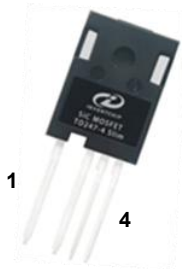


IV3Q14025T9Z-Gen3 1400V 25mΩ Automotive SiC MOSFET

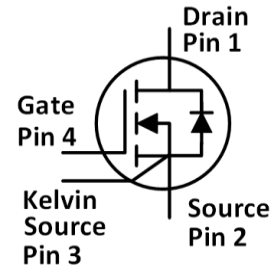
Features

- 3rd Generation SiC MOSFET Technology with +15~+18V gate drive
- High blocking voltage with low on-resistance
- High speed switching with low capacitance
- High operating junction temperature capability
- Very fast, robust and soft-recovery intrinsic body diode
- Kelvin gate input easing driver circuit design
- AEC-Q101 qualification
- Only wave soldering is supported
- Narrow gate leads and high creepage 7mm; CTI≥600V

Outline:



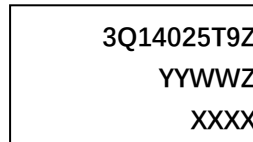
TO247-4S



Applications

- Solar MPPT and inverters
- Super charger piles and OBCs
- High voltage DC/DC converters
- Switch mode power supplies

Marking Diagram:



3Q14025T9Z= Specific Device Code
YY = Year
WW = Work Week
Z = Assembly Location
XXXX = Lot Traceability

Absolute Maximum Ratings ($T_c=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DS}	Drain-Source voltage	1400	V	$V_{GS}=0V, I_D=100\mu A$	
V_{GSmax} (Transient)	Maximum transient voltage	-10 to 23	V	Duty cycle<1%, and pulse width<200ns	
$V_{GSmax}(DC)$	Maximum DC voltage	-7 to 20	V	Static (DC)	
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)	102	A	$V_{GS}=18V, T_c=25^\circ\text{C}$	Fig. 23
		73.5	A	$V_{GS}=18V, T_c=100^\circ\text{C}$	
I_{DM}	Drain current (pulsed)	255	A	Pulse width limited by SOA	Fig. 26
I_{SM}	Body diode current (pulsed)	255	A	Pulse width limited by SOA and dynamic $R_{\theta(j-c)}$	Fig. 25 26
P_{TOT}	Total power dissipation	469	W	$T_c=25^\circ\text{C}$	Fig. 24
T_{stg}	Storage temperature range	-55 to 175	$^\circ\text{C}$		
T_J	Operating junction temperature	-55 to 175	$^\circ\text{C}$		
T_L	Solder Temperature	260	$^\circ\text{C}$	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	0.32	°C/W	Fig. 25

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} =1400V, V _{GS} =0V	
I _{GSS}	Gate leakage current			±100	nA	V _{DS} =0V, V _{GS} = -10~20V	
V _{TH}	Gate threshold voltage	2.0	2.8	4.0	V	V _{GS} =V _{DS} , I _D =13mA	Fig. 8, 9
			2.1			V _{GS} =V _{DS} , I _D =13mA @ T _J =175°C	
R _{ON}	Static drain-source on-resistance		22	27.3	mΩ	V _{GS} =18V, I _D =40A @T _J =25°C	Fig. 4, 5, 6, 7
			38.8		mΩ	V _{GS} =18V, I _D =40A @T _J =175° C	
			26.3		mΩ	V _{GS} =15V, I _D =40A @T _J =25°C	
			40.9		mΩ	V _{GS} =15V, I _D =40A @T _J =175° C	
C _{iss}	Input capacitance		3624		pF	V _{DS} =1000V, V _{GS} =0V, f=100kHz, V _{AC} =25mV	Fig. 16
C _{Oss}	Output capacitance		137		pF		
C _{rss}	Reverse transfer capacitance		6		pF		
E _{Oss}	C _{Oss} stored energy		61.5		μJ		Fig. 17
Q _g	Total gate charge		139		nC	V _{DS} =1000V, I _D =40A, V _{GS} = -3 to 18V	Fig. 18
Q _{gs}	Gate-source charge		46		nC		
Q _{gd}	Gate-drain charge		45		nC		
R _g	Gate input resistance		2.6		Ω	f=1MHz	
E _{ON}	Turn-on switching energy		815.2		μJ	V _{DS} =1000V, I _D =40A, V _{GS} = -3.5 to 18V, R _{G(ext)} =3.3 Ω, L=100μH T _J =25°C	Fig. 19, 20
E _{OFF}	Turn-off switching energy		163.5		μJ		
t _{d(on)}	Turn-on delay time		17		ns		
t _r	Rise time		24.1				
t _{d(off)}	Turn-off delay time		32.1				
t _f	Fall time		11.3				
E _{ON}	Turn-on switching energy		1287		μJ	Fig. 22	
E _{OFF}	Turn-off switching energy		178.7		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	$I_{SD}=20\text{A}$, $V_{GS}=0\text{V}$	Fig. 10, 11, 12
			3.1		V	$I_{SD}=20\text{A}$, $V_{GS}=0\text{V}$, $T_J=175^\circ\text{C}$	
I_S	Diode forward current (continuous)			88.4	A	$V_{GS}=-2\text{V}$, $T_c=25^\circ\text{C}$	
				51.3	A	$V_{GS}=-2\text{V}$, $T_c=100^\circ\text{C}$	
t_{rr}	Reverse recovery time		38.8		ns	$V_{GS}=-3.5\text{V}/+18\text{V}$, $I_{SD}=40\text{A}$, $V_R=1000\text{V}$,	
Q_{rr}	Reverse recovery charge		283.8		nC	$R_{G(\text{ext})}=9.1\Omega$ $L=100\mu\text{H}$	
I_{RRM}	Peak reverse recovery current		24.5		A	$di/dt=3000\text{A}/\mu\text{s}$	

