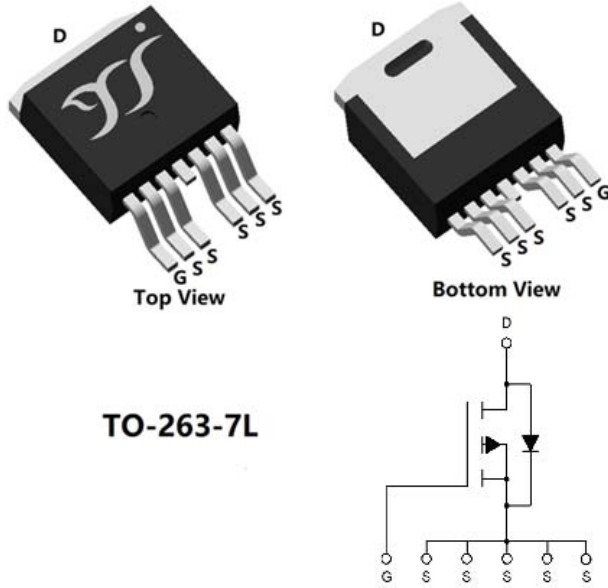


P-Channel Enhancement Mode Field Effect Transistor



TO-263-7L

Product Summary

• V_{DS}	-40V
• I_D	-231A
• $R_{DS(ON)}$ (at $V_{GS}=-10V$)	$<2.4m\Omega$
• $R_{DS(ON)}$ (at $V_{GS}=-4.5V$)	$<3.6m\Omega$
• 100% EAS Tested	
• 100% ∇V_{DS} Tested	
• ESD Level(HBM)	H3A

General Description

- Excellent package for heat dissipation
- High density cell design for low $R_{DS(ON)}$
- Moisture Sensitivity Level 1
- Epoxy Meets UL 94 V-0 Flammability Rating
- Halogen Free
- Part no. with suffix "Q" means AEC-Q101 qualified

Applications

- Automotive electronics
- Audio equipment
- Battery reverse protection

Limiting Values

Parameter	Conditions		Symbol	Min	Max	Unit
Drain-source Voltage			V_{DS}	-	-40	V
Gate-source Voltage (Note 1)			V_{GS}	-20	20	
Continuous Drain Current (Note 2,3)	Steady-State	$T_A=25^{\circ}C, V_{GS}=-10V$	I_D	-	-30.8	A
		$T_A=100^{\circ}C, V_{GS}=-10V$		-	-21.8	
Continuous Drain Current (Note 2,4)	Steady-State	$T_C=25^{\circ}C, V_{GS}=-10V, \text{Chip limitation}$		-	-231	
		$T_C=100^{\circ}C, V_{GS}=-10V$		-	-163	
Pulsed Drain Current	$T_C=25^{\circ}C, t_p \leq 10\mu s$		I_{DM}	-	-924	
Maximum Body-Diode Continuous Current	$T_C=25^{\circ}C$		I_S		-171	
Avalanche Energy (non-repetitive)	$T_J=25^{\circ}C, V_G=-10V, R_G=25\Omega, L=0.5mH, I_{AS}=-52.8A$		EAS	-	696.9	mJ
Total Power Dissipation (Note 2,3)	Steady-State	$T_A=25^{\circ}C$	P_D	-	3.6	W
		$T_A=100^{\circ}C$		-	1.8	
Total Power Dissipation (Note 2,4)	Steady-State	$T_C=25^{\circ}C$		-	205	
		$T_C=100^{\circ}C$		-	102	
Junction and Storage Temperature Range			T_J, T_{STG}	-55	175	$^{\circ}C$

Thermal Resistance

Parameter		Symbol	Typ	Max	Units
Thermal Resistance Junction-to-Ambient (Note 3)	Steady-State	$R_{\theta JA}$	-	41	$^{\circ}C/W$
Thermal Resistance Junction-to-Case	Steady-State	$R_{\theta JC}$	-	0.73	



