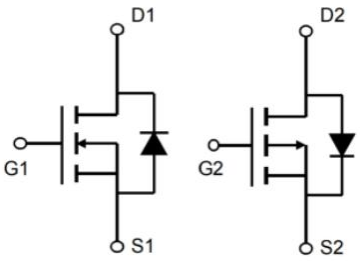
N&P-Channel 40V MOSFET

E040NP32EL1

V_{DS} (V)	$R_{DS(on),max}$ (mΩ)	I_D (A)
40V	13 @ V_{GS} = 10V	36
-40V	35 @ V_{GS} = -10V	-22

TO-252-4L



Pb-free
RoHS
COMPLIANT
HALOGEN
FREE

Features

- Low Gate Charge
- High Power and current handing capability
- Lead free product is acquired
- 100% UIS Tested, 100% DVDS Tested

Applications

- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

Package And Ordering Information

Ordering code	Package	Marking
E040NP32EL1	TO-252-4L	E040NP32EL1

Ordering Information

Package	Units/ Reel	Reels/ Inner Box	Units/ Inner Box
TO-252-4L	2500	1	2500

Key Performance Parameters

Parameter	Value	Value	Unit
VDS, min @ Tj(max)	40	-40	V
ID, pulse	144	-88	A
RDS(ON), max @ VGS=10V	13	35	mΩ
Qg	24.5	60	nC

Absolute Maximum Ratings at Tj=25°C Unless Otherwise Noted

Parameter		Symbol	N Limit	P Limit	Unit
Drain-source voltage		V_{DS}	40	-40	V
Gate-source voltage		V_{GS}	±20	±20	
Continuous drain current	T_C=25°C	I_D	36	-22	A
	T_C=100°C		23	-13.5	
Pulsed drain current		$I_{D,pulse}$	144	-88	
Avalanche energy, single pulse		E_{AS}	64	56	mJ
Power dissipation	T_C=25°C	P_D	29	27	W
	T_C=100°C		12	11	
Operating junction and storage temperature range		T_J, T_{stg}	-55 To 150		℃

Thermal Characteristics

Parameter		Symbol	N Limit	P Limit	Unit
Thermal resistance, junction-to-case	Steady state	$R_{\theta JC}$	-	-	°C/W
Thermal resistance, junction-to-ambient	Steady state	$R_{\theta JA}$	4.3	4.6	

N-Channel Electrical Characteristics at Tj=25°C unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test conditions
Static						
Drain to source breakdown voltage	$V_{(BR)DSS}$	40			V	V_{GS} = 0, I_D = 250 μA
Gate-source threshold voltage	$V_{GS(th)}$	1	1.5	2	V	V_{DS} = V_{GS}, I_D = 250 μA
Gate-body leakage	I_{GSS}			±100	nA	V_{DS} = 0 V, V_{GS} = ±20 V
Zero gate voltage drain current	I_{DSS}			1	μA	V_{DS} = 40 V, V_{GS} = 0 V
Drain-source on-resistance	$R_{DS(on)}$		10	13	mΩ	V_{GS} = 10 V, I_D = 15 A
Drain-source on-resistance	$R_{DS(on)}$		14.5	19	mΩ	V_{GS} = 4.5 V, I_D = 10 A
Forward transconductance	gfs		20		S	V_{DS} = 5 V, I_D = 15 A

Gate resistance	Rg		1.6		Ω	f=1MHz
Gate Charge						
Total gate charge	Qg		34.5		nC	V_{DS} = 20 V, I_D = 15 A, V_{GS} = 10 V
Gate-source charge	Qgs		3.7			
Gate-drain charge	Qgd		6.3			
Dynamic						
Turn-on delay time	$t_{d(on)}$		4.6		ns	V_{DS} = 20 V, V_{GS} = 10 V, R_L=1.3Ω, R_{GEN} = 3 Ω
Rise time	t_r		12			
Turn-off delay time	$t_{d(off)}$		18.8			
Fall time	t_f		6			
Input capacitance	C_{iss}		1160		pF	V_{DS} = 20 V, V_{GS} = 0 V, f = 1.0MHz
Output capacitance	C_{oss}		84			
Reverse transfer capacitance	C_{rss}		170			
Body Diode						
Diode forward voltage	V_{SD}			1.2	V	V_{GS} = 0 V, I_F = 15 A
Reverse recovery time	t_{rr}		17.5		ns	I_S = 15 A, di/dt = 100 A/μs
Reverse recovery charge	Q_{rr}		10.9		nC	