Typical Performance (curves)

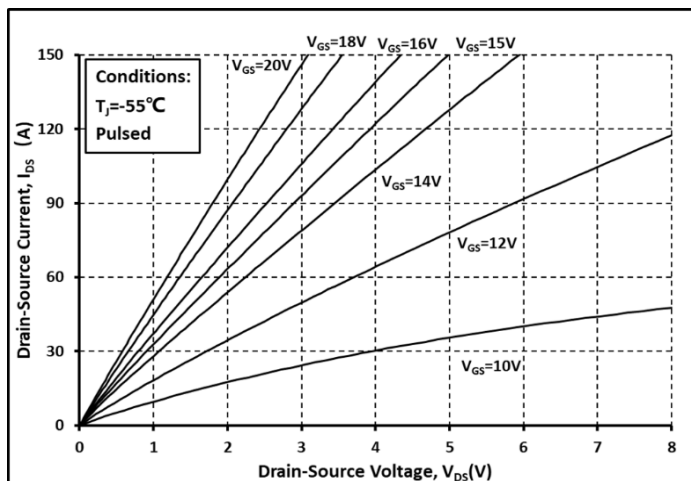


Fig. 1 Output Curve @ $T_J=-55^\circ\text{C}$

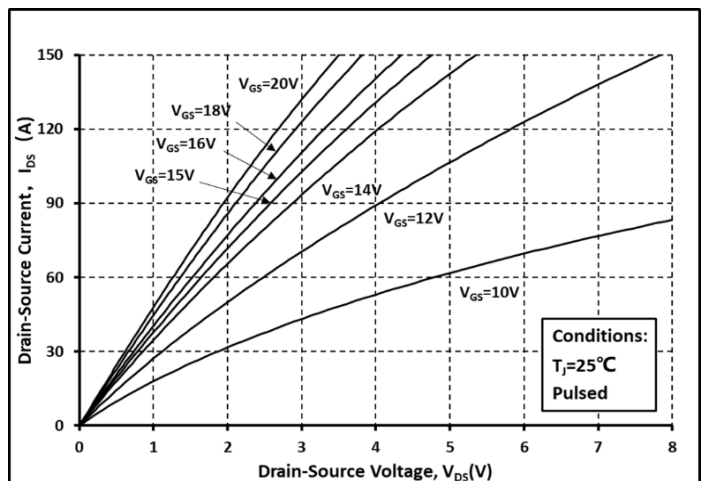


Fig. 2 Output Curve @ $T_J=25^\circ\text{C}$

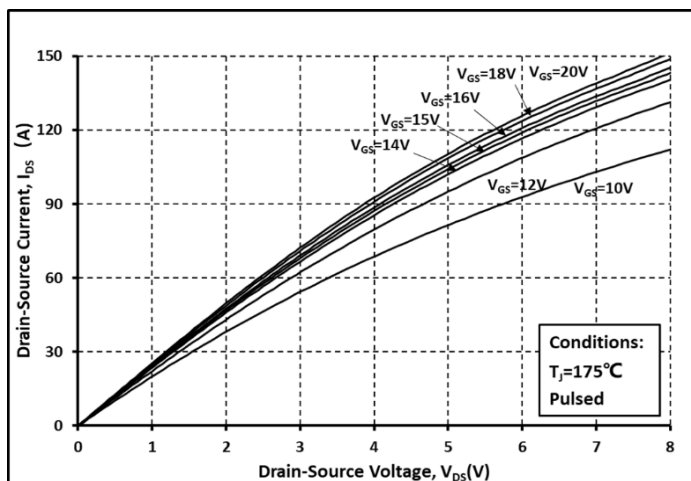


Fig. 3 Output Curve @ $T_J=175^\circ\text{C}$

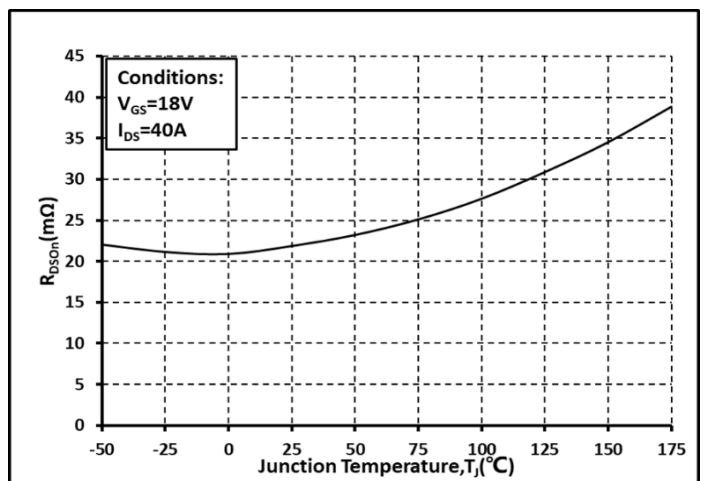


Fig. 4 R_{on} vs. Temperature

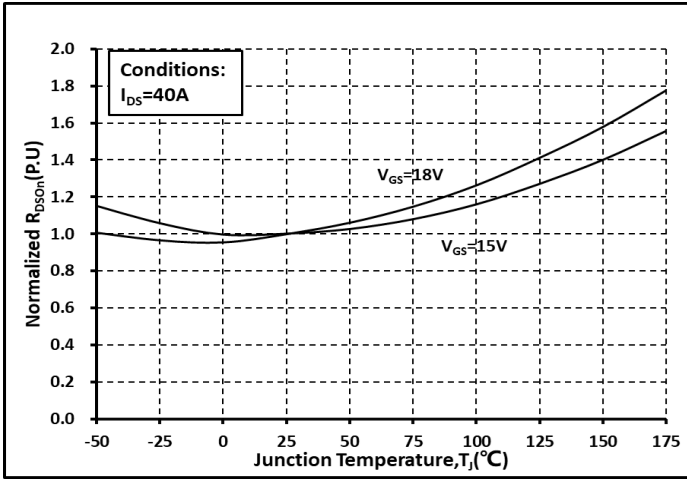


Fig. 5 Normalized Ron vs. Temperature

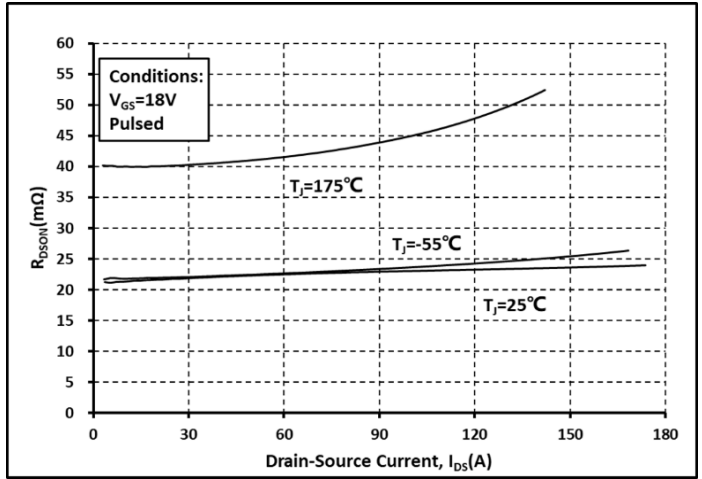


