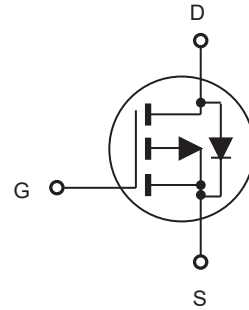


## P-Channel Enhancement Mode Field Effect Transistor

### FEATURES

- -40V, -89A,  $R_{DS(ON)} = 7.1m\Omega$  @  $V_{GS} = -10V$ .  
 $R_{DS(ON)} = 11m\Omega$  @  $V_{GS} = -4.5V$ .
- Super high dense cell design for extremely low  $R_{DS(ON)}$ .
- High power and current handling capability.
- RoHS compliant.
- TO-220 & TO-263 package.



### ABSOLUTE MAXIMUM RATINGS $T_C = 25^\circ\text{C}$ unless otherwise noted

Parameter	Symbol	Limit	Units
Drain-Source Voltage	$V_{DS}$	-40	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous @ $T_C = 25^\circ\text{C}$ @ $T_C = 100^\circ\text{C}$	$I_D$	-89	A
		-56	A
Drain Current-Pulsed <sup>a</sup>	$I_{DM}$	-356	A
Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$ - Derate above $25^\circ\text{C}$	$P_D$	89	W
		0.71	W/ $^\circ\text{C}$
Single Pulsed Avalanche Energy <sup>d</sup>	$E_{AS}$	338	mJ
Single Pulsed Avalanche Current <sup>d</sup>	$I_{AS}$	26	A
Operating and Store Temperature Range	$T_J, T_{stg}$	-55 to 150	$^\circ\text{C}$

### Thermal Characteristics

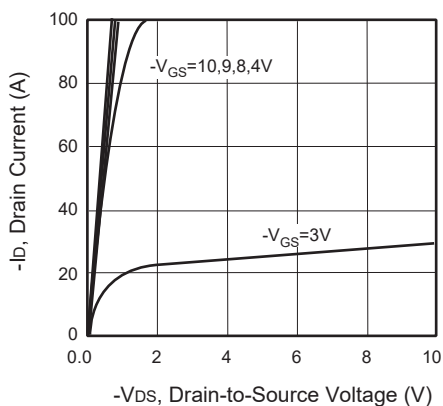
Parameter	Symbol	Limit	Units
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.4	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	62.5	$^\circ\text{C/W}$