N-Channel Electrical Characteristics Diagrams

Figure 1. Output Characteristics

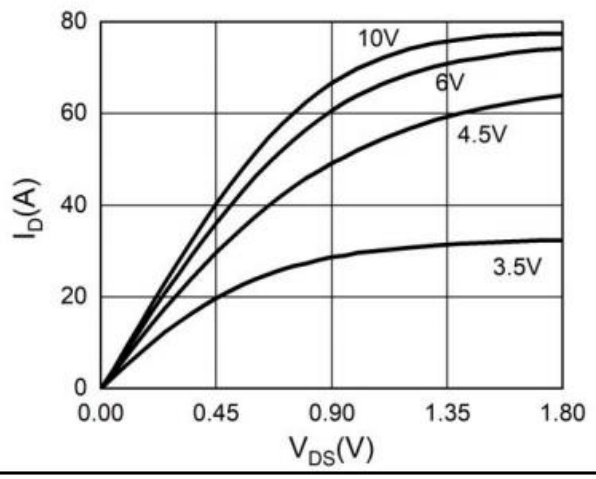


Figure 2. Transfer Characteristics

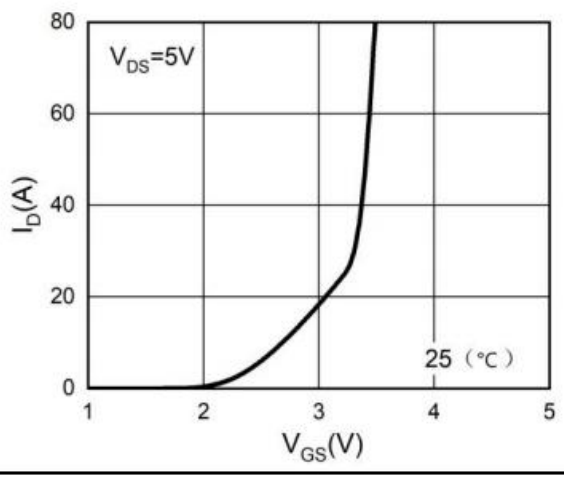


Figure 3. Power Dissipation

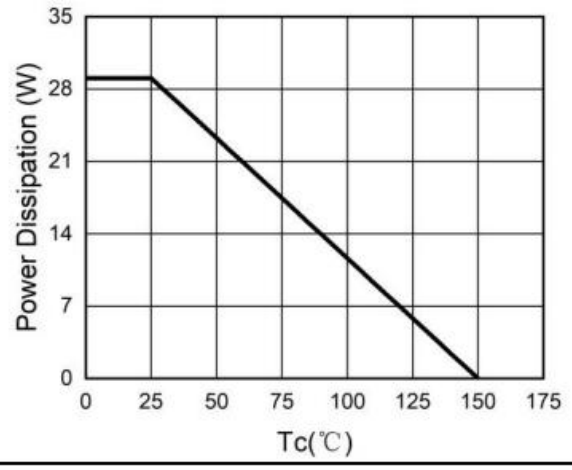


Figure 4. Drain Current

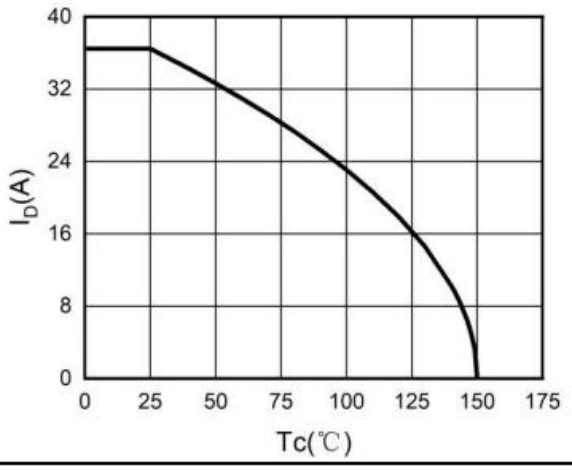


Figure 5. BV_{DSS} vs Junction Temperature

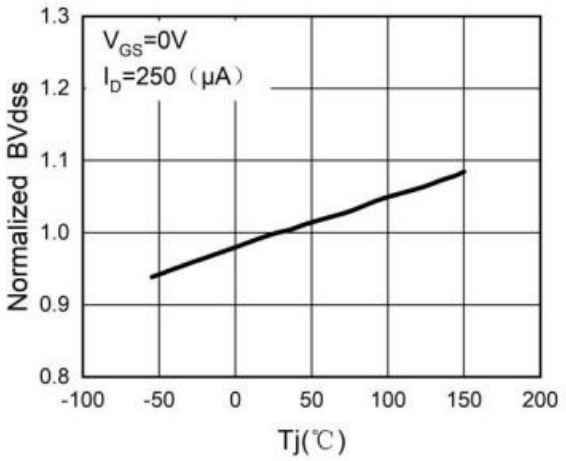


Figure 6. $R_{DS(ON)}$ vs Junction Temperature

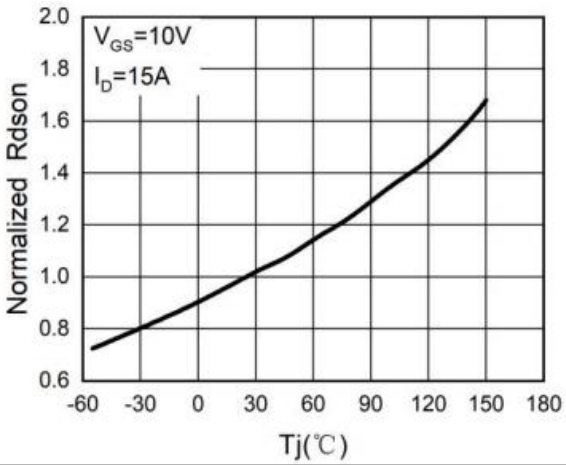


Figure 7. Gate Charge Waveforms

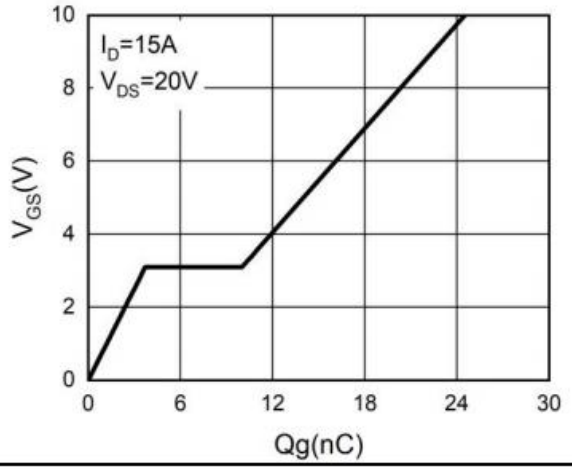


Figure 8. Capacitance

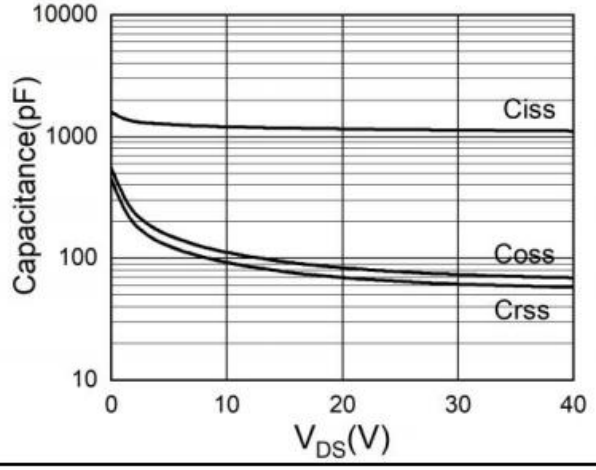


Figure 9. Body-Diode Characteristics

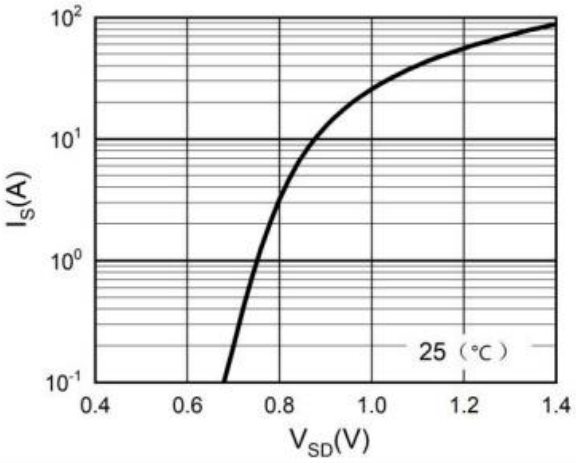