Fig. 6 Ron vs. I_{DS} @ Various Temperature

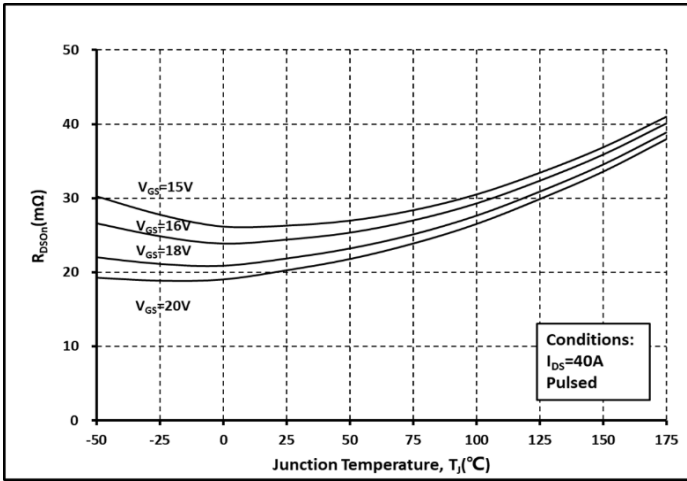


Fig. 7 Ron vs. Temperature @ Various V_{GS}

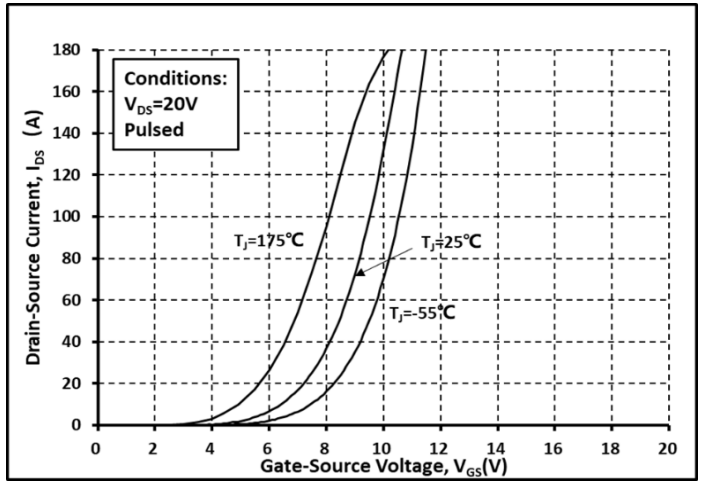


Fig. 8 Transfer Curves @ Various Temperature

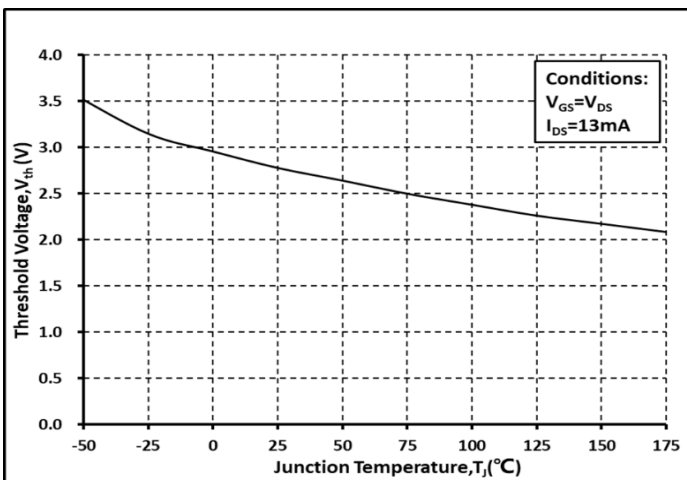


Fig. 9 Threshold Voltage vs. Temperature

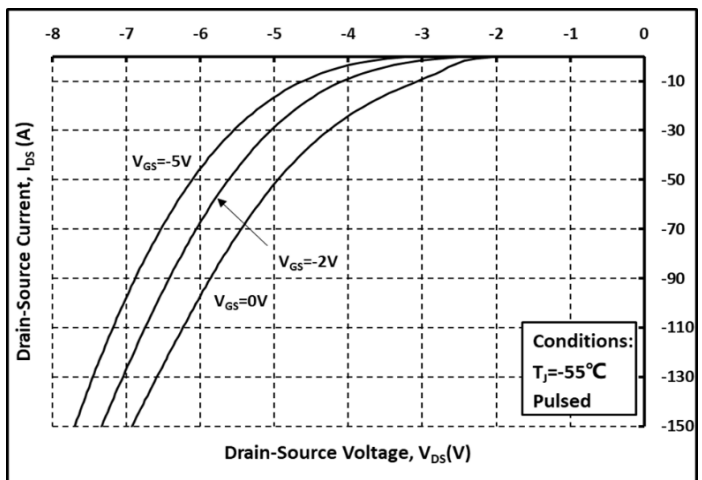


Fig. 10 Body Diode curves @ $T_J=-55°C$

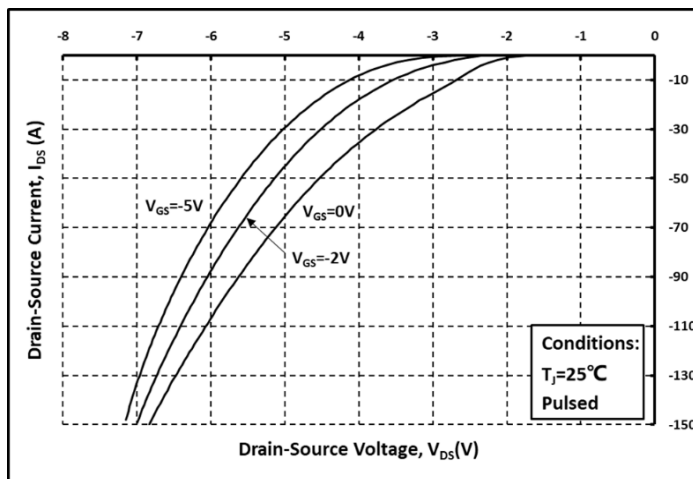


Fig. 11 Body Diode curves @ $T_j=25^{\circ}\text{C}$

