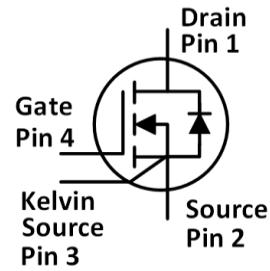
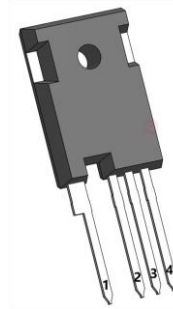


IV2Q07014T4Z– 750V 14mΩ Gen2 Automotive SiC MOSFET

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

Outline:

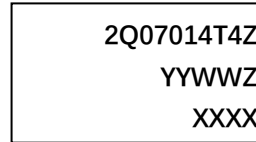


TO247-4

Applications

- EV Motor drivers
- Solar inverters
- High voltage DC/DC converters
- Switch mode power supplies

Marking Diagram:



2Q07014T4Z= 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 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)	138	A	V _{GS} =18V, T _c =25°C	Fig. 23
		102	A	V _{GS} =18V, T _c =100°C	
I _{DM}	Drain current (pulsed)	345	A	Pulse width limited by SOA	Fig. 26
P _{TOT}	Total power dissipation	554	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	0.27	°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	2.7	4.5	V	$V_{GS}=V_{DS}, I_D=20\text{mA}$	Fig. 8, 9
			2.0			$V_{GS}=V_{DS}, I_D=20\text{mA}$ @ $T_J=175^\circ\text{C}$	
R_{ON}	Static drain-source on-resistance		14	18	$\text{m}\Omega$	$V_{GS}=18\text{V}, I_D=60\text{A}$ @ $T_J=25^\circ\text{C}$	Fig. 4, 5, 6, 7
			24		$\text{m}\Omega$	$V_{GS}=18\text{V}, I_D=60\text{A}$ @ $T_J=175^\circ\text{C}$	
C_{iss}	Input capacitance		4659		pF	$V_{DS}=700\text{V}, V_{GS}=0\text{V},$ $f=1\text{MHz}, V_{AC}=25\text{mV}$	Fig. 16
C_{oss}	Output capacitance		379		pF		
C_{rss}	Reverse transfer capacitance		14.5		pF		
E_{oss}	C_{oss} stored energy		106		μJ		Fig. 17
Q_g	Total gate charge		194.6		nC	$V_{DS}=400\text{V}, I_D=60\text{A},$ $V_{GS}=-3.5$ to 18V	Fig. 18
Q_{gs}	Gate-source charge		55.3		nC		
Q_{gd}	Gate-drain charge		53.1		nC		
R_g	Gate input resistance		2.1		Ω	$f=1\text{MHz}$	
E_{ON}	Turn-on switching energy		379.7		μJ	$V_{DS}=400\text{V}, I_D=60\text{A},$ $V_{GS}=-3.5$ to $18\text{V},$ $R_{G(ext)}=3.3\Omega,$ $L=100\mu\text{H}$ $T_J=25^\circ\text{C}$	Fig. 19, 20
E_{OFF}	Turn-off switching energy		249.3		μJ		
$t_{d(on)}$	Turn-on delay time		18.6		ns		
t_r	Rise time		28.9				
$t_{d(off)}$	Turn-off delay time		42.5				
t_f	Fall time		16.3				
E_{ON}	Turn-on switching energy		425		μJ	$V_{DS}=400\text{V}, I_D=60\text{A},$ $V_{GS}=-3.5$ to $18\text{V},$ $R_{G(ext)}=3.3\Omega, L=100\mu\text{H}$ $T_J=175^\circ\text{C}$	Fig. 22
E_{OFF}	Turn-off switching energy		244		μJ		

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
			3.1		V	$I_{SD}=30\text{A}, V_{GS}=0\text{V},$ $T_J=175^\circ\text{C}$	
t_{rr}	Reverse recovery time		39		ns	$V_{GS}=-3.5\text{V}/+18\text{V},$	
Q_{rr}	Reverse recovery charge		350		nC	$I_{SD}=60\text{A}, V_R=400\text{V},$	
I_{RRM}	Peak reverse recovery current		29.3		A	$R_{G(ext)}=9.5\Omega, L=100\mu\text{H}$ $H\text{ di}/dt=3000\text{A}/\mu\text{s}$	

Typical Performance (curves)