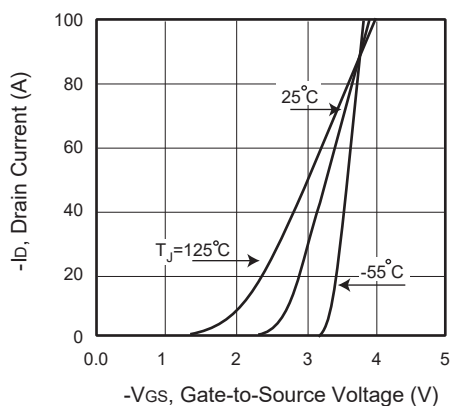
# CEP90P04/CEB90P04

## Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted

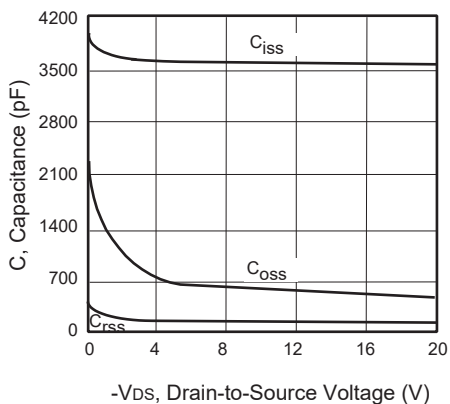
Parameter	Symbol	Test Condition	Min	Typ	Max	Units
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0V, I_D = -250\mu A$	-40			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -40V, V_{GS} = 0V$			-1	$\mu A$
Gate Body Leakage Current, Forward	$I_{GSSF}$	$V_{GS} = 20V, V_{DS} = 0V$			100	nA
Gate Body Leakage Current, Reverse	$I_{GSSR}$	$V_{GS} = -20V, V_{DS} = 0V$			-100	nA
<b>On Characteristics<sup>b</sup></b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}, I_D = -250\mu A$	-1		-3	V
Static Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = -10V, I_D = -20A$		5.9	7.1	$m\Omega$
		$V_{GS} = -4.5V, I_D = -20A$		8	11	$m\Omega$
<b>Dynamic Characteristics<sup>c</sup></b>						
Input Capacitance	$C_{iss}$	$V_{DS} = -20V, V_{GS} = 0V, f = 1.0\text{ MHz}$		3585		pF
Output Capacitance	$C_{oss}$			540		pF
Reverse Transfer Capacitance	$C_{rss}$			170		pF
<b>Switching Characteristics<sup>c</sup></b>						
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -20V, I_D = -1A, V_{GS} = -10V, R_{GEN} = 6\Omega$		36		ns
Turn-On Rise Time	$t_r$			20		ns
Turn-Off Delay Time	$t_{d(off)}$			245		ns
Turn-Off Fall Time	$t_f$			64		ns
Total Gate Charge	$Q_g$	$V_{DS} = -20V, I_D = -20A, V_{GS} = -4.5V$		54		nC
Gate-Source Charge	$Q_{gs}$			18		nC
Gate-Drain Charge	$Q_{gd}$			28		nC
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
Drain-Source Diode Forward Current	$I_S$				-68	A
Drain-Source Diode Forward Voltage <sup>b</sup>	$V_{SD}$	$V_{GS} = 0V, I_S = -20A$			-1.3	V
<b>Notes :</b> a.Repetitive Rating : Pulse width limited by maximum junction temperature. b.Pulse Test : Pulse Width $\leq 300\mu s$ , Duty Cycle $\leq 2\%$ . c.Guaranteed by design, not subject to production testing. d.L = 1mH, $I_{AS} = 26A, V_{DD} = 24V, R_G = 25\Omega$ , Starting $T_J = 25^\circ\text{C}$						



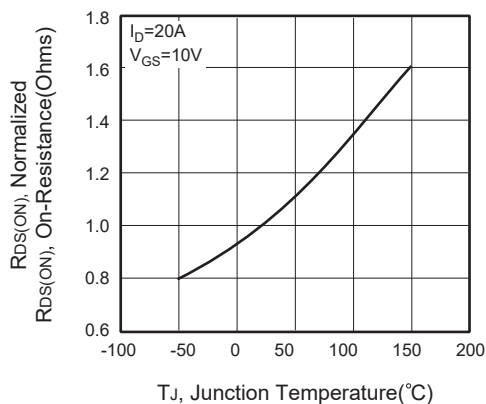
**Figure 1. Output Characteristics**



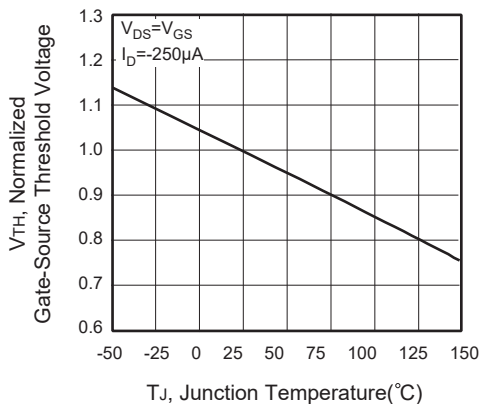
**Figure 2. Transfer Characteristics**



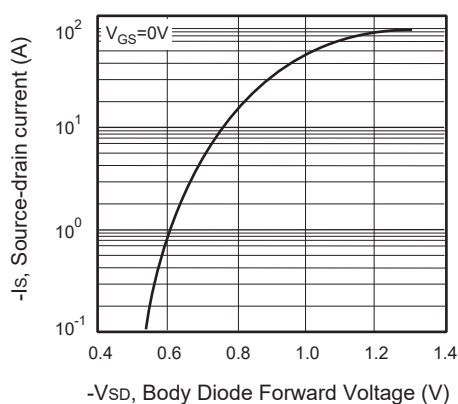
**Figure 3. Capacitance**



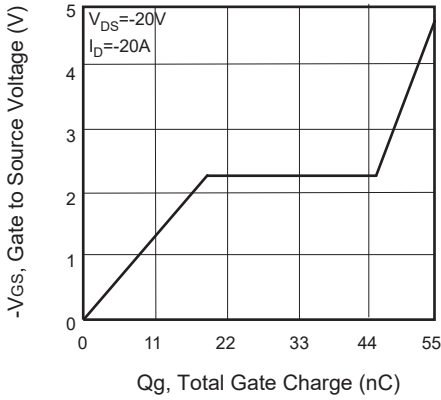
**Figure 4. On-Resistance Variation with Temperature**