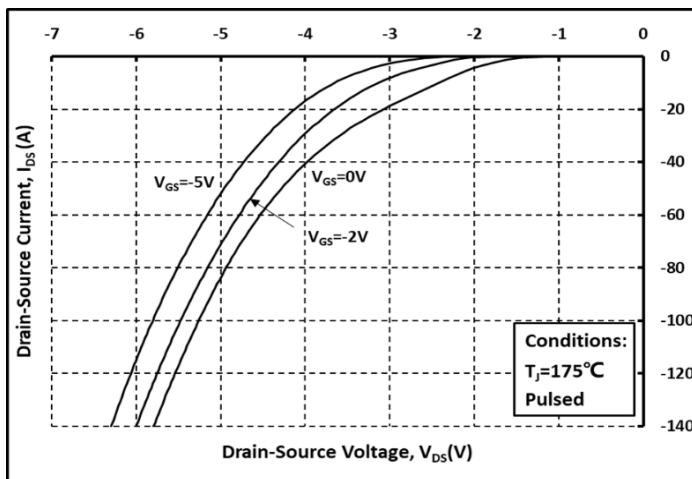


Fig. 12 Body Diode curves @ $T_j=175^{\circ}\text{C}$

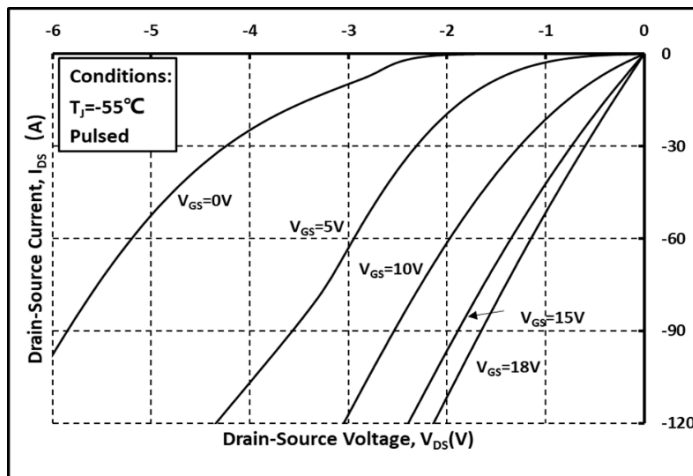


Fig. 13 3rd Quadrant curves @ $T_j=-55^{\circ}\text{C}$

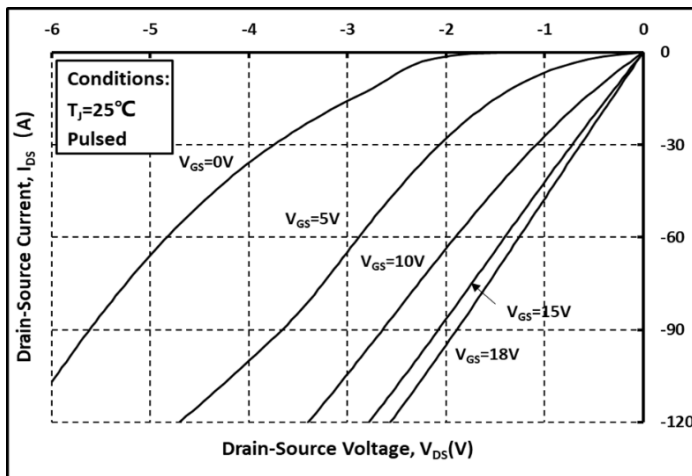


Fig. 14 3rd Quadrant curves @ $T_j=25^{\circ}\text{C}$

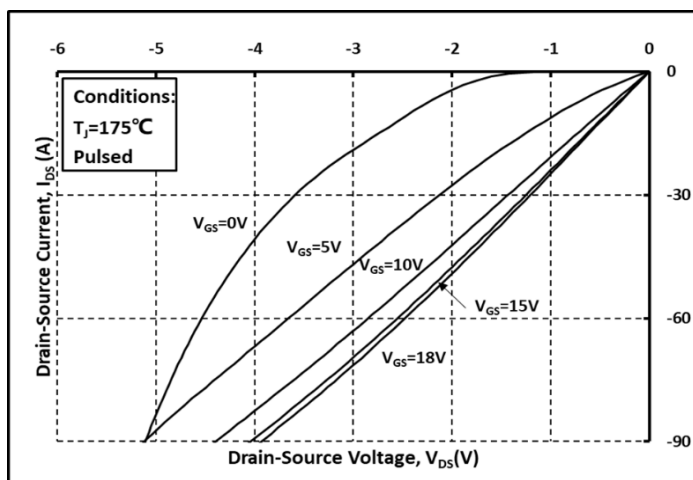


Fig. 15 3rd Quadrant curves @ $T_j=175^{\circ}\text{C}$

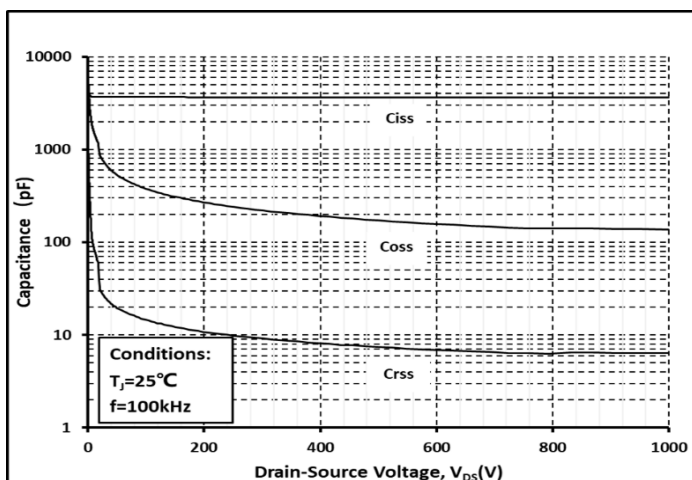


Fig. 16 Capacitance vs. V_{DS}

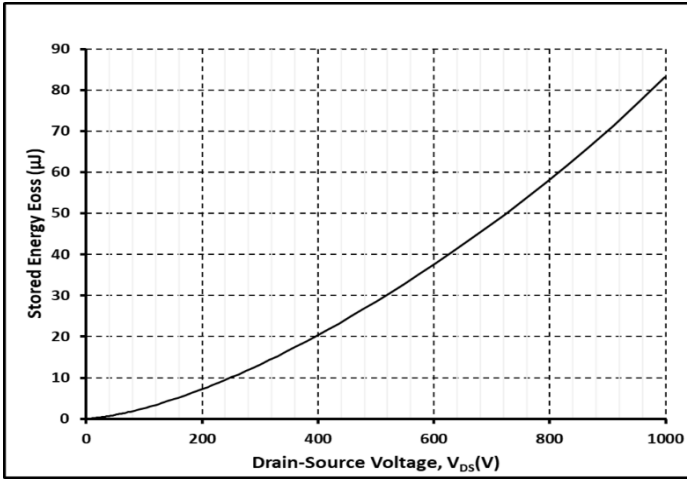