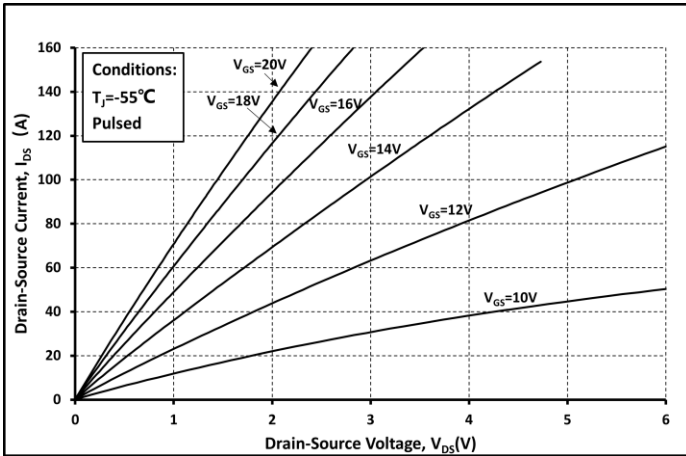


Fig. 1 Output Curve @ $T_j = -55^\circ\text{C}$

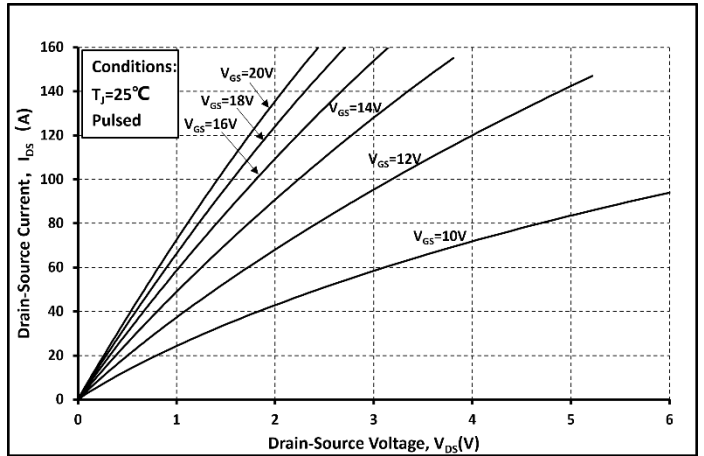


Fig. 2 Output Curve @ $T_j = 25^\circ\text{C}$

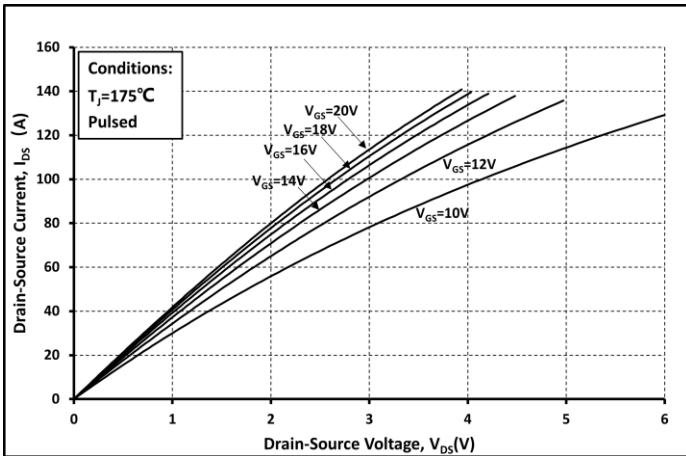


Fig. 3 Output Curve @ $T_j = 175^\circ\text{C}$

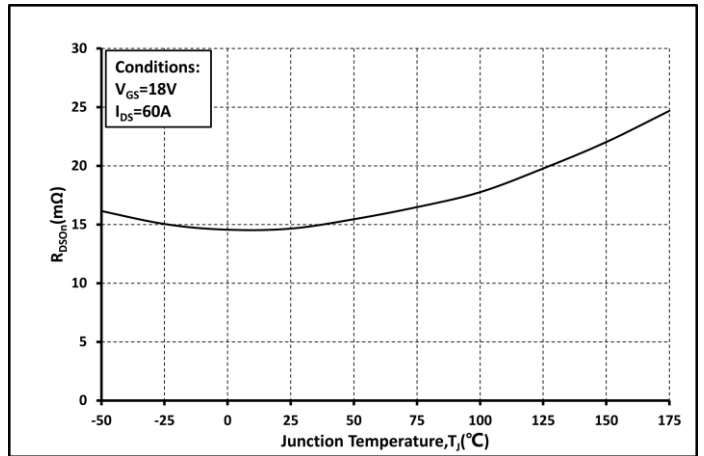


Fig. 4 R_{on} vs. Temperature

