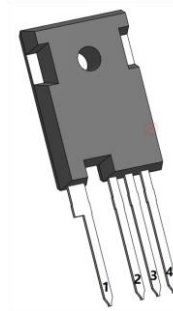


IV1Q07015T4G – 750V 15mΩ SiC MOSFET

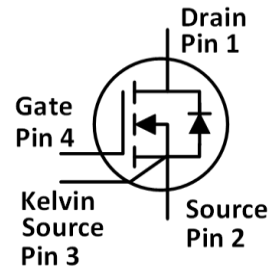
Features

- 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

Outline:



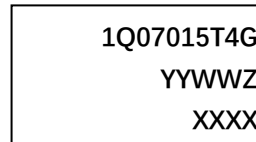
TO247-4



Applications

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

Marking Diagram:



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 _{θ(j-c)}	Thermal Resistance from Junction to Case	0.271	°C/W	Fig. 23

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

Symbol	Parameter	Value			Unit	Test Conditions	Note
		Min.	Typ.	Max.			
I_{DSS}	Zero gate voltage drain current		5	100	μA	$V_{DS}=750\text{V}, V_{GS}=0\text{V}$	
I_{GSS}	Gate leakage current			± 100	nA	$V_{DS}=0\text{V}, V_{GS}=-5\sim 20\text{V}$	
V_{TH}	Gate threshold voltage	1.8	2.8	5	V	$V_{GS}=V_{DS}, I_D=14\text{mA}$	Fig. 8, 9
			1.9			$V_{GS}=V_{DS}, I_D=14\text{mA}$ @ $T_J=175^\circ\text{C}$	
R_{ON}	Static drain-source on-resistance		15	21	$\text{m}\Omega$	$V_{GS}=20\text{V}, I_D=60\text{A}$ @ $T_J=25^\circ\text{C}$	Fig. 4, 5, 6, 7
			20		$\text{m}\Omega$	$V_{GS}=20\text{V}, I_D=60\text{A}$ @ $T_J=175^\circ\text{C}$	
C_{iss}	Input capacitance		5073		pF	$V_{DS}=700\text{V}, V_{GS}=0\text{V},$ $f=100\text{kHz},$ $V_{AC}=25\text{mV}$	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	$V_{DS}=400\text{V}, I_D=60\text{A},$ $V_{GS}=-5\text{ to }20\text{V}$	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	$f=1\text{MHz}$	
E_{ON}	Turn-on switching energy		480.9		μJ	$V_{DS}=400\text{V}, I_D=60\text{A},$ $V_{GS}=-3.5\text{V to }20\text{V},$ $R_{G(ext)}=2.4\Omega,$ $L=250\mu\text{H}$	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 ($T_c=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Value			Unit	Test Conditions	Note
		Min.	Typ.	Max.			
V_{SD}	Diode forward voltage		3.3		V	$I_{SD}=30\text{A}, V_{GS}=0\text{V}$	Fig. 10, 11, 12
			2.9		V	$I_{SD}=30\text{A}, V_{GS}=0\text{V},$ $T_J=175^\circ\text{C}$	
t_{rr}	Reverse recovery time		28.7		ns	$V_{GS}=-3.5\text{V}/+20\text{V},$ $I_{SD}=60\text{A}, V_R=400\text{V},$	
Q_{rr}	Reverse recovery charge		424.4		nC	$R_{G(ext)}=12\Omega,$	
I_{RRM}	Peak reverse recovery current		27.6		A	$di/dt=3000\text{A}/\mu\text{s},$ $L=250\mu\text{H}$	

Typical Performance (curves)