Fig. 17 Output Capacitor Stored Energy

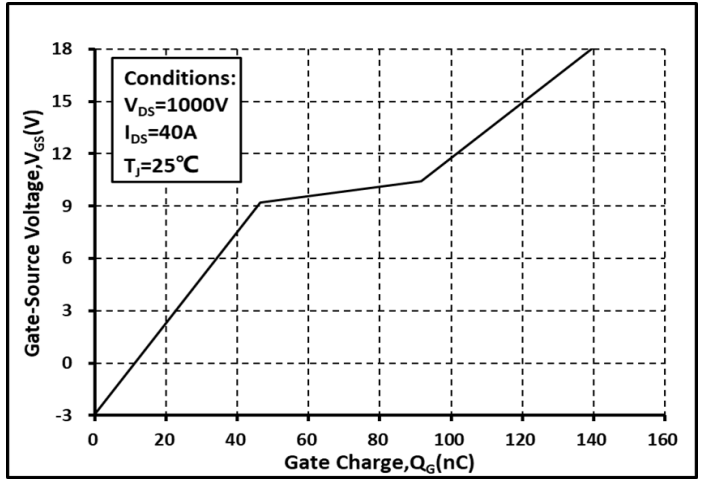


Fig. 18 Gate Charge Characteristics

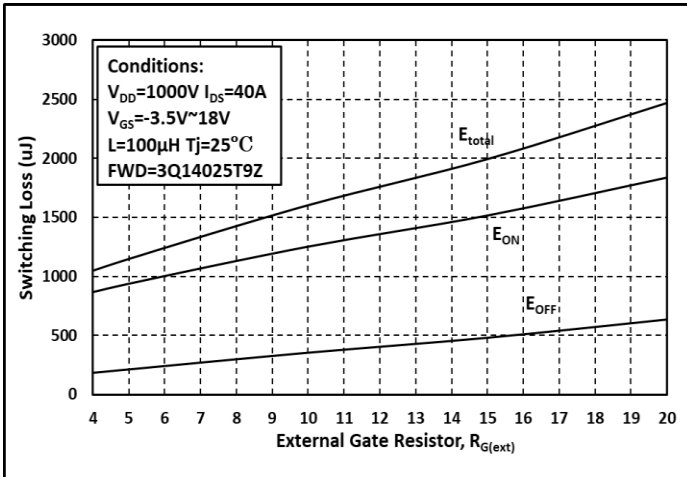


Fig. 19 Switching Energy vs. $R_{G(ext)}$

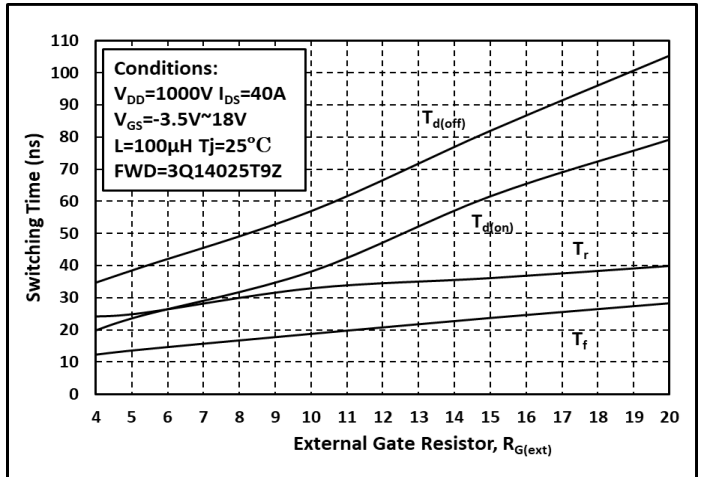


Fig. 20 Switching Times vs. $R_{G(ext)}$

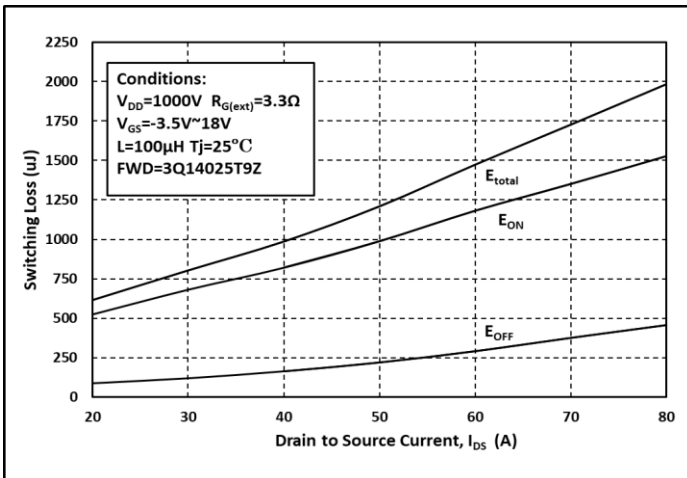


Fig. 21 Switching Energy vs. I_{DS}

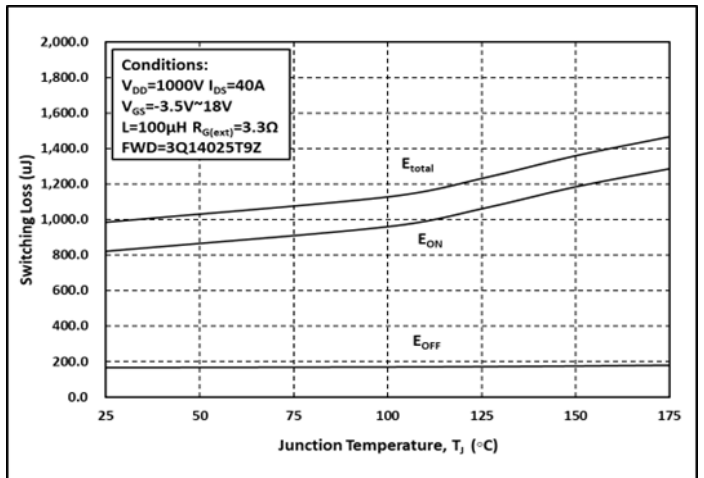


Fig. 22 Switching Energy vs. Temperature

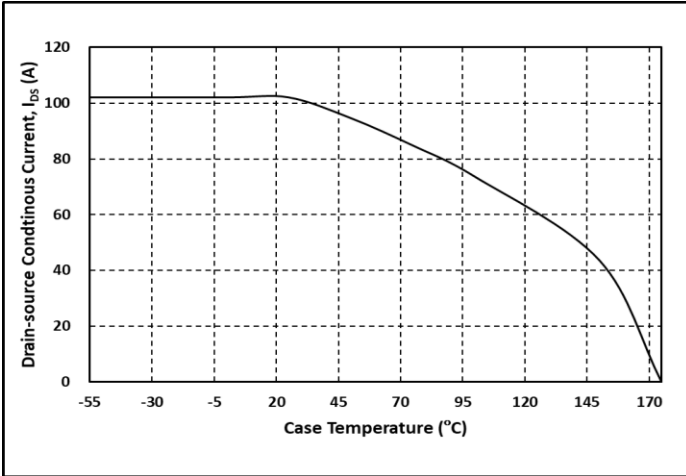