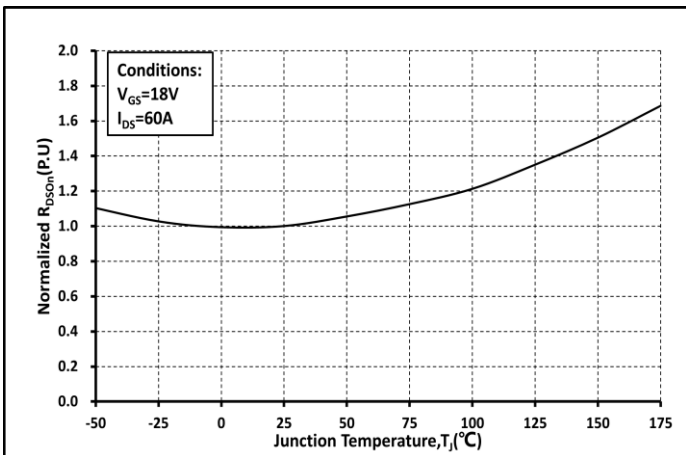


Fig. 5 Normalized R_{on} vs. Temperature

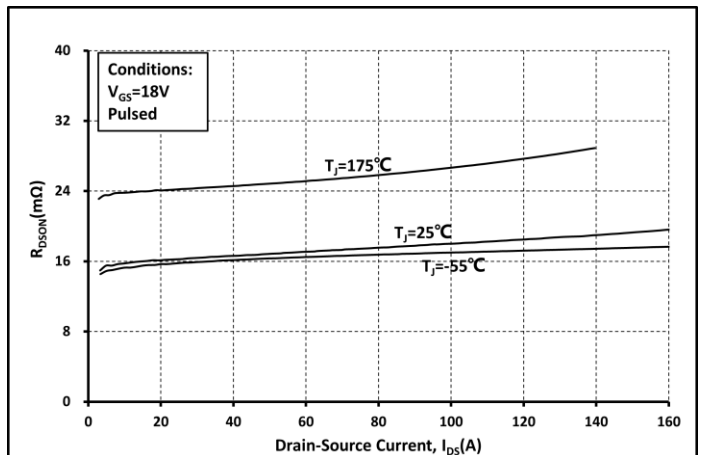


Fig. 6 R_{on} vs. I_{DS} @ Various Temperature

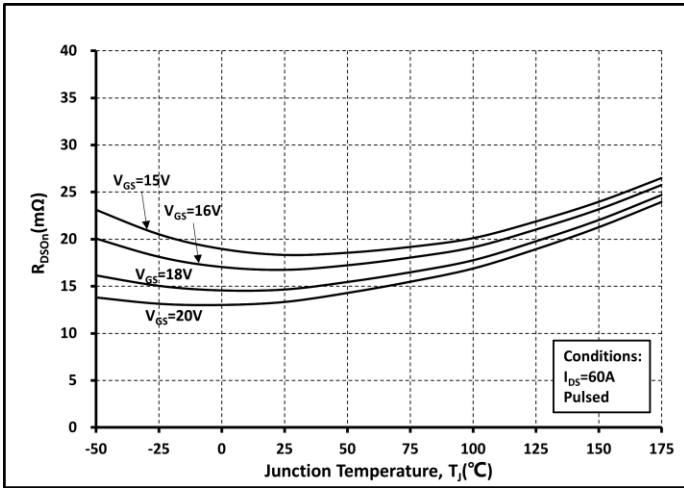


Fig. 7 Ron vs. Temperature @ Various V_{GS}

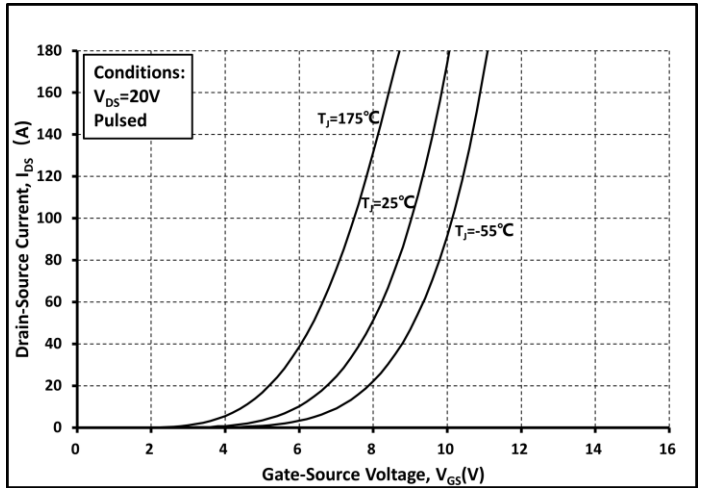


Fig. 8 Transfer Curves @ Various Temperature

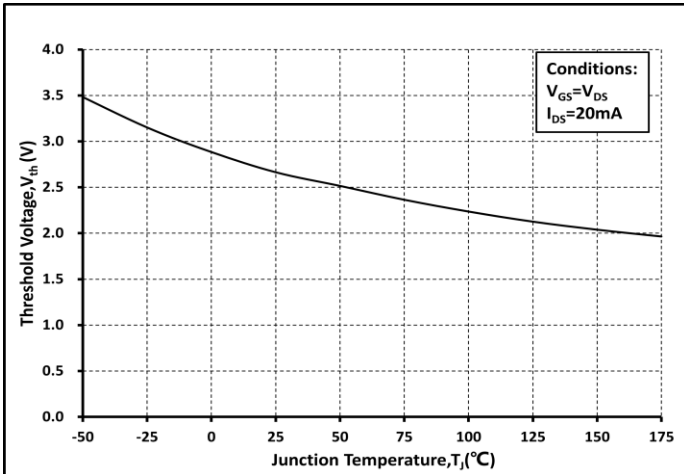