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■ Electrical Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Static Parameter						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=-1mA, T_j=25^{\circ}C$	-40	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=-40V, V_{GS}=0V, T_j=25^{\circ}C$	-	-	-1	μA
		$V_{DS}=-40V, V_{GS}=0V, T_j=100^{\circ}C$	-	-	-100	
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V, T_j=25^{\circ}C$	-	-	± 100	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A, T_j=25^{\circ}C$	-1	-1.6	-2.2	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-50A, T_j=25^{\circ}C$	-	1.75	2.4	m Ω
		$V_{GS}=-4.5V, I_D=-25A, T_j=25^{\circ}C$	-	2.4	3.6	m Ω
Diode Forward Voltage	V_{SD}	$I_S=-50A, V_{GS}=0V, T_j=25^{\circ}C$	-	-0.81	-1.2	V
Gate Resistance	R_G	$f=1MHz, T_j=25^{\circ}C$	-	4.1	-	Ω
Dynamic Parameters						
Input Capacitance	C_{iss}	$V_{DS}=-20V, V_{GS}=0V, f=1MHz, T_j=25^{\circ}C$	-	7868	-	pF
Output Capacitance	C_{oss}		-	4657	-	
Reverse Transfer Capacitance	C_{rss}		-	228	-	
Switching Parameters						
Total Gate Charge	Q_g	$V_{GS}=-10V, V_{DS}=-20V, I_D=-50A, T_j=25^{\circ}C$	-	142	-	nC
Gate-Source Charge	Q_{gs}		-	21	-	
Gate-Drain Charge	Q_{gd}		-	27	-	
Reverse Recovery Charge	Q_{rr}	$I_F=-50A, di/dt=100A/\mu s, V_{GS}=0V, V_R=-20V, T_j=25^{\circ}C$	-	111	-	nC
Reverse Recovery Time	t_{rr}		-	67	-	ns
Turn-on Delay Time	$t_{D(on)}$	$V_{GS}=-10V, V_{DS}=-20V, I_D=-50A, R_{GEN}=3\Omega, T_j=25^{\circ}C$	-	17	-	ns
Turn-on Rise Time	t_r		-	169	-	
Turn-off Delay Time	$t_{D(off)}$		-	163	-	
Turn-off Fall Time	t_f		-	181	-	

Note:

- $V_{GS}=-16V/+5V$ according AEC-Q101 at $T_j=175^{\circ}C$.
- The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
- The value of $R_{\theta JA}$ is measured with the device mounted on the 40mm*40mm*1.1mm single layer FR-4 PCB board with 1 in² pad of 2oz. Copper, in the still air environment with $T_A=25^{\circ}C$. The maximum allowed junction temperature of 175 $^{\circ}C$. The value in any given application depends on the user's specific board design.
- Thermal resistance from junction to soldering point (on the exposed drain pad).



