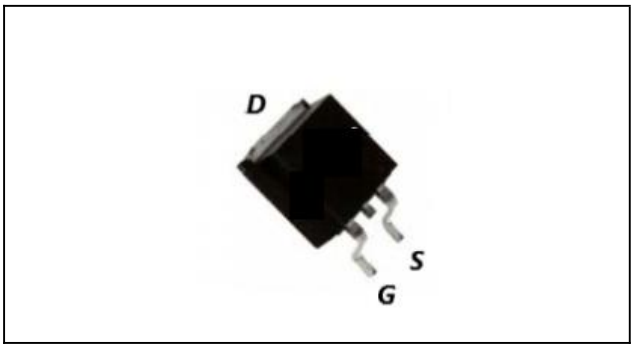
P-Channel 40V MOSFET

E040P013CL1

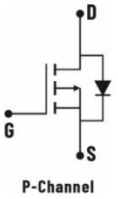
V_{DS} (V)	$R_{DS(on),max}$ (mΩ)	I_D (A)
-40V	13 @ V_{GS} = -10V	-63

TO-252



Features

- Low $R_{DS(on)}$ trench technology
- Low thermal impedance
- Fast switching speed
- 100% avalanche tested



Pb-free
RoHS
COMPLIANT
HALOGEN
FREE

Applications

- DC/DC conversion
- Power switch
- PD charger
- Moto driver

Package And Ordering Information

Ordering code	Package	Marking
E040P013CL1	TO-252	E040P013CL1

Ordering Information

Package	Units/ Reel	Reels/ Inner Box	Units/ Inner Box
TO-252	2500	2	5000

Key Performance Parameters

Parameter	Value	Unit
VDS, min @ Tj(max)	-40	V
ID, pulse	-252	A
RDS(ON), max @ VGS=10V	13	mΩ
Qg	61	nC

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

Parameter		Symbol	Limit	Unit
Drain-source voltage		V_{DS}	-40	V
Gate-source voltage		V_{GS}	±20	
Continuous drain current	T_C=25°C	I_D	-63	A
	T_C=100°C		-44.8	
Pulsed drain current		$I_{D,pulse}$	-252	
Avalanche energy, single pulse		E_{AS}	272	mJ
Power dissipation	T_C=25°C	P_D	79	W
	T_A=25°C		-	
Operating junction and storage temperature range		T_J, T_{stg}	-55 To 175	℃

Thermal Characteristics

Parameter		Symbol	Max.	Unit
Thermal resistance, junction-to-case	Steady state	$R_{\theta JC}$	1.9	°C/W
Thermal resistance, junction-to-ambient	Steady state	$R_{\theta JA}$	-	

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	-1.7	-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	$R_{DS(on)}$		10.2	13	mΩ	V_{GS} = -10 V, I_D = -15 A
Drain-source on-resistance	$R_{DS(on)}$		13.8	16.5	mΩ	V_{GS} = -4.5 V, I_D = -10 A
Forward transconductance	gfs		35		S	V_{DS} = -5 V, I_D = -15 A

Gate resistance	Rg		-		Ω	f=1MHz
Gate Charge						
Total gate charge	Qg		61		nC	V_{DS} = -20 V, I_D = -20 A, V_{GS} = -10 V
Gate-source charge	Qgs		8.7			
Gate-drain charge	Qgd		15.3			
Dynamic						
Turn-on delay time	$t_{d(on)}$		11.5		ns	V_{DS} = -20 V, V_{GS} = -10 V, R_L=1Ω, R_{GEN} = 3 Ω
Rise time	t_r		13.5			
Turn-off delay time	$t_{d(off)}$		39			
Fall time	t_f		13			
Input capacitance	C_{iss}		3404		pF	V_{DS} = -20 V, V_{GS} = 0 V, f = 1.0MHz
Output capacitance	C_{oss}		230			
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}		43		ns	I_S = -20 A, di/dt = 100 A/μs
Reverse recovery charge	Q_{rr}		48		nC	