Fig. 9 Threshold Voltage vs. Temperature

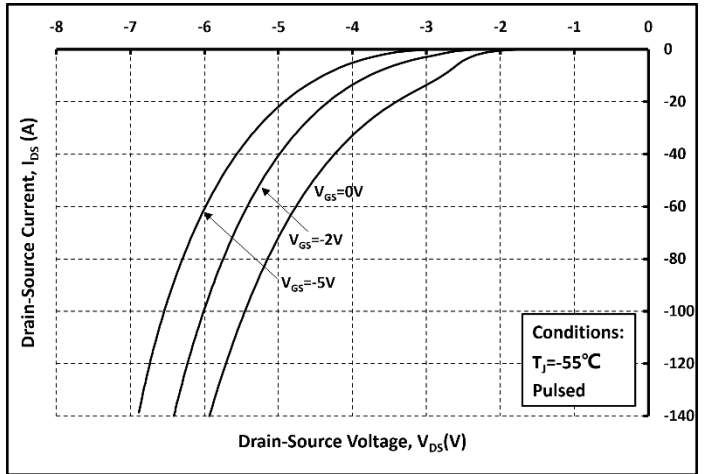


Fig. 10 Body Diode curves @ $T_J = -55^\circ\text{C}$

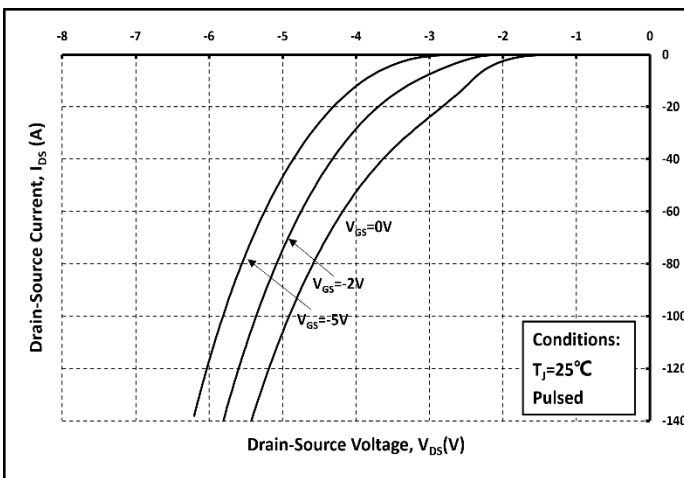


Fig. 11 Body Diode curves @ $T_J = 25^\circ\text{C}$

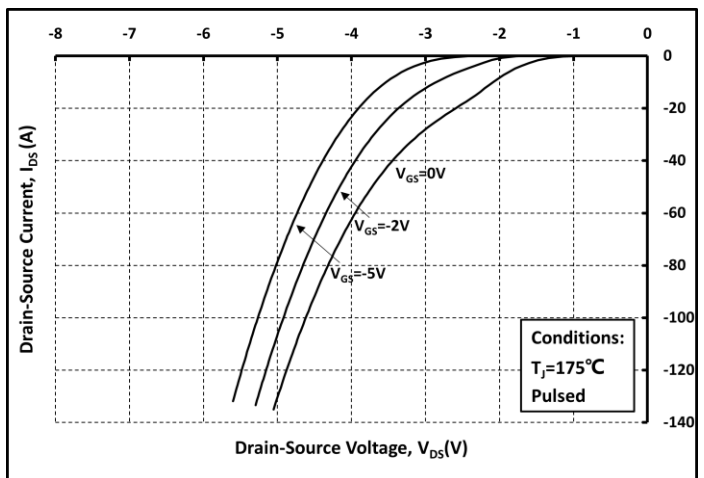


Fig. 12 Body Diode curves @ $T_J = 175^\circ\text{C}$

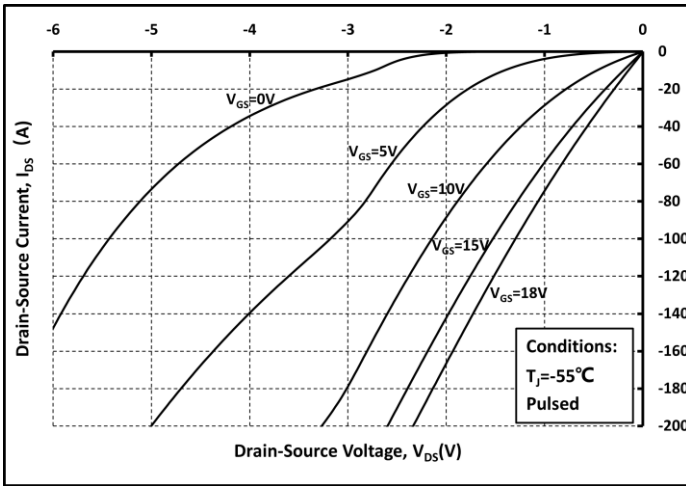