■ Typical Electrical and Thermal Characteristics Diagrams

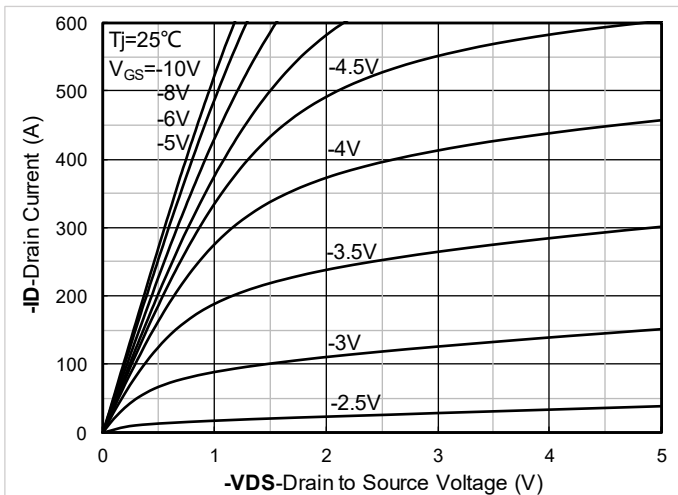


Figure 1. Output Characteristics; typical values

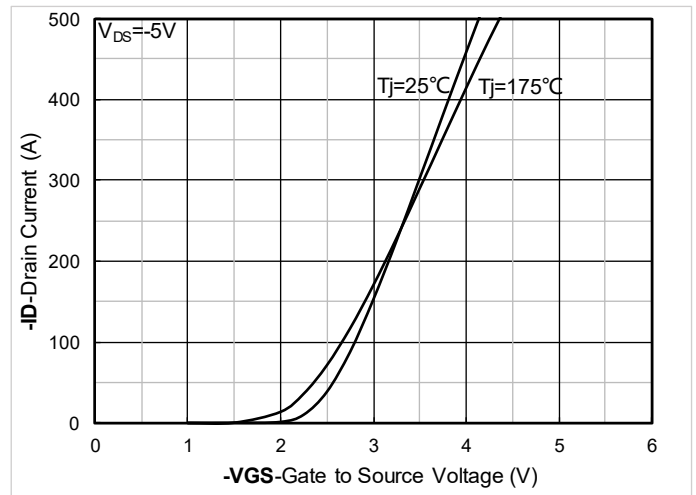


Figure 2. Transfer Characteristics; typical values

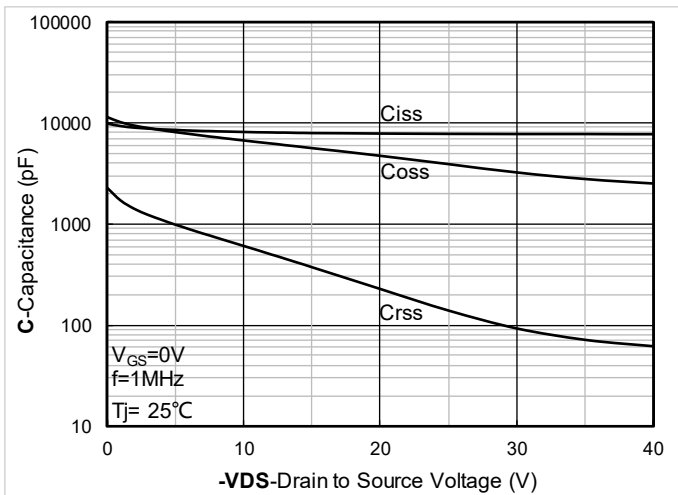


Figure 3. Capacitance Characteristics; typical values