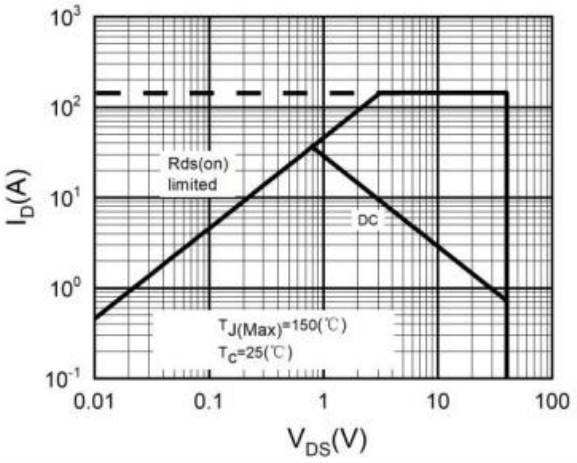


Figure 10. Maximum Safe Operating Area



P-Channel Electrical Characteristics at Tj=25°C unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test conditions
Static						
Drain to source breakdown voltage	$V_{(BR)DSS}$	-40			V	V_{GS} = 0, I_D = -250 μA
Gate-source threshold voltage	$V_{GS(th)}$	-1		-2.5	V	V_{DS} = V_{GS}, I_D = -250 μA
Gate-body leakage	I_{GSS}			±100	nA	V_{DS} = 0 V, V_{GS} = ±20 V
Zero gate voltage drain current	I_{DSS}			-1	μA	V_{DS} = -40 V, V_{GS} = 0 V
Drain-source on-resistance	$R_{DS(on)}$		27	35	mΩ	V_{GS} = -10 V, I_D = -3 A
Drain-source on-resistance	$R_{DS(on)}$		34	45	mΩ	V_{GS} = -4.5 V, I_D = -2 A
Forward transconductance	gfs		7		S	V_{DS} = -5 V, I_D = -3 A
Gate resistance	Rg		5.1		Ω	f=1MHz
Gate Charge						
Total gate charge	Qg		60		nC	V_{DS} = -20 V, I_D = -3 A, V_{GS} = -10 V
Gate-source charge	Qgs		8.5			
Gate-drain charge	Qgd		13			
Dynamic						
Turn-on delay time	$t_{d(on)}$		10		ns	V_{DS} = -20 V, V_{GS} = -10 V, R_L=6.7Ω, R_{GEN} = 3 Ω
Rise time	t_r		15			
Turn-off delay time	$t_{d(off)}$		38			
Fall time	t_f		16.4			
Input capacitance	C_{iss}		1010		pF	V_{DS} = -20 V, V_{GS} = 0 V, f = 1.0MHz
Output capacitance	C_{oss}		96			
Reverse transfer capacitance	C_{rss}		83			
Body Diode						
Diode forward voltage	V_{SD}			-1.2	V	V_{GS} = 0 V, I_F = -3 A
Reverse recovery time	t_{rr}		17.3		ns	I_S = -3 A, di/dt = 100 A/μs
Reverse recovery charge	Q_{rr}		9.5		nC	