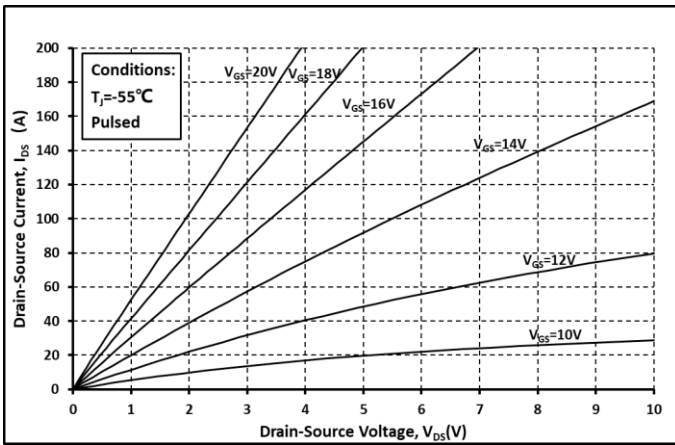


Fig. 1 Output Curve @ $T_j = -55^\circ\text{C}$

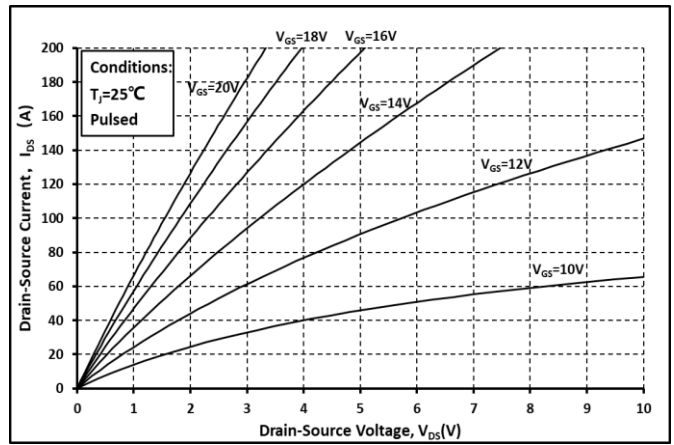


Fig. 2 Output Curve @ $T_j = 25^\circ\text{C}$

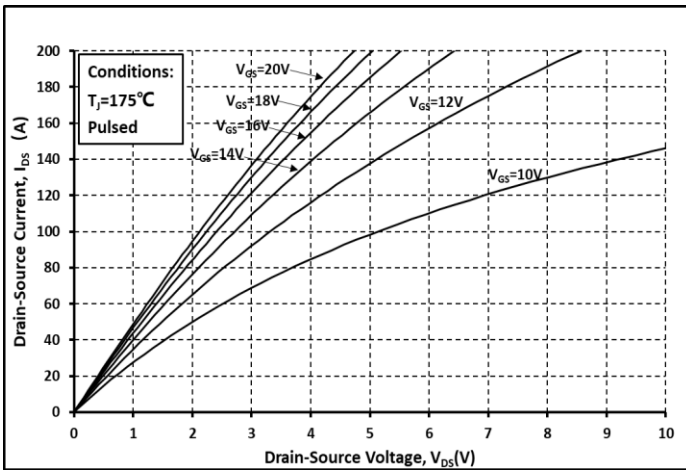


Fig. 3 Output Curve @ $T_j = 175^\circ\text{C}$

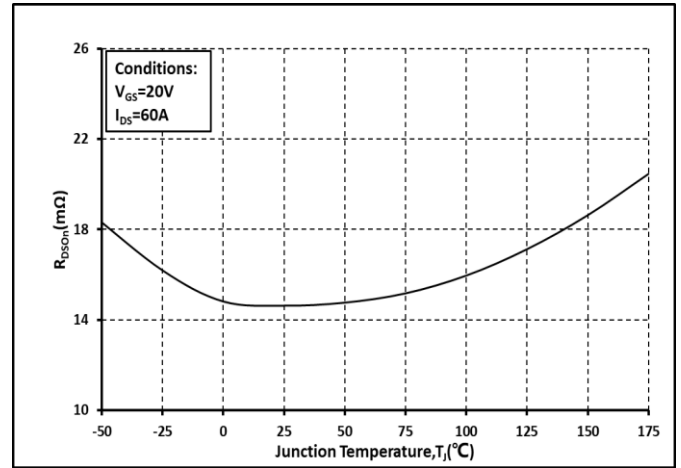


Fig. 4 R_{on} vs. Temperature