Electrical Characteristics Diagrams

Figure 1. Output Characteristics

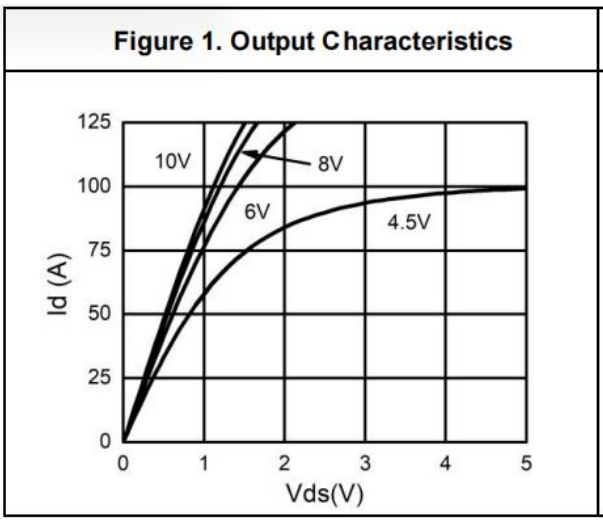


Figure 2. Transfer Characteristics

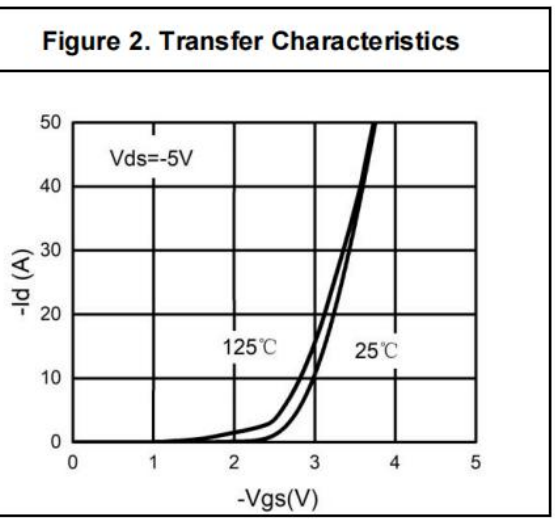


Figure 3. Power Dissipation

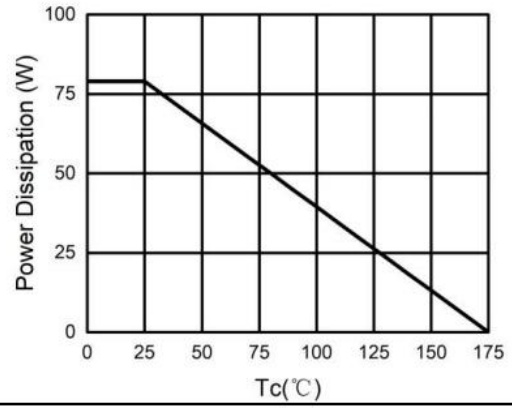


Figure 4. Drain Current

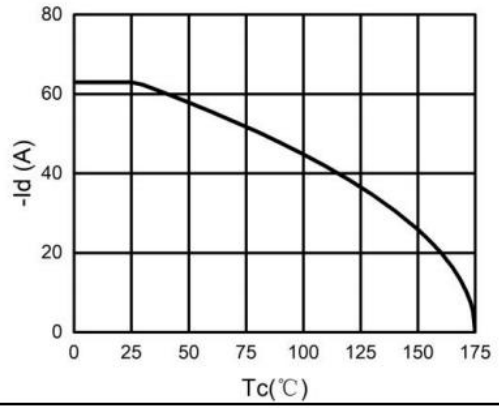


Figure 5. BV_{DSS} vs Junction Temperature

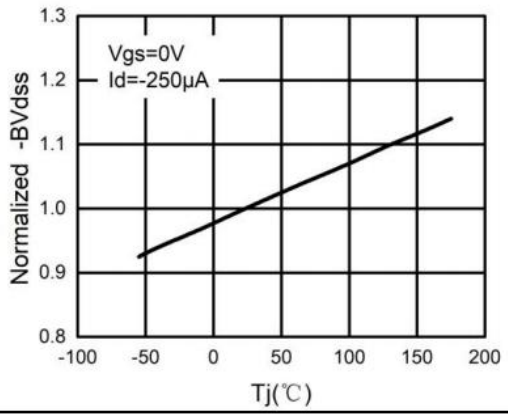


Figure 6. $R_{DS(ON)}$ vs Junction Temperature

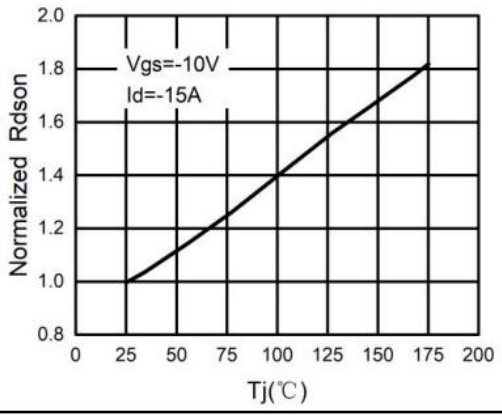


Figure 7. Gate Charge Waveforms

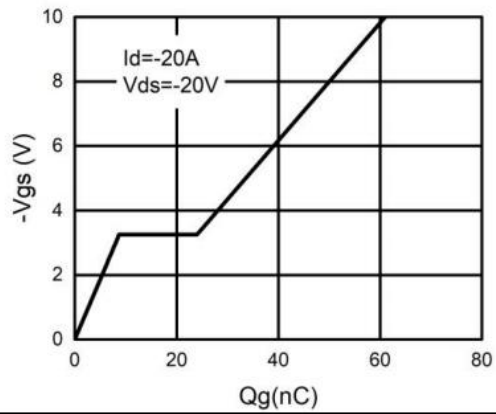


Figure 8. Capacitance

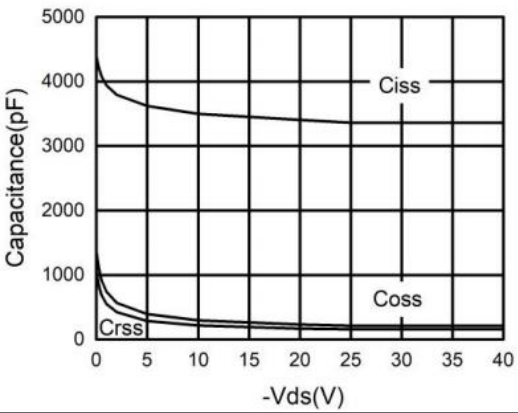