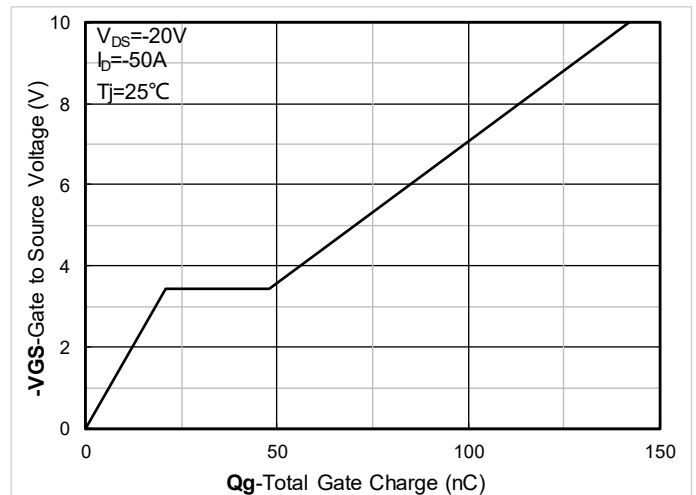


Figure 4. Gate Charge; typical values

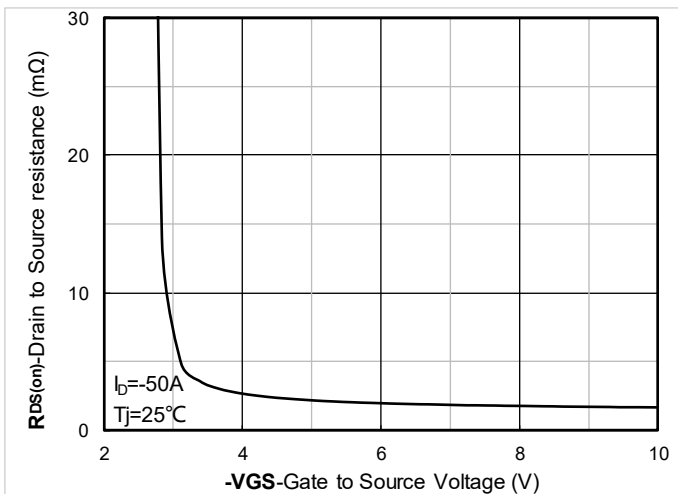


Figure 5. On-Resistance vs. Gate to Source Voltage; typical values

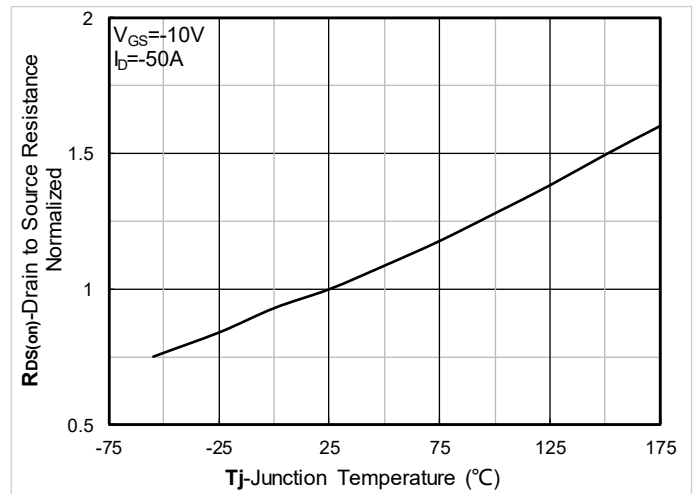


Figure 6. Normalized On-Resistance



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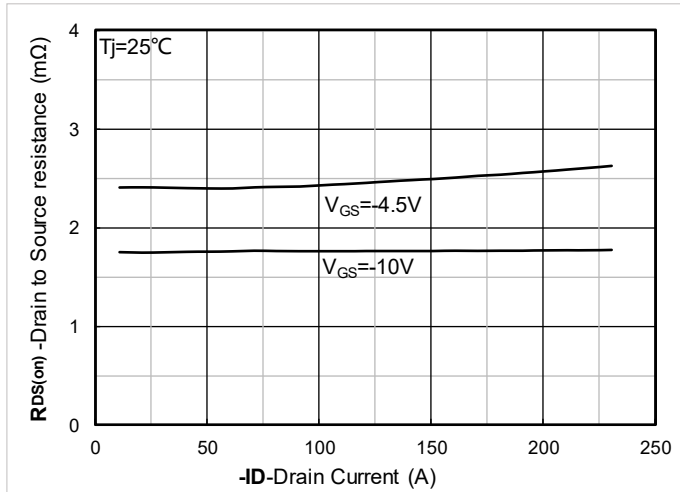