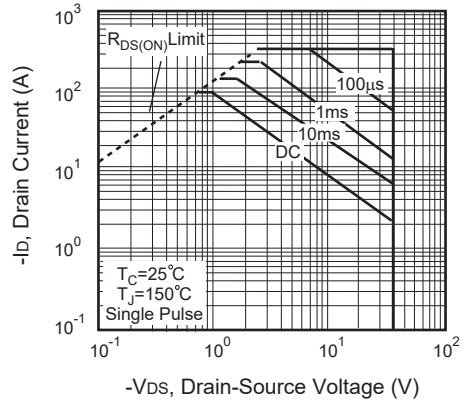
**Figure 5. Gate Threshold Variation with Temperature**



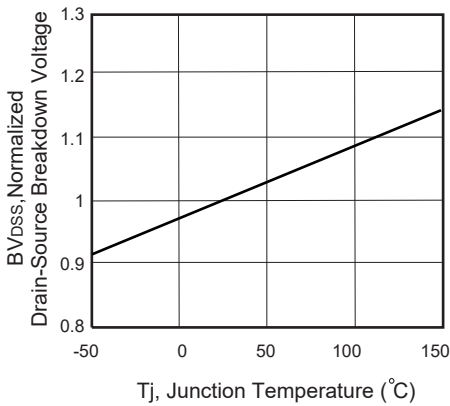
**Figure 6. Body Diode Forward Voltage Variation with Source Current**



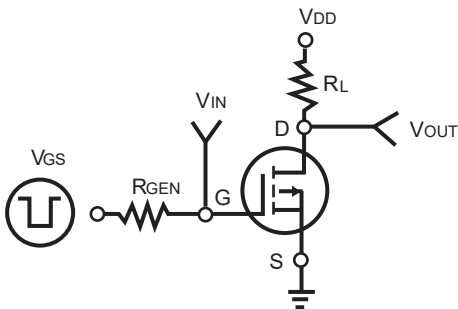
**Figure 7. Gate Charge**



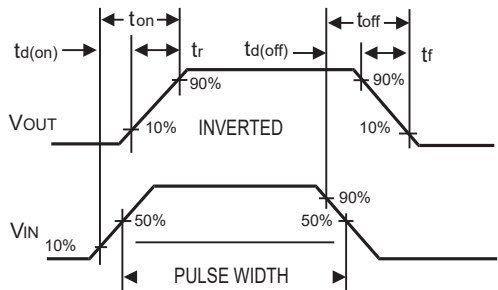
**Figure 8. Maximum Safe Operating Area**



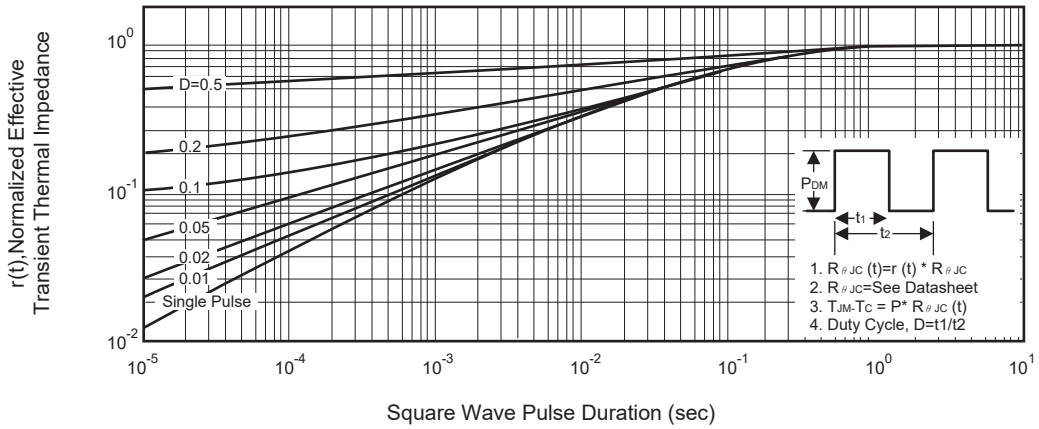
**Figure 9. Breakdown Voltage Variation VS Temperature**



**Figure 10. Switching Test Circuit**



**Figure 11. Switching Waveforms**



**Figure 12. Normalized Thermal Transient Impedance Curve**