Figure 9. Body-Diode Characteristics

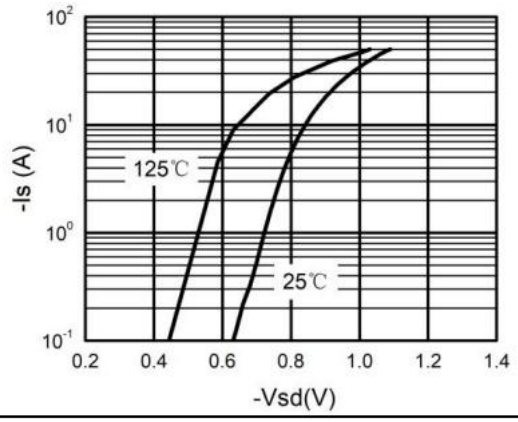
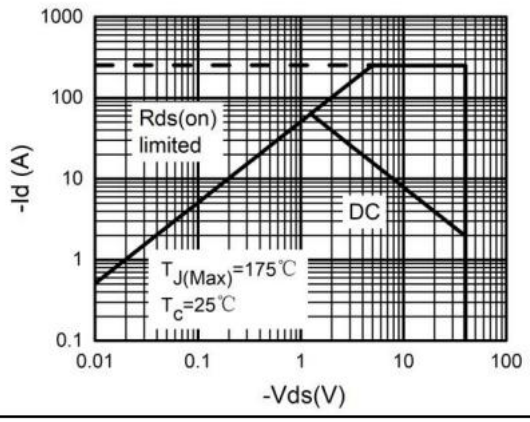
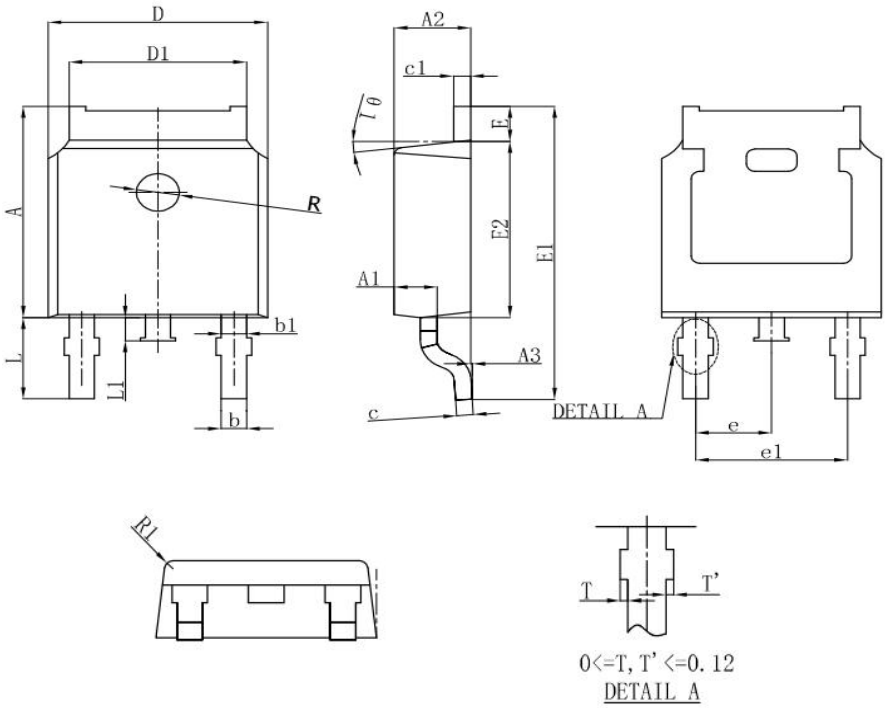


Figure 10. Maximum Safe Operating Area



Package Outline Dimensions



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	7.050	7.100	7.150
A1	0.960	1.010	1.060
A2	2.250	2.300	2.350
A3	0.000	0.050	0.100
b		0.760REF.	
b1		1.000REF.	
c		0.508REF.	
c1		0.508REF.	
D	6.550	6.600	6.650
D1	5.220	5.320	5.420
E	0.950	1.000	1.050
E1	9.700	9.900	10.100
E2	6.050	6.100	6.150
e		2.286BSC	
e1		4.572REF.	
L	2.650	2.800	2.950
L1	0.700	0.800	0.900
θ1		7° REF.	
R		0.250REF.	

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