Figure 7. $R_{DS(on)}$ vs. Drain Current; typical values

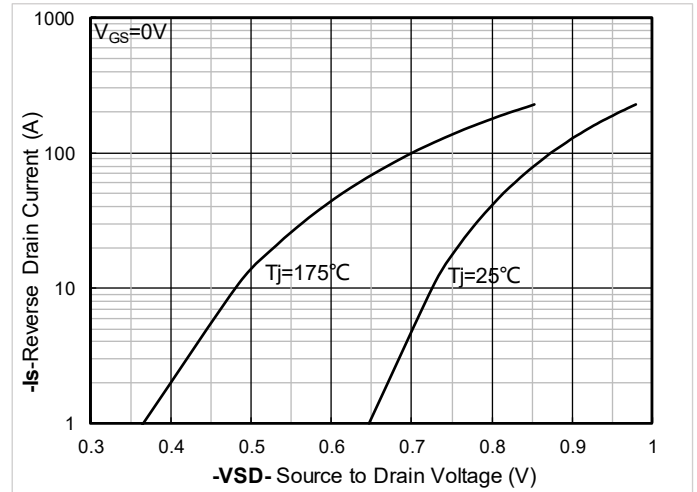


Figure 8. Forward characteristics of reverse diode; typical values

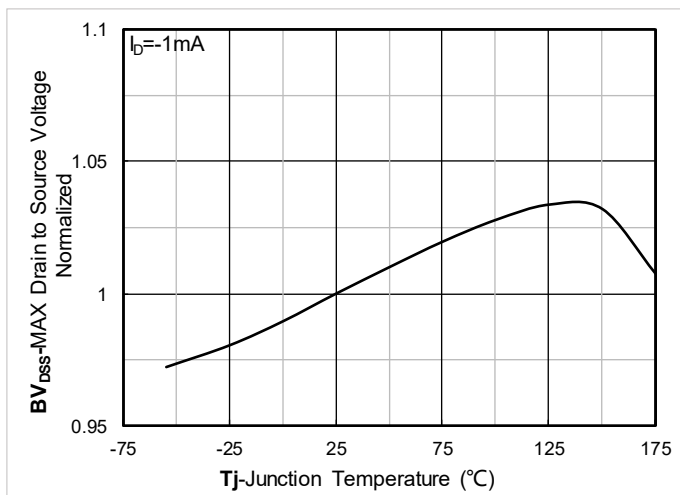


Figure 9. Normalized breakdown voltage

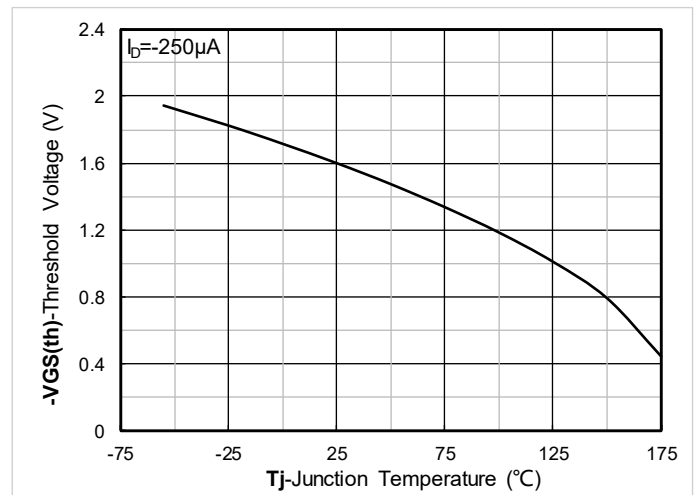


Figure 10. Gate Threshold voltage; typical values