P-Channel Electrical Characteristics Diagrams

Figure 1. Output Characteristics

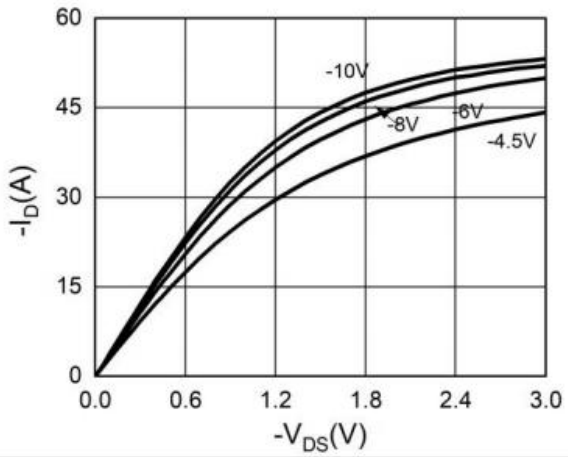


Figure 2. Transfer Characteristics

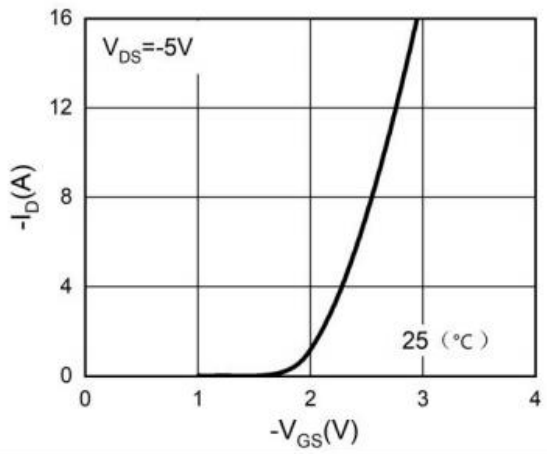


Figure 3. Power Dissipation

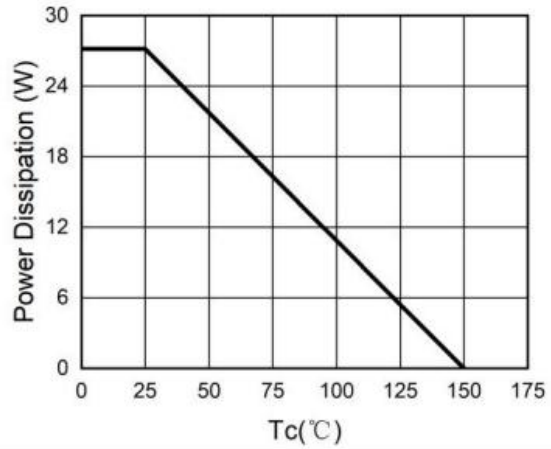


Figure 4. Drain Current