Fig. 13 3rd Quadrant curves @ $T_j = -55^\circ\text{C}$

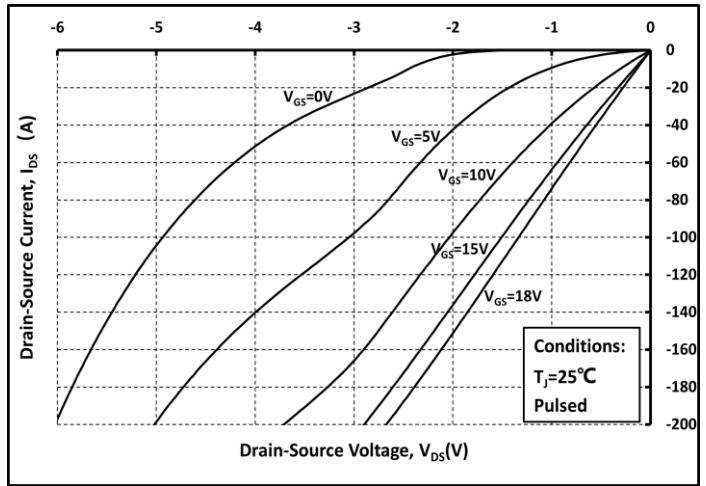


Fig. 14 3rd Quadrant curves @ $T_j = 25^\circ\text{C}$

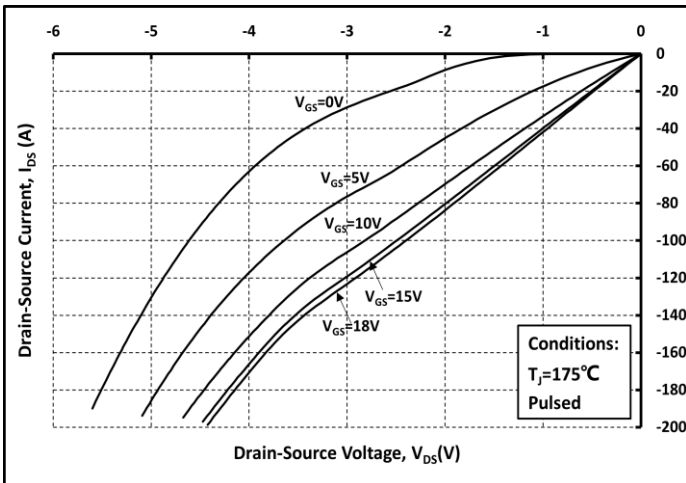


Fig. 15 3rd Quadrant curves @ $T_j = 175^\circ\text{C}$

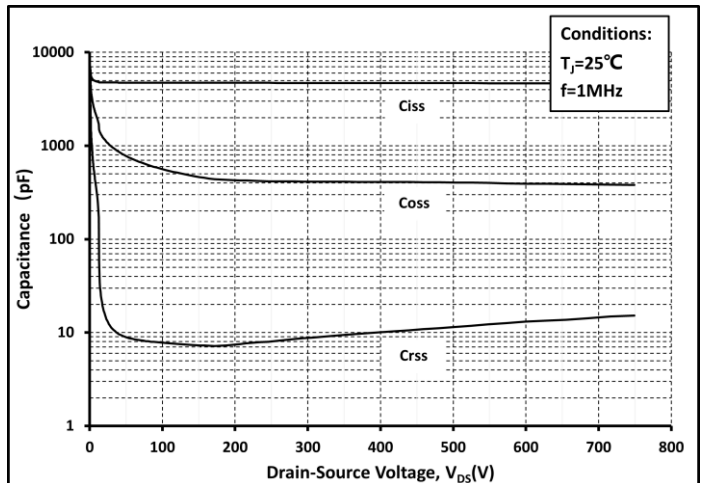


Fig. 16 Capacitance vs. V_{DS}

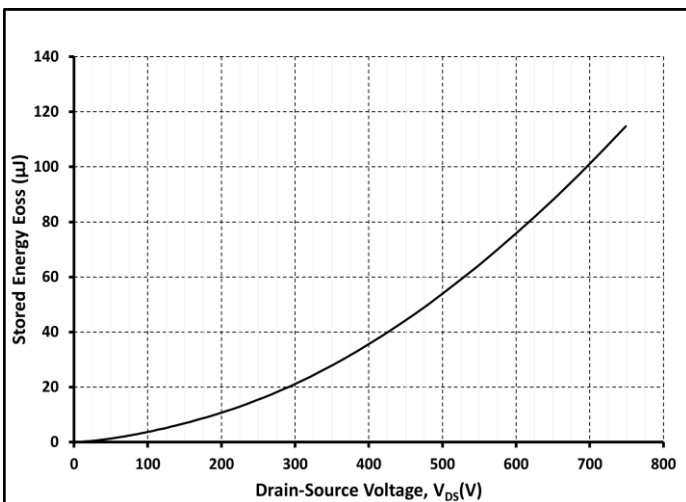