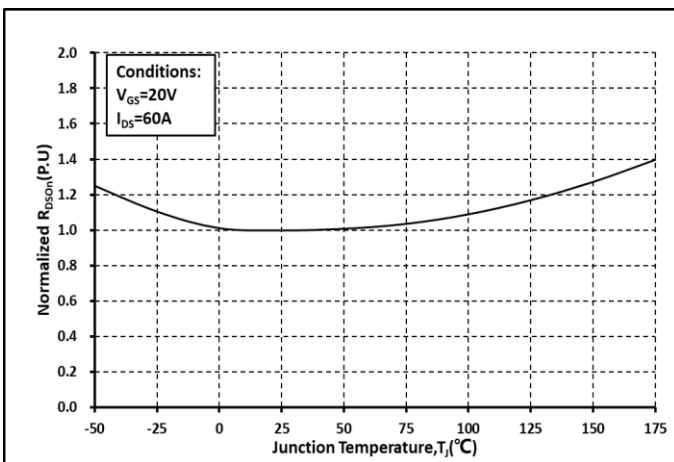


Fig. 5 Normalized R_{on} vs. Temperature

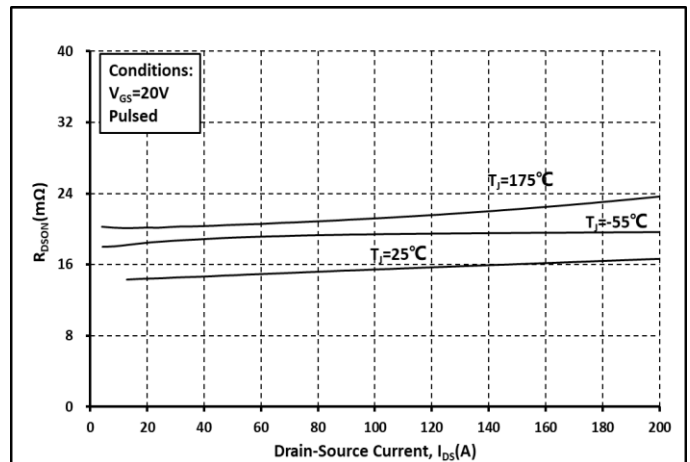


Fig. 6 R_{on} vs. I_{ds} @ Various Temperature

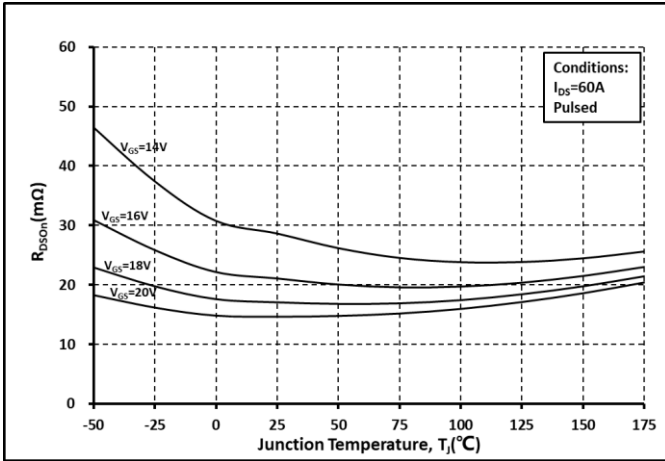


Fig. 7 Ron vs. Temperature @ Various V_{GS}

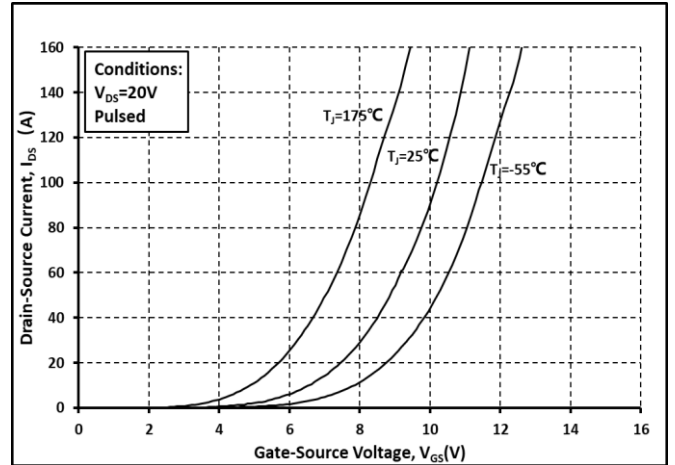


Fig. 8 Transfer Curves @ Various Temperature

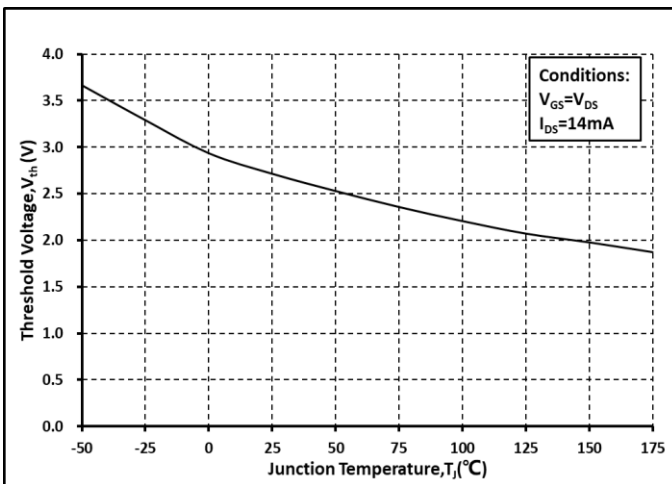