Fig. 23 Continuous Drain Current vs. Case Temperature

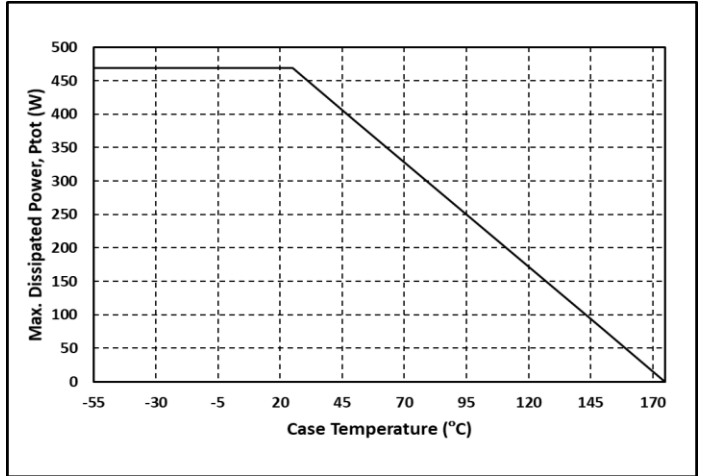


Fig. 24 Max. Power Dissipation Derating vs. Case Temperature

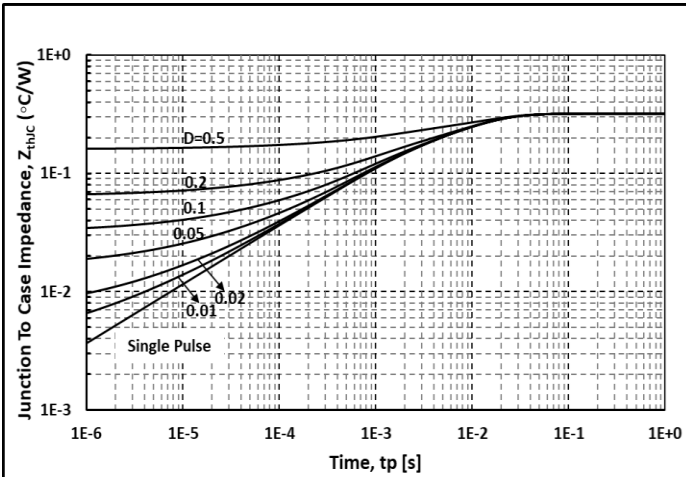


Fig. 25 Thermal impedance

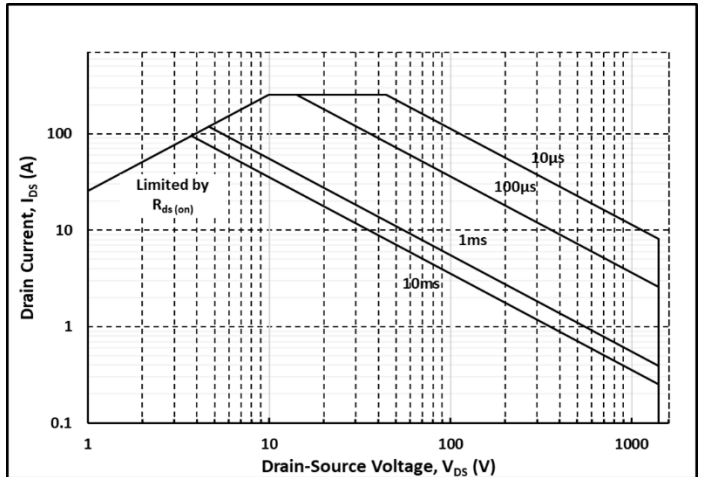
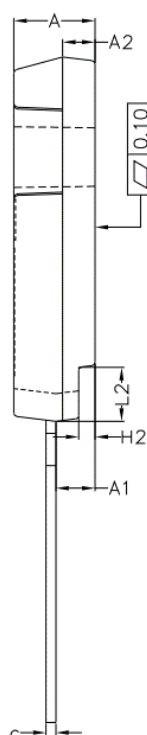
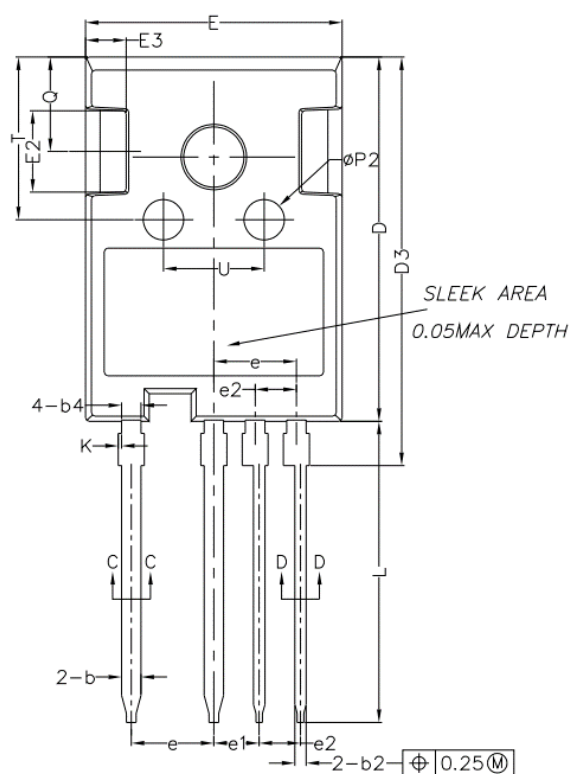
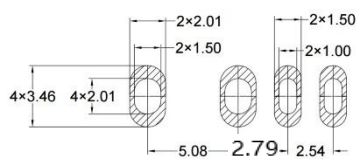
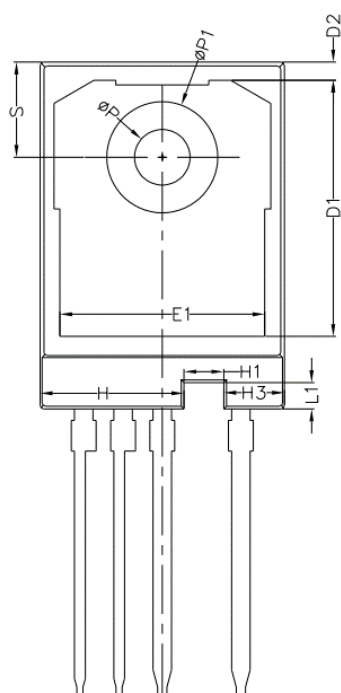


Fig. 26 Safe Operating Area