Fig. 17 Output Capacitor Stored Energy

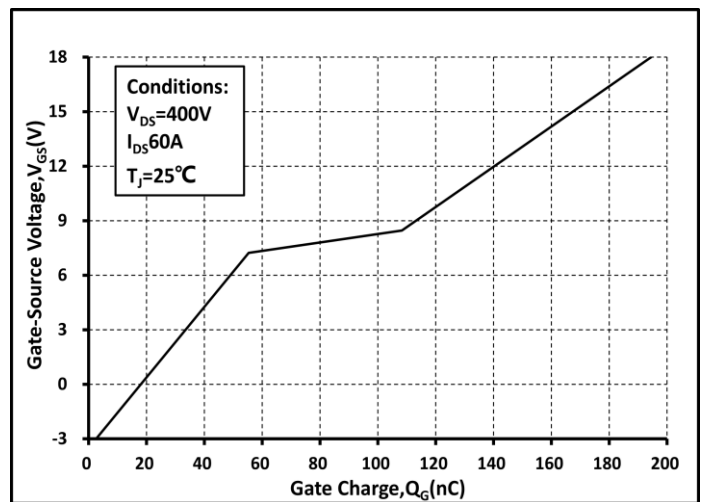


Fig. 18 Gate Charge Characteristics

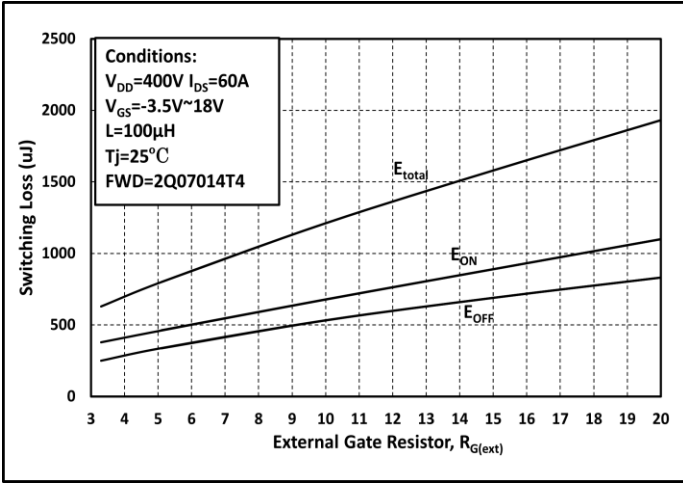


Fig. 19 Switching Energy vs. $R_{G(ext)}$

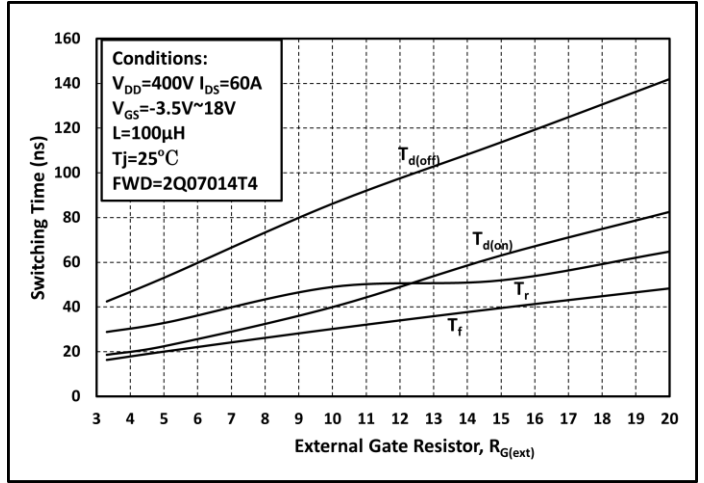


Fig. 20 Switching Times vs. $R_{G(ext)}$

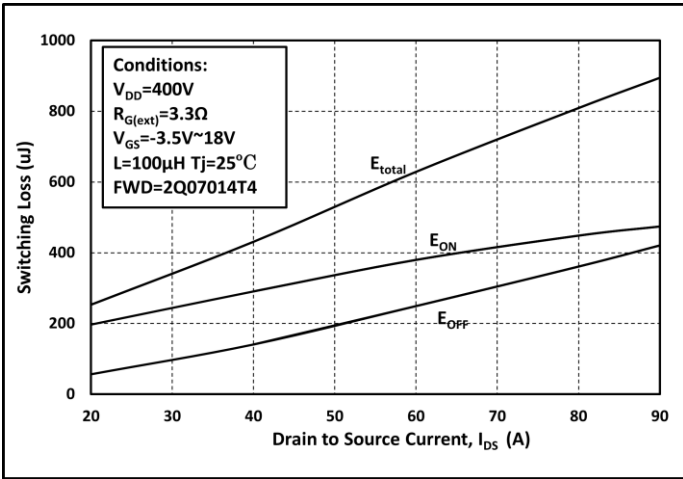


Fig. 21 Switching Energy vs. I_{DS}