Fig. 9 Threshold Voltage vs. Temperature

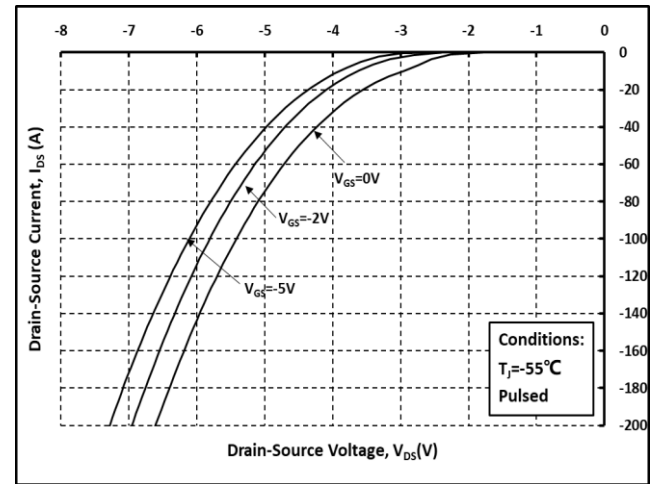


Fig. 10 Body Diode curves @ $T_j = -55^\circ\text{C}$

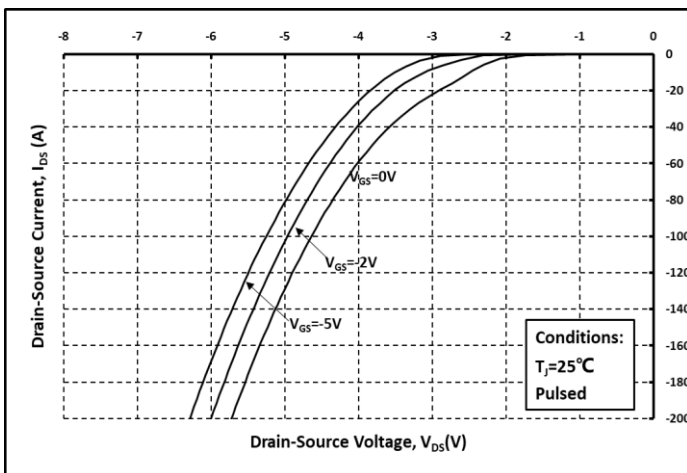


Fig. 11 Body Diode curves @ $T_j = 25^\circ\text{C}$

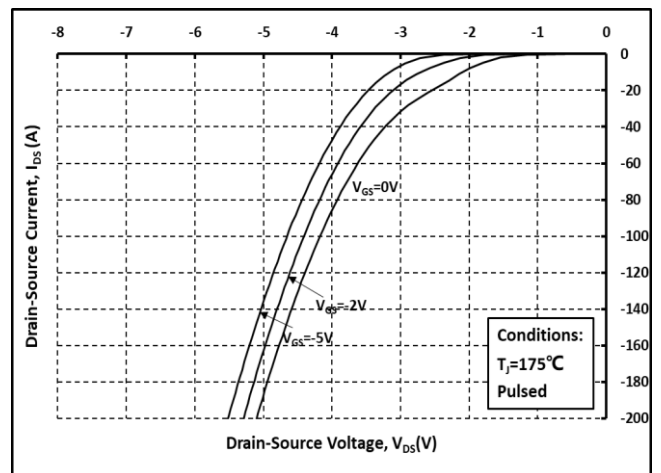


Fig. 12 Body Diode curves @ $T_j = 175^\circ\text{C}$