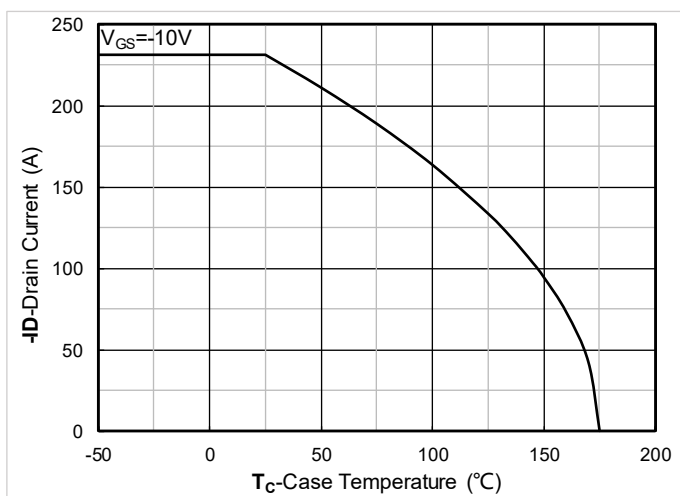


Figure 11. Current dissipation

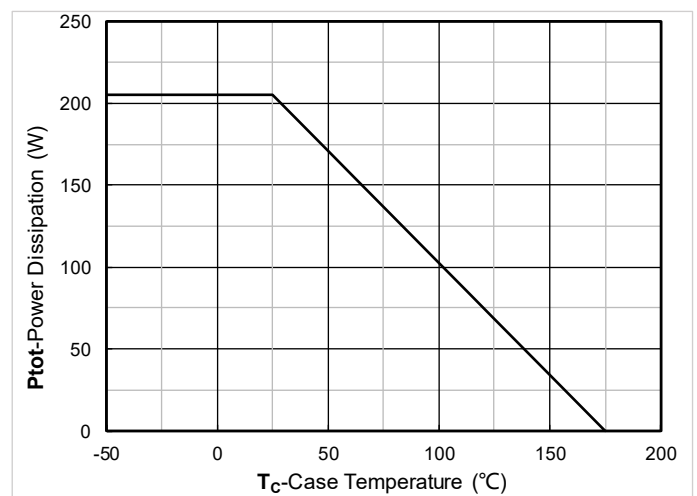


Figure 12. Power dissipation

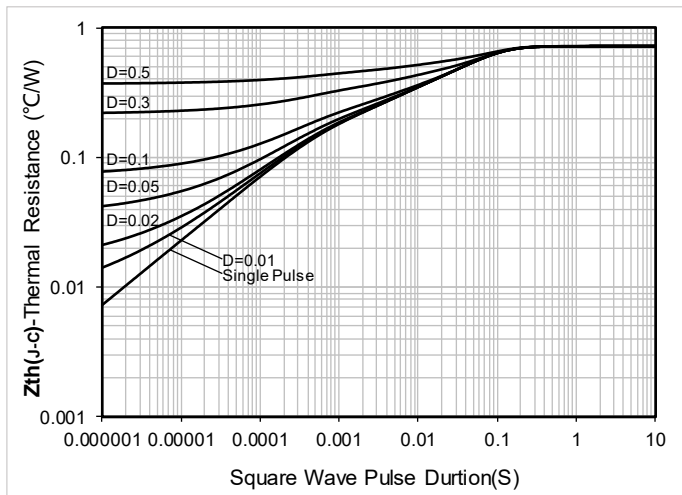


Figure 13. Maximum Transient Thermal Impedance

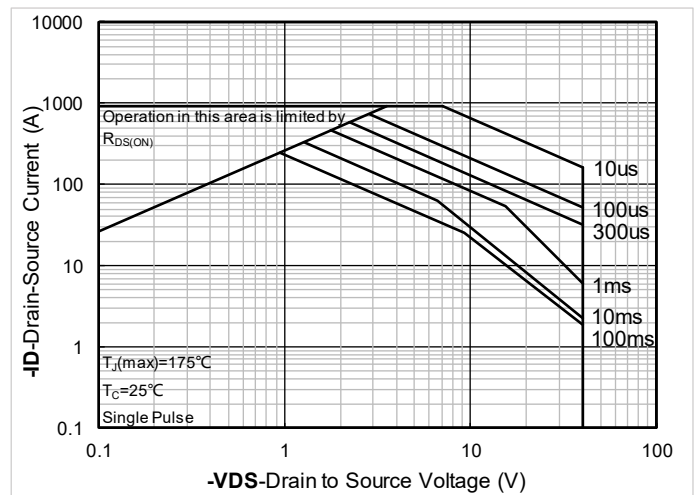
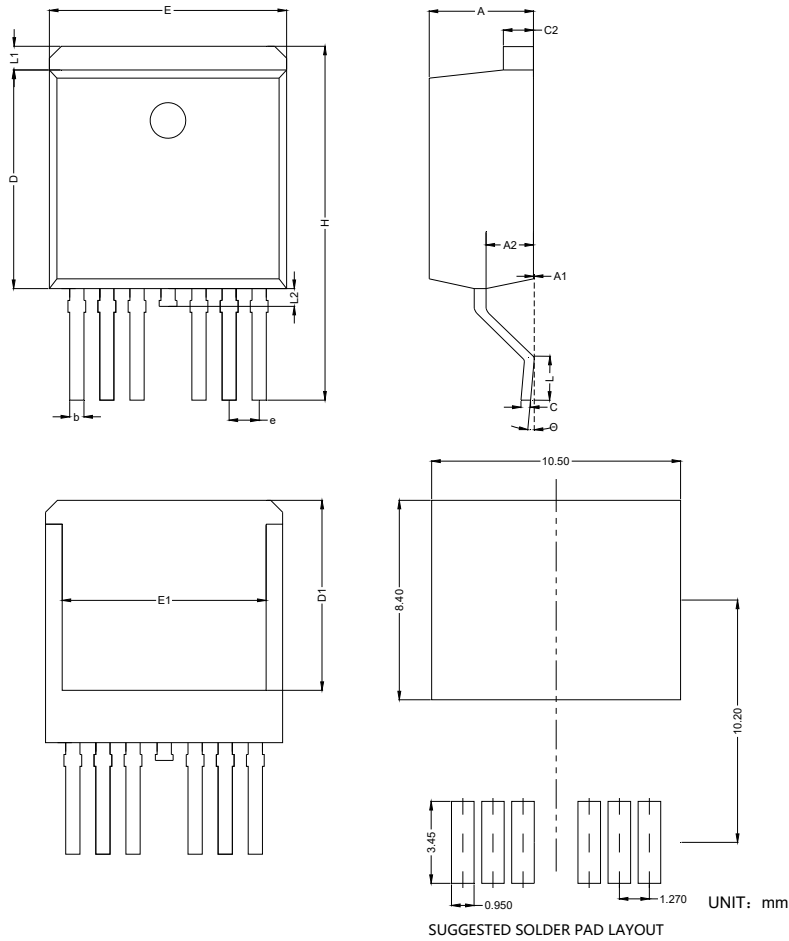