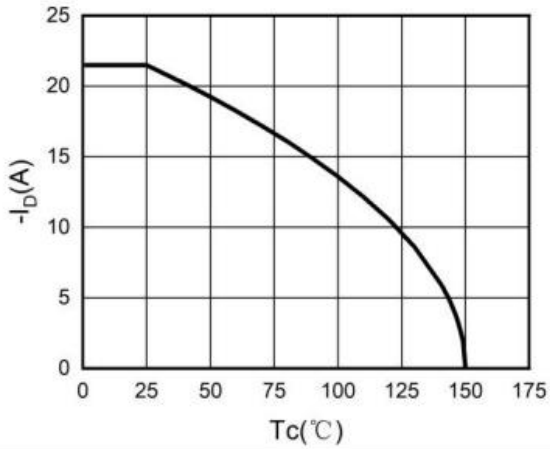


Figure 5. BV_{DSS} vs Junction Temperature

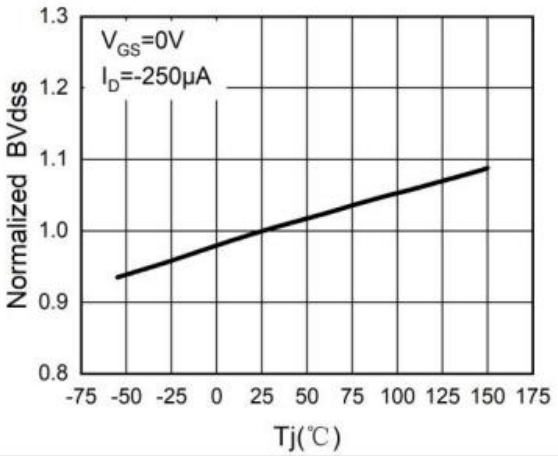


Figure 6. $R_{DS(ON)}$ vs Junction Temperature

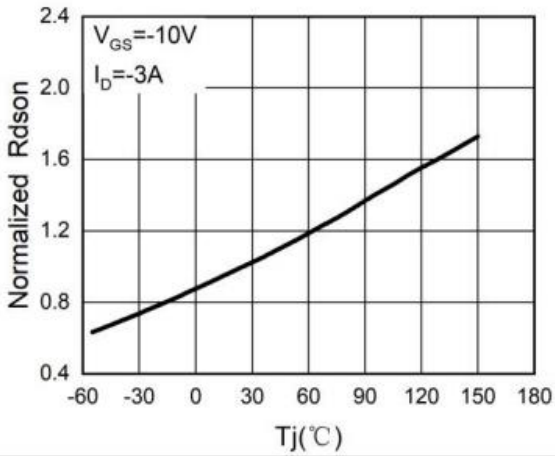


Figure 7. Gate Charge Waveforms

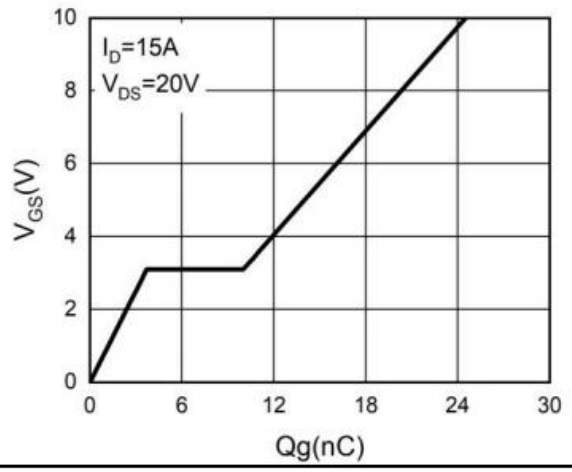


Figure 8. Capacitance