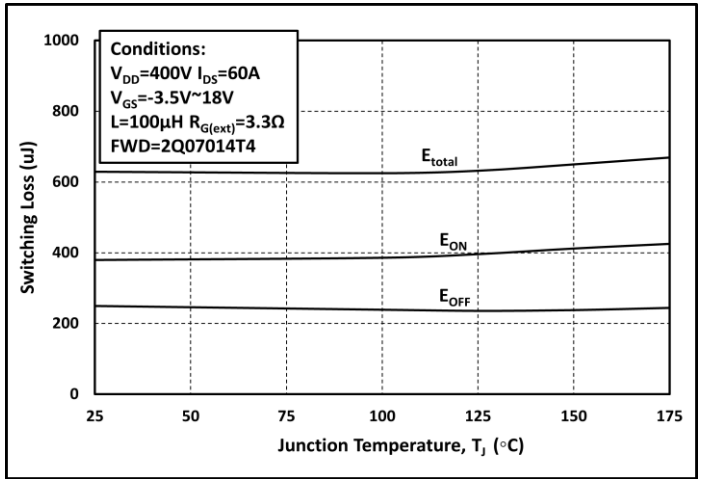


Fig. 22 Switching Energy vs. Temperature

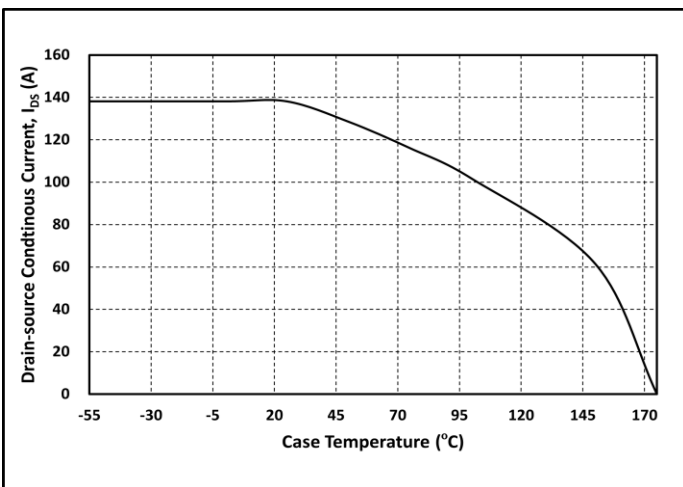


Fig. 23 Continuous Drain Current vs. Case Temperature

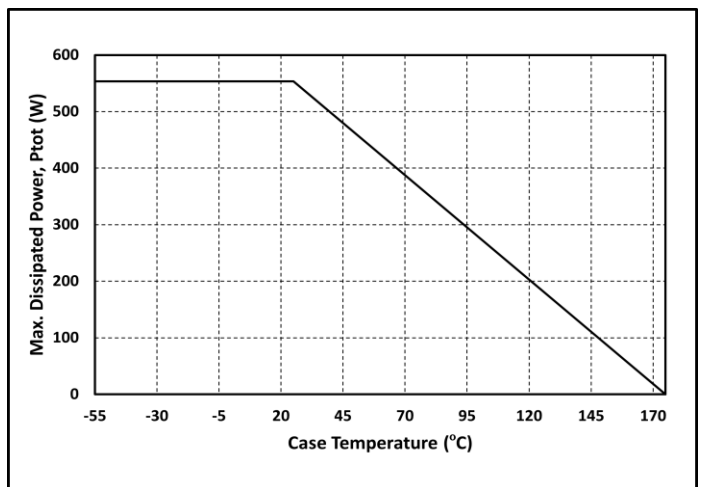


Fig. 24 Max. Power Dissipation Derating vs. Case Temperature

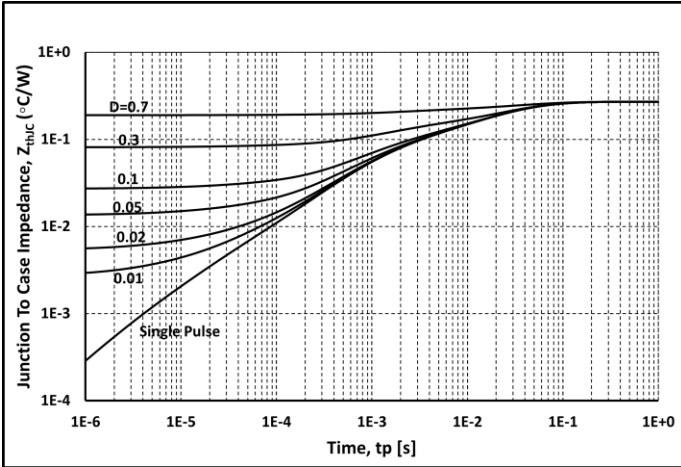


Fig. 25 Thermal impedance