Figure 14. Safe Operation Area



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■ TO-263-7L-B Package information



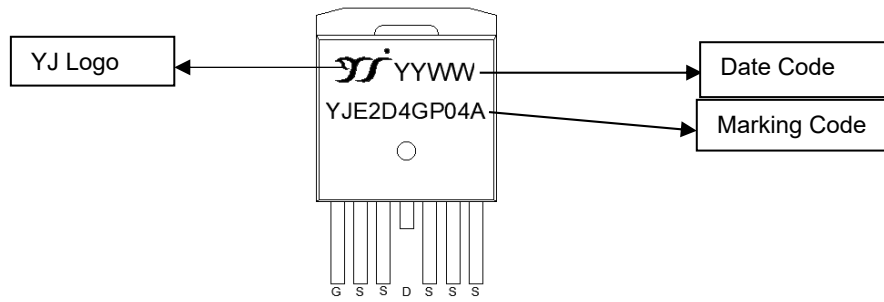
SYMBOL	DIMENSIONS			
	INCHES		Millimeter	
	MIN.	MAX.	MIN.	MAX.
A	0.169	0.185	4.300	4.700
A1	-	0.010	-	0.250
A2	0.087	0.102	2.200	2.600
b	0.020	0.028	0.500	0.700
c	0.018	0.024	0.450	0.600
C2	0.047	0.053	1.200	1.350
D	0.354	0.370	9.000	9.400
D1	0.307	0.323	7.800	8.200
E	0.386	0.402	9.800	10.200
E1	0.331	0.346	8.400	8.800
e	0.050		1.27 BSC	
L1	0.035	0.043	0.900	1.100
L2	0.034	0.045	0.850	1.150
H	0.575	0.625	14.610	15.880
θ	0°	8°	0°	8°

NOTE:
1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
2. TOLERANCE 0.1mm UNLESS OTHERWISE SPECIFIED.
3. THE PAD LAYOUT IS FOR REFERENCE PURPOSES ONLY.



YJE2D4GP04AHQ

■ Marking Information



Note:

1. All marking is at middle of the product body
2. All marking is in laser printing
3. YJE2D4GP04A is marking code, YYWW is date code, "YY" is year, "WW" is week
4. Body color: Black



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