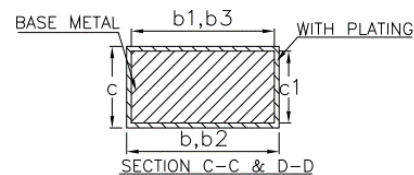
Package Dimensions



COMMON DIMENSIONS (UNITS OF MEASURE=MILLIMETER)			
SYMBOL	MIN	NOM	MAX
A	4.90	5.00	5.10
A1	2.31	2.41	2.51
A2	1.90	2.00	2.10
b	1.16	—	1.29
b1	1.15	1.20	1.25
b2	0.66	—	0.79
b3	0.65	0.70	0.75
b4	1.16	—	1.29
c	0.59	—	0.66
c1	0.58	0.60	0.62
D	22.30	22.40	22.50
D1	16.25	16.55	16.85
D2	1.05	1.20	1.35
D3	24.97	25.12	25.27
E	15.70	15.80	15.90
E1	13.10	13.30	13.50
E2	4.90	5.00	5.10
E3	2.40	2.50	2.60
e	4.98	5.08	5.18
e1	2.69	2.79	2.89
e2	2.44	2.54	2.64
H	9.20	9.30	9.40
H1	2.48	2.58	2.68
H2	0.90	1.00	1.10
H3	3.82	3.92	4.02
K	0	—	0.20
L	18.40	18.52	18.70
L1	1.60	1.70	1.80
L2	3.22	3.32	3.42
P	3.50	3.60	3.70
P1	—	—	7.40
P2	2.40	2.50	2.60
Q	5.60	—	6.00
S	6.00	6.15	6.30
T	9.80	—	10.20
U	6.00	—	6.40



Recommended Solder Pad Layout



Note:

- Package Reference: JEDEC TO247, Variation AD
- All Dimensions are in mm
- Dimension D&E Do Not Include Mold Flash
- Subject to Change Without Notice

Notes

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