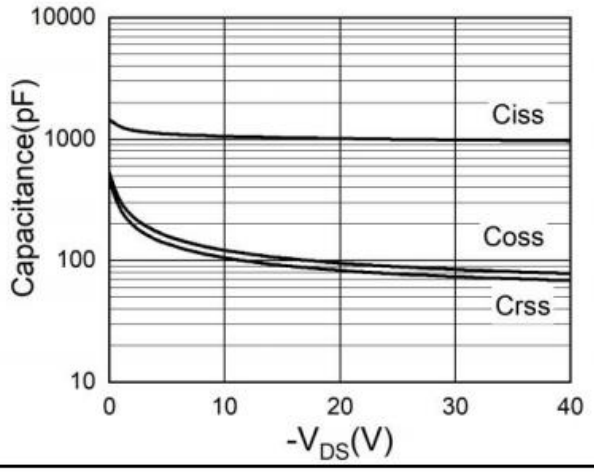


Figure 9. Body-Diode Characteristics

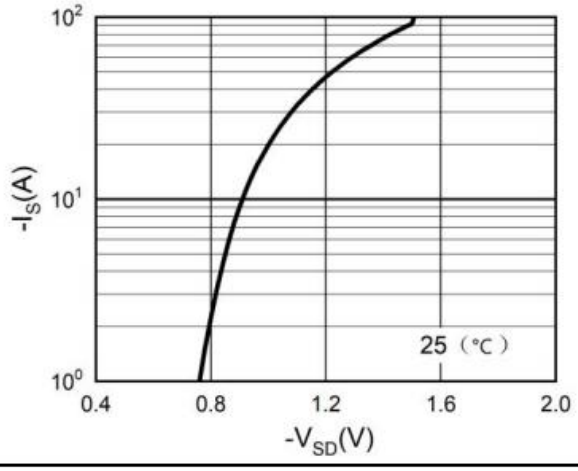
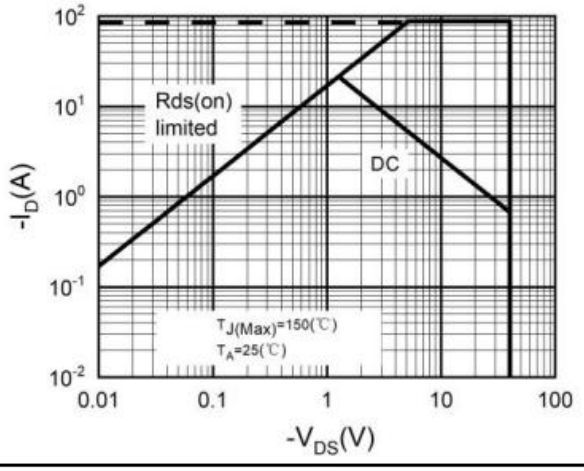
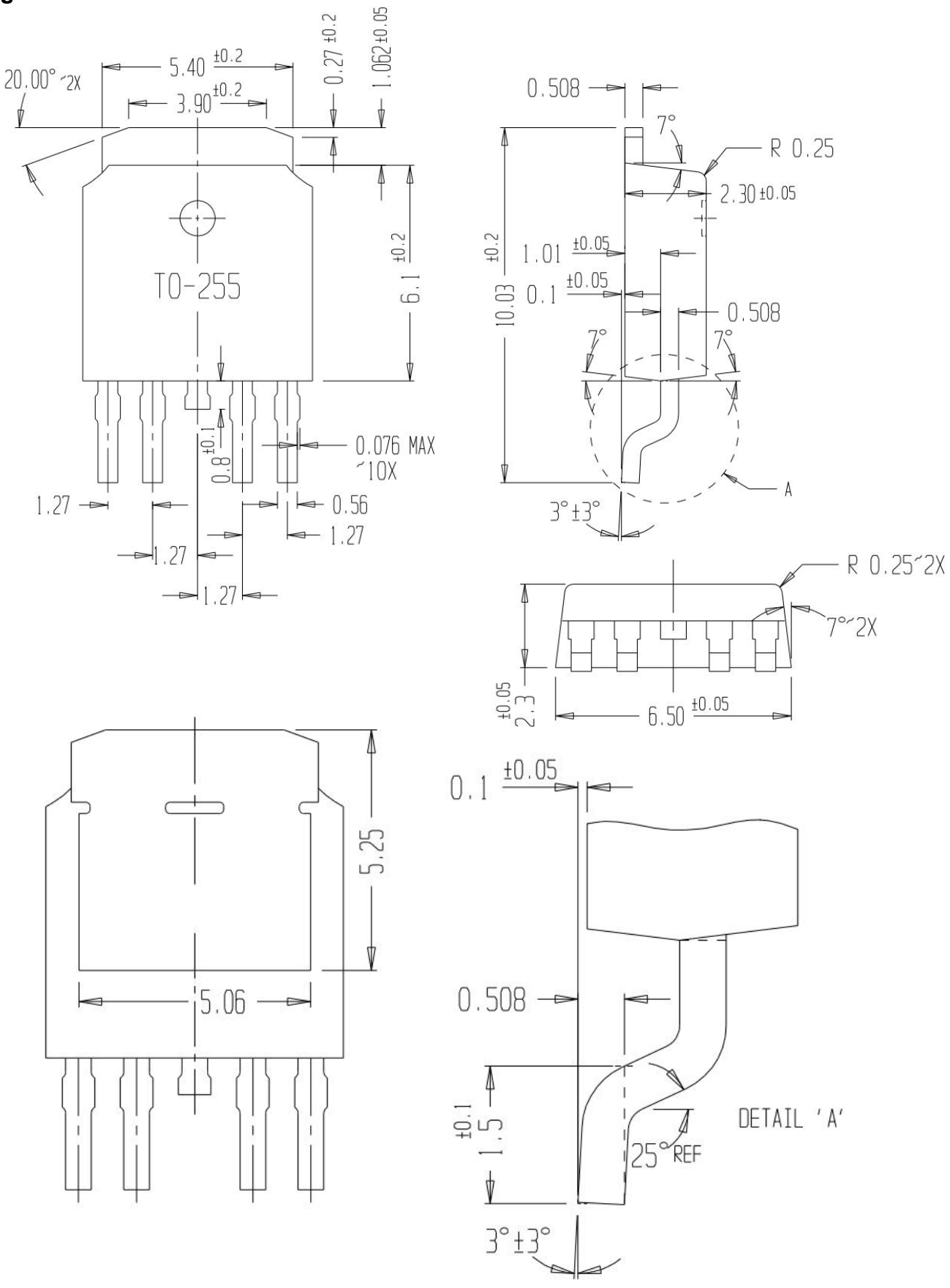


Figure 10. Maximum Safe Operating Area



Package Outline Dimensions



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