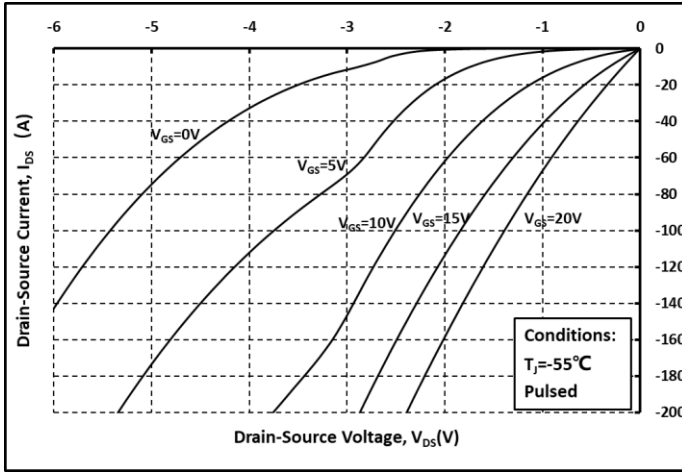


Fig. 13 3rd Quadrant curves @ $T_j = -55^\circ\text{C}$

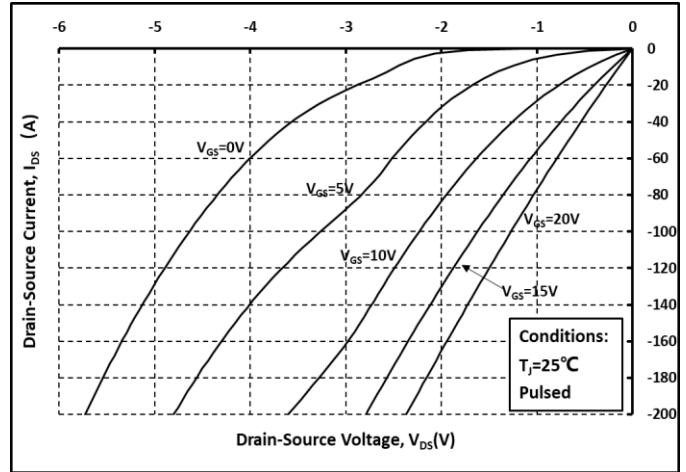


Fig. 14 3rd Quadrant curves @ $T_j = 25^\circ\text{C}$

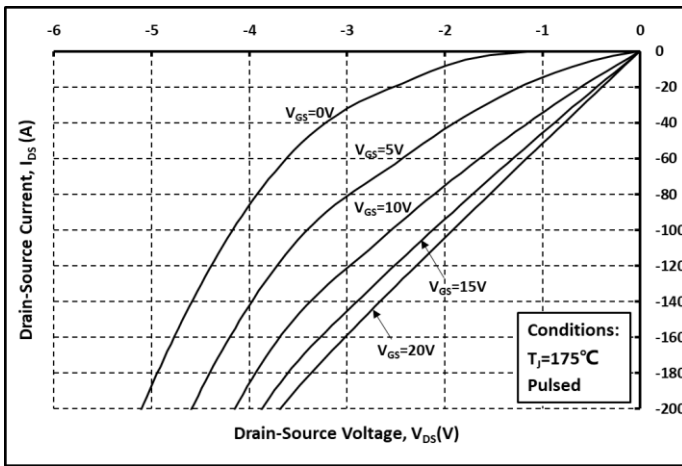


Fig. 15 3rd Quadrant curves @ $T_j = 175^\circ\text{C}$

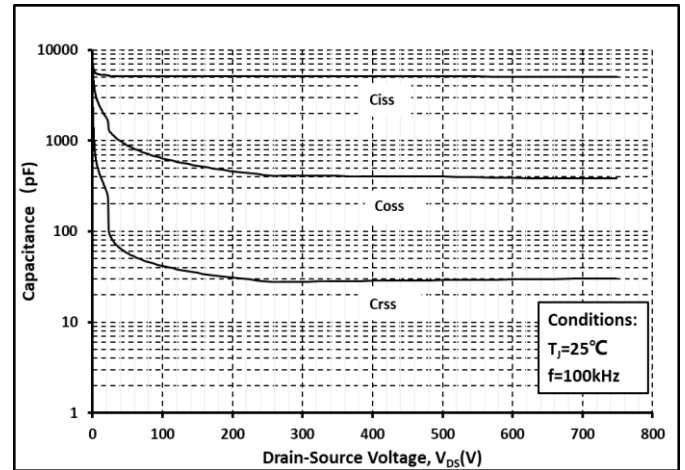


Fig. 16 Capacitance vs. V_{DS}