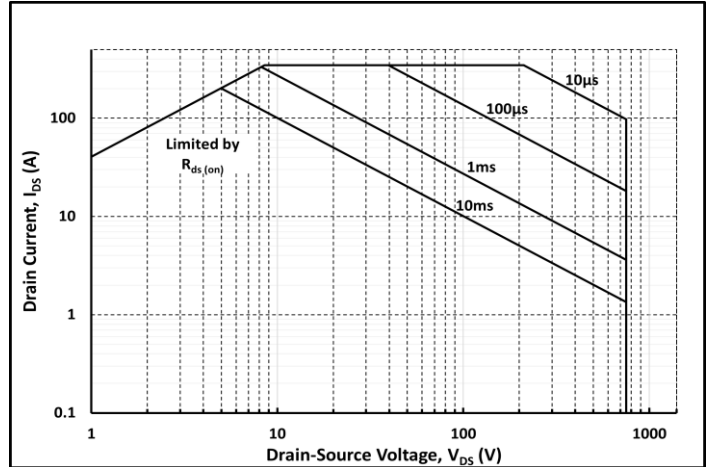
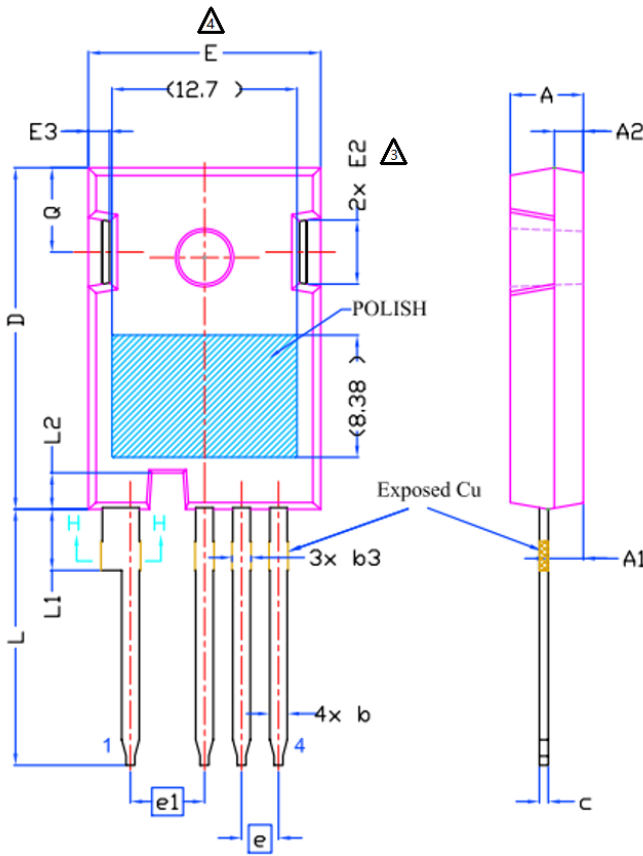
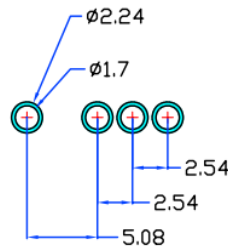
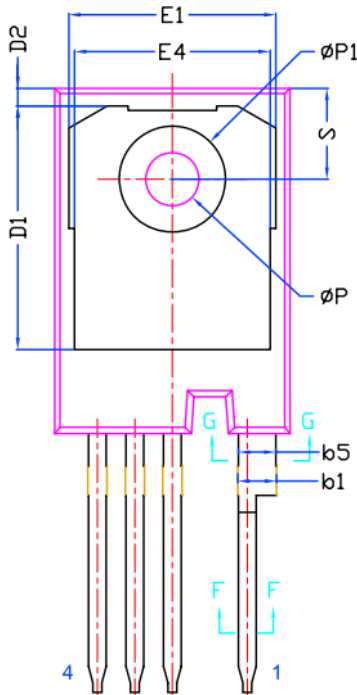


Fig. 26 Safe Operating Area

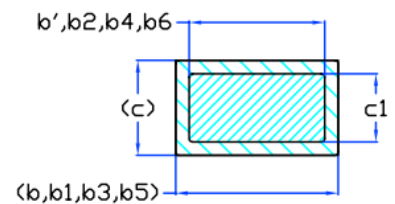
Package Dimensions



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

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