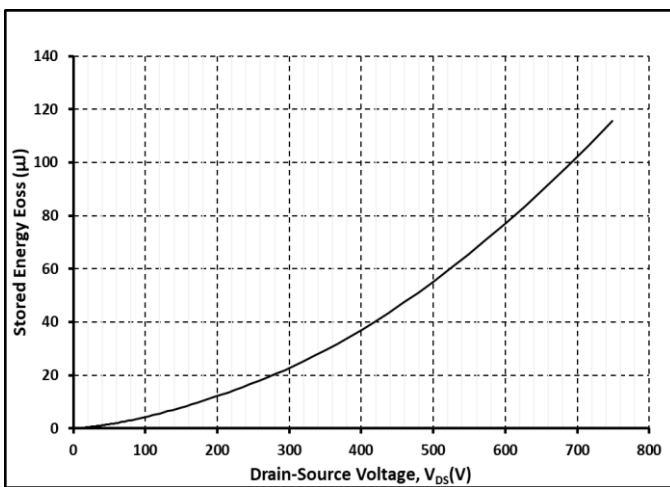


Fig. 17 Output Capacitor Stored Energy

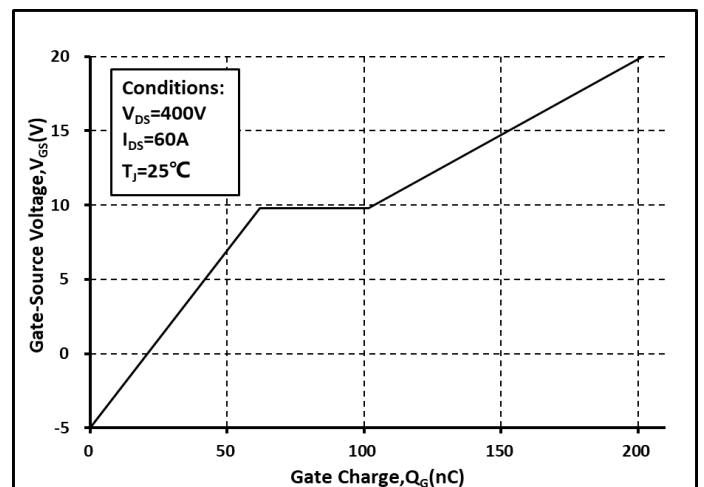


Fig. 18 Gate Charge Characteristics

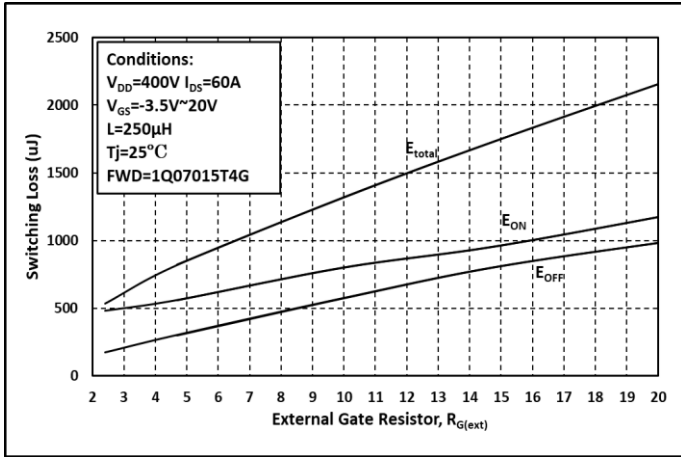


Fig. 19 Switching Energy vs. $R_{G(ext)}$

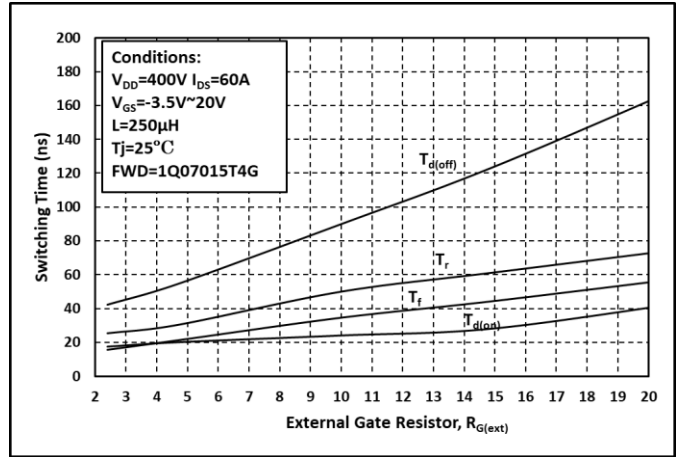


Fig. 20 Switching Times vs. $R_{G(ext)}$

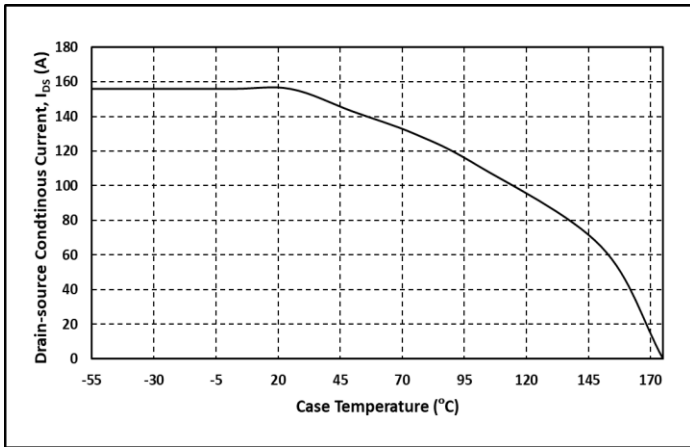


Fig. 21 Continuous Drain Current vs. Case Temperature

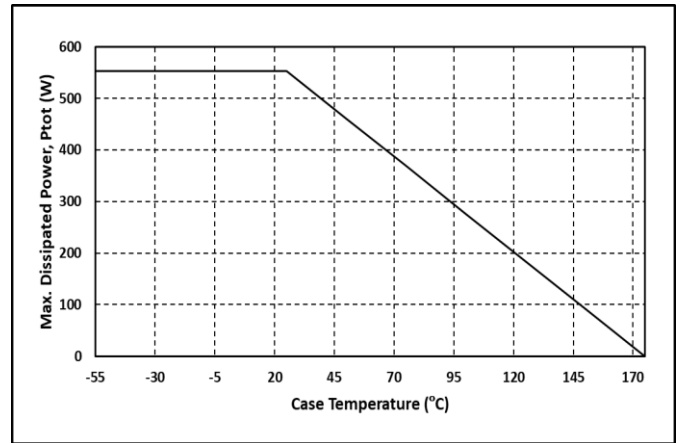


Fig. 22 Max. Power Dissipation Derating vs. Case Temperature

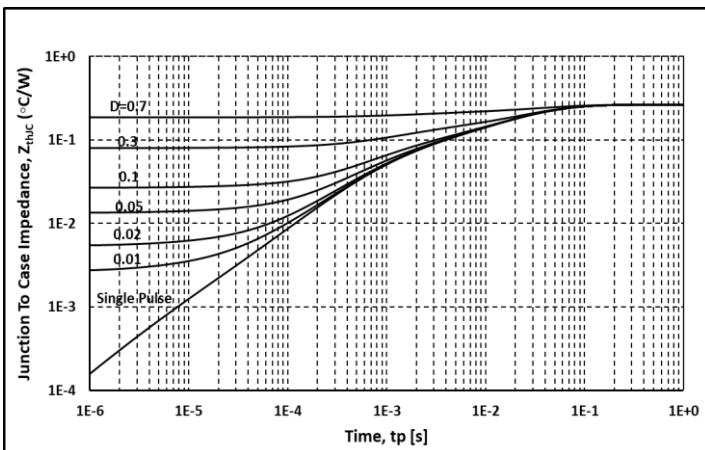


Fig. 23 Thermal impedance

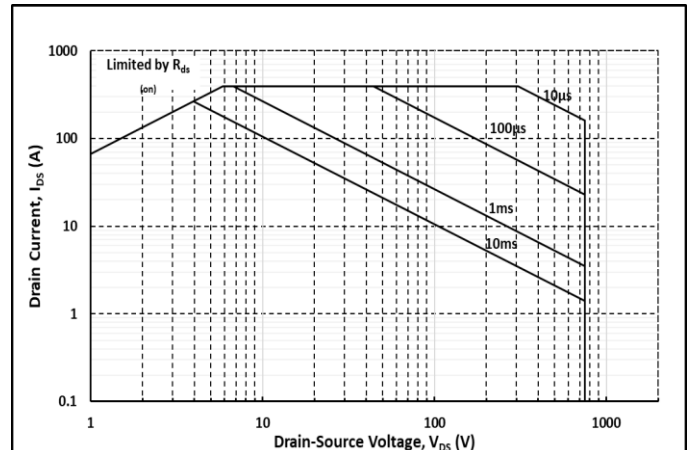
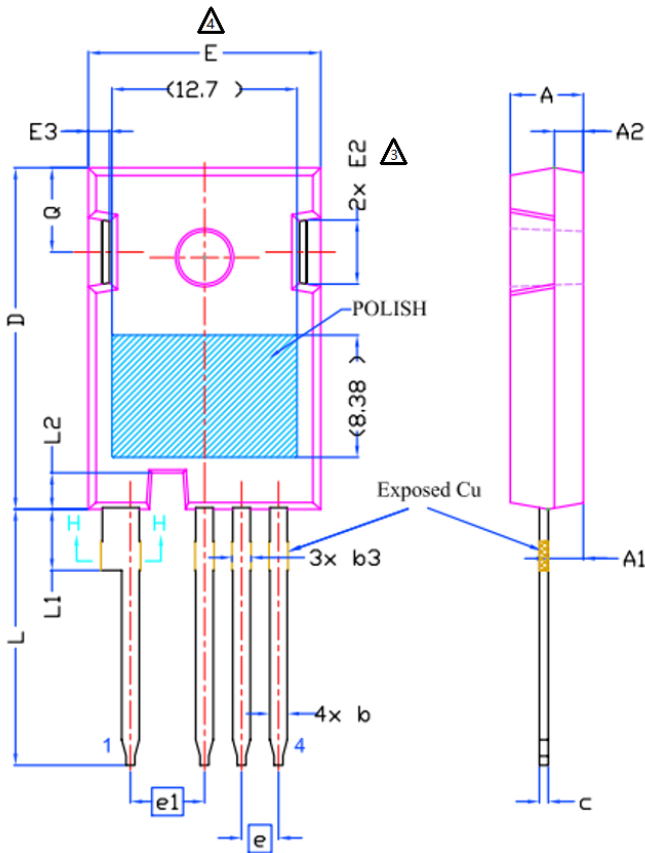
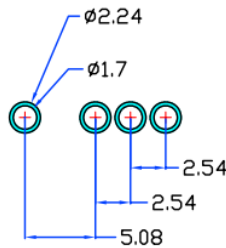
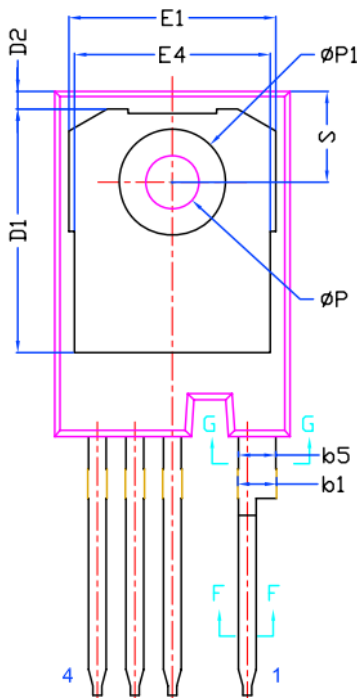


Fig. 24 Safe Operating Area

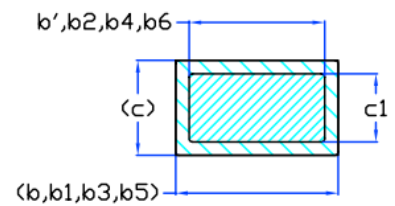
Package Dimensions



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

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[IV1B12013HA1L](#) [IV1Q12160T3](#) [IV1Q07015T4G](#) [IV1Q12750O3](#) [IV1Q06040T3](#) [IV1Q12050T4Z](#) [IV1Q12030T4G](#)